technopolis group

October 2021

Evaluation of the Fund for International Collaboration (FIC)

Baseline and Interim Process Evaluation – Technical Report

Version 1.6

October 2021

Evaluation of the Fund for International Collaboration (FIC)

Baseline and Interim Process Evaluation – Technical Report

Cristina Rosemberg and Neil Brown, with contributions from Charlotte Glass, Felix Dijkstal, Kalle Nielsen Maike Rentel, and Nadya Mihaylova

Table of Contents

1 This report 1

Appendix A Evaluation questions 2

Appendix B Methodology 4

B.1 Interviews and workshops 4

B.2 Surveys 9

B.3 Case studies 12

Appendix C Literature review 15

C.1 Introduction 15

C.2 Supporting international collaborative research and innovation 15

C.3 National programmes supporting international collaboration 19

C.4 Overview of evaluation methods 33

C.5 Concluding remarks 38

C.6 Annexed summary of evaluations 40

C.7 Annexed pros and cons of international collaboration 44

Appendix D FIC Portfolio analysis 45

D.1 FIC Programmes 45

D.2 FIC Projects 46

D.3 FIC Project Participants 48

Appendix E Collaboration with other countries 50

E.1 Identification of international partners in Council strategies 50

E.2 Identification of international partners through MoUs 51

E.3 Resources available to fund international collaboration 52

E.4 Partnerships within FIC projects 52

E.5 Collaboration in UKRI grants 53

Appendix F R&I outputs emerging from FIC programme 55

F.1 Collaborations 55

F.2 Funding leverage 56

F.3 Other knowledge outputs 57

F.4 Company performance (baseline) 59

Appendix G Case studies 61

G.1 United States National Science Foundation (Geosciences) 61

G.2 National Natural Science Foundation of China 72

G.3 Japan Science and Technology Agency 81

G.4 Ministry of Science and Technology, India (Department of Biotechnology) 88
G.5 Canadian Institutes for Health Research 97
Appendix H Bibliometrics 107
H.1 Bibliometric and other databases 107
H.2 Preparation of the FIC-supported researchers list 107
H.3 Affiliated institutions 107
H.4 Breakdown by FIC programmes 108
H.5 Comparator groups 108
H.6 Weighting of indicators to reflect the distribution of FIC publications across subfields 108
Appendix I Survey analysis 110
I.1 UK Successful Applicants 110
I.2 International partners (IUK projects) 126
I.3 International partners (Research Council projects) 136
I.4 Unsuccessful UK applicants 145
Appendix J Indicator framework 153
J.1 Process evaluation 154
J.2 Impact evaluation 156

Tables

Table 1 Summary of stakeholder groups targeted for consultation 4
Table 2 Summary of stakeholders consulted 6
Table 3 List of stakeholders consulted 6
Table 4 Summary of stakeholders consulted 10
Table 5 Overview of distribution of response rates (successful applicants) 11
Table 6 Case Study Selection 12
Table 7 Summary of key features and lessons from other national programmes 21
Table 8 Overview of FWF's international programmes for joint projects and seminars 28
Table 9 Summary table of relevant indicators 36
Table 10 Summary table of evaluations 40
Table 11 Summary of the pros and cons of international collaboration 44
Table 12 FIC Portfolio of programmes 45
Table 13 FIC Portfolio of programmes — partner countries 46
Table 14 FIC project classification – proportion of projects (n=356) 48
Table 15 FIC project classification – total value of grants 48
Table 15 Mentions of other countries within Council delivery plans 50

Table 16 Mentions of individual priority countries within Council delivery plans 50
Table 17 Number and value of grants allocated to grants / projects with at least one FIC priority country 52
Table 18 Summary of collaborations with priority countries for select timeframes 54
Table 19 Summary of collaborations outside the UK for select timeframes 54
Table 20 Collaborations per programme by type of partner 55
Table 21 Collaborations per programme by country of origin of partner 56
Table 22 Leverage reported by projects, per FIC programme 57
Table 23 Key financial indicators 59
Table 24 Key indicators on venture capital, private equity, and M&A deals 59
Table 25 Approach to addressing the process evaluation questions 154
Table 26 Fund level (Tier 1) Indicators and data sources 156
Table 27 FIC project level (Tier 2) indicators and data sources 159

Figures

Figure 1 Value of FIC awards by Council 47
Figure 2 Total number of active agreements between UKRI/Councils and other countries/funders 52
Figure 3 Number of organisations participating in FIC grants 53
Figure 4 Number of UKRI grants with collaborations with partners from priority countries, per grant start year 54
Figure 5 Comparison of the share of international co-publications using different weighting methods (2007-2020) 109

1 This report

This document provides a series of technical annexes to accompany the Main Findings report (and summary) for the baseline and interim process evaluation of the Fund for International Collaboration (FIC). It includes the following:

- **Appendix A** details the 5 headline **evaluation questions** and 19 sub-questions that the study is asked to address, covering the appropriateness, effectiveness and efficiency of the Fund.
- **Appendix B** provides details of the **methodology** employed for the main elements of evidence collection during this phase of the evaluation. Specifically, it covers the approach taken to interviews and workshops, questionnaire surveys and cases study development.
- **Appendix C** provides a selective **review of recent and relevant literature** (academic and grey) on approaches to supporting and evaluating international collaboration, looking at examples of comparable programmes in the UK and overseas, as well as evaluations of these, in order to draw lessons for FIC and its evaluation.
- **Appendix D** gives an overview of the programmes and projects within **the FIC portfolio.**
- **Appendix E** provides analysis of UK **collaboration with other countries**, drawing on a review of Council delivery plans and MoUs, plus information in Gateway to Research.
- **Appendix F** presents the results of an analysis of **research and innovation outputs** linked to FIC grants, based on data recorded within Researchfish.
- **Appendix G** presents a series of five **case studies** developed during the current phase of the study. Each focuses on a participating overseas funding organisation located in one of the FIC priority countries and explores the relationship between the UK and this partner, how this has evolved over time (and the role of FIC within this) and if / how this has led to outstanding research and innovation results (that would otherwise not have been possible).
- **Appendix H** provides information on the methodology employed for **bibliometrics**.
- **Appendix I** sets out the results of three **surveys** targeted at UK successful and unsuccessful applicants to FIC programmes, as well as international participants in UK-led projects.
- **Appendix J** presents the list of **indicators** (and data sources) that the evaluation is employing to assess FIC processes and provide evidence of achievement.

Appendix A Evaluation questions

The specifications for the evaluation set out five headline questions and 19 sub-questions (along with further subsidiary questions) for the evaluation to address, covering the Fund's appropriateness (process evaluation), effectiveness (impact evaluation) and efficiency (economic evaluation). These sub-questions were reviewed during the planning phase and minor adjustments were made to the wording or presentation in some cases to improve clarity or to better reflect FIC's intentions. The final list of questions and sub-questions was presented and agreed as part of the evaluation framework and is provided below for reference.

Process Evaluation Questions

Headline Question: To what extent, and how, is the FIC working and being delivered as intended?

• 1. What are the views of the different stakeholders involved on what is working more or less well regarding the delivery and implementation of the Fund and FIC programmes?
• 2. What were the unexpected facilitators or barriers to implementing and delivering FIC, if any, e.g. data sharing?
• 3a. In allocating FIC funding to specific R&I activities, how did UKRI use/interpret the overarching objectives of FIC to identify what internationally collaborative R&I proposals were of highest priority? • 3b. Was this approach to allocating FIC funding a success, in terms of maximising the impact of FIC?
• 4a. To what extent have targets for FIC's expenditure profile been met? • 4b. If delays to the release of funding occurred, why? • 4c. What has been the impact of the delays?
• 5. To what extent did the timing and amount spent in the two Waves affect the ability to deliver the best quantity and quality of programmes for the FIC portfolio?
• 6a. To what extent has FIC succeeded in leveraging additional, third-party investment and partner commitment (from the various organisations involved in the UK and overseas)? How much has materialised? • 6b. Where funding/commitment has materialised, how was this achieved? • 6c. Where funding/commitment has not materialised, why not? • 6d. Was awareness of FIC by organisations in the UK and overseas a necessary part of the process, or would it have happened anyway?
• 7. What potential lessons are there for future Waves/similar funds?

Impact Evaluation Questions

Headline Question: To what extent (and how) has FIC enabled collaboration between the UK and the best international R&I partners?

• 1a. To what extent, and how, has FIC strengthened, deepened, sustained and enabled international relationships (including with other funding agencies, research groups and research institutes overseas)? • 1b. What has been the impact of this? • 1c. Was the collaboration a necessary part of the impact, or would it have happened anyway? • 1d. Has FIC changed the perception of the UK as a partner of choice? If not, why not?
• 2. What impact has FIC had on delivering wider government objectives (e.g. additional funding leveraged by FIC contributing to the 2.4% target)?
• 3a. What, if anything, does the impact of FIC imply about the overall effectiveness of this approach to supporting internationally collaborative R&I? • 3.b To what extent, and how, has FIC delivered R&I over and beyond Council-specific international activities, cross-cutting UKRI international funds and other NPIF funds?

Headline Question: To what extent (and how) has FIC delivered knowledge impact, economic impact (for both the UK and high performing R&I nations) and societal impact?

• 4a. What has been the wider, overall impact of FIC on the state of knowledge, both in the UK and internationally? • 4b. To what extent, and how, has FIC boosted the overall quality and performance of: grant holders, funding agencies, research groups, research institutes and other organisations involved in FIC funding, as well as the overall UKRI International portfolio? • 4c. To what extent, and how, has FIC enabled discoveries in knowledge or advances in human understanding?
• 5a. What has been the wider, overall economic impact of FIC, including the economic value of non-market impacts? • 5b. How has FIC improved the status of the UK as a prime location for R&I investment, and what has been the impact of this? • 5c. where has there been increased long-term investment in UK R&D from local and international firms, and what has been the impact of this? • 5d. How has FIC improved future market access, as a result strengthening trading relationships between the UK and high performing R&D nations, and what has been the impact of this?
• 6a. What has been the wider, overall societal impact of FIC? • 6b. Where/how has FIC strengthened social-cultural relationships with international research partners, and what has been the impact of this? • 6c. To what extent has FIC contributed to fostering more equal, diverse and inclusive research environments?
• 7. What unintended outcomes and impacts have occurred as a result of FIC?

