Exploring Research Engagement with China
Opportunities and Challenges
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This report constitutes the draft public report for a study commissioned by the British Embassy Beijing, on behalf of the UK Foreign, Commonwealth and Development Office (FCDO). The study was conducted between November 2021 and February 2022 and had three core research objectives:

1. Improve the UK government and wider understanding of how and why UK academics engage with China on joint research activities.
2. Better understand how UK research organisations manage any resulting risks.
3. Inform ongoing efforts by the UK government and the science and technology community to help navigate this complex landscape.

This report provides an analysis of academic collaboration between research organisations in the UK and China. It further captures the findings of a series of interviews and surveys targeting UK-based academics and research administrators to explore their perceptions of risk, their motivations for forming and maintaining partnerships with Chinese organisations, and good practices for managing resulting risks. This report also presents a series of identified good practices that could be adopted by UK research organisations for setting up and managing their partnerships with China, as well as sets of policy recommendations for the UK government. These good practices and recommendations aim to cumulatively ensure that the benefits of international research partnerships, as well as the building of key skills capacities, the conditions for success and peer-to-peer networks, can be achieved while mitigating identified risks through the transfer of institutional knowledge.

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<th>Description</th>
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<tbody>
<tr>
<td>AHRC</td>
<td>Arts and Humanities Research Council</td>
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<tr>
<td>BBSRC</td>
<td>Biotechnology and Biological Sciences Research Council</td>
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<tr>
<td>BEIS</td>
<td>Department for Business, Energy &amp; Industrial Strategy</td>
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<tr>
<td>CAAS</td>
<td>Chinese Academy of Agricultural Sciences</td>
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<tr>
<td>CAS</td>
<td>Chinese Academy of Sciences</td>
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<tr>
<td>CASS</td>
<td>Chinese Academy of Social Sciences</td>
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<tr>
<td>CAMS</td>
<td>Chinese Academy of Medical Sciences</td>
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<tr>
<td>CCP</td>
<td>Chinese Communist Party</td>
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<tr>
<td>CNCI</td>
<td>Category Normalised Citation Impact</td>
</tr>
<tr>
<td>CPNI</td>
<td>Centre for the Protection of National Infrastructure</td>
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<tr>
<td>CSL</td>
<td>Cybersecurity Law</td>
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<tr>
<td>DCMS</td>
<td>Department for Digital, Culture, Media &amp; Sport</td>
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<tr>
<td>ECL</td>
<td>Export Control Law</td>
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<tr>
<td>EPSRC</td>
<td>Engineering and Physical Sciences Research Council</td>
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<tr>
<td>FCOO</td>
<td>Foreign, Commonwealth and Development Office</td>
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<tr>
<td>FDI</td>
<td>Foreign Direct Investment</td>
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<tr>
<td>GCRF</td>
<td>Global Challenges Research Fund</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<tr>
<td>GDPR</td>
<td>General Data Protection Regulation</td>
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<tr>
<td>GII</td>
<td>Global Innovation Index</td>
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<tr>
<td>HEI</td>
<td>Higher Education Institution</td>
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<tr>
<td>IP</td>
<td>Intellectual Property</td>
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<tr>
<td>IPO</td>
<td>Intellectual Property Office</td>
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<tr>
<td>MCF</td>
<td>Military-Civil Fusion</td>
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<tr>
<td>Acronym</td>
<td>Full Form</td>
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<td>---------</td>
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<tr>
<td>MOD</td>
<td>Ministry of Defence</td>
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<tr>
<td>MOE</td>
<td>Ministry of Education</td>
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<tr>
<td>MOST</td>
<td>Ministry of Science and Technology</td>
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<tr>
<td>MRC</td>
<td>Medical Research Council</td>
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<tr>
<td>NDA</td>
<td>Non-Disclosure Agreement</td>
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<tr>
<td>NSFC</td>
<td>National Natural Science Foundation of China</td>
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<tr>
<td>ODA</td>
<td>Official Development Assistance</td>
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<tr>
<td>PIPL</td>
<td>Personal Information Protection Law</td>
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<tr>
<td>PISA</td>
<td>Programme for International Student Assessment</td>
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<tr>
<td>PLA</td>
<td>People's Liberation Army</td>
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<tr>
<td>RCAT</td>
<td>Research Collaboration Advice Team</td>
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<tr>
<td>R&amp;D</td>
<td>Research and Development</td>
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<tr>
<td>R&amp;I</td>
<td>Research and Innovation</td>
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<tr>
<td>RQs</td>
<td>Research Questions</td>
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<tr>
<td>S&amp;T</td>
<td>Science and Technology</td>
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<tr>
<td>STEM</td>
<td>Science, Technology, Engineering and Mathematics</td>
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<tr>
<td>TRL</td>
<td>Technology Readiness Levels</td>
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<tr>
<td>UKRI</td>
<td>UK Research and Innovation</td>
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<tr>
<td>UUK</td>
<td>Universities UK</td>
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<tr>
<td>UUKi</td>
<td>Universities UK International</td>
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While all these individuals have made important and valued contributions to this study, any and all errors contained in this report remain the sole responsibility of the authors.
Introduction

This introductory chapter provides a brief outline of the study background, its purpose, its research approach, as well as an overview of the structure of this report.

1.1. Research collaboration between UK and China has always been complex, and even more so in a heightened strategic context

Research collaboration with China has always been complex for UK academics, because of several barriers to entry. Most notably, cultural and language gaps between UK and Chinese researchers can often lead to miscommunication. Geographical distance and time differences can complicate collaborative working processes. Additionally, differences in regulation as well as research and innovation (R&I) systems between the two countries can complicate the initiation and continuation of research collaboration activities.

On top of these core difficulties in establishing productive UK-China collaboration, new and disruptive challenges are rising to the fore today, making UK academic collaboration with China even more uncertain. The UK’s so-called ‘golden era’ of diplomatic relations with China (2014–2019) has drawn to a close, as an increasingly assertive China has conflicted with the strategic interests and values of the UK, as well as its allies and partners. Rising geopolitical tensions as a result of these challenges are leading some politicians and commentators to call for the UK to disengage and emulate countries like Australia and the US in introducing strict security measures regulating collaborations with China.

These perceptions have to be understood in light of the publication of China’s Military-Civil Fusion (MCF) strategy, which aims to support China in developing the most advanced military in the world, through closer integration of Chinese civilian and military Research and Development (R&D) ecosystems. The existence of the MCF strategy thereby undermines the credibility of any claims that researchers will be able to collaborate only with civil branches of Chinese companies and universities, and raises concerns over second and third order effects of information sharing.

1 Johnson et al. (2021).
2 Wang et al. (2020).
3 Tylecote & Clark (2021).
4 US Department of State (N.d.).
5 Tylecote & Clark (2021); Changyuan & Yan (2019).
even though not all UK-China research has military application.

Calls to disengage with China on R&I must also be understood against concerns over forced technology transfer and Intellectual Property (IP) rights. Since reform and opening up, China has used legal methods such as Foreign Direct Investment (FDI), joint ventures and licensing arrangements to gain access to foreign IP, often with the consent of foreign companies interested in accessing the Chinese market in return. However, China has also engaged in illegal activities such as cyber espionage and IP theft to acquire technology. In this case, research ecosystems have proven to be vulnerable to illegal technology transfer. In 2019, for example, the Centre for the Protection of National Infrastructure (CPNI) issued a warning that hostile state actors were targeting researchers to steal IP in order to ‘help their own military, commercial and authoritarian interests’. This poses questions about the potential for dual-use or IP theft in UK-China research collaboration, and only further heightens tensions around the topic.

1.2. Despite these challenges, the UK-China research ecosystem is heavily integrated and offers clear benefits

Despite these mounting challenges, there are clear benefits to the UK’s collaboration with Chinese partners. Research collaboration with China is first and foremost economically valuable for the UK with Chinese funding and student fees bringing significant financial gains to the UK research community. In 2019, for example, the flow of full-time Chinese higher education students contributed £3.7 billion to the UK higher education sector. Furthermore, at least 16 UK universities receive over a fifth of their total student income from Chinese students. These figures can help the UK higher education sector to cross-subsidise loss-making courses with the revenue gained from Chinese students, meaning that the UK’s academic excellence is in part facilitated by the integration of Chinese and UK research ecosystems.

UK-China collaboration also helps UK institutions to produce high-quality research outputs and furthers the global leadership of the UK research ecosystem. Particularly in the fields of Science and Technology (S&T), Chinese investments in UK R&D have translated into world-leading research centres that bring together academics and scientists at the top of their fields.

Academic collaboration with China has moreover contributed to producing innovative and impactful research with notable economic and social benefits. For example, UK-China research collaboration funded by the UK Research and Innovation (UKRI) has led to developments in medical and rehabilitation robots and 3D modelling of drug-resistant
bacteria, while collaboration funded by the Global Challenges Research Fund (GCRF) has supported research on environmental change and sustainable food systems.13

In many ways, therefore, deepening UK-China research collaboration supports the UK government’s R&D goals and allows both countries to work together on global challenges – as envisioned in the Integrated Review. Supporting the research sector is a key part of the UK government’s Research and Development Roadmap, which commits to ‘strengthen[ing] science, research and innovation across the UK’ and to increasing UK investment in R&D to 2.4 per cent of gross domestic product (GDP) by 2027.14 The Roadmap also highlights that world-class research is part of an ‘interconnected system... locally, nationally, internationally’.15 The UK research community is also committed to open science, which entails the exchange of fundamental scientific principles to drive R&I forward.16 As such, the deep level of existing UK-China collaboration and the opportunities it brings make decoupling both difficult and undesirable.

1.3. The FCDO commissioned RAND to help navigate this landscape by improving understanding of UK-China research collaboration

A small but growing body of literature has come to explore the complexities of UK-China research relationship and related tensions between economic and security implications.17 However, while clearly valuable, much of the existing literature either does not include primary qualitative research or does so only on singular aspects of research relations. The rich qualitative insights gained from interviewing highly experienced practitioners have largely been absent from holistic studies into UK-China research collaboration so far.18

In this context, the British Embassy Beijing, on behalf of the Foreign, Commonwealth and Development Office (FCDO), commissioned RAND Europe to contribute towards filling this crucial evidence gap and conduct an independent, evidence-based and mixed-method study into UK academics’ research engagement with China. Specifically, the study seeks to:

- Improve the UK government and wider understanding of how and why UK academics engage with China on joint research activities.
- Better understand how UK research organisations manage any resulting risk.
- Inform ongoing efforts by the UK government and the HEI community to help navigate this complex landscape, given intensifying global competition over S&T and the risks that can be associated with cross-border research collaborations.

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16 Johnson et al. (2021).
17 Johnson et al. (2021); Tylecote & Clark (2021).
18 To the best of our knowledge, the Higher Education Policy Institute paper published on 31 March 2022 is the only exception. See: Natzler (2022).
To this end, the study will focus on addressing the following research questions (RQs):

- **RQ1**: What is the experience of UK academics attempting to conduct research in China/with Chinese partners?
- **RQ2**: What is considered best practice for creating and managing UK-China partnerships to deliver high-quality research?
- **RQ3**: How do UK academics and research institutions manage any potential risk from such engagements?
- **RQ4**: What gaps and challenges can the UK government help mitigate?
- **RQ5**: What are the recommendations around approaches and tools for engagement?
- **RQ6**: What are the identified opportunities and directions for future collaboration?

To achieve these objectives, the RAND study team adopted a mixed-methods approach divided in three phases, which are summarised in Figure 1.1 (for further information on our methodological approach, please see Annex A).

**Figure 1.1 Summary of the research approach**

- **Phase 1**: Taking stock of existing evidence
  - Literature review of bibliometric studies
  - Literature review of benefits and risks

- **Phase 2**: Gathering new evidence
  - Update of the British Embassy database of UK-China joint research centres
  - 40 interviews with UK-based academics and support services from 34 UK research organisations
  - An asynchronous survey gathering 43 responses from 25 UK research organisations

- **Phase 3**: Analysing data and formulating recommendations
  - Network analysis of UK-China joint research centres
  - Desk-based analysis and synthesis
  - Synthesis and recommendations external workshop

Source: RAND Europe.
1.4. The research activities conducted are subject to limitations

The activities conducted and resulting findings are, however, subject to a number of limitations that should be kept in mind when reading this report, including:

- **Limited ability to triangulate emerging findings:** With support from the British Embassy Beijing, the study team compiled and refined an original database of 156 UK-China joint research centres. Our network analysis of this database formed the core of our analysis on the breadth and depth of UK-China research collaboration (see Section 2.5) and revealed new findings on the discipline and geographical concentration as well as institution-to-institution ties linking UK and Chinese academic ecosystems. Conscious that an analysis of joint research centres only provides a partial picture of research collaboration, the study team triangulated emerging findings wherever possible with available bibliometric literature on other outputs of UK-China research collaboration. However, in many instances, lack of further evidence prevented the corroboration and validation of our emerging findings. As such, these findings should be bounded and further studies on institutional links and output measures of UK-China research collaboration after 2019 should be conducted to advance knowledge of the breadth and depth of UK-China research collaboration.

- **Exhaustiveness of the database on UK-China joint research centres:** Data on joint research centres was gathered through a review of open-source literature and relevant government-furnished information provided to the study team by the British Embassy Beijing. However, limited resources prevented the compilation of a fully comprehensive partnership database. The partnership data presented is therefore an indication of the joint centre links between UK and Chinese organisations based on available data.

- **Stakeholder response bias:** The study team conducted 40 semi-structured interviews and received 43 full survey responses from UK research organisations and academics across 51 UK-based institutions. Given the complexity and sensitivity of the topic, some subsections of the UK research community may have felt more inclined to participate in our stakeholder consultations than others. To mitigate the risk of response bias, the study team sought a diversity of views from different academic institutions, disciplines and levels of engagement with China (see Table A.3), and caveated findings where relevant.

- **Statistical representation of the population consulted:** Due to limited resources, the study team adopted a qualitative approach to stakeholder consultation, focused on capturing the breadth of lived experiences from UK research organisations and academics working with China through a survey and semi-structured interviews. The study team conducted 40 semi-structured interviews and received 43 full survey responses from UK research organisations and academics across 51 UK-based institutions. While these consultations provided valuable insights into the working of UK-China research collaboration, these views do not represent the UK research community in a statistical sense. Moreover, the methodological approach chosen prevented the study team from capturing the full range of complex interdependencies and establishing causal relationships.
relationships between the types of research institutions interviewed/surveyed and their experience of engagement with China.

- **Time lags between lived experience and the stakeholder consultation period:** The study team conducted stakeholder interviews between 6 December 2021 and 17 January 2022, and kept the survey open for responses between 6 December 2021 and 16 January 2022. During this period, the study collected the insights of UK research organisations and academics engaged in joint research activities with China. Many of these insights are grounded in the present, as evidenced by the mention of challenges related to COVID-19 and the deterioration in UK-China research collaboration. However, some of the experiences reported, and especially insights on the straightforward nature of setting up joint collaborative activities with China, are based upon the recollection of events that may have happened in an era with warmer diplomatic relations.

1.5. **This report presents the core findings of the commissioned study**

This report presents the draft deliverable for this RAND study. The core chapters cover the following:

- **Chapter 2 – Exploring the breadth and depth of research collaboration between the UK and China:** This chapter focuses on understanding how UK academics engage with China on joint research and exploring the breadth and depth of research collaboration ties linking the UK and China.

- **Chapter 3 – Understanding the drivers and benefits of UK-China research collaboration: a UK perspective:** This chapter provides an overview of the drivers motivating UK research organisations and academics consulted for this study to engage in joint research collaboration with China, and a summary of the benefits and opportunities they have experienced when engaging with China.

- **Chapter 4 – Understanding the challenges and risks of UK-China research collaboration: a UK perspective:** This chapter provides an overview of the barriers, challenges and risks UK research organisations and academics consulted for this study have experienced when engaging in joint research collaboration with China.

- **Chapter 5 – Managing challenges and risks stemming from UK-China research engagements:** This chapter provides an overview of how UK research organisations and academics currently approach risk mitigation in their collaboration with China.

- **Chapter 6 – Conclusion:** This chapter presents good practices for UK research organisations seeking to create and manage UK-China research partnerships, and sets out policy recommendations around gaps and challenges identified in this study that the UK government could help mitigate and avenues for future collaboration.

In addition, a full bibliography is provided, along with a methodological annex that contains a list of the interviewees consulted during the research.

The terms ‘UK research organisations’ and ‘UK academic institutions’ are used interchangeably to speak of institutions in the UK research community. The terms ‘UK researchers’ and ‘UK academics’ are also used interchangeably to speak of individuals in the UK research community conducting research activities.
Exploring the breadth and depth of research collaboration between the UK and China

This chapter focuses on understanding how UK academics engage with China on joint research and exploring the breadth and depth of research collaboration ties linking the UK and China. To achieve these aims, the study team conducted a literature review of bibliometric studies on UK-China research collaboration. With support from the British Embassy Beijing, the study team then compiled and refined a non-exhaustive but nonetheless comprehensive database of 156 joint UK-China research centres through targeted literature searches, stakeholder interviews and survey methods. The data was interpreted through a network analysis using Stata, as well as through network visualisation using Gephi. In doing so, this chapter provides a novel analysis of UK-China research collaboration links that have previously been approached through the lens of Chinese student number flows and impact metrics including citation count, citation impact, publication volume and patent counts. By taking a micro-level approach and considering one example of the closer, more formalised links joining the UK and China, namely joint UK-China research centres, this chapter also seeks to bring a greater granularity and nuance to the understanding of UK-China research collaboration. Despite its benefits, this analysis provides only a partial picture of research collaboration links with China and the findings below should therefore be triangulated with other metrics of research collaboration where possible, as the study team has attempted to do using findings from the literature review. Where data for triangulating emerging findings was not available, the study team has suggested avenues for future research.

The subsequent sections are based upon the following working definitions:

- **UK-China research collaboration**: Collaborative working between individuals or groups of researchers from at least one UK-based and one China-based research institution or industry, involving a range of formal joint research activities (e.g., co-supervision of PhD students, academic exchange of research staff, co-authoring of research papers) and informal research activities (e.g., exchange of ideas, conference attendance).

- **UK-China joint research centre**: A form of research partnership that involves formal agreements between at least one UK-based and one China-based research institution to conduct various collaborative activities in a physical or virtual facility, work on joint research and/or strengthen research training and build capacity in areas of mutual benefit.

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19 Tanner (2020); Johnson et al. (2021); d’Hooghe & Lammertink (2020); He (2021).
Box 1 Summary of key findings from Chapter 2

UK and Chinese research ecosystems have become increasingly integrated since the early 2000s, with increasing numbers of Chinese academics working in UK universities, growing levels of co-published academic papers and a surging number of joint UK-China research centres being established between the two countries. Metrics of research outputs in particular show that collaboration greatly flourished during the so-called ‘golden era’ in UK-China relations (2014–2019). However, some indicators are today starting to show a potential slow-down in Chinese international collaboration with the UK. Our analysis of joint UK-China research centres reveals that, starting in 2019 and continuing into 2020 and 2021, the number of newly set-up joint UK-China research centres declined. Further studies of other research outputs after 2019 are however needed to corroborate and validate this initial finding.

The increasing integration of UK and Chinese research ecosystems has been particularly skewed to S&T-based disciplines. Our analysis of the academic disciplines studied in UK-China joint research centres corroborates existing studies on co-publications and shows that the majority (78 per cent) of joint UK-China research centres focus on Science, Technology, Engineering and Mathematics (STEM) disciplines. The most common academic topic researched across all joint UK-China centres is engineering, followed by materials science and environment/ecology. A further breakdown of STEM-focused research centres into the 17 sectors identified in the National Security and Investment Act (2021) shows that synthetic biology is the most common discipline of interest for UK-China joint research centres. This broadly coincides with the seven priority sectors defined by the UK Science and Innovation Network in China in 2017. However, high levels of political focus on and funding for STEM research in China and historical academic strengths in these topics may also explain the skew of joint UK-China centres towards STEM disciplines.

Our network analysis of joint UK-China research centres further reveals that a small proportion of research organisations account for most UK-China research collaboration when measured in terms of joint centres. One-fifth of the organisations account for two-thirds of research collaboration in joint centres. The most connected organisations overall are the University of Cambridge (UK), Southeast University (China) and the University of Edinburgh (UK). Chinese institutions make up approximately two-thirds of the organisations involved in joint research centres. As there are fewer organisations in the UK that have established research links with China than the reverse, UK research organisations have a higher density of research links through joint centres than their Chinese counterparts. Seven of the top ten most connected organisations in the network analysis of joint UK-China research centres are British. Further studies of other research outputs taking an institution-based, rather than country-based, approach are needed to triangulate these findings.

An analysis of our database of joint UK-China research centres also shows that more physical research centres are located in China than the UK, and especially in coastal provinces and economically developed municipalities that are at the centre of trade and migration flows and have historically benefited from preferential fiscal policies for experimentation, creating a favourable environment for innovation. The concentration of physical facilities in China may be explained by the incentives that exist for Chinese cities and universities to host joint research centres, including financial benefits ensuing from rural land expropriation and conversion.

Ultimately, a wide range of actors are involved in funding and sponsoring UK-China research collaboration, including joint research centres. Some of these actors include the National Natural Science Foundation of China (NSFC), the Chinese Academy of Sciences (CAS), the Ministry of Science and Technology (MOST), UKRI and the British Council. This list is, however, non-exhaustive and further studies should systematically map out funding bodies and their role in UK-China research collaboration to understand the weight of each actor in this network.
2.1. The UK and Chinese research ecosystems have become increasingly integrated since the 2000s

Over the last 20 years, the UK and Chinese research ecosystems have become increasingly integrated. The number of Chinese academics working at UK universities between 2015 and 2018 grew by 20 per cent, from 5,895 Chinese academics in 2015 to more than 7,000 in 2018.\textsuperscript{20} Levels of co-published academic papers between the UK and China also increased, with China climbing the ranks from being the UK’s ninth closest collaborator in terms of frequency of international co-authored papers in 2010 to being the UK’s second closest collaborator in 2019, behind the US.\textsuperscript{21} Similarly, UK-China joint publications grew from making up one per cent of the UK’s total output in 2000 to constituting 11 per cent of the UK’s total publication output in 2019.\textsuperscript{22} And, from 2005 onwards, the citation impact score of these joint UK-China publications has become higher than the non-joint publications produced by each country individually.\textsuperscript{23} Moreover, Chinese patent applications in the UK also increased by 87.75 per cent between 2014 and 2020, with China having filed 1,647 patent applications to the UK Intellectual Property Office (IPO) in 2020 compared to 293 in 2014.\textsuperscript{24}

Our analysis of joint UK-Chinese research centres further confirms these trends, with the number of joint UK-China research centres having exponentially increased from only one established joint research centre in 2003, to approximately 153 open joint research centres in 2021 (see Figure 2.1).

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure2.1}
\caption{Aggregated number of new joint UK-China research centres established per year}
\end{figure}

Source: RAND Europe analysis.