Headline Question: To what extent (and how) has FIC strengthened the UK's collective voice in R&I policy?

• 8. How has FIC led to improved criteria for targeting future international collaboration for UKRI and BEIS?
• 9a. To what extent and how has FIC led to improved visibility of UKRI international R&I funding strategies? • 9b. To what extent and how has FIC improved the alignment of UKRI and international partner strategies?

Economic Evaluation Questions

Headline Question: Based on the overall, estimated impact of FIC — considering those impacts which can be given market and non-market values — compared to the overall cost of delivering FIC, to what extent does FIC represent value for money?

• 10. To what extent does FIC represent value for money given overall impact on knowledge, economy and society relative to the size of the investment?
• 11. To what extent does FIC represent value for money compared to other possible alternative ways of achieving the same impacts?

Appendix B Methodology

This appendix provides details of the main elements of primary evidence collection undertaken during the baseline and interim process evaluation. Specifically, it covers the approach to interviews and workshops, questionnaire surveys and case study development. Details of the methods employed for the literature review (Appendix C), secondary data analysis (Appendix F) and bibliometric analyses (Appendix H) are detailed in their separate appendices.

B.1 Interviews and workshops

Stakeholder interviews and workshops are being undertaken during each phase of evaluation, with evidence sought to support both the process and impact evaluations, as well as the case studies that are being developed iteratively over the evaluation phases (see Appendix B.3).

During the current (baseline and interim process evaluation) phase, the study team have undertaken interviews with 56 individuals and consulted with a further 33 people through online workshops (held with programme leads and members of the UKRI International Committee). This section of the Appendix outlines the scope and focus of these consultation activities, as well as the approach taken, including details of the individuals consulted.

B.1.1 Scope and focus

The evaluation framework (December 2020) set out seven main groups of stakeholder that had been identified for consultation. The table below introduces each of these groups, along with the planned focus of consultation activities with these individuals during the current phase.

Table 1 Summary of stakeholder groups targeted for consultation

Group	Scope and focus
1. **FIC team.** Individuals responsible for the design and delivery of FIC	**Interviews** with members of the FIC team, focused on obtaining information and evidence for the process evaluation (assessment of various FIC processes, facilitators/barriers to implementation and delivery, potential lessons learned), as well as certain aspects of the impact evaluation (mainly around the results of monitoring activities and the development of an improved evidence base).
2. **International committee members,** who provide advice and support on the development and delivery of UKRI's international strategy and activities, as well as providing a forum for strengthening coherence across all of UKRI's international activities	All ~25 members invited to attend a two-hour **virtual workshop**, focused on obtaining information and evidence in relation to FIC processes (what works well or less well, facilitators and barriers to implementation, and issues around third-party leverage and commitment) and achievements (in particular in supporting cross-Council working, improving international partnerships, and in developing the evidence base on what works in designing and implementing such Funds). Additional **interviews** with one or more committee members for each of the case studies being developed, with individuals selected based on their knowledge of the parties and country involved in the relevant case.
3. **UK FIC programme leads** (Councils), who lead on the delivery of FIC programmes for UK partners.	UK leads for all FIC programmes invited to attend one of two **virtual workshops**, focused on obtaining information and evidence in relation to both the process and impact evaluation, including the bidding and selection, implementation and reporting processes, at both Fund and programme levels, as well as a broad range of outcomes expected from specific programmes. Additional **interviews** with at least one programme lead for each of the case studies being developed.

4. **UK leads for unsuccessful FIC programmes,** those that bid, but were not awarded funding as part of the Wave 1 or 2 FIC programme selection process	**Interviews** with a small selection of leads for unsuccessful programmes, focusing on those that just missed out (based on assessment scores), while avoiding individuals who are being consulted elsewhere. Interviews focused on exploring programme formulation and bidding processes, as well as what happened next in relation to their programme idea/partnership that was not funded through FIC.
5. **International FIC programme leads** (overseas agencies)	**Interviews** with a selection of lead partner organisations, mainly exploring issues around partnership building, funding arrangements and the collaboration process (including barriers and facilitators), as well as their views on programme outcomes as they relate to the UK. Each interview covers a different country (including all of the participating FIC priority countries), with the selection also including those overseas partners that are the focus of the case studies.
6. **UK SIN Reps,** whose officers work with the local science and innovation community in over 40 countries and territories in support of UK policy overseas	**Interviews** with selected representatives, focused on supporting the development of the case studies by providing a broader view of the effect of FIC on the UK's standing and relationships with the countries in question.
7. **UKRI International offices,** which are located in four strategic markets and provide expertise and support for the UKRI international strategy	**Interviews** with representatives from each of the offices, focused mainly on supporting the development of the case studies by providing a broader view of the effect of FIC on the UK's standing and relationships in these countries.

B.1.2 Approach

The evaluation team sought the support of UKRI in identifying relevant individuals to interview within each of the identified groups above. Initial approaches and requests were then made by UKRI before contact details were passed to the study team to arrange the interviews.

Interview guides were developed for each of the groups, covering the areas of focus outlined above, and iterated with UKRI. Interviews then took place by phone or online and lasted between 45 and 90 minutes, depending on the individual in question. The interviews were conducted in a semi-structured format, to allow for a combination of targeted questions and the opportunity to pursue and expand on specific lines of enquiry as they emerged. Brief notes were taken during interview, with the full conversations also recorded (with approval) and transcribed for further analysis.

Similarly, the evaluation team sought the support of UKRI in approaching programme leads and international committee members to participate in the online workshops. The study team provided briefing material in advance of these events and facilitated the conversations with attendees on the day based on a series of questions posed to the groups. Notetakers from the study team recorded the inputs provided at these events for analysis.

Table 2 summarises the number of individuals consulted across the seven stakeholder groups, via interviews or workshops.

Table 2 Summary of stakeholders consulted

Group	Interviewees	Workshop attendees
1. FIC team	4	
2. International committee members	4	15
3. UK FIC programme leads (Councils)	14	18
4. UK leads for unsuccessful FIC programmes	3	
5. International FIC programme leads	18	
6. UK SIN Reps	6	
7. UKRI International offices	7	
Total	**56**	**33**

Table 3 then lists the job titles and affiliation (at the time) of each of the individuals consulted. Note that some individuals appear more than once if they contributed through a workshop and a one-to-one interview.

Table 3 List of stakeholders consulted

Group	Role / Title	Affiliation (country)
1. FIC team (interview)	Director, International	UKRI
	Deputy Director, International (Global Partnerships)	UKRI
	Head of the Fund for International Collaboration	UKRI
	Senior Manager Fund for International Collaboration	UKRI
2. International committee (interview)	Executive Director Research Strategy and Programmes	BBSRC
	Director of Partnerships	EPSRC
	Director of International Relations	MRC
	Associate Director, International	NERC
2. International committee (workshop)	Associate Director of Programmes	AHRC
	Head of European & Global Partnerships	BBSRC
	Head of International Strategy	ESRC
	Director of Strategy	ESRC
	International Partnerships Senior Manager	EPSRC
	Deputy Director, Global	IUK
	Head of Europe and Global Strategy	IUK
	Director of International Relations	MRC
	Associate Director, International	NERC
	Institution Engagement Manager	Research England
	Associate Director, International	STFC

Group	Role / Title	Affiliation (country)
	Head of International Communications	UKRI
	Deputy Director, International (Global Partnerships)	UKRI
	Director, India	UKRI
	Deputy Director, International (European Partnerships)	UKRI
3. UK FIC programme leads (interview)	Programme Manager - Nuclear Physics and Particle Astrophysics	STFC
	Head, Novel Accelerator Science and Applications, Rutherford Appleton Laboratory	STFC
	Senior Programme Manager	STFC
	Head of Terrestrial, Earth and Water	NERC
	Senior Programme Manager	NERC
	Head of Marine	NERC
	Senior Programme Manager	NERC
	Senior Policy Manager	ESRC
	Programme Manager (NMHB)	MRC
	International Programme Manager	MRC
	Head of Global Innovation	IUK
	Head of Healthy Environment	NERC
	Senior Manager of International Strategy	ESRC
	Senior Manager of International Strategy	ESRC
3. UK FIC programme leads (workshop)	Senior International Partnerships Manager	AHRC
	International Partnerships and Engagement Manager	AHRC
	Senior International Partnerships and Engagement Manager (Europe)	AHRC
	Senior Portfolio Manager	BBSRC
	Senior Manager of International Strategy	ESRC
	Head of Europe and Global Strategy	IUK
	Partnership Manager – North America	IUK
	Head of Global Innovation Partnerships	IUK
	Senior Innovation Lead and SBRI Account Manager – Health and Life Sciences	IUK
	International Programme Manager	MRC
	Head of Atmospheric & Polar	NERC
	Senior Programme Manager	NERC
	Senior Programme Manager	NERC