\textsuperscript{20} Student Safety (2022).
\textsuperscript{21} Johnson et al. (2021).
\textsuperscript{22} ‘Citations are informative as they illustrate intellectual relationships between more recent and earlier work, as well as the subsequent influence of earlier work.... Raw citation counts [are normalised] by comparing the observed citation count for each individual paper with the expected average for its subject category and year of publication. The ratio (observed/expected) is referred to as category normalised citation impact (CNCI) and analyses typically report the average CNCI for a sample.’ See: Johnson et al. (2021).
\textsuperscript{23} Johnson et al. (2021).
\textsuperscript{24} Intellectual Property Office (2015); Intellectual Property Office (2020).
The UK is not the only country to have witnessed increasing levels of research cooperation with China. The number of co-authored papers between EU countries and China, for example, doubled from approximately 5,000 in 2007 to 10,000 in 2017. At the individual EU-country level, papers co-authored with Chinese researchers rose in Germany and Sweden, even though the UK seems to have witnessed the greatest relative growth in co-authored papers since 2012 (see Figure 2.2). US-China co-publications also increased from approximately 50,000 to 80,000 for US-China co-publications in the same period. Additionally, during the period 2004–2014, approximately four new joint research centres between China and France were created each year.

**Figure 2.2 Relative growth of British, German and Swedish co-publications with China**

![Graph 1. Relative growth of co-publications with China (Estimation based on STINT 2018 figures).]

Source: d’Hooghe & Lammertink (2020).

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25 Alves Dias et al. (2019).
26 French Embassy (2014).
Therefore, the deepening integration of UK and Chinese research ecosystems should be interpreted in the light of a global trend towards the internationalisation of R&I (see Figure 2.3). The proportion of internationally co-authored publications has indeed almost doubled in the past two decades, with 21 per cent of global publications internationally co-authored in 2018, compared with 11 per cent 20 years before.27

The deepening of UK and Chinese research collaboration should also be understood in the context of China’s economic expansion, increased investments in R&I, and the internationalisation of Chinese higher education.28 Over the last two decades, China has introduced a raft of S&T policies and related initiatives at the national, provincial and sectoral level to enhance its access to cutting-edge R&I. Most notably, the 2006 National Medium and Long-Term Plan for the Development of Science and Technology (2006–2020) committed the country to increasing its gross national spending on R&D as a percentage of GDP to 2.5 per cent and to becoming one of the top five countries in the world in terms of international scientific paper citations and patents.29 The 13th Five-Year Plan (2016–2020) and 14th Five-Year Plan (2021–2025) also consecutively reemphasised China’s commitment to improving its R&I, stating that the country should be a ‘leading innovative country by 2035’.30 China has thus almost tripled spending on R&D as a percentage of GDP since 2000, while also seeing GDP itself grow at around 8 to 10 per cent per annum throughout this period.31 China has moreover invested in the reform and improvement of the quality of its Higher

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28 Although ongoing reforms to curb Western influence in Chinese academia and improve educational autonomy may impact the future direction of these trends.
31 World Bank (2022).
Education Institutions (HEIs), notably through its talent programmes including the Talent Training Program 2.0 and the Thousand Talents Plan or National High-End Foreign Experts Recruitment Plan.\textsuperscript{32} As a result, Chinese research outputs have grown sharply, most notably in terms of quantity but also with increasing signs of high quality in certain areas. Since 2010, the number of Chinese scientific and research publications has grown at double the rate of the world average, and in 2018 China became the second most productive country in terms of the number of scientific papers published.\textsuperscript{33}

China has also become the world’s leader in terms of total number of annual patent filings since 2011, filing 43.4 per cent of total global patents in 2019 (1.4 million patents).\textsuperscript{34} Finally, China has also made substantial progress in terms of its human capita and wider enablers and capacity for R&I. For example, schools in China’s most prosperous regions (e.g., Beijing, the coastal areas) now lead the world in reading, mathematics and science, according to the 2018 OECD’s Programme for International Student Assessment (PISA) rankings, its dominant score of 590 for science education contrasting with 505 for the UK.\textsuperscript{35}

2.2. Some indicators, however, have started to show a potential decline in joint UK-China research collaboration starting in 2019

A more granular analysis of the date when new joint UK-China research centres were created, however, reveals that the integration of UK and Chinese research ecosystems may be starting to slow down, if not decline (see Figure 2.4). Joint UK-China research centres were first established in the early 2000s and gathered pace in the early 2010s, before reaching a peak during the so-called ‘golden era’ in UK-China relations (2014–2019). Starting in 2019 and continuing into 2020 and 2021, the number of newly set-up joint UK-China research centres however sharply declined. While 27 joint UK-China research centres were set up in 2018, this number progressively fell to 15 in 2019, 4 in 2020 and only 1 in 2021. It is unclear whether this is due the deterioration in UK-China relations in some policy areas (see Section 4.2.6), the impact of the COVID-19 pandemic (see Section 4.2.2) or a combination of both. Other unknown factors may also have been involved. In this regard, our analysis of the challenges and barriers associated with joint research collaboration between the UK and China detailed in Chapter 4 may provide further insights for explaining this sharp decline.

\textsuperscript{32} d’Hooghe & Lammertink (2020).
\textsuperscript{33} d’Hooghe & Lammertink (2020).
\textsuperscript{34} He (2021).
\textsuperscript{35} OECD (2018).
An analysis of patent applications to the IPO also shows a relative decline in the number of patent applications filed by China in 2018 and 2019. The number of patent applications filed by China steadily increased from 2014 to 2017, with 294 applications filed in 2014, 569 in 2015, 657 in 2016 and 1,078 in 2017. However, starting in 2018, this number starts to decline, with 1,006 filed in 2018 (–6.6 per cent) and 775 in 2019 (–22.9 per cent).

These figures seem to confirm the trend witnessed in our analysis of UK-China joint research centres. After this slow decline, the UK IPO witnessed a sharp surge of Chinese patent applications in 2020 (+112.5 per cent). The unavailability of data on 2021 patent applications does not permit at this point in time to confirm the direction of this trend. As such, further studies of other metrics of joint UK-China research collaboration, including analyses of UK-China co-publications after 2019, are needed to corroborate and validate these emerging findings.

2.3. The increasing integration of UK and Chinese research ecosystems has been particularly skewed to technology-based disciplines

Previous studies have found Chinese international research collaboration to be...
mainly concentrated in STEM areas. For example, UK-China research collaboration, measured in terms of co-publications, has been also predominantly concentrated in engineering and computer science. Engineering was also the most common field of research for joint US-China and EU-China co-publications, followed by other STEM subjects including biochemistry, medicine, physics and astronomy, and materials science.

Our analysis of the academic disciplines studied in joint UK-China research centres further confirms this trend. The majority (78 per cent) of joint UK-China research centres indeed focuses on STEM disciplines, while the rest specialise in non-STEM subjects (10 per cent) or multidisciplinary topics (13 per cent) (see Figure 2.5).

Some of the most common STEM disciplines studied in joint UK-China research centres include engineering (28 joint research centres), materials science (17), environment/ecology (17) and computer science (15). This broadly coincides with the seven priority sectors defined by the UK Science and Innovation Network in China in 2017, which included: agri-tech/food and water security, manufacturing and advanced materials, urbanisation, energy and environmental technologies, space and satellite applications, life sciences, and creative economy. In contrast, non-STEM disciplines with the most research centres were social science, general (10), arts and humanities (6), and economics and business (4).

When taking a different categorisation and breakdown approach of STEM-centred

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40 The definition of academic disciplines as ‘STEM’, ‘non-STEM’ or ‘multidisciplinary’ is based on the US Department of Homeland Security’s ‘STEM Designated Degree Program List’ (2016).
41 Johnson et al. (2021).
42 Alves Dias et al. (2019).
43 These numbers have been rounded to the closest decimal for clarity and presentation purposes. Non-rounded figures are: STEM subjects (77.56 per cent), non-STEM subjects (12.82 per cent) and multidisciplinary topics (9.62 per cent).
44 UK Science and Innovation Network China (2022).
Figure 2.6 Division of academic disciplines studied in joint UK-China research centres

Source: RAND Europe analysis.
research centres based on the 17 sectors identified in the National Security and Investment Act (NSIA) (2021), data shows that synthetic biology (47 joint research centres) is the most common discipline of interest for UK-China joint research centres (see Figure 2.6). It is followed by advanced materials (21), energy (15), engineering (12), artificial intelligence (8), satellite and space technologies (8), communications (4), transport (4) and data infrastructure (3). While the ‘engineering’ category is not considered one of the 17 NSIA sectors per se, several of the research centres analysed were found to operate across a range of engineering disciplines and could not therefore be categorised simply as working on one of the NSIA sectors. The ‘engineering’ category was therefore added by the study team to cover research centres working on a combination of advanced materials, advanced robotics, communications, computing hardware, data infrastructure and transport topics.

**Figure 2.7 Division of STEM disciplines studied in joint UK-China research centres into NSIA sectors**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthetic biology</td>
<td>47</td>
</tr>
<tr>
<td>Advanced Materials</td>
<td>21</td>
</tr>
<tr>
<td>Energy</td>
<td>15</td>
</tr>
<tr>
<td>Advanced Materials</td>
<td>21</td>
</tr>
<tr>
<td>Artificial intelligence</td>
<td>8</td>
</tr>
<tr>
<td>Communications</td>
<td>4</td>
</tr>
<tr>
<td>Satellite and Space Technologies</td>
<td>8</td>
</tr>
<tr>
<td>Transport</td>
<td>4</td>
</tr>
<tr>
<td>Data infrastructure</td>
<td>3</td>
</tr>
</tbody>
</table>

Source: RAND Europe analysis.

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45 The categorisation of STEM disciplines studied in research centres in these two different ways follows suggestions from government stakeholders in the interim findings workshop held by the research team. The rationale is that the breakdown by academic discipline is more useful to HEI stakeholders, whereas the breakdown by NSIA categories is more useful to government stakeholders.

One potential reason explaining the skew of joint UK-China research centres towards STEM disciplines could be China’s historical strengths and specialisation in STEM subjects.\(^{47}\) Another potential reason may be that China typically has high levels of funding available for STEM research, which would incentivise UK researchers to seek out collaboration with Chinese partners on these topics more than other areas.\(^{48}\) The skew may also be the result of strategic guidance by the Chinese government encouraging Chinese academics to pursue international collaboration in STEM disciplines.\(^ {49}\) Finally, some challenges specific to the social sciences and arts and humanities (see Section 4.2.6) may also constrain non-STEM collaboration and explain the skew towards technology-based disciplines in UK-China research collaboration.

### 2.4. A small number of research organisations account for the majority of UK-China research collaboration

Our network analysis of joint UK-China research centres reveals that, when measured in terms of joint centres, a small proportion of research organisations account for the majority of UK-China research collaboration. Out of a total of 156 existing joint UK-China research centres, involving 290 individual research institutions, government bodies and private companies, one-fifth of the organisations account for two-thirds of research collaboration in joint centres (1,124 organisation-to-organisation links out of a total of 1,762).\(^ {50}\) The levels of collaboration and interconnectedness between different research organisations in the UK and China are visualised in Figure 2.8.

The network analysis also reveals eight central network clusters of the most connected organisations. These clusters are mainly associated with larger research centres and consortia, where organisations in the centre share many of the same research links, creating ‘dense’ networks that are distinguishable from other research centre links. Organisations that are central to these clusters may either be connected to a small number of partnerships that have large numbers of members or to a more significant number of partnerships with smaller numbers of partner institutions. These institutions’ ‘centrality’ within the networks or clusters that they belong to is indicative of the total number of connections that they have with all research partners, domestic and international.

The network visualisation presented in Figure 2.8 also shows that a select number of key organisations are even more highly connected; 10 organisations out of 290 account for 16 per cent of all research collaboration.\(^ {51}\) The most connected organisations overall are the University of Cambridge (UK), Southeast University (China) and the University of

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47 Alves Dias et al. (2019); Johnson et al. (2021).
48 Alves Dias et al. (2019).
49 Johnson et al. (2021).
50 In this case, research collaboration in joint centres is measured through organisation-to-organisation links. A link is a one-to-one connection between two organisations; this could be as part of a research centre involving only two institutions, in which case this would be counted as one link, or as part of a larger consortium, in which case links would be counted for each of the one-to-one pairings of organisations that is possible within that partnership. Therefore, a research centre with four partners would have six organisation-to-organisation links. The total link volume also includes links between UK institutions, or between Chinese institutions, within joint UK-China research centres.
51 As defined through total number of organisation-to-organisation links; see explanation above.
Edinburgh (UK). They connect multiple distinct network clusters and also have links to a range of organisations outside of the main network clusters; namely, they also have a range of bilateral or trilateral partnerships. A further exploration of most connected organisations can be found in Figure 2.9 and Figure 2.10. Outside of the main network

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The exclusion of institutions such as Tsinghua and CAS from this stems from the interplay between data selection and the nature of these institutions. CAS, for example, operates as a diffuse network of affiliated research centres. This data for this network analysis draws on connections between central institutions and bodies and not between affiliations. Not only is the data regarding types of partnerships between affiliated research groups less complete, it is therefore also less reliable.
clusters, there are a range of institutions that conduct research but are not universities, such as hospitals or private companies. Figure 2.8 visually presents the collaboration of UK and Chinese research institutions through joint research centres. A description of the nine main network clusters is provided in Table 2.1.

Table 2.1 Description of the nine main network clusters of joint UK-China research centres

<table>
<thead>
<tr>
<th>Network cluster</th>
<th>Sample of institutions</th>
<th>Key institution(s)</th>
<th>Characteristics of network</th>
<th>Example/main partnerships</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>University of Leeds, University of Huddersfield, University of Sheffield, University of Bradford, University of Shanghai for Science and Technology, Sichuan University, Institute of Chemistry Beijing</td>
<td>University of Leeds, University of Sheffield</td>
<td>Most of these organisations collaborate closely with each other, but also have some more limited collaboration with other organisations that are not involved in other joint research centres.</td>
<td>UK-China Advanced Materials Institute</td>
</tr>
<tr>
<td>Light green</td>
<td>University of Birmingham, South China University of Technology, Cardiff University, University of Warwick, University of Manchester, Dalian University of Technology, University College London, Imperial College London, Harbin Institute of Technology</td>
<td>University of Manchester, University of Warwick, University of Birmingham</td>
<td>The majority of these organisations collaborate closely with each other; they also individually collaborate with other organisations that are not involved in many other joint centres.</td>
<td>UK-China University Consortium on Engineering Education and Research</td>
</tr>
<tr>
<td>Dark green</td>
<td>University of Nottingham, Shanghai Advanced Research Institute, Arts and Humanities Research Council (AHRC), Ningbo Municipal government, Yuyao District government</td>
<td>University of Nottingham</td>
<td>The majority of these organisations are connected through the University of Nottingham Ningbo.</td>
<td>University of Nottingham Ningbo</td>
</tr>
<tr>
<td>Grey</td>
<td>University of Edinburgh, University of Dundee, University of Strathclyde, Tianjin University, Southeast University, Tsinghua University, Nanjing University</td>
<td>Southeast University, Tsinghua University</td>
<td>The majority of these organisations collaborate closely with each other; they also individually collaborate with other organisations that are not involved in many other joint centres.</td>
<td>China-Scotland Signal Image Processing Research Academy</td>
</tr>
<tr>
<td>Purple</td>
<td>University of Cambridge, Chinese Academy of Agricultural Sciences, University of East Anglia, Capital Normal University, Beijing Normal University, Scotland’s Rural College</td>
<td>Equal nodes (no central institution)</td>
<td>These organisations collaborate closely with each other, but also collaborate with a range of other organisations outside the network cluster.</td>
<td>N-CIRCLE: Virtual Joint Centre for Closed-Loop Cycling of Nitrogen in Chinese Agriculture</td>
</tr>
<tr>
<td>Network cluster</td>
<td>Sample of institutions</td>
<td>Key institution(s)</td>
<td>Characteristics of network</td>
<td>Example/main partnerships</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>--------------------</td>
<td>-------------------------------------------------------------------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Light purple</td>
<td>University of Leicester, Shanghai Jiaotong University, Advanced Manufacturing Research Centre, Boeing, Brunel University, China Aerospace Science and Technology Corporation</td>
<td>Equal nodes (no central institution)</td>
<td>These organisations have relatively limited research links to each other, with most organisations collaborating with three or four other organisations in the network.</td>
<td>NISCO-UK Research Institute</td>
</tr>
<tr>
<td>Blue</td>
<td>University of Cambridge, University of Oxford, Chengdu Institute of Biology, State Key Laboratory of Phytochemistry and Plant Resources, Genentech, UKRI, Institute of Microbiology</td>
<td>Equal nodes (no central institution)</td>
<td>These organisations collaborate mainly with each other, except the universities of Oxford and Cambridge, which collaborate with a large range of other organisations.</td>
<td>Sino-UK Joint Research on Natural Compound R&amp;D</td>
</tr>
<tr>
<td>Orange</td>
<td>University of Edinburgh, UK CCS Research Centre, South China Sea Institute of Technology, NDRC, Scottish government, FCDQ, BEIS, China National Nuclear Corporation, National Nuclear Laboratory</td>
<td>Equal nodes (no central institution)</td>
<td>These organisations collaborate mainly with each other and have limited collaboration with other organisations.</td>
<td>UK-China (Guangdong) CCUS Centre</td>
</tr>
<tr>
<td>Pink</td>
<td>Imperial College London, University of Southampton, Aviation Industry Corporation of China, Beijing Aircraft Technology Research Institute, Huawei, University of Hong Kong</td>
<td>Imperial College London</td>
<td>These organisations are mainly connected through Imperial College London.</td>
<td>BIAM-Imperial Centre for Materials Characterisation, Processing and Modelling</td>
</tr>
</tbody>
</table>

Source: RAND Europe analysis.

### 2.5. UK research organisations are at the centre of UK-China research centres networks

Seven of the top ten most connected organisations in the network analysis of joint UK-China research centres are British (see Table 2.2).\(^{53}\) Indeed, the University of Cambridge is the institution with the highest number of organisation-to-organisation links across joint UK-China research centres, with 45 links. It is followed by Southeast University (32 links), the University of Edinburgh (30), the University of Oxford (29), the University of Birmingham (28), the University of Manchester (28), Tianjin University (25), the University of Sheffield (23), the Chinese Academy of Agricultural Sciences (CAAS) (20) and the University of Leeds (19). In addition, although approximately two-thirds of the organisations involved in joint centres were Chinese (184 out of 290), Chinese institutions only accounted...
for approximately half of organisation-to-organisation links (917 out of 1,762). This suggests that when looking at joint UK-China research centres, UK-China research collaboration involves a smaller number of organisations in the UK than in China; however, these organisations (especially key players like the University of Cambridge, the University of Edinburgh and the University of Oxford) also make up key nodes and are well-connected to the rest of the network.

Table 2.2 Combined top ten UK and Chinese research organisations with the most organisation-to-organisation links

<table>
<thead>
<tr>
<th>Rank</th>
<th>Institution</th>
<th>Number of links</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>University of Cambridge</td>
<td>45</td>
</tr>
<tr>
<td>2</td>
<td>Southeast University</td>
<td>32</td>
</tr>
<tr>
<td>3</td>
<td>University of Edinburgh</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>University of Oxford</td>
<td>29</td>
</tr>
<tr>
<td>5</td>
<td>University of Birmingham</td>
<td>28</td>
</tr>
<tr>
<td>6</td>
<td>University of Manchester</td>
<td>28</td>
</tr>
<tr>
<td>7</td>
<td>Tianjin University</td>
<td>25</td>
</tr>
<tr>
<td>8</td>
<td>University of Sheffield</td>
<td>23</td>
</tr>
<tr>
<td>9</td>
<td>Chinese Academy of Agricultural Sciences</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>University of Leeds</td>
<td>19</td>
</tr>
</tbody>
</table>

Source: RAND Europe analysis.

The dynamic in China is similar but less pronounced. While Chinese organisations are more numerous than UK institutions in the network of UK-China joint research centres, only a small group of Chinese organisations account for a significant portion of research links (see Table 2.3). However, compared to the UK, Chinese networks revolve around fewer key players including Southeast University, Tianjin University and CAAS. There is also, compared to the UK, a larger group of organisations in China that only have links with one or two other organisations in joint research centres.

The fact that the most-connected UK universities have more links than the most-connected Chinese universities is evident when comparing the top five UK versus the top five Chinese organisations. The five Chinese institutions with the highest number of research centre links were Southeast University (32 links), Tianjin University (25), CAAS (20), Harbin Institute of Technology (18) and Zhejiang University (18) (see Table 2.3). In comparison, all top five UK institutions had more connections than the second most well-connected Chinese institution: the University of Cambridge having 45 links, the University of Edinburgh (30 links), the University of Oxford (29), the University of Birmingham (28) and the University of Manchester (28).

Table 2.3 Top five Chinese institutions with the most research links

<table>
<thead>
<tr>
<th>Rank</th>
<th>Institution</th>
<th>Number of links</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Southeast University</td>
<td>32</td>
</tr>
<tr>
<td>2</td>
<td>Tianjin University</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>Chinese Academy of Agricultural Sciences</td>
<td>23</td>
</tr>
<tr>
<td>4</td>
<td>Harbin Institute of Technology</td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>Zhejiang University</td>
<td>18</td>
</tr>
</tbody>
</table>

Source: RAND Europe analysis.
Table 2.4 Top five UK institutions with the most research links

<table>
<thead>
<tr>
<th>Rank</th>
<th>Institution</th>
<th>Number of links</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>University of Cambridge</td>
<td>45</td>
</tr>
<tr>
<td>2</td>
<td>University of Edinburgh</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>University of Oxford</td>
<td>29</td>
</tr>
<tr>
<td>4</td>
<td>University of Birmingham</td>
<td>28</td>
</tr>
<tr>
<td>5</td>
<td>University of Manchester</td>
<td>28</td>
</tr>
</tbody>
</table>

Source: RAND Europe analysis.

Given the scope of the analysis, these findings remain only partial and should therefore be triangulated with further studies on institutional links in terms of citations, co-publications and patent applications.

2.5.1. Case study: University of Cambridge

The network analysis demonstrates that the University of Cambridge is a central node, or key organisation, in joint UK-China research links. It is part of four main network clusters, as identified in Table 2.1. These are the light green, pink, purple and blue networks. Some of the main research centres that these networks represent, which the University of Cambridge is part of, are the UK-China University Consortium on Engineering Education and Research (engineering); Sino-British College, University of Shanghai for Science and Technology (robotics); and the N-CIRCLE: Virtual Joint Centre for Closed-Loop Cycling of Nitrogen in Chinese Agriculture (agricultural science). Figure 2.9 provides a visualisation of the University of Cambridge’s network.

Figure 2.9 University of Cambridge network

Source: RAND Europe analysis.
2.5.2. Case study: Southeast University

The network analysis also shows that Southeast University is a central node, or key organisation, in joint UK-China research links. It is part of three network clusters, as identified in Table 2.1. These are the light green, purple and grey networks. Some of the main research centres that these networks represent, which Southeast University is part of, are the University of Cambridge, Nanjing Centre of Technology and Innovation, China-Scotland Signal Image Processing Research Academy and the UK-China University Consortium on Engineering Education and Research. Figure 2.10 provides a visualisation of Southeast University’s network.

**Figure 2.10 Southeast University network**

Source: RAND Europe analysis.
2.5.3. Case: University of Edinburgh

Based on the network analysis, the University of Edinburgh is another central institution in UK-China research collaboration in terms of joint research centres. It is part of the orange, grey and light green networks. Some of the main research centres that these networks represent, which the University of Edinburgh is part of, are the Zhejiang University-University of Edinburgh Institute, UK-China (Guangdong) CCUS Centre and the China-Scotland Signal Image Processing Research Academy. Figure 2.10 provides a visualisation of the University of Edinburgh’s network.

Figure 2.11 University of Edinburgh network

Source: RAND Europe analysis.
2.6. China hosts the physical facilities for most of the joint UK-China research centres

Joint UK-China research centres examined have either a physical or virtual interface. An analysis of distinct physical locations of joint centres identified across the UK and China, rather than of the location of every research organisation involved in their collaboration, reveals that most of the joint UK-China research centres with physical facilities are located in China. A total of 103 out of 132 physical centres were situated in China. Jiangsu Province hosts the highest number of physical centres, with 26 research centres established in the province. It is followed by Beijing (12 joint research centres), Guangdong (12), London (11) and Zhejiang (11). There are many incentives for Chinese cities and universities to host joint research centres compared to the UK. For example, developing a R&I cluster in a new industrial zone gives Chinese municipalities and other state authorities the right to requisition rural land and convert it into urban land at advantageous prices, making a profit.54
Looking at the UK specifically, the majority of physical research centres were located in London (11), Edinburgh (4) or Cambridge (4). This is likely to be due to the large number of joint laboratories (which are less likely to be virtual) involving organisations based in those three locations, primarily Imperial College London, the University of Edinburgh and the University of Cambridge.

Considering the location of joint UK-China research centres in China specifically, most research centres are concentrated in coastal provinces and prominent municipalities (see Figure 2.12). This is to be expected since China’s coastal provinces and major cities have historically benefited from higher levels of economic development than the rest of the country, notably due to preferential fiscal policies for economic experimentation and being characterised by a higher degree of openness to the rest of the world through trade and migration. As such, they have been at the centre of the country’s flows of information, capital, goods and people, creating a favourable environment for the generation of new knowledge and the assimilation of R&I.

2.7. Many UK and Chinese actors are involved in funding joint research

Funding for UK-China research collaboration, including joint research centres, comes from a wide range of actors, including national government departments, research funding agencies, regional and municipal governments and private companies, from the UK, China and some multinational companies. Some of Chinese funding and sponsor organisations of UK-China research collaboration most frequently mentioned by UK research organisations and academics consulted for this study include the NSFC, CAS, CAAS, the Chinese Academy of Social Sciences (CASS), the Chinese Academy of Medical Sciences (CAMS), MOST, the Ministry of Education (MOE), the Chinese Ministry of Agriculture and Rural Affairs, the Chinese National Space Administration, Jiangsu Science and Technology Department, Jiangbei District, Guangdong Science and Technology Commission, Guangdong Development and Reform Commission, the Shanghai Science and Technology Commission, Nanjing City government and Yuyao District government. The most frequently mentioned UK funding and sponsor organisations supporting UK-China research collaboration include BEIS, FCDO, UKRI (including the Engineering and Physical Sciences Research Council (EPSRC)) and the British Council. The list is however non-exhaustive and further studies should seek to systematically map funding bodies and their role in UK-China research collaboration. This may be done by analysing bibliometric data on the funding acknowledgements of co-authored papers.
Understanding the drivers and benefits of UK-China research collaboration: a UK perspective

This chapter provides an overview of the drivers motivating UK research organisations and academics consulted for this study to engage in joint research collaboration with China, and a summary of the benefits and opportunities they have experienced when engaging with China. To understand and provide a balanced account of UK academics’ experience, the study team generated an initial list of known drivers and benefits to UK academic institutions based on a review of peer-reviewed literature and grey literatures (e.g., blog posts, news articles, editorial comments) published after 2019. The indicative list of drivers and benefits was then queried, validated and refined through semi-structured interviews, an asynchronous survey and additional targeted literature searches. The study team conducted 40 interviews with a range of UK stakeholders working across 34 research organisations either as researchers or in support service roles. The study team also received and analysed 43 full responses to its asynchronous survey targeting the same population. While it is important to understand that these views are anecdotal and do not represent those of the UK research community in a statistical sense, they nonetheless contain a remarkable degree of insight and convey the perspectives of stakeholders with varying degrees of experience in joint research with Chinese entities. The following sections describe each of the drivers and benefits for collaborating with China as well as their implications.

55 The search was limited to English-language articles published after 2019 (i.e., the end of the so-called ‘golden era’ in UK-China relations) in order to identify most up-to-date and relevant material in a fast-evolving political, economic and regulatory landscape.
Box 2 Summary of key findings from Chapter 3

UK research organisations and academics consulted for this study overall talked very positively about their collaborative experience and research engagements with China. They spoke highly of their engagement with Chinese partners, stressing the benefits of working with leading researchers, emphasising the potential for delivering high quality research outputs and progress in their chosen discipline, and praising the quality, rigour and insights of the Chinese partners they worked with. Herein lies a key difference between stakeholder consultations on the one hand and the literature review data on the other, which produced a far greater emphasis on risks than arose through stakeholder consultations.

In addition, UK academics found establishing partnerships to be neither extremely easy nor extremely difficult; 13.5 per cent of stakeholders surveyed felt the process was ‘very’ straightforward, while another 13.5 per cent felt the process was ‘not’ straightforward. Most researchers encountered some degree of difficulty and academics’ contextual knowledge and experience of conducting research in China often determined their ability to successfully navigate any potential challenges.

Some of the primary drivers motivating UK researchers’ collaboration with Chinese partners include accessing Chinese human capital and leading expertise, tackling common global challenges, accessing data, data subjects and enabling infrastructures, and other economic and reputational benefits. The prospect of improving the quality and impact of their research through world-leading collaborations drove many UK academics to establish collaborative activities with Chinese partners. Many UK researchers praised the expertise and capacity for innovation of Chinese researchers and expressed a wish to collaborate with leading Chinese researchers as they would with leading researchers of any other nation. The existence of common global challenges such as climate change and pandemics also pushed many UK academics to reach out to Chinese partners. Moreover, the potential to collect, access and observe data in different ways motivated UK researchers to collaborate with Chinese actors. This was both in terms of the type of naturally occurring phenomena that could be observed in China (e.g., unique diseases, soil data), alongside the structural considerations that make China attractive for conducting primary research. The promise of rapidly available data could fail to materialise, however, as China introduces increasingly robust and stringent data protection laws for sharing certain forms of data beyond its borders. Finally, some UK research organisations mentioned other economic, commercial and reputational benefits for collaborating with China, including getting access to large pool of Chinese funding, attracting Chinese students and improving their international reputation through world-leading and global collaboration.

While UK academics consulted agreed on the overall benefits of collaborating with Chinese partners, there were clear differences between academic disciplines. For STEM academics, research collaboration allowed complementarity, by enabling UK and Chinese researchers to fill areas of knowledge where the other was lacking. For researchers in social sciences and arts and humanities, UK-China research collaboration offered the opportunity to engage with differing perspectives on the same research areas.

Developing trust and long-term relationships underpinned many of the benefits and was widely considered an essential feature to reaping the benefits of UK-China research collaboration. Many of the most experienced stakeholders consulted stressed the importance of demonstrating cultural sensitivity when developing UK-China research collaboration. Given the challenges with culture and language, taking time, being flexible and starting collaborations slowly before gradually expanding them was considered best practice. Ultimately, many of the benefits of UK-China collaboration were found to be contingent on personal networks and a strong operational understanding of how to conduct research in China. Understanding the language, knowing key figures in one’s discipline and being aware of differences to both countries’ research approach were all found to be key. Some UK researchers and research institutions strongly valued organisations like UKRI China and the British Embassy Beijing that could provide this information.
3.1. Contextualising the drivers and benefits associated with UK-China research collaboration

3.1.1. The overwhelming majority of UK research organisations and academics consulted felt positively about engaging with China in joint research

Overall, UK research organisations and academics consulted for this study felt very positive about their research engagements with China. They positively qualified their engagement with Chinese partners, stressing the benefits of working with leading researchers, emphasising the potential for delivering high-quality research outputs and progress in their chosen discipline, and praising the quality, rigour and insights of the Chinese partners they worked with. Across all disciplines, UK academics emphasised the reciprocal nature of UK-China research collaboration. Research was seen to be mutually beneficial, with both sides offering the other valuable perspectives and insights. The idea of ‘synergies’ repeatedly arose. One UK participant, for example, confessed they entered a partnership expecting only to offer knowledge, but instead found that they had much to learn from their Chinese counterparts.

This is a key difference between the individual interview and survey responses on the one hand and the literature review data on the other. As part of the data collection process, the study team reviewed the latest literature exploring UK-China research collaboration on a national scale. Such data was far more focused on the strategic elements of UK-China research collaboration, resulting in a far greater emphasis on risks than appeared in the interviews and survey data. This is not to say such concerns were not present in the interview and survey data – worries over academic freedom, personal safety, IP theft and transfer of dual-use technologies all arose, as will be explored in more detail in the following chapter. However, the overwhelming majority of stakeholders consulted for this study felt positively about engaging with China and stakeholders typically considered UK-China collaboration through a research/knowledge paradigm rather than a national security lens.

56 INT01, INT02, INT05, INT08, INT09, INT11, INT12, INT15, INT20, INT21, INT29, INT32, INT34, INT39, SURVEY1, SURVEY14, SURVEY27, SURVEY35, SURVEY37, SURVEY43, SURVEY40, SURVEY43.
57 INT05, INT06, INT08, INT10, INT11, INT15, INT16, INT17, INT29, INT31, INT33, INT34.
58 INT03, INT05, INT17, INT29, INT31, INT38, INT40, SURVEY2, SURVEY12, SURVEY26, SURVEY30.
59 INT01, INT02, INT05, INT08, INT09, INT11, INT12, INT15, INT20, INT21, INT29, INT32, INT34, INT39, SURVEY1, SURVEY14, SURVEY27, SURVEY35, SURVEY37, SURVEY43, SURVEY40, SURVEY43.
60 INT16, INT34, INT40, SURVEY2, SURVEY13, SURVEY24, SURVEY37.
61 INT12.
62 Tylecote & Clark (2021); Joske (2019).
63 INT01, INT22, SURVEY14, SURVEY23, SURVEY25, SURVEY26, SURVEY31, SURVEY35, SURVEY37.
64 INT01, INT02, INT05, INT08, INT09, INT11, INT12, INT15, INT20, INT21, INT29, INT32, INT34, INT39, SURVEY1, SURVEY14, SURVEY27, SURVEY35, SURVEY37, SURVEY43, SURVEY40, SURVEY43.
3.1.2. Establishing UK-China research collaboration has been mostly or somewhat straightforward for the majority of UK academics surveyed

Out of 37 survey respondents, 655 (13.5 per cent) felt that the process of setting up UK-China research collaboration was ‘very’ straightforward,66 while a similar number felt it was ‘not straightforward’.67 For all other survey respondents (73 per cent), it was somewhere in between, either ‘mostly’, ‘somewhat’ or ‘moderately’ straightforward.

The ease of establishing UK-China research collaboration was often dependent on a strong operational understanding of China as a research environment. This included knowing the relevant research actors in a field, understanding the relevant standings of various research institutions, having knowledge of Chinese literature and Chinese strategic research priorities, and being familiar with cultural differences in organising research.68

3.1.3. The benefits of UK-China research collaboration vary across academic disciplines

While UK academics consulted agreed over the overall benefits of collaborating with Chinese partners, there were clear differences between researchers of different disciplines. For STEM academics, research collaboration allowed complementarity by enabling UK and Chinese researchers to fill areas of knowledge where the other was lacking.69

For UK researchers in social sciences and arts and humanities, the dynamics by which UK-China collaborations are mutually beneficial takes a different shape. UK-China research collaboration in these fields offers the opportunity to engage with differing perspectives on the same core research areas.70 Differences in educational systems and worldview mean that Chinese and UK researchers can see topics like philosophy, migration and global development very differently, making engagement with different perspectives an important way of reflecting upon and furthering knowledge.71 While UK-China research collaboration was widely found to be a reciprocal and stimulating experience, the precise dynamics varied by discipline.

3.1.4. Many benefits of UK-China research collaboration stem from serendipitous encounters that develop into trusting, long-term relationships

Many UK-China research collaborations appear to have their roots in serendipitous encounters at conferences, work meetings or through hosting of Chinese PhD students.72 UK academics consulted highly valued such interpersonal encounters as they offer the ability to explore areas of mutual interest and

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65 The study team collected a total of 43 full survey responses. Out of this, six responses were attributed to UK research organisations or academics that had not engaged with China in the past. As such, these survey answers are not included in the count of participants that have shared their experience of setting up a partnership with China.
66 SURVEY1, SURVEY9, SURVEY21, SURVEY35, SURVEY43.
67 SURVEY8, SURVEY15, SURVEY23, SURVEY33, SURVEY42.
68 INT09, INT14, INT17.
69 INT09, INT10, INT29, INT31, INT32, SURVEY27.
70 INT03, INT04, INT05, INT17, INT38, INT40, SURVEY1, SURVEY29, SURVEY25.
72 INT05, INT06, INT08, INT10, INT11, INT13, INT16, INT17, INT29, INT31, INT33, INT34, SURVEY16, SURVEY22.
establish trust. Many took the view that it was best to start small, on an interpersonal level, before gradually developing the collaboration into a broader long-term relationship. While the following section of this report details several transactional incentives for initiating engagements, such as accessing data and funding, it was often positive interpersonal encounters that affirmed researchers’ desires to engage with Chinese partners and drove further engagement.

The process of developing such trusting relationships is time-consuming and requires active effort from UK research institutions. Important aspects of developing productive working UK-China relationships encompass taking the time to learn Mandarin (or incorporating fluent Mandarin speakers into the collaboration process), being open and respectful towards differing research cultures, and forging personal relationships over social engagements. Similarly, successful relationships rely upon adopting an informal interpersonal approach, appreciating the value of developing collaborations slowly and pushing back against formal and structured attempts to initiate engagements, such as rapid-fire ‘speed dating’ exercises.

3.1.5. Many benefits are concentrated in relatively uncontentious research areas

While this section explores the benefits and drivers of UK-China research collaboration, the underlying trust that facilitates such positive encounters may be significantly more forthcoming in uncontentious research areas, compared to sensitive areas with potential military applications. Research that contributes towards public goods, like medical research and working on food security, has a natural alignment of goals that is often lacking in disciplines with potentially military applications. One stakeholder for instance remarked that they would not care if Chinese partners took their work on antimicrobial resistance, as doing so would simply achieve their aims of reducing human suffering. Such sentiments illustrate a clear difference between the realms of academic disciplines with the potential for dual-use applications and those with minimal military relevance.

3.2. Understanding the drivers and benefits motivating and facilitating UK research institutions’ collaboration with Chinese partners

3.2.1. Chinese human capital and leading research expertise have driven UK researchers’ collaboration with China across all collaborative activities

In recent years, China has made substantial progress in terms of its human capital, as well as wider enablers and capacity for R&I. Schools in China’s most prosperous regions...
(e.g., Beijing, the coastal areas) now lead the world in reading, maths and science, according to the 2018 OECD’s PISA rankings; its dominant score of 590 for science education contrasting with 505 for the UK.\footnote{OECD (2018).} Chinese universities also feature among the world’s leading universities, with Tsinghua University and Peking University ranked as the joint-16th best universities in the world.\footnote{Times Higher Education (2022).} As a result of advances in education and other key inputs (e.g., infrastructure, regulation), China has risen up the Global Innovation Index (GII) rankings more quickly than any other nation and is the only middle-income economy in the top 30, coming in at 12th overall compared to the UK’s position in fourth or the United States in third in 2021.\footnote{Soumitra et al (2021).}

While some UK researchers expressed concerns over the impact of competition in Chinese academia and over the capacity of Chinese academics to innovate (see Section 4.2.13), for many more stakeholders consulted, the expertise of Chinese researchers and the quality of Chinese research institutions was a primary driver in UK researchers’ desire to collaborate with China\footnote{INT01, INT02, INT05, INT08, INT09, INT11, INT12, INT15, INT20, INT21, INT29, INT32, INT34, INT39, SURVEY1, SURVEY14, SURVEY27, SURVEY35, SURVEY37, SURVEY40, SURVEY43.} across all types of collaborative activities.\footnote{INT01, INT02, INT05, INT08, INT09, INT11, INT12, INT15, INT20, INT21, INT29, INT32, INT34, INT39, SURVEY1, SURVEY14, SURVEY27, SURVEY35, SURVEY37, SURVEY40, SURVEY43.} This was particularly the case for those within STEM disciplines, including agricultural sciences, engineering, materials science, microbiology, plant and animal science, and space science.\footnote{INT02, INT09, INT10, INT11, INT12, INT15, INT16, INT17, INT34; Johnson et al. (2021).} Moreover, the quality and work ethic of Chinese PhD students and early-career researchers regularly impressed UK researchers who worked with them. Indeed, many formal UK-China collaborations have their roots in personal networks established as postgraduate students.\footnote{INT13, INT26, SURVEY34.} UK academics commented on the expertise, dedication and academic potential that their Chinese PhD students had, and several stakeholders cited the quality of Chinese PhD students as a major reason for continuing to collaborate.\footnote{INT08, INT06, INT08, INT16, SURVEY41, SURVEY43.}

The quality and expertise of Chinese researchers and research institutions contributes towards a major driver for all researchers: the desire to publish impactful and leading research. Through UK-China research collaboration, UK researchers have helped to drive innovation across a variety of fields. Based upon the research of a Medical Research Council (MRC)-NSFC collaboration, for example, the Chinese Ministry of Agriculture dramatically reduced the prevalence of E. coli by banning the use of the antibiotic colistin as an animal feed additive.\footnote{UKRI (2018).} Likewise, an EPSRC-CAS-funded project on fuel cell technology reduced the dependence on platinum, a highly expensive catalyst, by developing a novel electrocatalyst that is significantly cheaper to produce.\footnote{UKRI (2018).} Delivering such innovative and impactful research is a significant motivation for UK researchers, highlighting the mutually
beneficial nature of much UK-China research collaboration.

### 3.2.2. Access to data, data subjects and supporting infrastructure has motivated UK researchers across academic disciplines to collaborate with China

For many researchers, the drive to produce high-quality research requires engaging with relevant data first-hand. Thus, the prospect of accessing data drove many stakeholders to develop joint research collaboration with China. For those in STEM disciplines, China offers the ability to collect data on naturally occurring phenomena – data like geospatial data, soil data and health data – that have unique characteristics and cannot be observed elsewhere. For example, one stakeholder working in plant and animal sciences commented that there were several animal-borne diseases that could only be observed in China, while China was also a natural place to study disease transmission as the rate of relevant diseases was far higher than in the UK. For researchers in social sciences and art and humanities, China also offers the opportunity to access data subjects and to observe discipline-specific phenomena. For a scholar in the field of migration, for instance, the opportunity to observe large-scale movement of people into Chinese cities is a considerable driver to their collaboration.

For scholars of Chinese studies, the drive to collaborate with China is an intrinsic aspect of their work.

In addition to certain kinds of data that are uniquely observable in China, many UK academics were also drawn to the promise of China as an environment in which the process of mobilising data resources would be easier. The sheer number of people in China means that developing large sample groups from which to draw statistically significant inferences is often a much easier task than in other research locations, making it an attractive location for conducting primary research.

Once collaborations had been established, some UK researchers also experienced that resources could be mobilised at speed should provincial and/or national governments deem the project a priority.

For UK researchers in STEM disciplines, the size and sophistication of certain forms of equipment in China allow one to conduct experimental research in ways that would be difficult to in Western Europe. For instance, one stakeholder interviewed praised a quarter-sized chemical reactor found at Beijing Normal University, which allows researchers to test reactions at an industrial scale – something deemed impossible in the UK due to the size

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90 INT02, INT04, IN05, INT06, INT09, INT11, INT15, INT16, INT37, SURVEY2, SURVEY8, SURVEY12, SURVEY23, SURVEY27, SURVEY26, SURVEY36.
91 INT02, INT06, INT09, INT11, INT16, INT37, SURVEY1, SURVEY7.
92 INT06.
93 INT04, INT05, INT15, INT39, INT40, SURVEY11, SURVEY22.
94 INT40.
95 INT05, INT11, INT17.
96 INT04, INT06, INT09, INT10, INT11, INT18, INT37, SURVEY26, SURVEY36, SURVEY43.
97 INT04, SURVEY43.
98 INT09, INT15.
99 INT09, INT16, INT37, SURVEY26, SURVEY36.
and cost of such technology.\textsuperscript{100} Both in terms of speed and scale, therefore, UK researchers and research institutions perceived China to be an attractive environment for conducting research. However, it is important to note that the promise of large, easily accessible datasets sometimes failed to materialise, often due to a lack of general understanding of Chinese data protection laws and a shrinking research space in China. This highlights the importance of increasing awareness of an evolving legislative environment on data access (see Section 4.2.7).

3.2.3. UK funding mechanisms have provided crucial access to Chinese networks, but limiting UK funds and the opportunity to access Chinese resources have also motivated UK researchers’ collaboration with China

Overall, specialised UK funding mechanisms have supported the establishment of joint UK-China research collaboration activities. Most notably, the Newton Fund played a considerable role in helping spur UK-China collaboration.\textsuperscript{101} The value of UKRI also went far beyond simply distributing finances.\textsuperscript{102} UKRI offered support, guidance and connections for UK researchers and research institutions seeking to establish collaborations, which several stakeholders cited as being highly beneficial when seeking to initiate their engagements.\textsuperscript{103} Stakeholders valued the in-country knowledge of the UKRI China office in Beijing, once again illustrating the importance of interpersonal connections and localised knowledge when seeking to collaborate.\textsuperscript{104} Similarly, UK academics also thanked the British Embassy Beijing for its support and localised knowledge, which in some cases proved to be essential for setting up UK-China research collaboration.\textsuperscript{105}

However, despite these opportunities, funds dedicated to joint UK-China research projects in the UK remain relatively limited compared to increasing demand for these resources, creating difficulties for accessing UK funding (see Section 4.2.5). The opportunity to access Chinese funding resources drove some stakeholders to collaborate with Chinese researchers/research institutions.\textsuperscript{106} The main Chinese funding organisations mentioned include the NSFC, CAS, CASS, CAAS and MOST, alongside the various institutional partnerships between universities.\textsuperscript{107} In cases where the collaboration involved establishing joint HEIs in China, some stakeholders consulted for this study were impressed by readily available funds and sizeable funding packages for staff members to develop facilities further.\textsuperscript{108}

For example, one leading academic at a joint partnership noted being able to offer £500,000 start-up packages for academics to establish

\textsuperscript{100} INT09.
\textsuperscript{101} INT06, INT09, INT10, INT12, INT15, INT18, INT20, INT23, INT25, INT27, INT29, INT31, INT33, INT34, INT37, INT40.
\textsuperscript{102} UKRI (2022).
\textsuperscript{103} INT04, INT13, INT18, INT35, S6, S14, S27.
\textsuperscript{104} INT14, INT18.
\textsuperscript{105} INT09, INT12, INT18, INT31.
\textsuperscript{106} INT04, INT13, INT18, INT35, SURVEY6, SURVEY14, SURVEY27.
\textsuperscript{107} INT06, INT09, INT10, INT12, INT18, INT27, INT29, INT31, INT36, INT37, INT39, INT40; For a fuller understanding of the relationships and connections between different organisations, please see the network analysis illustrated in Figure 2.8.
\textsuperscript{108} INT13, INT14 INT28, SURVEY7, SURVEY14.
further partnerships. However, it is important to note that institutional partnerships can incur different funding dynamics as compared to smaller and more informal forms of collaboration. Expanding China’s global education outreach is a national priority of the Chinese government, and the ministerial approval that institutional partnerships require can translate into comparatively easy access to regional and national finances. Another way in which UK institutions used Chinese partnerships to raise funds was to encourage Chinese students to come to the UK. A recent report by Kings College London estimated the net value of hosting full-time Chinese students at UK universities to be £3.7 billion in 2019. These gains allow UK institutions to cross-subsidise loss-making courses with the tuition fee income from Chinese students, although it may also introduce risks of reliance on Chinese partners (see Section 4.2.13).  