Group	Role / Title	Affiliation (country)
	Head of Marine	NERC
	Head of Terrestrial, Earth and Water	NERC
	Senior Programme Manager	NERC
	Head of International – Europe and North America	STFC
	International Communications Lead	UKRI
4. UK leads for unsuccessful FIC programmes (interview)	Associate Director International	BBSRC
	Head of Energy	EPSRC
	Associate Director, Astronomy	STFC
5. International FIC programme leads (interview)	Director	NHMRC (Australia)
	Scientific Program Coordinator	FAPESP (Brazil)
	Professor of Computer Science	FAPESP (Brazil)
	Assistant Director	CIHR (Canada)
	Senior Partnership Lead	CIHR (Canada)
	Head of the Division of European Affairs, Bureau of International Corporation	NSFC (China)
	Director	IRC (Ireland)
	Scientist E	MOST (India)
	Director General	IIA (Israel)
	Director of European Desk	IIA (Israel)
	Director	JST (Japan)
	Special Adviser	RCN (Norway)
	Senior Adviser	RCN (Norway)
	Director, Global Innovation Network & High Level Representative to EUREKA	Enterprise Singapore (Singapore)
	General Director	KHIDI (South Korea)
	Head of International Collaboration	Forte (Sweden)
	Cluster Lead	NSF (USA)
	Program Director	NSF (USA)
6. UK SIN Reps	Head of Bilateral Engagement & Science and Innovation	FCDO (Canada)
	First Secretary, Science and Technology, British Embassy Beijing	FCDO (China)
	Lead on Healthy ageing	FCDO (China)
	Head of Science & Innovation, British High Commission New Delhi	FCDO (India)
	First Secretary, Science, Innovation and Global Challenges	FCDO (Japan)
	Director	FCDO (USA)

Group	Role / Title	Affiliation (country)
7. UKRI International offices	Deputy Director, International (European Partnerships)	UKRI (Europe)
	Senior European Partnerships Manager	UKRI (Europe)
	Acting Director	UKRI (China)
	Deputy Director	UKRI (India)
	Director	UKRI (North America)
	Deputy Director	UKRI (North America)
	Head of Canada Partnerships	UKRI (North America)

B.1.3 Limitations and caveats

Hosting workshops has allowed the study to obtain useful inputs (and discussion) from a larger number of individuals than would be possible through interviews alone (given available resources). However, these interactions are inevitably 'lighter touch' (i.e. with less time spent exploring issues with each individual). Therefore, where workshops were used (for members of the international committee and UK programme leads), the study team also undertook in-depth interviews with a selection of these same stakeholders, tied to the development of the in-depth case studies, giving the opportunity to expand on specific points further.

A similar programme of interviews and workshops (both conducted remotely) is planned for the next two phases of evaluation, which will provide an opportunity to consult with additional stakeholders that could not be engaged during the current phase.

B.2 Surveys

During the current phase, online questionnaire surveys were run with three groups of project-level stakeholders. **In total, 403 responses were received**.

B.2.1 Scope and focus

The three groups targeted by the survey questionnaires were:

1. Successful UK applicants (FIC participants). This included all of the UK participants (leads and partners, or PIs and Co-Is) awarded a FIC programme grant, as of March 2021.
2. Unsuccessful UK applicants. This included most[1] UK lead applicants that have made unsuccessful applications for a FIC programme grant, as of March 2021.
3. International FIC participants. This included non-UK participants in FIC grants registered on the UKRI system[2], as of March 2021.

Some individuals appeared multiple times across these three groups (for example because they had applied multiple times). In these cases, the following rules were applied (in order):

- If an individual has been both successful and unsuccessful, they are only surveyed as a successful applicant (grant holder)

[1] Excluding those unsuccessful at the first stage of a two-stage process (where this applies), as well as those that applied to a call run by an overseas partner. In these cases, information is not held on the unsuccessful applicants.

[2] i.e. excluding calls that have been run by non-UK partners, where information is not held by UKRI on the participants.

- If an individual has been successful multiple times, they are only surveyed in relation to their earliest grant
- If an individual has been unsuccessful multiple times, they are only surveyed in relation to their earliest application

A total of 1,699 unique individuals were identified to approach in relation to the surveys.

B.2.2 Approach

A separate survey questionnaire was designed for each of the three groups, with additional sub-sections that were only posed to certain sub-groups (e.g. businesses). These questionnaires were then iterated with UKRI before being placed online and tested. The task of issuing of requests to participate was then split between the study team and UKRI:

- The study team issued requests to all successful UK applicants and all of the international participants for UK-led grants supported by one of the research Councils.
- UKRI issued requests to all unsuccessful UK applicants, plus international participants for UK-led grants supported by Innovate UK (as permission had not been sought at application to pass their details to the evaluation team).

All potential respondents were approached between 7th and 12th May with a request to participate by the 31st May, giving them 2-3 weeks to respond. Reminders were also sent to all three groups a few days before the surveys closed to encourage additional responses.

In total, 403 responses were received, representing 24% of the population approached. A response rate of over 20% was achieved for each of the three groups, as shown below. These represent good response rates, based on previous experience of surveying UKRI beneficiaries and participants in the European Framework Programmes.

Table 4 Summary of stakeholders consulted

Group	Population approached	Responses received	Response rate
UK Successful PIs / CoIs	654	147	22%
International CoIs	375	112	30%
Unsuccessful Applicants (PIs only)	670	144	21%
Total	**1,699**	**403**	**24%**

The contact details provided by the FIC team on UK successful applicants and international partners does not classify information per type of organisation (additionally, the survey on unsuccessful applicants was administered directly by the FIC team). Additionally, GtR does not distinguish between the different types of participating organisations either. However, we were able to make a basic distinction between businesses and other type of organisations. This was done by identifying companies using the approach described in the box below. Through this, we conclude that at least 17% of FIC participants can be identified as businesses (see Table 5). In turn, 12% of the survey responses (of successful applicants) are businesses. This shows there is a relatively good representation of businesses in the sample, and we will look to increase response rates from this group in the next stage of the study (as described in the Main report).

Table 5 Overview of distribution of response rates (successful applicants)

Group	Population	Distribution	Responses	Distribution of responses
Businesses	97	17%	29	12%

Identifying businesses in the population of FIC grants

Out of 577 unique participants associated with FIC grants, 17% (98) could be identified as companies. The identification of companies out of all organisations involved in FIC grants followed a three-step process:

1. Matching with the Global Research Identifier Database (GRID)[3]:

   GRID is a publicly available database of global research-related organisations. For this analysis, release 2021-03-05 was used covering a total of 100,467 institutions of which 29,065 are companies. The organisation names of companies in GRID were matched with the names of organisations associated with FIC using fuzzy matching to account for minor discrepancies in their spelling.

2. Matching with FAME and PitchBook

   Business data linked to FIC participants was extracted from FAME[4] and PitchBook[5] (see below for a more detailed description of this process). In cases where either of the two sources identified companies not already identified as such by GRID, these were added to the list of companies.

3. Identification based on legal form

   As a final step, organisations that included relevant legal forms in their names such as Ltd or Plc were also counted as companies.

B.2.3 Limitations and caveats

Ideally, all applicants would be asked to complete one survey per application (both successful and unsuccessful). However, this would be overly burdensome on the community. We took a sensible, rule-based approach to those cases where an individual has made more than one application to FIC programmes. We recommend that the same approach is employed for planned future iterations of the surveys during the next phases of evaluation.

The split of survey respondents between academic and business participants is broadly aligned with the population. However, because businesses are not well represented in the overall population, the number of responses from this group is quite small. In future iterations of surveys, additional effort should therefore be taken to encourage responses from the business community (for example, tailored approaches or additional reminders), in an effort to increase the number of responses (data points) from this group.

[3] Digital-science, Data-science; Science, Digital (2021): GRID release 2021-03-25. Digital Science. Dataset. https://doi.org/10.6084/m9.figshare.14316596.v1

[4] See: https://www.bvdinfo.com/en-gb/our-products/data/national/fame

[5] See: https://PitchBook.com

B.3 Case studies

A core element of the approach being taken to the evaluation of the Fund for International Collaboration (FIC) is the development of a series of five case studies, each of which focusing on a participating overseas funding organisation located in one of the FIC priority countries.

These case studies are being developed longitudinally, with a first version of each produced as part of the baseline and interim process evaluation (in 2021), which will then be updated and extended as part of the interim evaluation (in 2022) and then the final evaluation (in 2024).

The current iteration of the case studies (from the current phase) can be found in Appendix G to this Technical Report, while summary information from these cases is then also presented as part of the analysis in the Main Findings Report. The remainder of the current section outlines the scope, focus and approach to the development of the case studies.

B.3.1 Scope and focus

The unit of analysis for the case studies is individual funders in key priority countries. The FIC Evaluation Framework (December 2020) set out the five funders that were selected in consultation with UKRI (see Table 6). These organisations are currently involved in 11 FIC programmes in total, spread across both Waves of programme selection and involving all UKRI Councils. However, it is not the intention that the cases will cover each programme (and their projects/calls) in detail. Instead they will focus on the relationship between the UK and the relevant overseas funders, how this has evolved over time (and the role of FIC within this) and if / how this has led to outstanding research and innovation results (that would otherwise not have been possible).

Table 6 Case Study Selection

Country	Organisation	Programme (Lead + Partners)
United States	National Science Foundation (NSF), Geosciences Division	• FIC-23 Climate, Environment and Health (Lead: NERC. Partners: ESRC & MRC) • FIC-26 Delivering Health Soils: Signals in the Soil (Lead: NERC. Partners: BBSRC, EPSRC & STFC) • FIC2-02 The Changing North Atlantic Ocean and its Impact on Climate (Lead: NERC. Partners: Met Office & Hadley Centre)
Canada	Canadian Institutes for Health Research (CIHR)	• FIC2-07 UK-Canada Collaboration on Artificial Intelligence: Building Competitive, Resilient Economies and Societies (Lead: ESRC. Partners: AHRC, EPSRC & MRC) • FIC-17 UK-USA Neuroscience Collaboration through MRC Participation in the NSF NeuroNex Programme (Lead: MRC) • FIC2-11 UK-Canada Diabetes Partnership Initiative (Lead: MRC. Partner: ESRC)
India	Ministry of Science and Technology (MOST), Department of Biotechnology	• FIC2-20 Global Incubator Programme (Lead: IUK) • FIC-25 Tackling AMR in the Environment (Lead: NERC. Partner: ESRC) • FIC-STR-02 UK-India Covid-19 Partnership Initiative (Lead: MRC. Partner: ESRC)
Japan	Japan Science and Technology (JST)	• FIC2-09 UKRI-JST Joint Call on Artificial Intelligence and Society (Lead: ESRC. Partner: AHRC)
China	Natural Science Foundation of China (NSFC)	• FIC2-21 UK-China Healthy Ageing Flagship Challenge (Lead: ESRC. Partners: MRC & IUK*)

* The Health Ageing Programme consists of two quite distinct parts. One is led by IUK, the other by ESRC. NSFC are participating in the ESRC-led portion of the programme.