3.2.4. UK institutions without a long history of collaboration have sought out partnerships with China to improve their international reputation

Some UK research institutions collaborate with Chinese institutions to improve and sustain their international reputation, both for academic and economic reasons. On the academic side, the quality and reputation of Chinese institutions like Peking University, Tsinghua University and CAS means that striking up a partnership may enhance or sustain one’s reputation and lead to high-quality research outputs. On the economic side, partnerships can also be highly profitable. As detailed above, partnering with Chinese academics can be a valuable way of bringing talented researchers and attracting promising Chinese PhD students to one’s research institution. Some stakeholders therefore saw partnering with leading research institutions in China as a good way of expanding or maintaining brand recognition in a lucrative higher education market. This driver was greatest among UK institutions who felt they lacked international recognition. UK universities without a long history of UK-China collaboration commented that partnerships could help them to draw coveted Chinese students away from experienced and higher-ranking institutions. UK-China collaboration for such organisations was seen as a way of moving up the university rankings, as the collaboration could provide recognition, as well as the financial and academic resources necessary to deliver high-quality research outputs.

109 INT13.
110 INT14, INT15, INT36.
111 INT06, INT13, INT14, INT36.
112 Johnson et al. (2021).
113 Johnson et al. (2021).
114 INT11, INT14, INT15, INT16, INT21, INT33, SURVEY9, SURVEY11, SURVEY15, SURVEY32, SURVEY35, SURVEY41, SURVEY43.
115 SURVEY9, SURVEY11, SURVEY15, SURVEY32, SURVEY35, SURVEY41, SURVEY43.
116 INT14, INT21, SURVEY17.
117 INT14, SURVEY17.
118 INT14, SURVEY17.
3.2.5. Addressing shared global challenges has driven further research collaboration between the UK and China

The existence of shared global challenges drove many academics to reach out to Chinese partners in search of collaboration. Transnational issues like climate change, international migration and diseases like COVID-19 impact both the UK and China and cannot be tackled by single countries alone, making it mutually beneficial to pool resources and work towards solutions. UK academics consulted considered Chinese engagement crucial to tackling many global environmental and health challenges. Many stakeholders consulted for this study further felt that the act of developing UK-China collaboration helped to build bridges between the two countries. Moreover, in some cases, UK researchers saw collaborating with Chinese partners as affording the UK a degree of influence or understanding to how China approaches shared issues.

However, on politically contentious issues like human right abuses (see Section 4.2.13), some stakeholders felt uncomfortable speaking out, making China an increasingly challenging environment in which to address global issues with links to state policy. Nonetheless, many stakeholders consulted felt it was important to at least try and engage with Chinese partners where possible.

119 INT05, INT15, INT16, INT19, INT30, INT38, SURVEY6, SURVEY18, SURVEY34.
121 INT10, INT15, INT16, INT30, SURVEY18, SURVEY34.
122 SURVEY15.
123 INT37, INT38.
124 INT10, INT30, SURVEY18.
125 SURVEY15.
126 INT07, INT14.
127 INT01, INT32.

3.2.6. Other drivers and opportunities were also mentioned during our consultations

In addition to the main drivers and benefits detailed above, some UK research organisations and academics consulted for this study also reported additional drivers and benefits, which were nonetheless shared to a much lesser extent by other participants, including:

- **Soft power:** Establishing powerful, well-respected research centres with China reinforces the UK’s global leadership in development policy and research, making collaboration an important element of the UK’s global soft power.

- **City-to-city relations:** Some UK academics and research institutions drew upon the support of their city councils to establish relations and used the historical connections between their city and China as a rationale for establishing collaboration.

- **Commercialisation opportunities:** Some stakeholders consulted collaborated with China to gain access to industry connections and enable the more rapid commercialisation of products at higher Technology Readiness Levels (TRLs).
Box 3 Preliminary analysis of the drivers and benefits motivating and facilitating Chinese researchers’ collaboration with UK partners

While the current research has focused on gathering and understanding UK academics’ views of the drivers and benefits motivating and facilitating their collaboration with Chinese partners, through these consultations the study team has also gathered anecdotal evidence from UK researchers of some of the drivers and benefits Chinese academics experience when collaborating with UK partners, including:

- **Professional and economic opportunities**: There are considerable differences between UK and Chinese academia that weigh into Chinese partners’ decisions to collaborate. Most notably, the Chinese academic promotion system is contingent on publication in international journals. For this reason, many Chinese researchers seek international collaboration with the UK researchers.128

- **Internationalisation of Chinese research**: Since reform and opening up, the Chinese government has promoted the internationalisation of Chinese academia and research, most notably through mass investments.129 This has expanded the international outlook of Chinese universities and contributed to fostering collaboration with UK academic institutions.130

- **Land access**: Receiving partnership funding and provincial backing to establish a physical research centre in China can be a tactile way for Chinese officials to gain access to valuable rural land and convert it into urban land, thereby generating profit.131

128 INT04, INT08, INT27.
129 Owen (2020).
130 INT07, INT13, INT14, INT36.
131 INT09.
This chapter provides an overview of the barriers, challenges and risks UK research organisations and academics consulted for this study have experienced when engaging in joint research collaboration with China. To understand and provide a balanced account of UK academics’ experiences, the study team generated an initial list of known challenges and risks to UK academic institutions based on a review of peer-reviewed literature and grey literatures (e.g., blog posts, news articles, editorial comments) published after 2019. The indicative list of challenges and risks was then queried, validated and refined through semi-structured interviews, an asynchronous survey and additional targeted literature searches. In particular, the study team conducted 40 interviews with a range of UK stakeholders working across 34 research organisations either as researchers or in support service roles. The study team also received and analysed 43 full responses to its asynchronous survey targeting the same population. While it is important to understand that these views are anecdotal and do not represent those of the UK research community in a statistical sense, they nonetheless contain a remarkable degree of insight and convey the perspectives of stakeholders with varying degrees of experience in collaborating with China on joint research. The following sections describe each of the challenges and risks, their drivers, and implications. Of note, these sections are presented irrespective of any potential prioritisation, as the methodological approach used could not provide this level of insight.

The search was limited to English-language articles published after 2019 (i.e., the end of the so-called ‘golden era’ in UK-China relations) in order to identify most up-to-date and relevant material in a fast-evolving political, economic and regulatory landscape.
Box 4 Summary of key findings from Chapter 4

Recent geopolitical developments including heightened global strategic competition and the advent of the COVID-19 pandemic have dramatically disrupted research collaboration between the UK and China. Global strategic competition has damaged existing relationships between UK and Chinese partners by eroding trust and has, in some cases, hindered future collaboration opportunities. The sanitary situation and travel restrictions have also impacted UK academics’ ability to foster existing relationships with China and to set up new ones by creating a sense of disconnect between partners, reducing networking activities and constraining funding pools.

External events such as geopolitical tensions, the COVID-19 pandemic and Brexit have further contributed to reducing the pool of funding available to support joint UK-China research collaboration, heightening competition for already limited resources and resulting in increasing difficulties in accessing funding in the UK for joint UK-China research projects. Most notably, the lack of sufficient funds to support joint UK-China research collaboration has arguably increased the risk of strategic dependency on China by incentivising UK academics to turn to their Chinese partners to secure Chinese government funds.

In the UK, the polarised political climate and domestic defence and security policies on China have created new challenges for UK-China research collaboration. Specifically, strategic ambiguity over the UK government’s China policy has caused confusion and frustration among UK research organisations who find it increasingly difficult to navigate this sensitive environment. In this regard, UK research institutions have requested greater clarity over the risks associated with partnering with China and have asked for additional guidance on risk management from the UK government. In the absence of such guidance, some UK research institutions have adopted a risk-averse approach and based their decision to partner or not with specific Chinese stakeholders on potential reputational risks and the likelihood of wrongful affiliation and resulting negative press coverage.

In China, heightened political sensitivity and tightened control over Chinese research institutions’ research agenda under Xi Jinping has contributed to narrowing the scope of topics that may be safely researched. This is particularly true in the social sciences and arts and humanities. The closing research space in China has had various effects on UK-China research collaboration, from creating additional barriers to data and data subject access to deterring some UK researchers from continuing to work with Chinese partners in the future. Moreover, growing hostility by the Chinese government vis-à-vis so-called ‘hostile foreign forces’, including Western academics, has fostered an environment of suspicion and extreme caution in China, which has impeded the ability of UK academics with years of experience collaborating with China to conduct field work. The Chinese political context has also raised concerns among some UK research organisations over the physical and digital safety of their research staff working with China, with four interviewees and one survey respondent reported feeling at risk when working in China.

Beyond recent geopolitical developments in the UK, China and elsewhere, ‘traditional’ challenges and risks have continued to plague and disrupt joint UK-China research collaboration, including difficulties securing funding, risks to academic freedom and integrity, and high barriers to entry into collaboration with Chinese organisations and individuals. Despite efforts from the Chinese government to promote research integrity, China continues to experience cases of academic misconduct, as is the case elsewhere in the world. UK research organisations and academics across disciplines therefore continue to be concerned with the level of academic misconduct in Chinese academia and the narrowing space for conducting free and independent research, which through joint collaborations may have a trickle-down effect on their own academic integrity and freedom. For many, this is a red line which should not be crossed, at the expense of terminating joint collaborative activities.

Moreover, in comparison to other international partnerships, UK academics generally have faced higher barriers to entry when collaborating with Chinese partners. These include, among others, cultural differences, communication issues, reliance on existing networks, language barriers and the need to foster long-term relationships to establish trust and respect. UK academics who have never worked with China before also report difficulties in accessing Chinese data and data subjects. This often came as a surprise to them due to overpromises from their Chinese counterparts and a general lack of understanding of Chinese data protection regulations and China more generally by many UK researchers.

Interestingly, many of the challenges that have dominated the front pages in the past months, including risks of IP theft and transfer of dual-use technologies, had either been experienced to a much lesser extent by the stakeholders consulted for this study or were not reported at all during our consultations. This may be because sufficient safeguards had been put in place preventing the occurrence of these risks. However, this could also be due to a lack of awareness of the risks of collaborating with China among the UK research community.
4.1. Contextualising the challenges and risks associated with UK-China research collaboration

4.1.1. Type of risks of UK-China research collaboration differ between the literature reviewed and lived experience reported

Prior to gathering UK research organisations’ views through semi-structured interviews and an asynchronous survey, the study team generated an initial list of known challenges and risks to UK academic institutions from their engagement with China based on a review of peer-reviewed literature and grey literatures (e.g., blog posts, news articles, editorial comments) published after 2019. This indicative list showed that existing literature and media coverage related to joint UK-China research collaboration increasingly focuses on challenges and risks to UK national security including IP theft, transfer of dual-use technologies, strategic dependence on Chinese funding, risks to personal and digital safety of UK researchers, and lack of reciprocity in information sharing.

While all of these challenges and risks were mentioned during our stakeholder consultations, and some UK academics confirmed the relevance of these risks and challenges, the extent to which they disrupt and permeate joint UK-China research collaboration appeared to be minimal. As discussed in Section 3.1.1, many stakeholders consulted felt positively about their engagement with China and reported many opportunities and benefits ensuing from their collaboration. Many of these stakeholders explicitly reported having experienced no apparent barriers, challenges or risks when engaging with Chinese partners. Additionally, some of the challenges and risks reported (especially risks surrounding IP theft and academic integrity) were not experienced directly by stakeholders consulted. Instead, UK research organisations and academics mainly emphasised facing political, legal, logistical and regulatory barriers when collaborating with China. For example, UK academics consulted often mentioned the impact of changing geopolitics on their ability to access funding, data and data subjects.

The discrepancy between participants’ lived experience and the image of UK-China collaboration conveyed by the literature reviewed may be explained by a general lack of understanding about China and its strategic ambitions among the UK research community (see Section 5.1.3). However, it could also be informed by the infusion of political rhetoric and biases into the literature.

4.1.2. Most of the challenges experienced by UK researchers when collaborating with Chinese partners are not exclusive to research collaboration with China

Stakeholders consulted for this study emphasised that many of the challenges and risks experienced and reported were not unique to research collaboration with China, but were rather recurring features of international research collaboration more broadly and of collaboration with potential UK adversaries more specifically. This applies in particular to regulatory, financial and reputational...
challenges as well as to risks pertaining to IP theft and transfer of dual-use technologies (see Sections 4.2.4, 4.2.10 and 4.2.11). 137

4.1.3. Awareness of the challenges and risks associated with joint UK-China research collaboration varied across academic discipline and position

Stakeholders consulted for this study demonstrated varying degrees of awareness of and appreciation for the challenges and risks associated with research collaboration between the UK and China. Among the cohort interviewed and surveyed, participants from support services and research administrations or with a background in social sciences and arts and humanities, and especially in China studies, seemed more aware of the potential risks and challenges of collaborating with China. 138

Various factors may explain diverging levels of awareness of the challenges and risks associated with joint UK-China research collaboration in the cohort consulted. First, proximity to legal and regulatory guidance on the topic (e.g., the trusted research agenda) could have contributed to increasing knowledge of stakeholders in support services roles. Second, UK scientists have tended to want to distance themselves from political issues and have preferred to focus on scientific research. Third, broader understanding and interest in China among social scientists and humanities scholars could have boosted their levels of awareness. Ultimately, distinct variations in knowledge among the UK research community about China underpins all these potential explanations. As mentioned by one stakeholder consulted, UK academics setting up joint research activities with Chinese partners often lack even a basic understanding of the Chinese higher education system, Chinese literature on their topic of research, 139 the relationships linking Chinese academia with the Chinese Communist Party (CCP), Chinese strategic priorities and basic levels of Chinese literacy. 140 In contrast, Chinese scholars have an increasing understanding of the UK’s research priorities, its higher education system and funding streams, most notably from having spent time in the UK. 141 How to raise awareness among UK researchers and explain country-specific risks without demonising Chinese partners has been a dilemma that support offices continue to battle with. 142

4.1.4. Some of the challenges have prevented past engagement with China without reducing willingness to collaborate with Chinese partners in the future

Few stakeholders consulted for this study had not engaged with China in joint research activities. 143 The underrepresentation of this population in the research findings may be explained by difficulties in outreach and showcasing the relevance of this study to that audience. The following findings should therefore be understood in this context,
caveated accordingly and supplemented by further research if possible.

That being said, UK academics who had not engaged with China were spread across academic disciplines and research institution types. Existing partnerships with China in other parts of their organisation also did not seem to impact to their ability or willingness to engage with China. Among this cohort, most stakeholders consulted said they had wanted to engage with China in the past and would like to collaborate with Chinese partners in the future.144 However, relatively high barriers to entry including lack of or limited network in China, legal and regulatory barriers, and lack of understanding of joint research processes had often undermined their efforts to establish connections with Chinese partners (see Section 1.1).145 Lack of funding opportunities, concerns over reputational risks and IP rights had also constrained their engagement (see Sections 4.2.4, 4.2.10 and 4.2.11).146 In addition, concerns over academic freedom and integrity stemming from such partnerships had influenced social sciences scholars’ decision not to collaborate with Chinese partners (see Section 4.2.10).147 Finally, two stakeholders consulted reported there was no necessity for them to establish joint research activities to conduct their research on China, either because their topic of study did not necessitate this or because support from researchers of Chinese origin living outside of China was sufficient to conduct their research and produce high-quality outputs.148

4.1.5. Some of the challenges have led to the interruption of joint UK-China research collaboration activities across academic disciplines

A minority of stakeholders consulted across academic disciplines reported having had to pause or stop their joint research activities with Chinese partners.149 Indication on timelines were not provided by stakeholders consulted. The interruption of joint research with China was the result of a variety of factors further detailed in the below analysis, including heightened geopolitical strategic competition (see Section 4.2.1),150 geopolitical events including the COVID-19 pandemic (see Section 4.2.1),151 concerns over the personal safety of UK and Chinese research staff involved in the research (see Section 4.2.8),152 illicit transfer of dual-use technologies (see Section 4.2.11),153 IP theft (see Section 4.2.12),154 changes in UK

144 Concerns over the changing political climate and geopolitical tensions (see Section 4.2.1) was cited as the main reason for hesitancy to collaborate with Chinese partners in the future by stakeholders who had not engaged with China in the past. See: SURVEY18, SURVEY28.
145 SURVEY4, SURVEY12, SURVEY28, SURVEY36, SURVEY38.
146 INT03, SURVEY4, SURVEY18, SURVEY28.
147 INT03, INT22, INT30.
148 INT22, INT36.
149 INT01, INT06, INT31, INT32, INT35, INT39, SURVEY8, SURVEY13, SURVEY16, SURVEY21, SURVEY23, SURVEY24, SURVEY25, SURVEY26, SURVEY37, SURVEY39, SURVEY42.
150 INT01, SURVEY16.
151 INT28, INT34, SURVEY13, SURVEY21, SURVEY37.
152 INT26, SURVEY26.
153 INT02, SURVEY23.
154 SURVEY23.
export control legislation,\textsuperscript{155} misuse of data,\textsuperscript{156} restricted access to data (see Section 4.2.7),\textsuperscript{157} a closing research space in China (see Section 4.2.6),\textsuperscript{158} lack of funding (see Section 4.2.5),\textsuperscript{159} attempts to change contractual obligations, and interference in university research operations.\textsuperscript{160}

4.2. Understanding the challenges and risks experienced by UK research institutions when collaborating with Chinese partners

4.2.1. Global strategic competition has damaged existing joint UK-China research activities and disrupted future collaborative opportunities

In the past ten years, strategic competition between the US and China has intensified to ‘the extreme’ and expanded to numerous domains of activity, from the political and economic fields to the technological, environmental and spatial realms.\textsuperscript{161} Amid heightened global strategic competition, the UK’s relationship with China has drastically deteriorated from its so-called ‘golden era’ (2014–2019). Among other factors, tensions over Hong Kong’s right to political autonomy, concerns over human rights abuses in Xinjiang, wariness over the role of Huawei in the UK telecoms market and the degrading perception of China by the British public have contributed to souring UK-China relations, even though the UK government retains excellent relations with China in some policy areas.\textsuperscript{162} Changing terminology used by the UK MOD in its policy papers particularly reflects part of the UK government’s changing posture vis-à-vis China, with China being viewed as ‘a growing power’ in 2015 and being now labelled a ‘systemic competitor’ to UK Defence.\textsuperscript{163}

According to stakeholders consulted across academic disciplines and positions, global strategic competition and the deterioration of UK-China relations has presented one of the main challenges, if not risks, to successful research collaboration between the UK and China.\textsuperscript{164} It has damaged existing joint research activities with China by eroding trust between UK and Chinese partners.\textsuperscript{165} One stakeholder emphasised that the UK government’s Trusted Research agenda had fuelled mistrust and negative perception of Chinese partners, hurting existing research relationships, even though the agenda is actor-agnostic.\textsuperscript{166} The

\begin{footnotesize}
\begin{enumerate}
\item[155] SURVEY8, SURVEY25.
\item[156] SURVEY23.
\item[157] SURVEY42.
\item[158] INT26.
\item[159] SURVEY24.
\item[160] SURVEY23.
\item[161] Walker (2020); Geddes (2020).
\item[162] HM Government (2015); HM Government (2021). It should nonetheless be noted that the Integrated Review also encourages cooperation with China for tackling transnational threats including global health risks, climate change and biodiversity loss.
\item[163] INT01, INT05, INT07, INT10, INT11, INT12, INT29, INT36, INT37, INT38, SURVEY1, SURVEY2, SURVEYS, SURVEY5, SURVEY 8, SURVEY16, SURVEY30, SURVEY37, SURVEY40.
\item[165] INT07, INT36.
\item[166] INT12.
\end{enumerate}
\end{footnotesize}
degrading geopolitical landscape has in some cases contributed to the termination of research collaboration with China and hindered the set-up of future partnerships, notably by restricting funding access or weakening the negotiating power of UK research institutions.\textsuperscript{167}

While the UK’s hardened stance on China has greatly impacted joint UK-China research collaboration, the Chinese government’s anti-Western rhetoric and toughening positions vis-à-vis so-called ‘hostile foreign forces’,\textsuperscript{168} including foreign researchers, have also damaged research collaboration opportunities between the UK and China.\textsuperscript{169} They have created challenges for safeguarding the physical and digital safety of UK researchers (see Section 4.2.8) and accessing Chinese data and data subjects (see Section 4.2.7), affecting the willingness of some UK researchers to continue working with China on joint research in the future.\textsuperscript{170}

4.2.2. The COVID-19 pandemic has impacted some UK academics’ ability to foster existing relationship with Chinese partners and to set up new ones

Since the onset of the COVID-19 in the winter of 2019, China has adopted a zero-COVID policy. This policy has translated into some of the world’s strictest measures to stop the spread of the pandemic, including a temporary suspension of entry into China by non-Chinese nationals in the UK holding Chinese visas or resident permits, a mandatory 14-days quarantine on arrival and an additional 14-day quarantine following internal travels from high-to medium-risk areas to Chinese cities and provinces, as well as lockdowns, mass testing and contact tracing.\textsuperscript{171} The UK government has also imposed on and off travel restrictions for non-British nationals and residents throughout this period.

The COVID-19 pandemic and the measures imposed by the Chinese and UK governments on travel have complicated research collaboration between the UK and China.\textsuperscript{172} Denying researchers and international students the ability to travel between the two countries has created a sense of disconnection between both partners and constrained informal networking.\textsuperscript{173} Additionally, the public health situation has impacted some UK academics’ ability to foster and sustain existing relations with their Chinese partners and build an alumni base of Chinese students.\textsuperscript{174} The pandemic has also added new hurdles for establishing new partnerships by limiting funding resources and networking opportunities.\textsuperscript{175} For several stakeholders consulted, the impact of the pandemic differed slightly when it came to collaborating with China compared to other international engagements given the long-term efforts and trust-building necessary to exploit research collaboration outcomes.
with China, notably through regular country visits (see Section 5.1).\textsuperscript{176} However, while the pandemic has presented a set of challenges for sustaining and establishing joint research collaboration with China, it has also brought new opportunities for promoting research impact to a wider audience through online streaming platforms.\textsuperscript{177}

4.2.3. Strategic ambiguity over the UK government’s China policy has generated frustration and caused some UK research organisations to request further clarification

In the past few years, the UK government has published various public statements intended to explain or clarify its approach to China.\textsuperscript{178} However, for some members of the British political establishment, these statements have not sufficed to clarify the UK government’s policy towards China. In a report on the future of UK-China relations, the House of Lords’ International Defence Select Committee has, for example, denounced the ‘strategic void’ surrounding the objectives and actions of the UK government on China and the ‘inconsistencies’ ensuing from the UK government’s balancing of trade and security interests.\textsuperscript{179} Reiterating the request made by the Foreign Affairs Committee in April 2019, the International Defence Select Committee has called for the development of a China strategy to ‘resolve the ambiguities in the current government’s China policy’.\textsuperscript{180}

Many of the claims made by the International Defence Select Committee resonated with members of the British public, including UK research organisations.\textsuperscript{181} Indeed, many stakeholders consulted for this study expressed frustration with the lack of clarity in the UK government’s China policy and considered strategic ambiguity to be one of the main challenges they have faced when managing research collaboration with China.\textsuperscript{182} For one participant, strategic ambiguity has driven the adoption of a risk-averse approach to collaboration and therefore reduced the likelihood of setting up new research partnerships with China.\textsuperscript{183} In this regard, some UK research organisations have requested greater clarity from the UK government over the risks ensuing from collaboration with China and the Chinese actors they should avoid partnering with.\textsuperscript{184} Others have also asked for additional guidance on risk management to understand the precautionary steps that should be taken, raise awareness among university staffs and prioritise resource allocation.\textsuperscript{185}

\begin{itemize}
\item \textsuperscript{176} INT17, INT19, SURVEY32.
\item \textsuperscript{177} INT29.
\item \textsuperscript{178} HM Government (2021); FCDO (2021c); Ministry of Defence (2021); HM Treasury (2019).
\item \textsuperscript{179} House of Lords (2021).
\item \textsuperscript{180} House of Lords (2021).
\item \textsuperscript{181} Geddes (2021); Tatlow (2021).
\item \textsuperscript{182} INT03, INT09, INT11, INT20, INT35, INT39, SURVEY37.
\item \textsuperscript{183} INT20.
\item \textsuperscript{184} INT20, INT29, INT35, SURVEY37.
\item \textsuperscript{185} INT03, INT11, INT20.
\end{itemize}
4.2.4. Reputational risks have influenced some UK research institutions’ decisions to establish research activities with Chinese partners

Since the end of the so-called ‘golden era’ in UK-China relations and after heightened global geopolitical tensions, headlines reporting cases of Chinese interference and espionage in UK research institutions have multiplied in the British press and beyond. Some of these headlines read: ‘Alarming Chinese meddling at UK universities exposed in report’,186 ‘Net closes in on Chinese “spies” in UK universities where academics are suspected of passing pioneering British technology to Beijing’187 and ‘Almost 200 academics from more than a dozen British universities could face jail amid probe over fears they inadvertently helped China develop weapons of mass destruction’.188

Reputational risks are among some of the main risks linked to research collaboration with China.189 In particular, UK research institutions’ administrators consulted for this study reported concerns over negative press coverage associating their institutions to cases of IP theft and technology transfer,190 or to a degradation of academic integrity standards (see Section 4.2.10).191 In some cases, potential damages to academic reputation through association have even informed UK research institutions’ decisions to partner or not with some Chinese organisations.192 Further examples to support this claim cannot, however, be provided due for anonymity reasons.

4.2.5. Difficulties in accessing funding have constrained collaborative opportunities and increased risks of strategic dependency on China

Many UK research organisations and academics consulted for this study reported having experienced difficulties in accessing funding – primarily in the UK193 – which constrained or limited opportunities to foster or sustain collaborative research activities with Chinese partners.194 Contrary to popular belief, difficulties in accessing funding were not specific to UK academics working in social sciences, but were felt across academic disciplines by researchers operating in computer science, economics and business, engineering, environment and ecology, materials science, multidisciplinary areas, and plant and animal science.195 Two stakeholders also noted these difficulties may be more pronounced when conducting applied research and working at high TRLs.196

Numerous interrelated factors may explain UK academics’ difficulties in accessing funding. From the start, the UK’s supply of funds dedicated to joint UK-China research projects

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186 Wintour (2019).
188 Robinson; Birrell & Owen. (2021).
189 INT03, INT29, INT35, SURVEY14, SURVEY23, Johnson et al. (2021).
190 INT29, INT35, SURVEY14.
191 SURVEY23.
192 INT03, INT29.
193 INT04, INT19, INT27, INT32.
194 INT02, INT06, INT15, INT19, INT27, INT28, INT33, INT38, SURVEY17.
195 INT02, INT04, INT06, INT08, INT15, INT19, INT27, INT28, INT33, INT38, SURVEY17.
196 INT28, INT32.
had failed to match an increasing demand for joint funding.\(^{197}\) More recently, geopolitical events and political decisions including the deterioration in UK-China relations, Brexit, a reduction in the UK’s Official Development Assistance (ODA) spending and the COVID-19 pandemic have further reduced the pool of funding available to UK researchers for collaborating with China, including from the Newton Fund and the GCRF.\(^{198}\) This has heightened competition for already limited resources, resulting in increasing difficulties in accessing funding in the UK for joint UK-China research projects.

In addition to constraining opportunities for collaboration, the lack of sufficient funds to support joint UK-China research collaboration has arguably increased the risk of strategic dependency on China by incentivising UK academics to turn to their Chinese partners to secure Chinese government funds. In turn, imbalances in research funds and differences in funding models between the UK and China\(^{199}\) can cause tensions between research partners, with some Chinese partners feeling UK academics are bringing less to the table in terms of funding.\(^{200}\)

### 4.2.6. A shrinking research space in China

has deterred some UK researchers from collaborating with Chinese partners, especially in social sciences and arts and humanities

Since coming to power in 2012, Xi Jinping has tightened the CCP’s grip on Chinese higher education and academic institutions including universities and think tanks, vowing to turn them into ‘strongholds of the Party’s leadership’ that ‘serve the Communist Party in its management of the country’.\(^{201}\) The CCP has, for example, restructured universities to increase research on Xi Jinping Thought, established dedicated research centres on Xi Thought, restricted funding opportunities for topics that do not directly serve the interests of the Party, and obstructed promotion of academics working on these ‘non-essential’ topics.\(^{202}\) These efforts have contributed to closing the research space in China, narrowing the range of topics that can be safely studied and constraining access to data and data subjects on certain topics deemed sensitive by the Chinese government (e.g., Chinese politics, specific historical periods, social movements including MeToo).\(^{203}\) Increased political sensitivity and the ever-changing and growing list of topics that cannot be safely researched has further narrowed the research space in China.\(^{204}\) This is particularly true in social sciences and arts and humanities.\(^{205}\)

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197 INT15, INT27, INT33.
198 INT02, INT08, INT19, INT33, INT38.
199 INT10, INT13, INT19, INT23.
200 INT10.
201 Reuters (2016); Taber (2018); Ekman (2021).
203 INT25, INT30, INT37, INT38; Harlan (2019); Ekman (2021).
204 INT25, INT37.
205 INT25, INT38; Ekman (2021).
The narrowing research space in China has had various impacts on joint UK-China research collaboration. On one side of the spectrum, political caution from Chinese partners trying to navigate this sensitive landscape has created additional challenges for some UK researchers, especially in accessing local data. On the other side of the spectrum, particularly for individuals working in social sciences and arts and humanities, the closing research space in China has negatively influenced one stakeholder’s willingness to continue working with Chinese partners in the future and has even deterred other UK researchers from renewing joint research activities or working with China at all because of difficulties getting access to primary data and challenges in navigating this sensitive landscape. One stakeholder interviewed in particular cited safety concerns and responsibility vis-à-vis their Chinese partners as a primary reason for not renewing their joint research activities with China.

4.2.7. Restricted access to Chinese data and data subjects has increasingly burdened UK researchers

Access to Chinese data and data subjects has been cited as being one of the main drivers motivating collaboration between UK researchers and Chinese partners (see Section 3.2.2). However, data and data subjects access has also ironically been one of the main challenges faced by UK research organisations across academic disciplines when collaborating with China. Indeed, stakeholders consulted for this study have reported difficulties in acquiring and processing certain types of data including geospatial, environmental, health, national surveillance and heritage. Researchers working in social sciences and arts and humanities have also found it difficult to collect primary data from Chinese sites or subjects during fieldwork. The reasons why UK researchers have faced difficulties in accessing Chinese data and data subjects often varied depending on their level of experience in conducting research in and with China. For many UK researchers who had not previously worked with China, these difficulties often came as a surprise as they thought from their initial discussions or even legal agreements with their Chinese counterparts that data access would be guaranteed. However, a lack of understanding of Chinese data protection regulations, legal culture, as well as overpromises from Chinese partners, regularly clouded UK researchers’ vision and distorted their expectations. This is tied more generally to an endemic lack of understanding of China in the UK research community (see Section 5.1.1).

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206 INT31.
207 INT37.
208 INT25.
209 INT30.
210 INT25.
211 INT05, INT09, INT12, INT21, INT23, INT31, INT37, INT38, SURVEY42.
212 INT05, INT09, INT12, INT21, INT31.
213 INT31, INT37, INT38; Johnson et al. (2021).
214 Although it should be noted that many stakeholders consulted did not provide any explanation as to why they had faced these barriers, which could be a result of their lack of general awareness and understanding of the situation.
215 INT01, INT09, INT10, INT12, INT23.
For UK academics more experienced in conducting research in and with China, a closing research space in China (see Section 4.2.6) and weariness of foreign researchers (see Section 4.2.7) were the primary reasons for being increasingly\(^{216}\) denied access to primary data, even with satisfactory legal agreements in place.\(^{217}\) Increasingly stringent Chinese data protection laws could also provide another explanation for the mounting challenges experienced in accessing primary data, although it was not explicitly mentioned by stakeholders consulted for this study. Multiple data protection laws have passed recently, including China's 2017 Cybersecurity Law (CSL), the 2021 Data Security Law (DSL) and the 2021 Personal Information Protection Law (PIPL), which have introduced additional requirements\(^{218}\) for transferring of data offshore and processing of Chinese data outside of the country. The reasoning behind these laws is often for national security reasons or tightening the CCP's grip on national internet giants, which may ultimately also have hindered UK-China research collaboration.\(^{219}\)

Finally, it is crucial to note that while increasing restrictions on data access and processing have created additional hurdles for UK researchers when collaborating with China, in most cases these barriers have not been detrimental to the delivery of the research. Many researchers found ways to overcome such obstacles and mitigate any potential risks to their partnerships, as will be more extensively discussed in Chapter 5.

### 4.2.8. Concerns over the physical and digital safety of UK and Chinese research staff have emerged during our consultations

Anti-Western rhetoric and warnings against 'hostile foreign forces' seeking to destabilise the Chinese nation and its ideological sphere have dramatically risen under Xi Jinping.\(^{220}\) Wariness and suspicions of foreign researchers and teachers who play a crucial role in shaping the ideological sphere in particular have steadily grown, as attested by the recent clampdown on overseas teachers and private tutors as part of a larger campaign to curb the private tutoring industry.\(^{221}\)

Geopolitical tensions and changes in the political climate vis-à-vis foreigners, especially Western researchers, have raised concerns among some UK research organisations over the physical and digital safety of their research staff working with China. In particular, four interviewees and one survey respondents have felt personally at risk when collaborating on joint research activities with Chinese partners.\(^{222}\) Others have also expressed concerns for the safety of their Chinese counterparts and felt a sense of responsibility towards them, as they have had to navigate heightened suspicions when collaborating...
with Western researchers. In some cases, UK research institutions took greater and China-specific precautions before signing off any potential travel of UK research staff to China than for other countries, especially with regards to cybersecurity. In other cases, personal safety prevented the establishment of joint research collaboration and even led to interruption of research activities with Chinese partners.

4.2.9. Barriers to entry for collaborating with China have been higher than for other international research collaborations

In comparison to other international research partnerships, first-time research collaborations with China have been more difficult to establish or navigate for UK academics across academic disciplines and have involved higher barriers to entry. Specifically, time differences, geographical distances, cultural differences, difficulties in accessing Chinese research institutions, communication challenges and the language barrier have often been cited as hindering collaborating with China. Having pre-established links with China, maintaining flexibility and taking the time to establish long-term relationships with Chinese partners based on trust and respect were also necessary for setting up successful joint UK-China research collaboration and fully exploiting its research outcomes (see Sections 3.1.4 and 5.2.1).

To bypass these barriers, some UK academics have relied on key individuals, including native Chinese faculty members or PhD students, for navigating cultural differences and the Chinese bureaucratic system, establishing connections with Chinese institutions and translating research concepts and material. However, in some cases, reliance on these individuals introduced biases, led to further misunderstanding between research partners, impacted data gathered and created tensions within research institutions, as cultural interpretation was beyond the bounds of their positions. In one reported case, links with Chinese collaborators were even lost upon departure of the key individual. These experiences, however, remain those of a few stakeholders consulted, and therefore should be contrasted with the overwhelming positive relationships UK academics have maintained with their native Chinese colleagues (see Section 3.1.1).

4.2.10. Risks to academic integrity and freedom have endangered the continuation of joint UK-China research collaboration

Since the 1990s, the Chinese government and HEIs have taken actions to promote research integrity among Chinese academics following various scandals of academic misconduct that have undermined China’s research internationalisation efforts. They
have most notably developed codes of conduct and ethics policies, introduced penalties and joint social punishments, funded projects addressing academic integrity and established oversight committees.\(^{232}\) For example, between 1998 and 2005 the NSFC, placed under the State Council of China, set up an oversight committee to investigate allegations of misconduct in Chinese scientific circles reported anonymously on the Chinese New Threads website.\(^{233}\) Other government stakeholders, including MOST and MOE, quickly followed through and also established their own oversight boards.\(^{234}\) More recently, the Central Committee of the CCP together with the State Council issued their first policy on academic ethics covering all academic disciplines and various drivers of academic misconduct including funding, publications and job applications.\(^{235}\)

Despite these efforts, China nevertheless still experiences cases of academic misconduct, as is the case elsewhere in the world. Common academic misconduct issues in Chinese academia include data falsification, image manipulation, double-dipping of publications, corruption in research administration, plagiarism (notably in Chinese to English translations), corruption in academic promotion, data fabrication and theft, corruption in doctoral student training, intentional cover ups of academic misconduct, and other fraudulent actions damaging academic integrity.\(^{236}\) For Chen and Macfarlane, cultural and contextual factors specific to China including ‘norms of reciprocity associated with guanxi, low salary levels, payment by publication, bribery and the importance of first authorship in academic promotion and doctoral publication’ have contributed to, or at least have not deterred, widespread academic misconduct in Chinese academia.\(^{237}\)

In addition to issues surrounding academic integrity, Chinese academia has historically – but even more so recently – experienced constraints placed on academic freedom. As state-sponsored professionals, Chinese academics are highly dependent on the Chinese government for accessing funding and promotion, ‘leaving little room for the development of professional autonomy and reflectivity’ and affecting the type of research and partnerships being conducted.\(^{238}\) Recent measures seeking to tighten the Party’s grip on academia and think tanks through restructuring of universities to increase research on Xi Jinping Thought or restricting funding opportunities for topics that do not directly serve the interests of the Party, have further impeded academic freedom in China.\(^{239}\) Censorship of narratives or data contradicting the Party’s line on its handling of the COVID-19 pandemic is but the latest example showcasing the Chinese clampdown on academic freedom at home and abroad.\(^{240}\)

232 Lu (2019).
234 Resnik & Zeng (2010).
235 Lu (2019).
237 Chen & Macfarlane (2016).
238 Chen & Macfarlane (2016); Johnson et al. (2021).
239 Taber (2018); Ekman (2021).
240 Sharma (2020).
Indeed, as Chinese academia has internationalised and foreign research organisations have sought to further engage with China, restrictions placed upon academic freedom in China have expanded beyond Chinese frontiers and permeated international research. In the UK especially, reports of self-censorship, sanctioning of academics speaking against the Chinese government and confiscation of papers mentioning Taiwan under pressure from the Chinese embassy have multiplied.\(^{241}\)

These incidents have resonated with the experience of some stakeholders across academic disciplines consulted for this study, who deemed risks to academic integrity and freedom and self-censorship to be one of the main challenges they faced when collaborating with Chinese partners.\(^{242}\) In particular, some UK research institutions and academics consulted noted a lack of alignment in ethical standards when conducting research with Chinese partners (e.g., cases of plagiarism, conduct of interviews with children without parental consent) and expressed concerns over the potential degradation of UK universities’ values and ethical codes of conduct and risks to the reputation of UK academics.\(^{243}\) Others thought research collaboration with China ran the risk of undermining the objectivity and independence of UK research and associated policy recommendations, as UK academics were at risk of engaging in self-censorship or being influenced by narratives supporting CCP policies.\(^{244}\) Ultimately, for many UK academic institutions and researchers consulted, risks to academic integrity and freedom made at any point in a project constituted a red line, which if crossed would lead to the termination of collaborative activities with Chinese partners.\(^{245}\) In this regard, three participants said they had not wished to engage in research collaboration with China because of concerns over academic integrity and freedom, which could undermine the reputation of their institutions.\(^{246}\)

While these challenges should be seriously considered and mitigation solutions should be developed to address them, it should nonetheless be noted that the challenges noted here have been experienced by a minority of stakeholders consulted and UK academics consulted have also acclaimed the research ethics of many of their Chinese counterparts (see Section 3.1.1).

4.2.11. Transfer of dual-use technologies to the Chinese military has dominated the media, but only a minority of stakeholders consulted have experienced this issue

Similarly to Western notions of a ‘whole-of-government’, ‘comprehensive’ or ‘integrated’ approach, China understands global strategic competition and warfare as requiring a cohesive approach bringing together all military and non-military levers of power and actors, including opposing forces (i.e., a ‘united front’ approach) to advance its interests.\(^{247}\) In recent years, this approach has been mostly reflected in China’s MCF strategy, which has aimed to support the country’s efforts to develop the

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241 House of Commons (2019); Weale (2020); Parker (2021); Tugendhat (2021).
242 INT01, INT03, INT08, INT11, INT22, INT26, INT29, INT34, SURVEY17, SURVEY23, SURVEY25, Johnson et al. (2021).
243 INT03, INT04, INT05, INT24, SURVEY23, SURVEY43; Johnson et al. (2021).
244 INT08, INT39, SURVEY25.
245 INT01, INT02, INT11, INT17, INT29.
246 INT03, INT22, INT26.
247 Black et al. (2022).
most advanced military in the world through closer integration of Chinese civilian and military R&D ecosystems, including academia. Chinese civilian universities have notably collaborated with the People’s Liberation Army (PLA) and supported research on defence-related topics and training of military scientists.248

The existence of the MCF strategy and these links has undermined the credibility of any claims that UK researchers will be able to collaborate only with civil branches of Chinese companies and universities and has raised concerns that UK developed technologies could be leveraged as dual-use technologies by the Chinese government and its armed branch. A recent report published by Civitas has most notably showed that today half of the UK Russel Groups’ universities were inadvertently engaged in research collaborations with Chinese universities and manufacturers with close ties to the Chinese military.249

In this context, some UK research organisations consulted recognised that there was a potential risk of transferring dual-use technologies when collaborating with China on joint research.250 Among them, two UK universities interviewed had been approached by Chinese public companies or Chinese postdoctoral students who it was revealed had hidden ties with the Chinese military and intelligence apparatus.251 Thanks to robust safety checks in place, these links had been uncovered prior to the establishment of new research collaborations. In two other cases reported, UK academics had decided to limit or stop collaboration with China in sensitive research areas and to restrict collaboration with trusted Chinese partners with a proven track record to reduce the likelihood of these risks materialising.252 Nonetheless, the proportion of stakeholders consulted who held this view seems limited in comparison to media coverage dedicated to this topic (see Section 4.1.1) and many of the stakeholders who raised this issue had not experienced this risk themselves or provided further evidence substantiating their claims (see Section 4.1.1).253

4.2.12. IP theft has concerned some UK research organisations, although many have not experienced this risk themselves

Since reform and opening up, China has leveraged legal methods such as FDI, joint ventures and licensing arrangements to gain access to foreign IP, with the consent of foreign companies interested in accessing the Chinese market in return.254 However, China, like other countries, has also engaged in illegal activities such as cyber espionage and IP theft to acquire technology. Recent reports indicate that technology transfer is occurring through individual Chinese researchers working overseas, including Chinese postdoctoral students or through overseas professional associations.255 A recent study, for example, found that 126 out of 208 professional

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248 Joske (2019).
249 Tylecote & Clark (2021).
250 INT01, INT02, INT29, INT39, SURVEY25, SURVEY27.
251 INT01, INT02.
252 INT02, SURVEY23.
253 SURVEY25.
254 O’Connor (2019).
255 Johnson et al. (2021).
associations openly advertised that they were engaged in technology transfer with China. In 2019, the CPNI issued a warning that hostile state actors were targeting researchers to steal IP to ‘help their own military, commercial and authoritarian interests’. In this context, a number of stakeholders consulted for this study considered IP theft to be a key challenge when collaborating with Chinese partners. Among this cohort, only two UK academics had been victim of IP theft by Chinese collaborators or knew colleagues who had. Instead, and contrary to current media coverage (see Section 4.1.1), the majority of stakeholders who had deemed IP theft to be a risk in joint UK-China research collaboration had not experienced this risk themselves or had not provided further evidence or explanation to substantiate their concerns. This could because some UK academic institutions interviewed had already put in place robust safeguards (e.g., protected servers, provision of old and clean computers for research staff working in China) across their portfolio of partnerships or specifically for these partnerships, hindering Chinese efforts to steal their IP. It may also be because some of those participants worked at lower TRLs, which made them less attractive for IP theft.

4.2.13. Other challenges and risks associated with joint UK-China research collaboration have emerged during our consultations

In addition to the main challenges and risks described above, some UK research organisations and academics consulted for this study also reported other challenges and risks, which were nonetheless shared to a much lesser extent by other participants, including:

- **Chinese academia’s capacity to innovate:** An academic promotion system rewarding publication coupled with other practices, such as the payment for publication by Chinese academic journals and an incentive pay system in Chinese universities rewarding publications in high-impact journals, have encouraged quantity over quality in Chinese academia. Some UK academics consulted regretted these practices, which they felt impeded innovation in Chinese academia and therefore higher-quality collaborations.

- **Competition in Chinese academia:** Increasing competition between Chinese researchers to collaborate with UK partners to advance their career prospects has driven UK-China research collaboration (see Section 3.2.1). However, in one case reported, it has also hindered broadening of the collaboration agreement with Chinese academics.

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257 Staton, Warrell & Cameron-Chileshe (2021).
258 INT07, INT09, INT20, INT39, SURVEY23, SURVEY27, SURVEY31, SURVEY37.
259 INT20, INT39.
260 INT07, INT09, SURVEY23, SURVEY27, SURVEY31, SURVEY37.
261 INT07, INT09.
262 SURVEY31, SURVEY35.
263 INT27, INT32, SURVEY43.
researchers not integrated in the initial study team.\textsuperscript{264}

- **Living conditions in China:** Two stakeholders consulted noted that differences in living standards, such as high levels of fine particles 2.5 (PM2.5) in some Chinese regions and provinces, coupled with difficulties in accessing international education or spousal employment had impeded recruitment of UK academics to work on joint research in China.\textsuperscript{265} However, one of these two stakeholders had succeeded in circumventing this challenge through shorter-term contracts and substantial benefit packages.\textsuperscript{266}

- **Pace of change in China:** Since reform and opening up, China’s political, social and economic environment have rapidly transformed. The speed at which change happens in China, including political and regulatory change, has surprised and worried some UK academics, who fear unexpected events could disrupt their collaboration.\textsuperscript{267}

- **Data sharing and data protection:** Differences in data protection regulations between the UK and China have raised concerns in one UK research organisation about the security of the data shared and the anonymity of data subjects.\textsuperscript{268}

- **Unauthorised data acquisition:** One stakeholder surveyed mentioned that unauthorised acquisition of UK data by Chinese partners could pose a considerable risk to UK-China research collaboration.\textsuperscript{269} However, they did not provide further information to contextualise this claim.