Case study selection has focused on priority countries that are most actively involved in FIC (i.e. partnering in most programmes), or those considered by UKRI to offer valuable insights to the study. Within these countries, we have then selected organisations that are most active in FIC, while also ensuring a good spread across other criteria (FIC Waves, UKRI Councils involved, size, thematic Focus, etc.). However, as mentioned above, the sample is not intended to be representative of the wider population. The cases are just one aspect of the wider FIC evaluation. Other evidence collection activities cover the full FIC portfolio (all countries, Councils and programmes). The purpose and added value of the case studies is to focus in greater depth on a selection of specific examples.

The case studies will follow a longitudinal design, involving data collection at three distinct points in time (baseline, interim and final evaluation). This enables us to provide early evidence, as well as to illustrate the dynamic aspects of the programmes and change over time. This first iteration is for the baseline and so it mainly focuses on the pre-FIC situation (relationships) and on the establishment of the programme, alongside any early evidence of progress, achievements and benefits. As such, funders with newly established programmes are still relevant for inclusion within these case studies. The cases will then be revisited and updated as part of the interim and final evaluations, when more evidence is expected to be available for inclusion on the outcomes and impacts of the FIC-supported partnerships.

B.3.2 Approach

The case studies are being developed primarily on the basis of desk research and interviews, as set out below. In addition, where relevant, they will draw selectively on evidence collected via other means as the evaluation progresses.

Desk research: The team has analysed available documentary evidence for each case, including programme descriptions, programme proposals, and other relevant information (e.g. industrial Strategy, R&D roadmap, BEIS and UKRI international strategy) for context on the strategic importance of funders, countries and areas covered in the programmes.

Interviews: For each case study, the team have interviewed a selection of relevant UK programme leads (Councils), members of the UKRI international committee, UKRI international offices, UK SIN representatives and overseas partner organisations. In total, 30 individuals have been consulted (interviewees are listed at the end of each case). Further interviews are planned as part of future iterations, which may include some of the same contacts.

Analysis / reporting: We are following a comparative case study approach, whereby the case studies are described along the same dimensions. We used a theory-based approach and defined these dimensions according to the FIC Theory of the Change set out within the Evaluation Framework report. Each case study is therefore presented in the same format, following a standard template, to enhance readability and enable comparative analysis.

The fifth section of each case ("Programme activities, outputs and outcomes") is organised around the two objectives of FIC and three "themes" that the evaluation has been asked to consider in order to understand how effectively FIC has met its objectives. These are:

- Enabling funding. Reducing the barriers for accessing and applying for international collaboration R&I funding.
- Deepening R&I. Supporting R&I within new and existing areas of strategic importance across the UKRI international portfolio
- Developing partnerships. Enabling, strengthening, deepening and broadening relationships: within the UK and internationally; at all levels (funders, institutions, individuals); and both within and beyond FIC.

The cases have been cross-analysed to compare and contrast experiences and are referenced at various points in the analysis presented in the Main Findings Report.

B.3.3 Limitations and caveats

By design, the case studies only cover a selection of the countries and overseas funders involved in FIC, as well as only part of the programme portfolio. This selection has been chosen to ensure a good range across various different criteria and some of the most active and important overseas relationships, but it is not intended to be representative of the wider population. Instead, the purpose and added value of the case studies is to focus in greater depth on a selection of specific example cases; something that would not be possible for the full portfolio based on the resources available. Having said this, the case studies are just one aspect of the wider FIC evaluation, and other evidence collection activities are covering the FIC portfolio in its entirety (all countries, Councils and programmes).

The Fund is at a relatively early stage of its implementation, with some programmes only recently started, and these factors limit the amount of evidence available currently on the outputs and outcomes of these activities (as was expected). However, it is important that the evaluation is able to provide early insights into the processes around the set-up and early implementation of FIC programmes, as well as any early signs of progress and achievement. This is why an iterative approach is being taken to the development of the case studies, with the current versions focusing on the pre-FIC situation (relationships) and on the establishment of the programme (as well as providing any early evidence of progress, achievements and benefits), and later iterations focusing more on the outcomes and impacts of the FIC-supported partnerships.

Appendix C Literature review

C.1 Introduction

This appendix provides a selective (rather than systematic) review of recent and relevant literature (academic and grey) on approaches to supporting and evaluating international collaboration, looking at examples of comparable programmes in the UK and overseas, as well as evaluations of these, in order to draw lessons for FIC and its evaluation. It is intended to inform our understanding of what works in terms of supporting international R&I collaboration, as well our approach to the current evaluation. Note that the review was concluded at the end of 2020 and so some references to size of the FIC programme portfolio are now outdated.

We took a targeted approach to the review, focusing on national programmes that are similar to FIC (in that they support international collaboration across a range of international partners and topics) and evaluations of similar international collaboration initiatives. There may be other programmes and evaluations that could provide useful learning for FIC and its evaluation, but it was beyond the scope of this exercise to undertake the more comprehensive and systematic search and review process necessary to identify these. As a desk-based exercise, the review also had to rely on public information and the decisions taken by others as to the types of information and the depth of analysis that are available. As a result, the findings can raise further questions for which there is insufficient evidence available to answer. The information presented provides a range of interesting insights into other programmes and initiatives, as well as useful learning on approaches taken to evaluation. Further exploration of questions emerging from these findings would require a separate study to explore further.

After this brief introduction, the document is set out as follows:

- Section C.2 provides an overview of **key themes in the literature** relating to international collaboration and maps out the **main types of support that exist** globally.
- Section C.3 looks in more detail at a series of **comparable programmes** to support international collaboration and reflects on the **effectiveness of these different approaches** based on the available evidence.
- Section C.4 reviews a series of **recent evaluations** of programmes that support international collaboration, focusing particularly on the **approaches and methods** deployed, as well as the **challenges faced** and how these have been addressed and overcome.
- Section C.5 ends by providing some concluding remarks on the **main lessons** from the programmes and evaluations considered in this review.

C.2 Supporting international collaborative research and innovation

This first section draws on the literature to provide an overview of recent trends in international R&I collaboration and to classify the main types of Government initiatives to support this.

C.2.1 Trends in international collaboration

The literature points to several important trends in the nature and extent of international collaboration in research and innovation over the past decades. Key issues include:

- **The internationalisation of knowledge production**. A large body of literature has used bibliometric analysis to look at changing patterns in research collaboration. Increasing internationalisation of the production of research has been observed across different

countries and fields of science,[6] while it has also been demonstrated that international collaboration increases the quality and academic impact[7] of research outputs. More than half of all UK publications are now internationally co-authored,[8] and analyses have identified a significant 'impact premium' for such papers.[9] Among other theories, It has been suggested that this is because international collaborations tend to involve the best researchers in each country.[10] The UK's most frequent collaborator countries are the United States (US), Germany and France. In fact, the US is the most frequent collaborator for most major research nations — including the UK, Germany, and France — while the most productive co-authorship country-pairing world-wide is between China and the US, with more than 150 thousand co-authored articles between 2011 and 2015. Amongst the top 20 country-pairings (based on the number of co-authored articles, 2011-2015), the highest field-weighted citation index (FWCI)[11] is for co-authored articles between the Netherlands and the US (FWCI of 3.12), followed by the UK and France (3.01) and Switzerland and the US (3.0). The UK's other top country-pairings (in addition to France) have an FWCI of 2.87 (Italy), 2.86 (Australia), 2.80 (Germany), 2.75 (the US) and 2.15 (China). [12]

- **The importance of (and barriers to) International mobility.** There has been increasing interest in the issue of international researcher mobility. This is not a new concern,[13] but it is seen as an integral part of the 'Fourth Age of Science',[14] and a necessary component of a successful R&I system. Studies have found that mobility (outwards and inwards) is associated with multiple beneficial effects, including improved academic performance and professional development (e.g. in terms of citation impact or seniority),[15] as well as knowledge and technology transfer.[16] Several barriers to international mobility have also been described, including the difficulty in obtaining funding, labour market conditions, visa requirements (mainly seen as a barrier to inward mobility) and family commitments.[17]

- **The internationalisation of policies and programmes.** The last decade has seen a rapid development, particularly within Europe, of joint and open programmes, whereby domestic national research and innovation programmes are increasingly coordinated or opened up

---

[6] Wanger, C.S. (2005), "Six Case Studies of international collaboration in science", Scientometrics Vol. 62, No. 1, 3-26. Wagner C.S., T.A. Whetsell and L. Leydesdorff (2017), "Growth of International Collaboration in Science: Revisiting Six Specialities", *Scientometrics*, Vol. 110, No. 3, 1633 –1652.

[7] Quality and academic impact are typically defined in terms of bibliometric indicators such as citation impact.

[8] BEIS (2019) *International comparison of the UK research base*, Published 10 July 2019

[9] Adams, J. (2013) "The fourth age of research", *Nature*, Vol. 497, pp. 557-560.

[10] Elsevier (2017), *International comparative performance of the UK research base 2016, p. 79*

[11] An indicator of research impact, FWCI divides the number of citations received by a publication by the average number of citations received by publications in the same field, of the same type, and published in the same year. The indicator is always defined with a world average baseline of 1.0.