- **UK-China Research & Innovation Non-Disclosure Agreement:** The UK FCDO has established a UK-China Research & Innovation Non-Disclosure Agreement (NDA) to ‘help UK companies and academics develop collaborative research and technology projects with Chinese partners’. One stakeholder surveyed noted the NDA created an additional barrier to research collaboration with China.\textsuperscript{270} They did not, however, provide further information to contextualise their statement.

- **Chinese export control law:** In December 2020, China enforced a new Export Control Law (ECL), which seeks to control the export of dual-use technologies, military products and any other goods, technologies and services that could potentially impact its national security interests.\textsuperscript{271} One stakeholder consulted emphasised greater attention should be paid to the development of Chinese ECLs as these were likely to impact UK-China research collaboration in the future, as had the enforcement of ECLs in the UK and US.\textsuperscript{272}

\textsuperscript{264} SURVEY11.
\textsuperscript{265} INT14, INT31.
\textsuperscript{266} INT14.
\textsuperscript{267} INT13, INT14, INT23, INT40, SURVEY37, SURVEY43.
\textsuperscript{268} INT07.
\textsuperscript{269} SURVEY1.
\textsuperscript{270} SURVEY37.
\textsuperscript{271} Baker McKenzie (2021).
\textsuperscript{272} INT09.
• **Serendipitous and informal set-up of research collaboration agreements:** Research collaboration between the UK and China is often established and agreed serendipitously and informally between researchers over social activities (see Section 3.1.4). One administrator of a UK research organisation noted that in some cases this could constrain central offices’ awareness of the partnerships and limit their ability to apply risk mitigation strategies at the early stages of the project.273 Another reported it limited the ability of UK researchers to back out of the agreement later in the project when unforeseen events materialised.274

• **Misalignment of research goals and ambitions:** Differences in expectations and ambitions between UK and Chinese partners, because of asymmetry in organisational structures, poor clarity and communication at early engagement stages, or differences in research agendas (e.g., Chinese blue-sky research versus UK impact-driven research), have reportedly decreased collaboration outcomes and impact, and conversely increased the risk of empty collaboration agreements.275

• **Human right abuses:** Human rights abuses have been mentioned by two stakeholders as a challenge faced and a potential deterrent to joint research collaboration with China.276

• **UK government pressure over collaboration with China:** Some stakeholders consulted raised concerns that increasing pressure from the UK government over research collaboration, especially with China, could create additional barriers to successful joint UK-China research collaboration.277

• **Differences in concepts and terminologies:** One stakeholder interviewed noted that differences in academic definitions and concepts used between the UK and China could result in communication issues and thereby complicate collaboration.278 For data anonymisation reasons, however, further information on the types of concepts mentioned cannot be disclosed.

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273 INT11.
274 INT09.
275 INT05, INT25, INT31
277 INT03, INT17, SURVEY6, SURVEY13.
278 INT04; Science Museum (2020).
Box 5 Preliminary analysis of the challenges and risks Chinese researchers face when collaborating with UK partners

While the current research has focused on gathering and understanding UK academics’ views of the challenges and risks associated with joint research collaboration between the UK and China, through these consultations the study team also gathered anecdotal evidence from UK researchers of some of the challenges and risks Chinese academics face when collaborating with UK partners, including:

• The toughening position of the Chinese government vis-à-vis so-called ‘hostile foreign forces’ and foreign researchers has resulted in the creation of additional regulatory barriers constraining Chinese partners’ ability to collaborate with UK researchers. The changing political climate in China has also limited Chinese researchers’ freedom of speech and open communication with their UK counterparts.

• New data protection laws and a changing political climate have increased barriers to data access for Chinese researchers, who need to seek approval and clearance to access and share data with foreign institutions.

• As a result of significant investments and reforms in education, China has made substantial progress in terms of its human capita and wider enablers and capacity for R&I with the UK (see Section 3.1.1). However, increasing Chinese intellectual capital and the growing quality of Chinese academia could in the future also come at the expense of UK-China research collaboration and lower China’s need and opportunities for collaboration with the UK, notably by reducing the outflow of Chinese PhD students to the UK who have often played a key role in setting joint UK-China research partnerships.

These findings remain preliminary and a second-hand recall from UK academics. As such, they should be further researched and refined through direct consultations with Chinese researchers.

279 INT30, INT31, INT37.
280 INT06, INT26, SURVEY19.
281 INT37.
282 INT01; Johnson et al. (2021).
Managing challenges and risks stemming from UK-China research engagements

This chapter provides an overview of how UK research organisations and academics currently approach risk mitigation in their collaboration with China. Building upon the preceding section on challenges and risks, this section explains how UK researchers and research institutions currently navigate such difficulties. To achieve this, the study team gathered the views and looked at the experience of UK research organisations and academics through an asynchronous survey and 40 interviews with UK academics and administrators from 34 research organisations. While it is important to understand that these views are anecdotal and do not represent those of the UK research community in a statistical sense, they nonetheless contain a remarkable degree of insight and convey the perspectives of stakeholders with varying degrees of experience in collaborating with China on joint research. The following sections describe risk mitigation strategies employed by UK research organisations and academics when engaging with China.
Box 6 Summary of key findings from Chapter 5

Most risk management approaches adopted by UK research organisations and academics consulted have focused upon expanding one's knowledge of China and China literacy more generally. To achieve this, stakeholders consulted have engaged with more experienced research organisations and relevant government bodies (e.g., UKRI China, the British Embassy Beijing) to better understand who to partner with, how to set up partnerships and how to mitigate potential risks. Project investigators from successful partnerships have also in turn shared and exchanged knowledge with less experienced UK researchers seeking to establish new links with China.

Risk management approaches commonly adopted by UK researchers engaging with China have also focused upon building trust as a prerequisite to engagement. To do so, UK researchers have valued slow approaches to partnership building and have taken the time to get to know their Chinese counterparts through regular encounters and follow-on collaborations. While the COVID-19 pandemic has placed limitations on international travel, in-person meetings where possible were preferred for building trust.

Beyond measures for fostering trust and expanding China literacy, UK research organisations consulted have applied careful due diligence processes for managing potential risks for engaging with China as they would for any other international collaboration. This most notably involved setting up central ways for scrutinising partnership requests, monitoring social media to detect potential reputational risks, and adopting secure data protection and cybersecurity practices. As a last resort, some UK research organisations considered disengaging, or have disengaged with China altogether, as a means of reducing the impact of certain risks from partnering with China including risks to personal safety of UK and Chinese researchers.

While the stakeholders consulted for this study put forward a range of proactive risk mitigation strategies, ultimately many felt that as the challenges and risks reflected structural issues, effective risk mitigation was often outside of their control. Many UK research organisations and academics therefore requested government action to find solutions to structural issues; for example, they asked that the UK government clarify the UK’s long-term strategy towards China, expand the knowledge base of China within the UK, and develop clear and systematic guidance to inform UK-China collaboration going forward.

5.1. Contextualising the management of challenges and risks in UK-China research collaboration

5.1.1. Most risk management approaches involve expanding China literacy

As detailed in the preceding chapters, while there is a heavily media focus on issues like IP theft, transfer of dual-use technologies and cybersecurity concerns, most of the stakeholders consulted for this study felt positively about their research engagements with China. For many of these researchers, the challenges did not concern shortcomings of Chinese research partners but instead limitations of the UK’s ability to confidently engage, mostly due a lack of contextual and operational understanding and relatively low

283 INT01, INT02, INT05, INT08, INT11, INT12, INT15, INT20, INT21, INT29, INT32, INT34, INT39, SURVEY1, SURVEY14, SURVEY27, SURVEY35, SURVEY37, SURVEY43, SURVEY40, SURVEY43.
levels of China literacy among the UK research community. Stakeholders lamented the widespread lack of language skills, ignorance of cultural differences in developing research partnerships, and poor levels of understanding among the UK research community as to the identity of relevant research actors or organisations in China, which may lead to overreliance on external individuals and introduce additional risks. As a result, when asked if they had any recommendations for mitigating risks and challenges ensuing from their engagement with China, the most common response among UK research organisations and academics consulted was to expand knowledge and China literacy. This finding resonates strongly with a recently published paper by the Higher Education Policy Institute, to date the only other study of UK-China research collaboration to interview researchers, which found that the UK lacks the level of China knowledge to make informed decisions on how to engage. To achieve this, many stakeholders consulted pooled knowledge from more experienced UK-China joint partnerships, consulted in-country experts from the UKRI China office or the British Embassy Beijing, or spoke with Chinese studies academics (see Section 5.2.2).

5.1.2. Most risk mitigation approaches focus on risks to partnerships rather than the China threat

As most UK research organisations and academics consulted felt positively about their engagement with China (see Section 3.1.1), many conceptualised risk management in terms of the risk to their partnership rather than as a threat to themselves or the UK, and applied generic processes that they also adopted when engaging with other countries. However, this is not necessarily the case for all researchers consulted, with many having raised explicit security concerns. This might be because UK researchers held different conceptualisations of the term ‘risk’. While stakeholders in social sciences most frequently understood risks in terms of national security, partly because the nature of their work can bring them into contention with state policy, STEM researchers tended to consider risks in terms of risks to the success of their partnership and research.

5.1.3. Some structural issues prevent effective risk mitigation by UK researchers

Despite numerous efforts described below, many stakeholders felt that they could not effectively mitigate the risks to themselves or their collaborations due to structural limitations. Stakeholders consulted mostly felt that several risks and challenges encountered had their roots in structural limitations, such as the UK’s policy of strategic ambiguity on China or the low levels of China literacy in the UK research community. Many therefore felt that effective risk mitigation was not an issue of individuals or organisations using best practices but required intervention on a structural level.

In this context, many UK research organisations and academics consulted

286 INT01, INT03, INT08, INT11, INT22, INT26, INT29, INT34, SURVEY17, SURVEY23, SURVEY25.
287 INT03, INT22, INT26, INT39.
asked for structural solutions. For example, they requested a clear, systematic framework they could consult for guidance on evaluating their collaborations with Chinese partners. Stakeholders felt the existing guidance from the UK government could introduce competing pressures, with the drive to expand research partnerships on the one hand clashing with national security considerations on the other.\textsuperscript{288} Without a cross-government position as to how to safely and legally navigate these tensions, and with the knowledge that existing guidance is largely advisory, stakeholders felt nervous about their legal culpability if problems were to result from their partnership.\textsuperscript{289}

5.2. Understanding UK researchers’ approaches to risk management when collaborating with China

5.2.1. UK researchers have sought to build and maintain trust with their Chinese partners

UK researchers and research institutions demonstrate varying degrees of familiarity with China as an operational environment and diverging levels of awareness of the risks ensuing from research collaboration with China (see Section 4.1.3). As such, given the importance of developing trust to UK-China collaboration (see Section 3.1.4), many UK research organisations and academics have adopted a long-term approach to research collaboration, built upon patience, flexibility, trust-building and constant communication. Many noted that taking things slowly, developing trust for one another and exploring potential synergies in a flexible manner was a valuable strategy for risk reduction.\textsuperscript{290} Starting small helped researchers get to know their counterparts and allowed them to understand the intersections between research areas and the Chinese research agenda, meaning that any further collaborations that grew out of these small beginnings was informed by the greater contextual understanding of China, which is often lacking in the UK (see Section 3.1.4). Part of the reason for the adoption of a long-term and flexible approach is cultural; experienced stakeholders reflected that Chinese researchers often take a less transactional understanding of research collaboration than other nations.\textsuperscript{291} However, some UK research organisations and academics also approached partnerships slowly to enable sufficient time for conducting the necessary due diligence on prospective partnerships, which may take longer in the case of Chinese partnerships than for other nations due to a lack of transparency and public information sharing around Chinese partnerships.\textsuperscript{292} In addition to taking things slowly, UK research organisations and academics also focused upon constant communication for building trust and mitigating potential risks. While the COVID-19 pandemic and travel restrictions imposed by both the UK and Chinese government have placed constraints on in-person meetings (see Section 4.2.2), stakeholders consulted felt that in-person meetings were a crucial way of managing the challenges that arise through cultural and

\begin{footnotesize}
\begin{enumerate}
\item INT08, INT10, INT11.
\item INT09.
\item INT03, INT09, INT10, INT11, INT12, INT13, INT14, INT16, INT18, INT24, INT29, INT31, INT33, INT34, SURVEY1, SURVEY6, SURVEY11, SURVEY21, SURVEY22, SURVEY31, SURVEY34.
\item INT09, INT10, INT12, INT18.
\item INT09, INT10, INT12, INT18.
\end{enumerate}
\end{footnotesize}
linguistic differences between Chinese and UK researchers. While it may be convenient to deliver the outputs of an existing research project with a well-established partner via digital technology, the stimulating and free-flowing nature of in-person conversations better supported the generation of ideas and innovation. These encounters allowed researchers the opportunity to get to know one another and to develop the necessary trust to navigate any difficulties that might arise throughout the duration of the project. This is particularly relevant for researchers at the beginning of a collaboration, who may not have the familiarity or contextual knowledge to successfully deliver collaborative research remotely. Given the harm that COVID-19 can have on reciprocal people flows, some researchers managed the risk of disengagement by developing joint Masters and PhD programmes.

5.2.2. UK researchers have drawn on and shared knowledge with government bodies

Some UK research organisations and academics have drawn upon expert guidance and support mechanisms from other research organisations and in-country government bodies before collaborating as a crucial way of navigating the potential pitfalls of UK-China collaboration. Stakeholders consulted leveraged the expertise of experienced collaborators to understand who to talk to, how to resolve tensions and how to overcome unforeseen challenges around data or funding. Some more experienced stakeholders also reflected upon their past experiences of conducting research in China to manage new collaborations.

Moreover, stakeholders highly valued the in-country knowledge of the UKRI China office and the British Embassy Beijing. These organisations provided stakeholders with invaluable guidance on how to engage with partners in China and facilitated the process of finding suitable organisations or individuals to collaborate with. In particular, several researchers emphasised the value of drawing upon specialised subdivisions of the UKRI China office. One academic in the field of plant and animal science for example consulted UKRI’s Biotechnology and Biological Sciences Research Council (BBSRC), while another in engineering relied upon UKRI’s EPSRC. Many approached their initial partnerships under the consultation of the UKRI’s trusted R&I programme, which offers discipline-specific advice and guidance on how to safely deliver high-quality collaborative research.

In turn, stakeholders consulted also considered it good practice to share their own experiences with prospective collaborators and to connect groups of experienced collaborators with those likely to need guidance such as university vice chancellors. Constant knowledge sharing and communication was seen as a proactive way of developing a residual level
of China knowledge among the UK research community and helping to overcome the various challenges discussed above that stem from a lack of knowledge. Ultimately, while this underscores the importance of information sharing, it also demonstrates how the barriers to entry for less experienced researchers detailed in Section 1.1 can translate into a lesser capacity for risk mitigation.

5.2.3. UK researchers have applied careful due diligence as they would with other countries

Beyond the need for established trust and contextual knowledge as prerequisites to risk mitigation, UK research organisations and academics have applied due diligence processes to mitigate potential risks identified as stemming from their collaboration with China, including reputational risks, cybersecurity risks, risks to the personal safety of UK researchers, risks of IP theft and illegal transfer of dual-use technologies, and risks to academic freedom and integrity. Most notably, stakeholders consulted took some of the following steps for due diligence, which many mentioned were also practiced in collaboration with nations other than China:

- **Setting up central mechanisms for information sharing**: Some UK research organisations encouraged efforts to centralise information sharing about new partnerships, which may have emerged through casual encounters.
- **Ethics committee approval**: UK research organisations ensured their collaborations were approved by the ethics committee at their institutions.
- **Media monitoring**: Some UK research organisations conducted media monitoring and considered the social media response towards partnerships before engaging to veto potential new partners and manage potential reputational risks.
- **Digital safety and cybersecurity**: One UK research organisation provided guidance on digital safety to staff members going out to China and gave them old phones without any personal data on to be used in China on the assumption that personal devices and data could be hacked.
- **Data protection**: Some UK research institutions developed and enforced clear data security protocols to guide researchers in their engagements. One UK research organisation improved their cybersecurity by installing secure portals restricting users’ access to specific datasets. Another stressed the importance of abiding by General Data Protection Regulation (GDPR) principles, as would be important for any partnership.
- **Exploratory grants**: One academic consulted sought small, exploratory grants

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301 SURVEY1, SURVEYS, SURVEY30, SURVEY34.
302 INT05, INT06, INT08, INT10, INT11, INT13, INT16, INT17, INT29, INT31, INT33, INT34, SURVEY16, SURVEY22.
303 INT05, INT11.
304 INT29.
305 INT20.
306 INT01, INT06, INT10.
307 INT06.
308 INT29.
to allow them to spend time in China developing their ideas before committing to a large partnership.309 Anecdotal evidence suggests that the challenges posed by increasing geopolitical tension, concerns over IP loss and dual-use technologies, and the UK’s policy of strategic ambiguity may have increased the desire for a more formalised approach and due diligence among stakeholders consulted. These all reflect an increasing degree of proactive risk mitigation procedures that UK stakeholders are enacting in light of the growing sense of difficulty in conducting safe UK-China collaboration.

5.2.4. UK researchers have in some cases disengaged with China to mitigate risks

Across the last decade, the CCP has intensified responses to dissenting voices, while also expanding repressive and controversial policies against the general population. In this context, many stakeholders in the social sciences have raised concerns for their personal physical and digital safety and that of their Chinese partners when engaging with China (see Section 4.8).

Particularly in the light of the ‘two Michaels’ situation, whereby two Canadian nationals (one of whom worked for the international non-governmental organisation (NGO) Crisis Group) were detained in retaliation to Canada’s detention of Huawei’s deputy chair Meng Wanzhou, many felt risks to their personal safety and academic freedom.310 To mitigate risks to personal physical and digital safety of UK researchers and Chinese partners, stakeholders consulted have employed varying approaches depending on their discipline. On the one hand, UK researchers in STEM disciplines have managed the risk that speaking up could have to their collaboration and their partner by staying ‘non-political’ and keeping quiet.311 On the other hand, for UK researchers whose disciplines overlap with these controversial areas – such as those working on human security – keeping quiet can amount to curtailing academic freedom.312 As such, several researchers in these areas reflected that they may ultimately manage this risk by disengaging from UK-China research collaboration altogether.313

309 INT21.
310 INT39, SURVEY23; Agence France-Presse (2021).
311 INT10.
312 INT26, INT30, INT40, SURVEY15.
313 INT26, INT37.
Conclusion

This chapter presents good practices for UK research organisations seeking to create and manage UK-China research partnerships and sets out policy recommendations around gaps and challenges identified in this study that the UK government could help mitigate and avenues for future collaboration.

6.1. The study team has gathered good practices for UK research organisations to draw from when seeking to engage with China

Successful UK-China research partnerships share some common characteristics, which may be translated into good practices for UK research organisations seeking to create, manage and deliver high-quality and safe research collaboration between the UK and China. Figure 6.1 summarises the list of perceived good practices collected from UK research organisations and academics throughout this study. While this list provides a robust starting point from which to build and manage research partnerships with China, these good practices should be adapted by UK research organisations to the context in which they are applied, the institutions they work with and their ultimate objectives.

Figure 6.1 Summary of good practices and due diligence measures for UK research organisations engaging with China

<table>
<thead>
<tr>
<th>Good Practices for Building Connections and Partnerships</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing personal networks and building interpersonal trust through regular visits to China and continuous exchange of ideas even after the completion of a partnership.</td>
</tr>
<tr>
<td>Understanding the Chinese research and academic landscape, including Chinese issues and publications, to choose the most appropriate partners.</td>
</tr>
<tr>
<td>Fostering an alumni base of visiting Chinese PhD students and fellows to create an organic community of researchers with similar academic interests.</td>
</tr>
</tbody>
</table>
Exploring Research Engagement with China

Good Practices for Building Connections and Partnerships

Encouraging the learning and use of Mandarin as a working language to promote a symmetrical relationship, and reduce reliance on external partners for translation which may introduce miscommunication issues.

Adopting a culturally sensitive approach to international collaboration, to avoid imposing a UK research agenda onto a China setting and improve mutual learning (i.e., it is as much about what the UK can offer to China as what Chinese partners and experiences can bring to the UK).

Good Practices for Mitigating Potential Risks

Adopting a holistic approach and a centralised process for reviewing partnership requests and raising awareness of potential risks, independent from the country of origin.

Scrutinising social media posts and other sources such as the Australian Strategic Policy Institute (ASPI) China Defence Universities Tracker to inform risk management and partnership decisions for safeguarding reputation.

Adopting a scaled approach for scrutinising collaboration requests by the universities’ central offices as early as possible in the collaboration, to protect UK researchers from inadvertent breach of rules and agree the terms of engagement.

Being transparent about the type of research conducted, the partners involved and the origin of the funding, to safeguard reputation.

Applying a robust due diligence process informed by available guidance and knowledge exchange with stakeholders in the field.

Slowing down, clarifying the ambitions of the partnership, and agreeing on respective expectations in the statement of intent to ensure a common understanding between international partners, whilst remaining flexible and capable of managing expectations in case these are not met.

Good Practices for Knowledge Sharing

Encouraging external knowledge exchange and guidance sharing with other UK research organisations and academics to benefit from their experience and share yours.

Leveraging existing networks and resources by seeking advice from relevant UK Government departments, including the British Embassy in Beijing, UKRI China Office, the Department for International Trade (DIT), the Centre for protection of National Infrastructure (CPNI), and Universities UK International (UUKi).

Fostering internal feedback and knowledge sharing between Chinese studies experts, academics who have engaged with China, and universities’ central offices to update and inform universities’ guidance.

Source: RAND Europe analysis.
6.2. The study team has developed recommendations for the UK government on engaging in research collaboration with China

In light of the findings identified through study activities, the study team formulated recommendations for the UK government to support organisations engaging in research collaboration with China. These recommendations were developed through desk-based analysis of study findings, stakeholder consultations with UK research organisations and academics, and they were stress-tested in an external workshop involving multiple UK government departments and the HEI community (including the FCDO, BEIS, DCMS, MOD, UKRI, Universities UK International (UUKi)). Figure 6.2 provides an overview of the strategic recommendations for the UK government, their potential impact and feasibility of implementation.

Figure 6.2 Summary of policy recommendations, their potential and feasibility of implementation

### Enabling Connections, Facilitating UK-China Research Collaboration

1. Creating networking opportunities to enable innovative partnerships and promote a bottom-up approach to UK-China research collaboration.

2. Leveraging existing UK-China city region partnerships and networks to foster local research links in a global world.

3. Building upon existing networks and promoting expertise sharing in the UK research community to reduce barriers to entry to collaboration.