[12] Elsevier (2017), *International comparative performance of the UK research base 2016, p. 82*

[13] See e.g. Archibugi and Pianta (1992), *The Technological Specialization of Advanced Countries*, Commission of the European Communities, p. 16.

[14] Adams (2013), op. cit.

[15] Guthrie S., et al. (2017), International mobility of researchers: A review of the literature, RAND for Royal Society, p. 7.

[16] Edler J. et al. (2011), "International scientists' mobility and the locus of knowledge technology transfer", *Research Policy*, 40, pp. 791-805.

[17] Opinion Leader (2017), *The role of international collaboration and mobility in research: Findings from a qualitative and quantitative study with Fellows and grant recipients of the Royal Society, British Academy, Royal Academy of Engineering and the Academy of Medical Sciences*, March 2017.

to international participation.[18] The policy rationales for international programmes have also evolved, with increasing focus on global challenges, and 'missions' which require participation from multiple countries and stakeholder groups to address effectively — e.g. because they address problems that are international in nature (climate change, Antarctic research, etc.) or because they require a critical mass of resources (e.g. costly, large scale projects, or research into rare diseases with few patients in each country).[19]

The next EU Framework Programme ('Horizon Europe') will have an increased focus on 'missions' and 'impact'.[20] The UK has also seen the launch of a number of 'challenge-led' programmes, both to support collaboration with developing countries (e.g. Global Challenges Research Funding, GCRF) and to address industrial challenges (the Industrial Strategy Challenge Fund). In 2020, the global SARS-CoV-2 pandemic (COVID-19) has also mobilised an international collaborative research effort and UKRI has engaged in a number of international collaborative initiatives to face this crisis:

- The MRC/UKRI and LSHTM Uganda Research Unit, which has received £2.7million to tackle COVID-19 [21]
- The Global Effort on COVID-19 (GECO) Health Research — a new cross UK government funding call addressing COVID-19 in Low- and Middle-Income Countries supported by NIHR and UKRI [22]
- The GCRF/Newton Fund agile response call to address COVID-19 (which includes the possibility to switch existing GCRF grants to COVID Priority areas)[23]
- The Joint Statement of UKRI and the National Natural Science Foundation of China

In addition to overall policy rationales, there are a variety of reasons why individual researchers and companies would consider taking part in international collaboration — from accessing world-leading expertise and facilities (not available nationally), or working with end-users or customers to expand markets, to personal preference and prestige. However, while the potential benefits of international collaboration are evident, there are also a number of barriers that may dissuade or prevent this from happening, be they financial (international collaboration can be expensive), administrative and legal (ensuring funding and compliance systems match up), practical (e.g. travel requirements and working across different time zones), or even cultural (understanding the collaborators' expectations and ways of working).

A summary of the pros/benefits and cons/barriers to international collaboration is provided in Appendix C.7.

C.2.2 Support for international collaboration

Government support for international collaboration is provided in a variety of ways and most countries have an increasingly varied portfolio of relevant initiatives. In many cases, these are

[18] Reale, Lepori et al. (2013), *Investments in Joint and Open Research Programmes and analysis of their economic impact. Final Report*, European Commission.

[19] Kuhlman and Rip (2018), Next-Generation Innovation Policy and Grand Challenges, *Science and Public Policy*.

[20] Lamy et al. (2017), *LAB – FAB – APP: Investing in the European future we want*, European Commission.

[21] https://www.ukri.org/research/coronavirus/our-global-contribution/new-funding-supports-covid-19-research-in-uganda/ (accessed 17 July 2020)

[22] https://www.ukri.org/funding/funding-opportunities/global-effort-on-covid-19-geco-health-research/ (17 July 2020)

[23] https://www.ukri.org/funding/funding-opportunities/ukri-gcrf-newton-fund-agile-response-call-to-address-covid-19/apply-to-switch-your-existing-ukri-gcrf-grant-to-covid-19-priority-areas/ (accessed 17 July 2020)

not stand-alone programmes with earmarked budgets (as is the case with FIC), but rather a combination of various elements that enhance or adjust existing funding arrangements and schemes. These may include general administrative rules that allow funding for international projects, agreements with funders in other countries to facilitate joint projects, funding instruments (dedicated or generic) open to applications for internationally-collaborative projects, as well as programme budgets that are available to fund such activities.

We have classified six broad types of initiative below (although there are overlaps between these), based on our review of relevant activities being undertaken internationally. We provide selected examples to illustrate these different types; further examples of national programmes supporting international collaboration are provided in the next section.

- **Big science**. A classic rationale for international collaboration is the pooling of funds to build costly research infrastructure that would be infeasible or uneconomical for most national governments to finance on their own. One of the first, and most well-known, examples in the post-war period is the European Organization for Nuclear Research (CERN),[24] which involves very significant capital costs. More recent examples also include networked infrastructures, such as the Integrated Carbon Observation System (ICOS), that rely on its members not only for financing but also for data collection.[25] Other examples include the European Space Agency (ESA) and the Square Kilometre Array (SKA). These undertakings are typically organised on an intergovernmental basis, where each member country contributes to the governance of the infrastructure, as well as the construction and running costs, in exchange for access for national researchers to projects, facilities, data and other opportunities, usually as part of national grant-funded projects.
- **Science diplomacy and international relations**. International collaboration is often underpinned or enabled by diplomatic relations. For instance, intergovernmental agreements or Memorandums of Understanding (MoUs) are agreed between the UK and multiple countries, providing a framework and impetus for further collaboration. Many bi- and multi-lateral agreements also exist between funding bodies to facilitate the funding of collaborative projects at a more operational level. UKRI have several such agreements in place, e.g. with the National Science Foundation (NSF) in the United States and the São Paulo Research Foundation (FASPEP) in Brazil. Similarly, Switzerland has concluded bi-lateral agreements with countries from the BRICS group of emerging economies — Brazil, Russia, India, China and South Africa — described in the section on their bi-lateral programmes below, while the D-A-CH[26] agreement between Germany, Austria and Switzerland is another long-standing example (included in the section on the Austrian international portfolio below). Finally, in the UK, the Science and Innovation Network (SIN) of attachés hosted in consulates and embassies around the world also provides a resource that UK researchers and innovators can draw on for advice and contacts with would-be collaborators overseas.
- **Multi-country R&I programmes.** These seek to promote international collaboration and address strategic needs that can be more effectively tackled internationally. The European Framework Programmes, currently Horizon Europe, are the prime example of this type of initiative and are by far the largest of any international collaborative initiative. FIC would also fall within this category.

[24] https://home.cern/ (accessed 16 July 2020)

[25] https://www.icos-cp.eu/ (accessed 16 July 2020)

[26] The acronym D-A-CH indicates the participating countries, Germany (D), Austria (A) and Switzerland (CH)

- **Support for International development.** This has increasingly involved R&I collaboration, as part of the effort to address global societal challenges (e.g. the UN Sustainable Development Goals). In the UK, several large dual-purpose funds[27] have been set up to support ODA-compliant collaborative R&I with developing countries. These include the Newton Fund and the Global Challenges Research Fund (GCRF, profiled below).
- **Opening of national programmes to international participation**. Research funding bodies increasingly have explicit provisions for allowing international participation in mainstream national grants, e.g. as co-investigators in MRC or EPSRC grants. In some programmes (e.g. the US National Science Foundation's PIRE programme profiled below), international participants are allowed to take part as long as they pay their own way, while in others grant funding can be allocated to overseas partners for certain purposes (e.g. exchanges), on an ad hoc basis, or up to a certain threshold (e.g. < 20% in Switzerland).
- **Other accompanying measures.** A range of other types of scheme exist to support international engagement. For example, support for mobility, often in the form of relatively small grants for travel and conference fees, aimed to help researchers develop their international networks and potentially seed new collaborative relationships that may subsequently be funded by larger grants. Other schemes aim to attract talent to the sponsor country. For example, the von Humboldt international professorship scheme is available to international researchers willing to relocate to Germany. Finally, many countries also provide specific grants to support the internationalisation of national communities, e.g. by building international strategies (e.g. Sweden) or support to prepare applications for international programmes (e.g. Norway's PES2020 programme).

The types of support funded through FIC (profiled in Section C.3.2) are found elsewhere, but often spread across a portfolio of different initiatives. As such, FIC is rather unusual in providing an overarching fund structure and dedicated long-term funding. The next section explores in more detail four programmes that are implemented by other national funding bodies in support of international collaboration, highlighting their similarities and differences to FIC.

C.3 National programmes supporting international collaboration

C.3.1 Overview

The following sub-sections introduce the key features of FIC before providing a more detailed description of four programmes implemented by other national funding bodies in support of international collaboration. These are:

- **Switzerland's bilateral programmes** — which have a strategic focus on collaboration with emerging R&I countries in selected themes.
- **The US National Science Foundation's (NSF's) Partnerships for International Research and Education (PIRE)** — which provide large 5-year grants to US institutions to build international collaborative projects around a topic.

[27] 'Dual-purpose funds' is a term used to describe the Newton Fund and the Global Challenges Research Fund (GCRF) — as well the Prosperity Fund — which aim to support international development as well as R&I or Trade. See e.g. House of Commons International Development Committee (2019), 'The Newton Fund review: report of the Sub-Committee on the work of ICAI'.

- **The Austrian Science Foundation's (FWF's) international portfolio** — which supports basic research on any theme, often through administratively efficient 'lead agency' agreements.
- **The UK's Global Challenges Research Fund (GCRF)** — which is a large, complex UK programme with the dual purpose to support R&I and international development.

We selected examples using the following criteria

- National programmes similar to FIC, in that they support international collaboration across a range of international partners and topics. They are by no means identical, however, with each having a specific focus and different ways of operating.
- Availability of evaluations or evidence on effectiveness**.** We have also sought examples that have been operational for some time, with results and experiences to draw on.

Key findings on the implementation and effectiveness of the programmes are summarised in the boxes and table below. Further detail is then provided in the sections that follow.

Implementation

- Several countries have consolidated their support for international collaboration, introducing increased investment, but also stronger coordination and oversight.
- This creates complex programmes that typically involve multiple organisational layers and increased need for coordination. The programmes have found different ways of balancing support tailored to the specific needs of the communities with coordination and efficiency.
- In terms of scope, the examples include programmes focused on specific priority countries and themes/challenges (Switzerland, GCRF), and others that are more open (PIRE, FWF).
- The coordination with overseas partners takes different forms. Bilateral agreements with overseas agencies to fund national components of joint projects are common, but we also see 'lead agency' agreements where the selection process is more integrated (FWF), as well as looser agreements that don't guarantee funding for overseas partners (PIRE).

Effectiveness

- International projects are often found to perform well in terms of scientific production (publications), with similar or better performance than equivalent programmes that don't include international collaboration requirements.
- This effect appeared to differ somewhat between groups of researchers (e.g. early career researchers benefited more than senior researchers in PIRE) and depending on the partner countries involved (partnerships with emerging countries were found to be less productive (FWF) — although these were perhaps beneficial in other ways).
- Several programmes, including the FWF and PIRE, were also found to foster sustainable partnerships that lasted beyond the life of the projects. However, it appears that mobility schemes alone, without the opportunity to work collaboratively, are less effective (FWF). The (lack of) availability of follow-on funding within the national portfolio is also a potential risk, as the value created in the projects could be lost.

Table 7 Summary of key features and lessons from other national programmes

Name	Scope	Budget*	Key features	Evaluation	Evidence on effectiveness	Key findings on implementation
Fund for International Collaboration (FIC) *UKRI, UK*	Geography: Global R&D leaders Thematic: All	£160m (2018/19-2023/24)	• Overarching fund covering UKRI's broad remit • Focus on priority countries	Process, impact and economic evaluation commissioned	• n/a — to be obtained through the current evaluation	• n/a — to be obtained through the current evaluation
Bilateral cooperation programmes *Switzerland*	Geography: BRICS+ Thematic: Call-specific	CHF 48m (2017-2020) (£38m)	• Strategic focus on priority countries • Decentralised management model	Programme evaluations (2011 and 2020)	• Funding has led to successful collaborative outcomes, but a lack of follow-on funding can mean this value is lost • Limited effects on increasing R&I collaboration volumes	• Standardisation of administrative procedures and centralisation of communication has been positively received by (potential) participants
Partnerships for International Research and Education (PIRE) *NSF, US*	Geography: World-wide Thematic: Science and engineering	$25m/year (2018 figure) (£20m/year)	• Large institutional awards ($4m) to US HEIs • Applicants can use NSF overseas partnerships	Programme evaluation (2015)	• Research productivity and quality are comparable to other NSF programmes • Evidence of increased and sustainable collaborations • Early career researchers benefited more in terms of an increase in outputs	• Institutional support (administration, coordination) has proved beneficial for participants • Flexibility around how international partnerships are defined has led to little or no overseas funding in some cases
International Portfolio *FWF, Austria*	Geography: Europe, North America, East Asia Thematic: Open	€30m/year (2018 figure) (£26m/year)	• FWF funding through bi-/multilateral partnerships • Collaborative projects and seminars	Portfolio evaluation (2017)	• Collaboration increased quality (measured via citation impact) but not quantity (volume of publications) • Helped to continue international collaboration patters or establish new ones	• In-depth partnerships with lead agency agreements are possible but may be easier for similar countries • Collaborative work more likely to lead to sustained collaboration than mobility alone
Global Challenges Research Fund (GCRF) *BEIS, UK*	Geography: ODA Thematic: Development challenges	£1.5bn (2016/17-2020/21)	• Implemented through 9 delivery partners • Suite of instruments	Foundation evaluation (2018)	• Too early to measure impact	• Complex programmes face trade-offs between strategic direction and the need to delegate • 'Shovel-ready' proposals are favoured when programmes are launched on short notice

Source: Technopolis (2020). *Budget from most recent year or budget period. Approximate GBP calculated using HMRC average rate for 2020 to 31 March.

C.3.2 *Fund for International Collaboration*

C.3.2.1 Overview

The UK's Fund for International Collaboration (FIC) was announced in the Industrial Strategy White Paper in December 2017 with the aim to "enhance the UK's excellence in research and innovation." (p. 89). The £160m fund runs until 2023/24[28] and seeks to develop strategic partnerships with global R&D leaders and reduce barriers to access to international funding.

The Fund's strategic objectives are:

- To enable UK researchers and innovators to collaborate with the best international partners
- To carry out world-leading R&I which delivers new knowledge as well as societal and economic impact to the mutual benefit of the UK and partner countries
- To support BEIS and wider Government objectives, including science diplomacy, enabling the UK to strengthen its collective voice in research and innovation policy

The Fund provides an overarching structure for a variety of programmes implemented by UKRI and the constituent Councils and overseen by the FIC Board, which consists of internal and external stakeholders.

C.3.2.2 Scope

Geographical Scope. FIC focuses on collaboration with global R&D leaders — thus complementing existing programmes which support collaboration with developing countries. UKRI has, in consultation with BEIS, identified key target partner countries[29], as part of an evolving Priority Framework for International Investment. As of August 2020, programmes with the USA and Canada were most common (12 and 8 programmes respectively, out of 32).[30]

Thematic Scope. FIC covers the entire remit of UKRI and supports a range of research and innovation activities. The programmes funded are diverse, including challenge-driven programmes as well as other less prescriptive ones (e.g. Global Incubator Programme). Many programmes are multidisciplinary in nature and around half involve more than one Council.

C.3.2.3 Financial arrangements and funding allocation

FIC's overall £160m budget is allocated through a competitive process in two steps:

- UKRI's constituent Councils (individually or in partnership) were eligible to bid into an internal assessment process for funds to deliver individual FIC programmes. These bids were examined and assessed by the FIC Board, which sought to build a FIC programme portfolio that captured a diversity of international partners and research areas. The first Wave of programmes was selected in the Summer of 2018 and the second Wave of programme

[28] At business case the FIC funding profile total was £160m. The initial timeframe was 2018/2019 to 2020/2021, however there are 3 post Spending Review commitment years, 21/22, 22/23 and 23/24. Within the initial timeframes, for Waves 1 and 2, the total is approximately £110m.

[29] Currently: Australia, Canada, China, India, Ireland, Israel, Japan, Singapore, South Korea, Sweden, the US and EU Associated Countries (Norway and Switzerland)

[30] Additional programmes may be awarded in future under FIC.

proposals was considered by the FIC Board in January 2019. A total of 32 programmes were selected, each with a budget between £650k and £12m.

- The selected programmes are implemented by the Councils through calls for proposals or specific infrastructure investments. As of the end of Q1 2020/21, 313 grants and innovation projects had been awarded and three investments in infrastructure had been made[31].

C.3.3 Switzerland's bilateral cooperation programmes

C.3.3.1 Overview

Switzerland's bilateral programmes aim to promote scientific cooperation with non-European countries that show high or promising research potential.[32] Based on the principles of scientific excellence, mutual interest and co-financing, the objectives of the programmes are: (i) to encourage the diversification and intensification of international partnerships through the provision of cooperation instruments; and (ii) to help to remove obstacles to cooperation, e.g. resulting from differences in funding systems, cultures, language, and geographical distance.

The programmes offer two main types of support:

- Calls for Joint Research Projects (JRPs), implemented by the Swiss National Science Foundation (SNSF) in collaboration with partners in priority countries
- A range of smaller, flexible pilot schemes (e.g. to seed new collaboration or support mobility), provided on a decentralised basis by the 'Leading House' liaison offices (see below)

However, these should be seen in the context of a much wider portfolio of grant support schemes that are used extensively for international collaboration[33], and also allow some support for international partners.

The management model of the Swiss bilateral programmes is unusual. It involves three levels:[34]

- The State Secretariat for Education, Research and Innovation (SERI) maintains contact with the authorities in partner countries, represents Switzerland in Joint Committee meetings, and oversees contracts and coordination with the Leading Houses.
- The Swiss National Science Foundation (SNSF) negotiates bilateral agreements with funding bodies in partners countries and implements joint calls for JRPs.
- Selected Swiss universities are contracted to serve as 'Leading Houses'. These are liaison offices for each country or geographical region which takes part in the bilateral programmes and may develop their own additional support instruments (typically early stage funding and mobility) to complement the JRPs.

The Leading House model has been a feature since the start of the programmes, but the division of labour between the layers has been amended over time. In 2013 — five years after the bilateral programmes were launched — the responsibility for administering the calls for JRPs

[31] Further awards and investments are expected.

[32] http://www.snf.ch/en/funding/programmes/bilateral-programmes/Pages/default.aspx (accessed 16 July 2020)

[33] http://p3.snf.ch/Default.aspx?id=intcollab (accessed 25 June 2020)

[34] See e.g. IRIS (2020), Evaluation of Switzerland's bilateral cooperation programmes in science and technology, p. 26

was transferred from the Leading Houses to the SNSF in order to strengthen grant administration and communication. Participants report that programme administration and access has improved as a result, as SNSF has been able to incorporate the JRPs into the general funding framework, streamline communication and align it with other instruments.[35]

C.3.3.2 Scope

Geographical scope. The bilateral programmes prioritise countries with high potential where Swiss researchers did not already have well established collaborative relationships. Following initial pilot programmes with China and India in the early 2000s, the bilateral programmes were launched in 2008 with a larger group of countries. As of 2020,[36] the programmes cover bilateral agreements with China, India, South Korea, Japan, South Africa, Russia, and Argentina. In addition, the Leading Houses, drawing on their dedicated share of the budget, have a role in facilitating collaboration with the broader regions beyond the specific priority countries and, as of the current programme period (2017-2020), the programme covers all regions outside the EU, North America and Australia. The regional focus complements rather than replaces the bilateral JRPs with priority countries.