### Sustaining the Benefits, Deepening UK-China Research Collaboration

4. Improving reciprocity in research collaboration ties between the UK and China.

5. Encouraging continuous engagement with Chinese partners to deepen and strengthen existing links, build trust and enable the flow of research benefits.
Recommendation 1: Creating networking opportunities to form innovative partnerships and promote a bottom-up approach to UK-Chinese research collaboration.

Stakeholders consulted felt that the most successful and sustainable partnerships and collaborative efforts between the UK and China were built upon and sustained by informal relationships that developed organically between researchers. Many of these organic encounters initially took place at conferences and/or through personal networks, such as those among academics who once previously studied together. Several noted that they enjoyed deliberate attempts to connect researchers, but only if these allowed researchers flexibility and time so as not to feel too forced. Trusting working relationships are strengthened through repeated interactions over time, most desirably (from the perspective of the researchers) in person while attending events relevant to shared areas of research. The UK government should therefore strive
to provide opportunities for this bottom-up, informal and organic network building between potential collaborators from the UK and China to develop. These efforts should, where possible, allow for in-person interaction, be open-ended and not output driven, and span an extended period.

In consultation with UK government stakeholders this recommendation was identified as likely providing medium to high impact towards mitigating risks and maximising the rewards from UK-China research partnerships. These same stakeholders scored this recommendation as being low to medium in terms of feasibility\(^{314}\). Both impact and feasibility were also seen as highly dependent on the context regarding possibility of travel and in-person interaction in relation to COVID-19 restrictions, while also being dependent upon the amount of funding available.

Some potential avenues for implementing this recommendation include:

a. **Providing dedicated UK-China overseas travel grants:** In a similar format to UKRI overseas travel grants, the grants should not be tied to existing research grants in order to promote and develop new international collaboration between the two countries through conference attendance, visits of Chinese research centres or exploratory field trips. The UK government should facilitate travel for UK researchers to visit potential collaborators in China and vice versa. These visits should not be tied to specific research grants or proposals and should instead be project agnostic to allow open and organic development of relationships between researchers with shared areas of specialism. These travel grants could be targeted at specific research areas identified as of interest to the UK government but should make efforts to allow for academic-led agenda setting – for example, through the delivery of conferences.

b. **Awarding dedicated UK-China partnering grants:** In a similar format to the existing UKRI BBSRC global partnering award, this grant should focus on developing partnerships between UK and Chinese research centres by supporting collaborative activities including joint exchanges of research staff and international travel. In order to support, sustain and build these long-lasting relationships in a manner that our responding stakeholders suggest leads to collaboration and partnerships, the UK government should provide a specific set of grants designed to encourage and fund collaborative activities such as exchanges in both directions between UK and Chinese researchers.

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\(^{314}\) RAND Europe Workshop, 11 February 2022.
involves devolved powers and regional and city governments as early on as possible.

In consultation with UK government stakeholders, this recommendation was identified as likely providing medium to high impact towards mitigating risks and maximising the rewards from UK-China research partnerships. These same stakeholders scored this recommendation as being low to medium in terms of feasibility. Stakeholders expressed the view that the limiting factor on the feasibility of this set of recommendations would be the capacity of academic stakeholders and the likelihood of being able to incentivise buy-in from all stakeholders.315

Some potential avenues for implementing this recommendation include:

a. **Further integrating UK city diplomacy or city-to-city cooperation with science diplomacy:** The UK government should actively encourage city and regional engagement as part of science diplomacy, such as the work of the Science Envoys within the FCDO. Early and regular engagement from regional and city representatives in this process will allow for effective uptake of local resources in the setting up and supporting of partnerships or related activities. This will also allow for a more complete stakeholder representation of perspectives when identifying risks and opportunities and developing mitigation strategies. This ensures that specific regional or domestic concerns can be covered within scientific diplomacy efforts, with the outputs of this work simultaneously being better able to be adapted to the specific concerns of regions or cities that might play host to existing or future partnerships and to specific areas of growth that these regional actors would like to aim to develop.

b. **Adopting a trilateral model including the city council, academics and a business delegation when signing twinning city or sister city agreements:** The UK government should aim to expand the approach taken by Swansea in its approach to a twinning agreement with Wuhan. The city’s approach involved stakeholders from the academic cadre of the city, the local council and businesses, ensuring a wide coverage of stakeholder representation on the delegations and that negotiations integrated the requirements and interests of the city in a more complete and thus resilient fashion.

**Recommendation 3:**
**Building upon existing networks and promoting expertise sharing in the UK research community to reduce barriers to entry to collaboration.**

Stakeholders who took part in this project represented a great deal of experience and expertise with regards to the development and management of collaboration and partnerships with Chinese institutions and individuals. This resource could be better leveraged by the UK government through a series of formalisation efforts. The support of a formalised, structured and centrally advertised network would provide relatively large rewards with regards to lower barriers to entry for collaboration and the translation of best practice for a similarly small outlay.

In consultation with the UK government stakeholders, this recommendation was identified as likely providing medium to high impact towards mitigating risks and maximising the rewards from UK-China
research partnerships. These same stakeholders scored this recommendation as being low to medium in terms of feasibility. Once again, the feasibility score was influenced by the perception that academic stakeholders would be unlikely to engage or buy-in to these efforts unless given further incentives that may not be viable within current funding constraints.\textsuperscript{316}

Some potential avenues for implementing this recommendation include:

a. **Organising regular workshops and Q&A sessions focused on experience sharing involving UUK, UKRI, the British Embassy Beijing and directors of established UK-China research centres:** The UK government, through departments such as the FDCO and offices such as the British Embassy Beijing, should organise regular workshops and Q&A sessions where representatives from established partnerships or collaborative projects can share their experiences and approaches within a wider network of research and business stakeholders. The goals of this network would be to provide a forum and focal point for the transfer of experience and best practice between UK institutions in manner that breaks down silos and stimulates the formation of an expanding community.

b. **Setting up a network of academics and administrative staff with substantive experience in UK-China research collaboration to act as a pool of expertise to offer advice to other institutions considering setting up partnerships or research agreements:** The UK government should encourage the formation of a formalised community, outside university structures, based around these regular events and provide resources to ensure it is effectively signposted to other government stakeholders, UK HEI and the private sector.\textsuperscript{317} This community or network will serve as a forum where individual academics, administrators, institutions and businesses with limited or no experience of collaborating with Chinese partners can benefit from peer-to-peer transfer of knowledge from those who have long-standing partnerships and the knowledge generated as a result.\textsuperscript{318}

c. **Providing tangible examples of lived experience in policy documents and guidance such as UUK’s security-related issues:** Many of our stakeholders directly referenced risks that are commonly associated with partnerships within the literature (see Chapter 4) but mentioned that they had no direct experience of these themselves and that most of the examples they could reference were anecdotal and second- or third-hand (see Section 4.1.1). To ensure a more complete and accurate understanding of the risks presented by UK-China partnerships and collaboration to institutions and to the UK in more general terms, the UK government (and especially Research Collaboration Advice Team (RCAT)) should seek to include tangible, contextualised examples of instances where risks have been realised.\textsuperscript{319} These examples should span both positive and negative case studies in a manner that

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\textsuperscript{317} RAND Europe Workshop, 11 February 2022.

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demonstrates the value and efficacy of the use of best practice in mitigating risks and the rewards it can bring.

Recommendation 4: Improving reciprocity in research collaboration ties between the UK and China.

Research collaboration with China was seen by many respondents to interviews and surveys to be an attractive goal for a variety of reasons spanning access to data, financial incentives and access to research or production facilities. Finance and the ease of access to it, while being one of the most cited incentives, is not the only means by which the UK government can simultaneously encourage mutually beneficial collaboration and ensure it maintains in a position where it can oversee and influence research efforts. Alternative levers can be applied to ensure that international partners continue to be attracted to the prospect of working with UK institutions, while also ensuring that the outcomes of these partnerships are mutually beneficial to all stakeholders, including the UK government. While this study cannot comment with certainty as to the reciprocal motivations from Chinese partners, the UK government should be seeking means to address the imbalance in incentives in a manner that continues to maintain a government stake in partnerships and outputs.

In consultation with UK government stakeholders, this recommendation was identified as having a low to medium feasibility score. They did not allocate an impact score to this recommendation. These stakeholders expressed the position that improving reciprocity goes far beyond simply redressing imbalances in financial support, and instead involves developing programmes to improve mobility and develop R&I initiatives.

Some potential avenues for implementing this recommendation include:

a. Setting up new mutual funding scheme financing the scientific and cultural exchange of UK and Chinese research staff: The UK government should seek to develop mutual funding schemes in partnership with appropriate Chinese government departments to allow for an equally distributed scheme to encourage scientific and cultural exchange. Equal distribution of financial costs and reciprocal administrative arrangements with regards to travel arrangements or events signals to both governments and academic partners that collaboration should be mutually beneficial with the risks and rewards of endeavours shared equally.

b. Building on and investing in existing mutual UK-China research funds like the ESPRC Sciences Bridges in China: The UK government should leverage and expand upon existing mutual research funds and programmes such as the UKRI-EPSRC Science Bridges. These programmes and funds provide an existent platform on which to build and should be expanded to include a greater range of disciplines. These could be further tuned to reflect areas of S&T that the UK government has identified as being key to its wider strategic goals but difficult to produce or develop domestically that are also viewed as areas of mutual benefit for the UK and China.

c. Exploring other means of balancing research costs and rewards between

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international partners and the UK such as the provision of advanced research or manufacturing facilities: The UK government should consult with the HEI sector as to what other resources or support could be provided alongside or instead of financial grants. This could include developing arrangements to grant access to useful datasets, research facilities and networks, or through subsidising research-related activities through other means.

Recommendation 5: Encouraging continuous engagement with Chinese partners to deepen and strengthen existing links, build trust and enable the flow of research benefits.

Stakeholders have indicated that the most effective, valuable and resilient partnerships and collaborations with Chinese institutions are those that have developed over an extended period of time. These long-term partnerships allowed for the building of trust and mutual understanding with regards to research interests, limitations and culture. Partnerships also grew in depth and breadth over the longer term when sufficient status was attached through wider recognition and the engagement of senior officials and high-profile industry partners. The UK government should therefore aim to encourage joint research that takes place over the longer term and seek to increase the status of key partnerships.

UK government stakeholders when consulted and asked to score this recommendation against impact and feasibility provided no score on feasibility but suggested that this recommendation would have a high impact should it be realised. Across the departments consulted, DCMS, BEIS and the FCDO all expressed the position that encouraging deep and meaningful interpersonal relationships between potential Chinese and UK partners would be highly beneficial with regards to maintaining existing research partnerships and developing new ones.322

Some potential avenues for implementing this recommendation include:

a. **Supplementing short-term initiatives and mechanisms such as speed dating exercises with opportunities for more organic and less formalised engagement between UK and Chinese stakeholders:** UK government initiatives aimed at stimulating the creation or continuation of valuable research partnerships or collaborations between the UK and international institutions should be developed in an informal and unstructured manner. Effort should be made to avoid formats that infer centralised goals or desired outputs/metrics as this suggests to participants that such activities are superficial and likely to lead to partnerships of limited scope or opportunity.

b. **Embedding continuity in funding opportunities by factoring in the regularity of meetings in travel grants and potential future collaborative outputs in grant applications:** The UK government should seek to include scope for travel grants in connections to grant applications. This extended scope should not be limited to travel directly related to the specific project goals but should be actively encouraged to be used towards the end stages of projects as a means of encouraging discussion between research partners regarding follow-up research projects and further collaboration.

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c. **Raising the status of partnerships through encouraging the presence of an official and high-level representative at the opening ceremony of future joint research centres:** As a means of attracting future collaborations and ensuring the longevity of existing partnerships, the UK government should seek to amplify the status of formalised partnerships or centres by ensuring that suitably senior government representatives are present at launch events. This direct involvement should be encouraged throughout the lifecycle of the project as means of confirming the importance associated to such relationships by the UK government. This approach will also provide avenues for further government engagement with these centres in a manner that could allow for greater insight and opportunities for consultation and feedback.

**Recommendation 6:**
**Raising the awareness of China literacy in the UK research community and the general population to build a resilient and informed research ecosystem.**

A deeper understanding of China, its language, culture and political and economic systems should be developed across HEI and across disciplines. A great deal of this knowledge already exists within UK academic establishments. The UK government should seek to encourage and incentivise HEI to make use of pools of China expertise across these areas to upskill their academic and administrative staff, with particular focus on those that may be considering or already engage in collaborative research efforts with Chinese partners.

UK government stakeholders consulted on these recommendations and asked to offer scores towards impact and feasibility labelled this suggestion as having a medium to high potential impact and a low to high feasibility. The range of the feasibility assessment was reflective of the recommendation’s goal being highly aspirational within current policy efforts, but one that would have limited barriers to successful implementation should it be prioritised by government in the future.

Some potential avenues for implementing this recommendation include:

a. **Developing opportunities and providing support for UK academics to upskill their China literacy in areas such as language and culture:** The UK government should work with UK HEI to develop programmes targeting key knowledge and understanding gaps with regards to Chinese language, culture, politics and economics. These programmes should then be offered to academics who currently work with Chinese partners or may seek to develop partnerships in future.

b. **Integrating more China-focussed content in national school curriculums, including materials on Chinese history, politics and economics:** Over the longer term, the UK government and devolved administrations should work to update the current national school curriculum to cover materials relating to China. While educating the current generation of practitioners who are collaborating with China provides one means of addressing the risks and achieving the rewards identified in this paper, finding the time and capacity for this to be effective is difficult. Developing a curriculum that would form the basis of

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a much-improved China literacy across all future stakeholders is a future-facing solution to the problem.

c. Including in joint research grants applications for all countries a compulsory section about the potential impact of the proposed research on national security interests (similar to the Australian approach) or wider risks to prompt thinking about potential implications:
The UK government and research funders should borrow from the Australian example of including a compulsory section on all potential grant applications where international partners are involved where applicants must detail potential wider risks or security implications resulting from their collaboration. This should not be applied solely to international partnerships with China and should be equally administered across all government-funded research grants.

Recommendation 7:
Creating and managing a joint repository of resources on research engagement with China to improve clarity, remove strategic ambiguity and provide a single point of information and guidance.

Departments across the UK government have researched and produced materials designed to help inform UK HEI on issues arising from partnerships with international partners. Other materials have been produced to offer similar resources to industry. The UK government’s strategic ambiguity towards China, as expressed by HEI stakeholders (see Section 5.1.3), is leading to an increasingly level of hesitancy from academics interviewed due to a lack of surety as to the current or future trajectory of the UK government policy with regards to China and what that might mean for the viability and longevity of existing or potential partnerships.

In consultation with UK government stakeholders across a range of departments, this recommendation was the only one identified as simultaneously providing a high impact should it be implemented while also being highly feasible. Stakeholders from across government departments all agreed on the value of a single source of advice in avoiding contradiction and they were keen to correct potential failures of signposting that had resulted in almost no mention of key advice documents or resources from academics interviewed as part of this study.

Some potential avenues for implementing this recommendation include:

a. Collating UK government advice regarding international research partnerships from diverse departments onto a single source to avoid confusion or mixed messaging: The UK government should develop a single portal that collects advice produced by all departments and bodies relevant to a full range of stakeholders who might be considering or already engaged in partnerships or collaborations with China. Examples of resources that should be hosted on this portal include those produced by the BEIS RCAT, DCMS, UKRI and UUK. This repository should be regularly and effectively maintained and moderated by a sole responsible department to ensure that the advice
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b. **Develop robust signposting targeting administrators, academics and senior academic staff (chancellors, vice chancellors) to ensure that materials and guidance are connecting with targeted stakeholders:** In order to ensure that this central repository not only deconflicts contradictory advice and also offers an effective resource to enable strategic, long-term decision making by stakeholders in UK HEI, there should be effective signposting targeting the full range of those stakeholders. The UK government should identify key stakeholders and stakeholder groups within UK HEI and then conduct outreach across the sector to direct those identified to this repository.

**Recommendation 8: Exploring the applicability to the UK of other international and sectoral approaches for mitigating risks form research collaboration with China.**

Much as this project has identified good practices as developed and employed by HEI with long-standing partnerships with Chinese institutions, further risk mitigation strategies and tools are likely to exist within sectors outside of HEI and outside of the UK. The UK government, as well as UUKi, should seek to identify other potential sources of institutional knowledge and experience that could be used to further inform or tailor advice or support to UK HEI.

In consultation with UK government stakeholders, this recommendation was identified as likely providing medium to high impact towards mitigating risks and maximising the rewards from UK-China research partnerships. These same stakeholders scored this recommendation as being low to medium in terms of feasibility. Motivation for these scores was expressed as being as a result of a recognition that international partners or sectors outside academia faced similar issues as those at the heart of this project and that it was therefore likely that value could be found in the inclusion of these perspectives in developing solutions within the academic and research contexts. Further discussion highlighted that these efforts would be relatively feasible and likely preferable to attempting to develop solutions in isolation and from the foundations upwards.

Some potential avenues for implementing this recommendation include:

a. **Promoting ongoing research by UKRI on the UK viability and challenges of the Australian, US, South Korean and Singaporean approaches to managing risks ensuring from research collaboration with China and other international partners:** The UK government should promote and improve signposting of ongoing research by UKRI into the approaches to managing the risks and rewards of research partnerships with China employed by other nation state peers such as Australia, South Korea and Singapore. All of these nations have significant investment in S&T, historic partnerships with Chinese institutions and have developed or modernised related policies, advice and programmes to encompass the current geopolitical context concerning China.

b. **Conducting research on non-academic sectors’ approaches to mitigating risks**

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for collaboration with China and other international partners and testing these approaches for applicability to the UK-China research collaboration case:
The UK government should commission or conduct research into approaches employed by non-academic sectors in developing and managing partnerships with Chinese peers. Partnerships between private sector companies may provide alternative approaches and best practice from a different perspective that could be adapted to suit HEI institutions within the UK.

Recommendation 9: Investing in early career researchers to build a new generation of UK academics working with China and to ensure the perennity of UK policy.

The UK government should embark on a series of measures to ensure the delivery of a long-term supply of China-literate academics and administrators. A more effective, achievable and holistic solution to the skill gap problem referenced in earlier recommendations is the provision of support to early career researchers seeking to work in areas that might connect with China. This approach not only redresses the balance within partnership relationships with regards to translating language and culture, but it also removes potential risks arising from dependencies on Chinese students or nationals that are a more finite and difficult to secure resource.

UK government stakeholders consulted on these recommendations labelled this as medium to high impact but with low feasibility. Stakeholders explained this scoring as a result of obvious benefits to the outcomes of the recommendations should they be enacted, but also the requirement of significant time for the benefits to be realised and the possibility that solutions over this extended a period would not be sufficiently attractive to be classed as feasible options. Some potential avenues for implementing this recommendation include:

a. Encouraging the inclusion of UK and Chinese early career researchers (PhD students, postdocs or equivalent) in binational research teams in grant applications: The UK government should directly encourage the inclusion of early career researchers in government-funded grants or projects. Doing so not only provides the opportunity for early and deep language and cultural exchange, but it also incentivises these researchers to continue to develop their China literacy as a means of securing future employment and research opportunities. Similarly, the UK government’s incentivisation towards this inclusion ensures that HEI create opportunities that encourage this kind of China literacy career development and potentially provides supplementary resources for these individuals to upskill their China literacy in a programmatic fashion as suggested in an earlier recommendation.

b. Retaining Chinese and wider international talents in UK universities through advantageous compensation packages and clear routes into industry or the public sector: The UK government should explore and deploy means of retaining key talent and expertise within the UK from international partners. A clear goal should be the development of incentives to encourage individuals who benefit from UK HEI to stay in the UK after their education or research project is complete. These individuals will not only be able to
contribute to the UK economy or research outputs, but they will also bring existing cultural and language knowledge that can help support and develop future or existing formal partnerships.

**Recommendation 10:**
Focusing future collaborative opportunities on areas of mutual benefit to the UK and China in order to mitigate potential risks while maximising the opportunity for reward.

Research partnerships are a critical resource for the UK government, allies and other states with regards to answering some of the larger and more fundamental global challenges over the horizon. The UK government should prioritise the identification of these challenges and which might be able to act as the focal point for uncontentious research collaboration between institutions in the UK and China. This approach would also provide the opportunity for significant dividends in the development of S&T diplomacy between China and the UK in a manner that could build trust and serve as the foundation for wider collaboration on shared areas of interest.

In consultation with representatives from across the UK government, this recommendation was scored as having the potential to provide medium to high impact while also being scored as highly feasible. Throughout our workshops involving government stakeholders, there was agreement that the provision of accessible and practical guidance would be both easily achievable and likely to have an outsized impact relative to the cost.  

Some potential avenues for implementing this recommendation include:

a. **Investing in research collaboration focused upon tackling global challenges such as climate change, global health, food security and energy security, as well as promoting the arts and creative industries:**
   
   The UK government should develop and promote grants and projects that encourage research collaboration and long-term partnerships that focus on global challenges with as of date relatively low to no risk to UK security. While identifying totally risk-free research areas may be impossible, one means of bracketing areas of less risk and significant opportunity would be to encourage a focus on researching problems that represent mutual or global interests.

b. **Cooperating with UK universities, research institutions, the private sector and the third sector to identify research outputs that could prove mutually beneficial to both China and the UK:**
   
   Through engagement with a full range of stakeholders across UK HEIs, the private sector and the third sector, the UK government should seek to reduce the grey area of safe research areas by identifying areas of mutual interest or benefit for both the UK and China. The inclusion of a variety of stakeholder representation means that this could be achieved in a manner that draws on the research sector’s ability to identify research goals that could offer solutions to global problems, the third sector’s understanding of humanitarian concerns and implications, and the UK government’s ability to offer feasible

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and practical means of supporting the suggestions that, through consensus, are identified as of value and being safe areas for engagement. This may be done, for example, using horizon-scanning capabilities.

c. Cooperating with UK universities, research institutions, the private sector and the third sector to develop a rigorous, forward-leaning and adaptable process for assessing research opportunities against UK S&T priorities and risks: In order to address the complexity of advising on areas of research that should or should not be considered as acceptable risk for the purposes of research partnerships between China and the UK, the UK government should engage in multi-stakeholder consultations with a view to developing a process that can be applied on a case-by-case basis in a resource efficient manner. This consultation should seek to identify sources of potential risk across national security, economic concerns, values and normative principles, and reputation. These measures can then become the basis for a rigorous, forward-leaning and adaptable process for balancing the opportunities of research partnerships with their risks.

d. Enabling joint research on multidisciplinary areas by creating interdisciplinary departments within UKRI and other research councils, based on a model similar to the NSFC: The NSFC has a specific body for multidisciplinary research – the Department of Interdisciplinary Science – while UK engagement on multidisciplinary issues relies on ad-hoc partnerships between different specific research councils, leading to structural mismatches that can complicate UK-China collaboration on interdisciplinary research. Accordingly, alongside efforts to break down silos between pools of institutional knowledge with regards to best practice in operating and forming partnerships with Chinese institutions, the UK government should further work to encourage a greater level of multidisciplinary work. This should seek to encourage joint efforts between STEM fields but also through the drawing in of social science disciplines. This recommendation is also an opportunity for the UK government to learn from and adapt an approach taken by China in the NSFC.