Thematic scope. One or more separate thematic areas are defined for each call depending on mutual interest. Recent examples include joint calls with India on 'Systems Medicine' (2020), with China on 'Surface Earth System Science' and on 'Air quality and Health' (2019), and with Brazil covering ICT, and 'Water Related to Environment' (2019). Survey responses in the most recent evaluation suggest an approximately even split between (i) natural sciences and engineering, (ii) biology and medicine, and (iii) humanities and social sciences.[37]

C.3.3.3 Financial arrangements and funding allocation

Budget. The budget allocation for the current programming period (2017-2020) is CHF 48m (£38m), or approximately CHF 12m (£10m) per year. Around two-thirds of this budget is spent on calls for JRPs, with the remaining third allocated to the Leading Houses for administration and to provide funding and support for additional activities.

Eligibility criteria & selection process. Calls for JRPs are launched for each country every 3-4 years, with a budget and theme adapted to the partner country. The maximum permissible budget for the Swiss partners in a project is CHF 250-350k (approximately £200-280k) for a duration of 3-4 years. The SNSF's eligibility criteria are broadly similar to other SNSF grants with respect to applicants and costs, whereas criteria for the partner countries vary. As noted above, the evaluation found that the alignment of the JRPs with the SNSF's general procedures and communication was seen to have improved administration and access to the instrument.

The proposals are prepared jointly and submitted in each country separately. The evaluation of proposals is organised using standard peer review (either jointly or separately) and on this basis, the funding bodies will jointly decide which funding projects to fund.

In addition to the JRPs, the Leading Houses provide a variety of smaller, flexible grants using different modalities, including seed money grants (CHF 10-25k or approximately £8-20k),

[35] IRIS (2000), op cit, pp. 42, 47

[36] http://www.snf.ch/en/funding/programmes/bilateral-programmes/Pages/default.aspx (accessed 24 June 2020)

[37] IRIS (2020), p. 87.

mobility/exchange grants (CHF 2.5-10k or £2-8k), and bridging grants to build on successful seed grants (CHF 25-50k or £20-39k). Each Leading House has a different offer of these types of grants, adapted to the specific communities.

C.3.3.4 Evidence of effectiveness

The Swiss Bilateral programmes have been evaluated twice, in 2011 and again in 2019/20. In addition to assessing scientific outcomes, the evaluations have focussed on the management model of the programme and particularly the role of the Leading Houses. Key findings include:

- The governance model was found to work well, balancing efficiency of the administration of grants by the SNSF with the tailored and flexible support by the Leading Houses. Still, there were suggestions that the programmes offered by the Leading Houses could be harmonised to improve visibility and avoid duplication of efforts.
- The grants from both categories were found to have led to successful collaborative outcomes, but in many cases appropriate follow-on funding was not available (e.g. thematic mismatch between seed grants and JRPs), and the value created by the projects could therefore be lost.
- There is no evidence to suggest a strong impact on overall levels of collaboration with the priority countries, where the growth of Swiss collaboration was relatively modest compared to other European countries.

Switzerland's bilateral cooperation programmes — Summary of key findings

- The Swiss bilateral programmes provide a good example of a prioritised programme, with a clear policy aim to build collaboration with emerging R&I hotspots.
- The programmes have found a model to manage coordination between top-down programme direction and grant administration, and bottom-up support tailored to the communities, although this involves some trade-offs between flexibility and efficiency.
- Supporting internationally collaborative research projects alone is not sufficient to raise the level of collaboration with target countries, but is probably only one of a range of instruments needed to achieve this.
- The programme's grants are relatively small, and its success relies on the ability of grantees to leverage a wider portfolio of opportunities to support further collaboration at scale.

C.3.4 NSF Partnerships for International Research and Education

C.3.4.1 Overview

The Partnerships for International Research and Education (PIRE) is the US National Science Foundation's (NSF) largest programme for international collaboration. It is run by the organisation's Office of International Science and Engineering (OISE).

The programme funds large competitive awards to US Higher Education Institutions (HEIs) with the aim to "support high quality projects in which advances in research and education could not occur without international collaboration [and] catalyse a higher level of international

engagement in the US science and engineering community".[38] The programme has a particular focus on creating international opportunities for students and early career researchers and also seeks to develop new models for international research and education.[39] Each project may include multiple US institutions as well as overseas partners, and is expected to present plans for research, educational activities and management.[40]

The programme funded its first cohort of projects in 2005, with subsequent competitions run every two to three years. The latest competition, PIRE6, was held in 2017. The programme is currently paused for revision, with the next round expected to launch in late 2020.[41]

C.3.4.2 Scope

Geographic scope. The programme allows world-wide collaboration, but applicants can make use of the NSF's co-funding agreements with counterparts in 18 countries (PIRE 6) across Asia, Europe and the Americas. The UK has previously collaborated with the NSF on PIRE (e.g. for PIRE4 in 2012), but is not currently listed among partner countries. In addition, funding for partners in developing countries can be covered by complementary grants from USAID's Partnerships for Enhanced Engagement in Research Program (PEER Science). The PIRE portfolio of projects includes collaborations with countries across all parts of the world.

Thematic focus/scope. The programme is open to all science and engineering disciplines within the NSF's remit (including social science). A narrower focus was adopted for the 2012 competition (PIRE4) that focussed exclusively on the NSF invest area of Science, Engineering, and Education for Sustainability (SEES) — in partnership with the UK's EPSRC and ESRC among others.[42] By way of example, the latest cohort (PIRE6) includes projects on black hole astrophysics (with Chinese Taipei, Germany and Mexico), bio-inspired materials and systems (Switzerland), and ciguatera fish poisoning in tropical oceans (the only project including the UK — where the country is listed as an international partner), among others.[43]

C.3.4.3 Financial arrangements and funding allocation

Budget. The programme previously limited the budget of each award to $2.5m (approximately £2m), but this cap has now been removed and awards in the most recent round were typically about $4m (£3m) each. The annual budget for the latest round of projects was $8-12m (£6-9m). As two cohorts of projects are active at any time, the overall annual budget is double this amount, e.g. $25m (£20m) in 2018.[44]

Eligibility criteria & selection process. US academic institutions with Ph.D. programmes are eligible to apply for PIRE. The selection process is organised in two stages, with a first selection based on preliminary proposals, before a shortlist is invited to submit full proposals. Each institution is limited to a single preliminary proposal per round. Each proposal is evaluated

[38] PIRE program solicitation (2016)

[39] NSF (2016), "Partnerships for International Research and Education (PIRE): Webinar for Pre-Proposals Due September 14, 2016", PIRE Webinar, July 7, 2016.

[40] Ibid.

[41] PIRE website: https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505038 (accessed 16 July 2020)

[42] PIRE4 website: https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12819 (accessed 16 July 2020)

[43] PIRE6 Award Information: https://www.nsf.gov/od/oise/PIRE/pire-2017-list.jsp (accessed 16 July 2020)

[44] NSF (2018) FY 2018 Budget Request to Congress, available at: https://www.nsf.gov/about/budget/fy2018/toc.jsp (accessed 16 July 2020)

through the NSF's Merit Review process and is assessed against two general criteria — intellectual merit and broader impacts — and a set of programme-specific criteria: (i) value added through partnership (is international partnership essential to the project?); (ii) internationally engaged educational activities; (iii) institutional engagement (role of each partner); (iv) evaluation and assessment (plans for measuring outputs and outcomes); and (v) project management.[45]

C.3.4.4 Evidence of effectiveness

The PIRE programme was evaluated for the first time in 2015, ten years after the first awards, but before the most recent programme round (PIRE6). The evaluation primarily aimed to assess the programme's performance against its objectives, but also explored the experiences and outcomes for programme participants, contributions to societal challenges and the role of institutional policies and practices in promoting international collaboration.

The main findings of this evaluation were:

- Research outcomes (publications) were comparable in quality and quantity with other NSF programmes, but with higher international involvement and increased productivity for early career researchers. More-senior researchers did not increase productivity, possibly due to the added administrative burden for PIs and co-PIs of managing international partnerships.
- International collaborations increased both during the projects and afterwards.
- HEIs promote international collaboration through administrative support and coordination. PIRE aligned with institutional strategies and raised awareness of the value of international collaboration.
- Foreign investigators struggled to find match-funding. Nearly one-quarter (24%) reported receiving no funding from any source, while more than half of those consulted reported that they had insufficient funding for their contribution. Based on these findings, the evaluators recommended that the NSF strengthen international partnerships.

NSF Partnerships for International Research and Education — Summary of key findings

- Participation in international collaboration can have different effects on younger and more senior researchers.
- Institutional support for international projects and alignment with institutional strategies can play a beneficial role as integral parts of collaborative projects.
- PIRE is flexible in letting applicants define their international partnerships, but this proved to have the effect that many overseas partners had little or no funding to support their contribution to the joint project.

C.3.5 The Austrian Science Fund's international portfolio

C.3.5.1 Overview

The Austrian Science Fund (FWF) is responsible for funding basic research with the aim to strengthen Austria's international performance and capabilities, develop human resources,

[45] PIRE program solicitation (2016), p. 15.

and enhance interaction between research and society.[46] International collaboration plays an increasingly important part in the organisation's funding portfolio.