6.2.1. We have developed these recommendations to complement each other in achieving UK government goals on research collaboration with China

While these recommendations are separated by category and could be considered or enacted in isolation, they have been developed with the intention that they be treated holistically in that they are intentionally synergistic, complementary and, in some cases, overlapping.

Key examples of the interactions between our recommendations are the repeated references to signposting, the amalgamation of disparate and disconnected information sources into a single repository, and the development and support of a formalised network of stakeholders with partnership experience to provide peer-to-peer knowledge transfer. While each of these recommendations will provide some benefits in line with the goals of this project, each is made more effective when complemented by the other. The creation of
a single source repository for information and guidance for industry and academic institutions will decrease the confusion caused by contradictory and disconnected documents from across government departments. Improving signposting to this resource across academic stakeholders, including executive staff, academics and administrators, will amplify these benefits. Further, a formalised peer-to-peer network that is aware of this single source repository will be able to ensure continuation of signposting across new parties joining the network and provide context as to the application of the advice that it contains.

6.2.2. China’s COVID-19 response requires that these recommendations be considered within different contexts

This report and research project has been conducted in a unique global context. The COVID-19 pandemic saw China enact a strict series of policies and restrictions on travel both in and out of the country towards the goal of eliminating the disease within the country. The data collection stages of this research took place between December 2021 and January 2022 when these restrictions were firmly in place and where there have been no signs of their easing barring exceptional circumstances such as for the Beijing Winter Olympics.

Prior to assessing whether the recommendations of this report should be actioned as suggested and how they should be prioritised or measured with regards to potential impact versus their feasibility, a decision must be made as to the expected context into which these actions will be set.\textsuperscript{336} Should restrictions such as those currently in place at the beginning of 2022 still stand and be expected to do so for an extended period of time, the recommendations above that support reciprocal travel, exchanges or in-person events are likely to be less achievable, come with a higher cost or may only be able to offer limited returns. In this context, recommendations that focus on domestic capacity building, upskilling or knowledge transfer would likely provide the best balance between feasibility and impact.

If these restrictions have been lifted, or there is evidence to suggest that they will be lifted within a reasonable timeframe, then the balance of feasibility versus impact should be reconsidered. Many of the recommendations that aim to ensure a secure and resilient pipeline of mutually beneficial partnerships between institutions in the UK and China depend upon the ability to foster long-term, unstructured relationships built upon repeated meaningful interaction and taking place over an extended period. Such interactions should ideally be conducted in person to ensure that they maintain that meaningful status and so that they concurrently provide the additional and supplementary benefit of cultural exchange and experience that comes from physically visiting a region as opposed to an alternative, digital connection.

6.3. The study team has identified areas for further study

The study findings and recommendations have sought to be as comprehensive as possible. However, despite best efforts, these were bound by financial and other resource constraints and therefore should be expanded upon wherever possible. To facilitate address any gaps in the study findings and facilitate some of the recommendations presented, the study team identified areas for further research, including:

\textsuperscript{336} RAND Europe Workshop, 11 February 2022.
• **Further bibliometric studies of UK-China research collaboration**: The emerging findings from Chapter 2 highlight a number of avenues for future bibliometric studies to improve understanding of the breadth and depth of UK-China research collaboration. Most notably, further bibliometric analysis of co-authored publications should be conducted to triangulate the claim that UK-China research collaboration may be slowing down. Other bibliometric studies of the 17 sectors on the NSIA list and institution-to-institution links in terms of co-authored publications and patent applications should also be conducted to build upon emerging findings from our network analysis of UK-China joint research centres. Finally, future studies should seek to systematically map funding bodies and their role in UK-China research collaboration. This may be done by analysing bibliometric data on the funding acknowledgements of co-authored papers.

• **Deep dives into specific disciplines’ experience of engaging with China**: While this study revealed that UK academics broadly think positively of their engagement with China, emerging findings have also shown some degree of variation along discipline line, which would merit further investigation. In particular, future research may wish to take a deep-dive approach into the experiences of researchers within a certain discipline of national interest (e.g., materials science) and compare these with an equally deep investigation of the experiences of researchers in a relatively uncontroversial research area (e.g., clinical medicine) to yield further information on the experiences of UK researchers in engaging with China. It should however be noted that issues of anonymity could arise if conducting and publishing detailed research on smaller research communities.

• **Exploration of policies and practices from other sectors or from other nation states that could be adapted by the UK and HEI**: While this study effectively targeted good practices, concerns and suggestions of HEI within the UK context, it would be highly beneficial to seek to extend this evidence gathering to encompass sectors beyond higher education and research and also to consider policy efforts from states facing similar challenges. Suggestions would be to analyse policies and good practices from the United States, Australia, Singapore, South Korea and Japan. Once good practices, challenges and policy approaches from these different perspectives are identified, the next step would be to explore whether they could be adapted into the context of UK HEI.

• **An extension of project’s methodology and reach to include a wider range of stakeholders from across HEI**: While the stakeholders who were interviewed or who took part in the surveys in the data collection stage of this study were representative of a range of stakeholders in HEI engaged in partnerships with Chinese institutions, a larger number of respondents would increase the utility of the data gathered and the potential granularity of analysis. An expanded number of respondents from a wider array of institutions reflecting institution type, research discipline and status of international research partnerships, as well as a quantitative survey approach, would help to identify more targeted trends, challenges and mitigation strategies to more specific sub-groups across the UK HEI sector, and may be able to prioritise challenges and risks encountered for resource allocation.
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Annex A. Methodological approach

This annex presents and describes the methodological approach taken for this study. The research approach was divided into three phases. The first phase of the study aimed at taking stock of existing evidence on UK-China research collaboration through two literature reviews of existing academic and grey literature on UK-China research collaboration and its resulting benefits and challenges. The second phase of the study sought to gather new evidence on how and why UK researchers engage in joint UK-China research activities through stakeholder consultations, including 40 semi-structured interviews with UK-based academics and research administrators from 34 UK research institutions, and an asynchronous survey with the same population gathering 43 full survey responses from 25 UK research organisations across academic disciplines. The third phase of the study focused on combining, analysing and synthesising findings from Phase 1 and 2 through desk-based activities. This phase of the study also aimed to validate emerging findings and stress-test draft recommendations on potential impact and feasibility of implementation with relevant UK government departments and the higher education community. Figure A.1 summarises the study’s research approach.
The following sections provide further detail on each study phases’ methodological approach.

**A.1. Phase 1 aimed at taking stock of existing evidence on UK-China research collaboration through two literature reviews**

The aim of the first phase of the study was to review initial evidence on how and why UK academics engage in joint UK-China research activities. To achieve this objective, the study team conducted two targeted literature reviews to map out publicly available knowledge and gather initial evidence on how and why UK academics engage in joint UK-China research activities. The first targeted literature review focused on making sense of how UK academics engage in joint UK-China research activities. The second targeted literature review focused on understanding why UK academics engage in joint UK-China research activities and what are the resulting benefits, opportunities, challenges and risks stemming from these collaborations.

In the first literature review, the study team reviewed peer-reviewed literature and grey literature (e.g., blog posts, news articles, government and official agencies reports, editorial comments) on quantitative trends in UK-China research collaboration (e.g., bibliometric studies of co-authored publications and citation impact). Literature on numbers of Chinese students at HEIs in the UK was excluded from the review.

In the second literature review, the study team reviewed peer-reviewed literature and grey literature on the drivers, benefits, challenges and barriers associated with UK-China research collaboration (e.g., bibliometric studies of co-authored publications and citation impact). Literature on numbers of Chinese students at HEIs in the UK was excluded from the review.

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**Figure A.1 Summary of the study’s research approach**

<table>
<thead>
<tr>
<th>Phase 1: <strong>Taking stock of existing evidence</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>Literature review of bibliometric studies</strong></td>
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<tr>
<td><strong>Literature review of benefits and risks</strong></td>
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</table>

<table>
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<tr>
<th>Phase 2: <strong>Gathering new evidence</strong></th>
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<tbody>
<tr>
<td>Update of the British Embassy database of UK-China joint research centres</td>
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<tr>
<td>40 interviews with UK-based academics and support services from 34 UK research organisations</td>
</tr>
<tr>
<td>An asynchronous survey gathering 43 responses from 25 UK research organisations</td>
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</tbody>
</table>

<table>
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<tr>
<th>Phase 3: <strong>Analysing data and formulating recommendations</strong></th>
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<tbody>
<tr>
<td>Network analysis of UK-China joint research centres</td>
</tr>
<tr>
<td>Desk-based analysis and synthesis</td>
</tr>
<tr>
<td>Synthesis and recommendations external workshop</td>
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</tbody>
</table>

Source: RAND Europe.
balance the predominant assumptions of mainstream debate. Videos on the topic were excluded from the review.

In both literature reviews, sources were identified through targeted searches of titles and abstracts on Google and Google Scholar using bespoke search strings detailed in Box 7 and Box 8. The study team also applied a snowballing approach to identify further literature from the reference lists of reviewed sources. The search was limited to English-language articles published after 2019 (i.e., the end of the ‘golden era’ in UK-China relations)\(^{337}\) to identify the most up-to-date and relevant material, and concluded when the study team reached data saturation and homogeneity in data captured. Moreover, a data extraction matrix served to systematically capture data reviewed.

**Box 7 Search strings used for the first literature review**

- Trend* OR history OR pattern* AND “UK” AND “China” AND joint research OR collaborative research OR research partnership* OR research collaboration
- Bibliometric stud* OR scientometric stud* OR citation* stud* AND “UK” AND “China” AND joint research OR “collaborative research OR research partnership* OR research collaboration
- Future* OR trajectory OR direction AND “UK” AND “China” AND joint research OR collaborative research OR research partnership* OR research collaboration

**Box 8 Search strings used for the second literature review**

- Driver* OR reason* OR purpose AND “UK” AND “China” AND joint research OR collaborative research OR research partnership* OR research collaboration
- Benefit* OR advantage* OR value OR profit AND “UK” AND “China” AND joint research OR collaborative research OR research partnership* OR research collaboration
- Barrier* OR challenge* OR risk* OR threat* AND “UK” AND “China” AND joint research OR collaborative research OR research partnership* OR research collaboration

**A.2. Phase 2 focused on gathering new evidence on UK-China research collaboration through stakeholder consultations**

To complement and supplement existing evidence with lived experiences, the study team engaged with UK researchers and research support offices across different types of UK research institutions and disciplines, and with differing degrees of engagement with China, through semi-structured interviews and an asynchronous survey. The aim of these stakeholder consultations was twofold. First, the study team sought to consolidate findings from the targeted literature reviews on how and why UK academics engage in joint UK-China research activities. Second, the study team aimed to better understand how UK research institutions manage any resulting risks by considering risk management procedures and
frameworks in place (if any) and identify best practices for creating and managing UK-China partnerships.

**A.2.1. The study team conducted 40 semi-structured interviews with UK academics and research administrators**

The study team conducted 40 semi-structured interviews with 34 UK research institutions across academic disciplines, positions and types of organisations. In terms of institution type, 13 stakeholders consulted in the interview and the survey belong to Cluster 1 (Oxbridge), 44 to Cluster 2 (majority of old universities), 13 to Cluster 3 (mix of old and new universities), 2 to Cluster 4 (majority of new universities), 10 to Cluster 5 (non-university research institutes), and 1 survey respondent choose not to disclose their academic affiliation. In terms of position, 70 per cent of interviewees were academics/researchers, 29 per cent were research administrators/held support service roles and 1 per cent held dual functions. In terms of academic discipline, 54.5 per cent of interviewees worked on STEM research, 39.4 per cent on non-STEM research and 6.1 per cent on multidisciplinary topics.

The aim of the interviews was to capture the personal experience of UK researchers and support offices engaging with Chinese partners and to provide greater depth and nuance on the processes and mechanisms influencing their engagement with Chinese partners, and the resulting benefits and risks identified during Phase 1. To achieve this, the interviews examined:

- The nature of UK researchers’ experience in engaging with China.
- UK researchers’ and support offices’ experience of establishing joint UK-China partnerships.
- Factors that motivate UK researchers to initiate research activities and continue to engage on joint research with Chinese partners.
- Additional opportunities and benefits of conducting joint UK-China research activities.
- Factors that may have led UK researchers to pause or cease joint research activities with Chinese partners.
- Additional challenges and barriers to conducting joint UK-China research activities.
- Best practices and recommendations for mitigating resulting risks and enhancing safe and high-quality joint research activities.

To engage with a range of stakeholders from across various disciplines, types of UK academic institutions and varying degrees of engagement with China, the study team conducted a multiple-step stakeholder mapping. As a first step, to ensure balanced representation across various types of research institutions, the study team leveraged Boliver’s hierarchical cluster analysis of 127 publicly funded UK universities (see Figure A.2), which groups together similar UK institutions across indicators of research activity, teaching quality, economic resources, academic

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338 Measures of research activity used by Boliver include research income adjusted for science/arts mix and institution size, percentage of postgraduate students and RAE scores. See: Boliver (2015).
339 Measures of teaching quality used by Boliver include two National Student Survey satisfaction measures and the value-added score calculated by the compilers of the Guardian University Guide. See: Boliver (2015).
340 Measures of economic resources used by Boliver include endowment and investment income, spending on academic services per student and student-staff ratio. See: Boliver (2015).
selectivity\textsuperscript{341} and socioeconomic student mix.\textsuperscript{342} The study team then augmented this analysis with an additional cluster grouping non-university academic institutions. In a second step, to ensure balanced representation across academic disciplines, the study team used the Web of Science (Clarivate) discipline index to categorise potential interviewees. In a third step, the study team mapped UKRI’s suggested contacts and RAND’s own contacts against each of the categories identified in the previous step to ensure balanced representation across stakeholder categories and increase likelihood of response rate from potential interviewees. The study team also selected potential interviewees across a variety of disciplines and roles (both academics and professional support roles) with varying degrees of relations to China (from sinologists and researchers focusing on Chinese issues, to specialised researchers in a topic area with one experience of joint collaboration with China, to international relations officers in charge of overseeing the university’s strategy in China or expansion into China). Table A.3 provides a list of stakeholders who were interviewed, based on the level of anonymity consented.

\begin{itemize}
\item Measures of academic selectivity used by Boliver include UCAS point score of the average entrant, degree completion rate and percentage of students receiving a good degree. See: Boliver (2015).
\item Measures of socioeconomic student mix used by Boliver include percentage of students who are not from low participation neighbourhood, who are from more advantaged social class backgrounds and who attended a private school. See: Boliver (2015).
\end{itemize}
Figure A.2 Universities in each of the four clusters identified by Boliver's hierarchical cluster analysis of publicly funded UK HEIs

<table>
<thead>
<tr>
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<th>Cluster 2 (39 cases)</th>
<th>Cluster 3 (67 cases)</th>
<th>Cluster 3 continued</th>
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<td>University of Aberdeen&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>The University of Northampton&lt;sup&gt;d&lt;/sup&gt;</td>
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<td>University of Oxford&lt;sup&gt;b&lt;/sup&gt;</td>
<td>University of Bath&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Aberystwyth University&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>University of Birmingham&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Arts University Bournemouth&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Northumbria University&lt;sup&gt;y&lt;/sup&gt;</td>
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<td>University of the Arts London&lt;sup&gt;g&lt;/sup&gt;</td>
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<td>Aston University&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>Sheffield Hallam University&lt;sup&gt;y&lt;/sup&gt;</td>
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<td>De Montfort University&lt;sup&gt;g&lt;/sup&gt;</td>
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<td>&lt;sup&gt;d&lt;/sup&gt;Million+;</td>
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<td>&lt;sup&gt;g&lt;/sup&gt;Unaffiliated New (post-1992) universities.</td>
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### Table A.3 List of stakeholders interviewed

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<th>Role</th>
<th>Organisation</th>
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<td>N/A</td>
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<td>Director of National Graphene Institute</td>
<td>University of Manchester</td>
<td>09/12/22</td>
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<td>N/A</td>
<td>09/12/22</td>
</tr>
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<td>Anonymous</td>
<td>Liverpool Hope University</td>
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<td>Kerry Brown</td>
<td>Director of the Lau China Institute and Professor of Chinese Studies</td>
<td>King's College London</td>
<td>13/12/22</td>
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<tr>
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<td>Associate Fellow</td>
<td>Chatham House</td>
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<td>N/A</td>
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<td>Professor Pierre Failer</td>
<td>Professor of Economics and Director of the Centre for Blue Governance</td>
<td>University of Portsmouth</td>
<td>15/12/22</td>
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<td>University of Nottingham Ningbo China</td>
<td>16/12/22</td>
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<td>Professor Phil Coates, FREng</td>
<td>Director of the Polymer Interdisciplinary Research Centre</td>
<td>University of Bradford</td>
<td>16/12/22</td>
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<tr>
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<td>Director Science Bridges China programme</td>
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<td>Director UK-China Advanced Materials Research Institute</td>
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<td>INT11</td>
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<td>Head of Public International Partnerships</td>
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A.2.2. The study team conducted an asynchronous survey to increase our scope of outreach and the likelihood of stakeholder engagement

In addition to the 40 semi-structured interviews, the study team also carried out an asynchronous survey of UK academics and research administrators/support offices from various disciplines and institution types. In total, the study team gathered 43 full survey responses from 25 UK research organisations. Taking together interview and survey responses, 13 stakeholders consulted in the interview and the survey belong to Cluster 1 (Oxbridge), 44 to Cluster 2 (majority of old universities), 13 to Cluster 3 (mix of old and new universities), 2 to Cluster 4 (majority of new universities), 10 to Cluster 5 (non-university research institutes), and 1 survey respondent choose not to disclose their academic affiliation. In terms of position, 69.7 per cent of survey respondents were academics, 16.3 per cent were research administrators/held support service roles and 14 per cent held dual functions. The number of academics surveyed was broadly consistent with that of interview participants, however a slightly larger number of respondents in dual functions were surveyed compared to the number of such stakeholders interviewed.

The survey aimed to increase our scope of outreach and to offer stakeholders the possibility to engage with us at their own pace and in their own time, considering constraints on the population survey during the time of stakeholder consultations (6 December 2021–16 January 2022). The survey gathered similar data with the survey as with the interviews, ensuring consistency in our data collection efforts.

The study team used RAND and UKRI’s communication networks to disperse the survey hosted on the Smart Survey platform. The study team also asked interviewees to circulate links to the survey to their own networks.

A.3. Phase 3 sought to combine, analyse and synthesise data gathered to develop key findings and formulate policy recommendations

The study team analysed the data collected through Phase 1 and Phase 2 activities to develop key conclusions and formulate policy recommendations, which were stress-tested in an external workshop with relevant UK government departments and the higher
A.3.1. The study team analysed research collaboration data to understand how UK research institutions engage with Chinese partners

The study team first analysed and synthesised trends in UK-China research collaboration identified during the first literature review in Phase 1. To complement emerging findings, the study team also conducted a network analysis of UK-China joint research centres.

To perform this analysis, the study team used an initial database of joint research centres provided by the British Embassy Beijing and updated it with targeted searches of new joint research centres opened and closed in 2020 and 2021. The study team also supplemented the database with information gathered from the interview and survey data. While the study team aimed to be as comprehensive as possible, this database is non-exhaustive. There are likely to be more UK-China joint research centres that the study team is not aware of, but the scope of the search was limited by the time and budgetary constraints of the study.

To understand institution-to-institution links, the joint research centre data was cleaned and imported into Stata. Using Stata, the study team conducted a network analysis of the partnership data. Network analysis is a set of techniques that derived from network theory in computer science and allows the mapping of relations between actors or entities to analyse the ‘structures that emerge from the recurrence of these relations’. The results can be represented visually to show ‘nodes’, which in this case are institutions, and the connections between them, namely their links with other institutions in UK-China research partnerships. The data output from Stata was input into Gephi, a network visualisation software. This helped to identify network clusters (closely connected organisations) and which organisations had the most connections and therefore were the most involved in collaboration with China through joint research centres. The network analysis helped understand the number of organisation-to-organisation links within UK-China joint research centres in total and by organisation. It also helped understand what the nature of these links were and which were the most connected organisations. The network analysis enabled the identification of eight key network clusters. The study team named these clusters and gathered further information, including what joint research centres were associated with them. The network analysis also permitted the identification of the three most connected organisations. The study team again performed further research to gather information about the joint research centres these most connected organisations were associated with.

To understand the physical concentration of joint research centres, the study team also analysed data on physical joint research centres by location using Excel and represented its analysis visually on a map of
China. Specifically, the study team ranked the frequency of the most occurring locations. It should be noted that this visualisation did not focus on the location of each organisation involved in a joint research centre, but the analysis rather concentrated on the location of physical centres where they were available. The analysis excluded virtual centres.

To understand the concentration of joint research centres by academic discipline, the study team conducted an analysis in Excel using the Stata output from the network analysis to analyse the frequency of sectors researched in joint research centres. This was visually presented using a Treemap graph. Sectors were also grouped into STEM, non-STEM and multidisciplinary categories in Excel and their frequency analysed to yield an analysis of the three-way split in types of sectors. The output was presented in a column chart.

Finally, to understand the trends in the establishment of joint research centres, the founding dates of joint research centres were analysed and presented as two bar charts to show how the number of joint research centres being established evolved over time.

A.3.2. The study team combined and analysed Phase 1 and 2 data to understand why UK research institutions engage with China and identify good practices for risk management

Upon completion of data collection activities, the study team combined and analysed data from the second literature review (Phase 1) and the stakeholder consultations (Phase 2) to develop high-level findings on why UK academics engage with China and identify best practices for managing resulting risks. In particular, the study team examined whether there was evidence of interactive dynamics between types of institution and/or partnership/discipline and how these partnerships operate and were formulated.

To achieve this, the study team used a common framework in Excel to support the combination and analysis of interview and survey data, which was used to develop the data collection tools themselves (i.e., survey questionnaire and interview protocol). The common framework was structured around the research objectives with further subcategories for addressing specific research questions.

A.3.3. The study team convened an external synthesis workshop to explore emerging findings and develop policy recommendations

The study team ultimately convened a two-session remote workshop involving subject matter experts from RAND, external participants from UK government departments (e.g., FCDO, DCMS, MOD, BEIS) and the Higher Education community (e.g., UUKi) to explore the implications of the findings.

The first session of the workshop entailed a presentation and discussion of the preliminary findings of the study. The aim was to present the study's preliminary findings to relevant stakeholders and capture their feedback and experience against each of the study's findings through a semi-structured discussion and integrate their reflections in the final analysis. The first session also sought to ensure findings were broadly understood and accepted by participants prior to formulating recommendations.

The second session focused on stress-testing preliminary recommendations and formulating new recommendations, considering the evidence presented in the first workshop session. The workshop participants stress-tested the recommendations using a low/medium/high scoring system against two main criteria, namely:
• **Impact:** Potential effect or consequence of the recommendation on leveraging the benefits of UK-China research collaboration and mitigating identified challenges.

• **Feasibility of implementation:** Potential technical, organisational, financial, political and other barriers to implementation that may impact the adoption of some of the interventions by the UK government, its partners and implementers.

The workshop was held under Chatham House rules so while parts of the discussions were referenced in the study findings, no comments or assessment were attributed to individuals participating in this activity.

Upon the completing of the workshop, the study team integrated workshop outputs in the final report.