The FWF has a series of bi- and multilateral arrangements through which it funds collaborative projects and networks, as shown below.[47]

Table 8 Overview of FWF's international programmes for joint projects and seminars

Type of agreement	International collaborative agreements [1]	FWF funds invested (2018) [2]
Bilateral agreements outside of Europe	• NSFC (China) • MOST (Israel) • JSPS (Japan) — incl. joint seminars • MOST (Chinese Taipei) — incl. joint seminars	€2.0m (£1.7m)
European Research Area Networks (ERA-NET)	• 13 active participations (2018) [2]	€7.4m (£6.5m)
Bilateral/lead agency in Europe	• ANR (France) • FNR (Luxembourg) • FWO (Belgium) • NKFIH (Hungary) • South Tyrol (Italy) • RFBR (Russia) • Germany-Austria-Switzerland collaboration (D-A-CH) • Central European Science Partnership (CEUS) (Poland, Slovenia, Czech Republic)	€20.5m (£17.9m)
Total		**€30.0m (£26.2m)**

Sources: [1] FWF-website [48], [2] FWF Annual report 2018. Approximate GBP calculated using HMRC average rate for 2020 to 31 March.

C.3.5.2 Scope

Geographical scope. FWF's collaborative agreements include a long-established partnership with counterparts in German-speaking neighbouring countries (Germany and Switzerland) but also in the rest of Europe, North America and East Asia. The most frequent partner countries are Germany (participation in 61% of all projects), France, Switzerland and the UK, whereas non-European countries such as the US, Canada and Japan were more likely to be involved in 'self-organised' collaboration through the FWF's non-international grants.[49] In addition, funding for partners in developing countries is available through FWF's standard grant procedures.

Thematic scope. The majority of FWF's calls are open to applications within all fields of scientific research, in the context of the FWF's focus on supporting basic research aimed at generating

[46] https://www.fwf.ac.at/en/about-the-fwf/corporate-policy/ (Access 16 July 2020)

[47] The category 'International programmes' includes programmes based on bi/multilateral agreements but excludes unilateral support for mobility.

[48] https://www.fwf.ac.at/en/research-funding/fwf-programmes/international-programmes/joint-projects/ (Access 16 July 2020)

[49] Portfolio Evaluation: FWF International Programmes, September 2017,p. 35.

new knowledge. Exceptions include a current call with MOST in Israel which covers only specific topics in the areas of genetics and 'heritage science', and an initiative for "urgent funding for research into humanitarian crises like epidemics and pandemics" funded through multiple grant types, including international lead agency agreements.

C.3.5.3 Financial arrangements and funding allocation

Budget. In 2018, FWF invested a total of €30.0m (£26.2m) in international programmes, or 13% of its funding budget.[50] The funding available for international programmes has increased significantly over the past decade, from €8.4 million (£7.3m), or 6% of FWF funding, in 2009.[51] The support for each project was approximately €200-250k (£174-218k) across the different schemes. Geographically, more than 90% of this funding supports collaboration with other European countries.[52]

Eligibility criteria & selection process. The procedures used for the bi-/tri-lateral programmes fall within two main groups:

- Bilateral programmes with parallel submission. This procedure is used in cases where two national sub-projects are so closely connected that they can only be carried out in conjunction with one another. Individual national proposals must be submitted to the participating funding organisations in accordance with the national guidelines and are only successful if both receive approval. This group currently includes agreements with non-European countries and Russia.
- Lead agency procedure. Following specific calls, the joint application is submitted to the 'lead agency' (either FWF or the international partner organisation) and the other agency will accept the funding decision. FWF still requires administrative documentation from the applicants. This group of agreements have gradually expanded and now includes agreements with countries from the EU.

FWF follows standard national procedures (e.g. from 'stand-alone projects') to review and select projects, adding an extra assessment criterion: "International cooperation arrangement(s) — complementarity and integration of the research contributions."

Over time, the FWF has seen a sharp increase in the use of 'lead agency' agreements, which as of 2017 funded most international projects. This development has happened concurrently with the discontinuation of the European Science Foundation's EUROCORES programmes, but also reflects an overall increase in the number of FWF's international programmes — thus the Lead Agency agreements are additional to, rather than replacing, more traditional bilateral agreements and ERA-NET networks.[53]

C.3.5.4 Evidence of effectiveness

The FWF's international portfolio was evaluated in 2017. The evaluation was able to look at data going back more than a decade. With respect to effectiveness and impact, the evaluation's

[50] FWF Annual Report 2018, p. 76

[51] https://www.fwf.ac.at/en/about-the-fwf/funding-statistics/ (Accessed 16 July 2020)

[52] FWF Annual Report 2018, p. 90.

[53] Portfolio Evaluation, ibid, p. 22.

conclusions relied primarily on bibliometric analysis in which 'stand-alone' projects from the FWF portfolio were used as a control group for international projects.

Key findings from the evaluation were as follows:

- Research output. The international programme did not have a positive effect on productivity. The number of publications resulting from international projects (4.72 on average) was slightly *lower* than 'stand-alone' projects (5.33). Lead Agency agreements and ERA-NETs in particular were less likely to publish.
- Research quality. Publications from International projects had a higher average field-normalised citation impact (1.8) than other FWF projects (1.5), although it tended to be lower for publications co-authored with emerging countries.
- Sustainability. Publication histories, as well as survey responses from past international project leads, suggested that international projects helped to continue collaboration patterns or establish new ones. The correlation between mobility and sustainable collaboration, on the other hand, was much weaker.
- Internationalisation. While the programmes help connect participating researchers to international colleagues, the effect on the general cooperation culture in the Austrian system was thought to be limited.

The Austrian Science Fund's (FWF) International Portfolio — Summary of key findings

- The FWF is an example of international collaboration in basic research focussed on research excellence and with few thematic restrictions.
- Collaborative mechanisms appear to be increasingly formalised in Lead Agency agreements with a more efficient application process. This appears to be more feasible for collaboration with countries that are closer (geography, language, institutions) and in support of basic research where quality criteria tend to converge between countries.
- International programmes were found to produce fewer but higher quality publications than other projects, but also that publications with emerging countries were unlikely to score as highly. This may change as collaboration with these countries becomes more embedded (e.g. enabling better matching with partners, better collaborative procedures).
- Collaborative projects appear to be more likely to lead to sustainable collaboration than mobility schemes, perhaps suggesting that other schemes should be available to build on support for mobility to ensure a lasting effect.

C.3.6 UK Global Challenges Research Fund

C.3.6.1 Overview

The Global Challenges Research Fund (GCRF) is a £1.5bn fund which runs from 2016 to 2021. A dual-purpose programme, it aims to both promote UK research excellence and address global development challenges. It differs from FIC in thematic and geographical scope, but has similarities in the complex programme structure and multi-layered implementation that makes it relevant to consider. The programme is delivered by 9 delivery partners, including UKRI (all UK

Research Councils, Innovate UK and Research England), the four national academies, the UK Space Agency, and the devolved national funding Councils. By June 2018, GCRF delivery partners had implemented 69 separate programmes, issuing 91 calls for proposals and awarding 1,410 grants.[54]

C.3.6.2 Scope

Geographic scope. The GCRF forms part of the UK's commitment to spend 0.7% of GNI on Official Development Assistance (ODA). As such, the geographical scope of the programme is countries defined by the OECD's Development Assistance Committee (DAC) list. GCRF projects cover more than 100 countries. The most frequent partners in GCRF projects include: South Africa (97), India (90), Kenya (83), and Uganda (76). Brazil (47) and China (40) are involved but not among the most frequent.[55]

Thematic focus/scope. The programme aims to contribute to the UN Sustainable Development Goals and associated targets via the GCRF's 12 challenges, which were defined under three main headings: Equitable Access to Sustainable Development (e.g. energy, air, water and food); Sustainable Economies and Societies (e.g. sustainable living and production); and Human Rights, Good Governance and Social Justice (e.g. conflict and poverty)

Decisions about the thematic focus of individual programmes were largely delegated to the delivery partners. With limited time to prepare the initial round of programmes, these early programmes tended to focus on areas of existing strengths and established partnerships, whereas subsequent rounds allowed for more long-term planning.[56]

The GCRF primarily focuses on public research, except for the programmes run by the more innovation-focussed UK space agency and, included later, Innovate UK.

C.3.6.3 Financial arrangements and funding allocation

Budget. With a £1.5bn overall budget, the GCRF's average annual budget is approximately £300m, but the investment has ramped up over time from £112m in 2016/17 to nearly £500m in 2020/21.[57] The funding is allocated to the delivery partners through different channels: (i) annual allocations to individual delivery partners who award the funding to institutions through a competitive process; (ii) two Collective Funds for which the Research Councils and academies can submit joint bids for cross-disciplinary programmes; and (iii) Institutional funding allocated through the national funding Councils based on their general research quality.

The delivery partners have used a great variety of instruments for their GCRF programmes, including scoping/pump-priming/feasibility, transitional research grants, follow-on funding, hubs, infrastructure, symposia/workshops, and training and development. The most frequently used instruments were standard project grants and scoping/pump priming. Grant sizes range from small grants of a few thousand pounds to large projects worth more than £10m. [58]

---

[54] Barr et al. (2018), GRCF Evaluation — Foundation Stage: Final Report, p. B4

[55] https://www.ukri.org/research/global-challenges-research-fund/funded-projects/ (Accessed 16 July 2020)

[56] Barr et al. (2018), op. cit., p. B8

[57] BIS (2016) The Allocation of Science and Research Funding 2016/17 to 2019/20, March 2016

[58] Barr et al., Op. Cit., pp. B6-B7.

Eligibility criteria & selection process. Projects are in most cases led by UK principal investigators and institutions eligible for funding by UK funding bodies can apply for GCRF funding. International co-investigators can be based anywhere and are eligible for up to 100% of direct costs. To be ODA compliant, projects must have development in countries on the DAC list as its main objective. Beyond the minimum eligibility criteria, the core selection criteria reflect the complex aims of the programme, namely: problem and solution focussed; research excellence; likelihood of impact; and capacity building and partnership.

C.3.6.4 Evidence of effectiveness

The programme is still ongoing, and it is not yet possible to assess its full effects. Even so, important insights into the programme design and processes can be obtained from the 'Foundation evaluation' of GCRF (2018),[59] the ICAI 'Rapid Review' (2017)[60] and the ICAI 'Follow-up Review' (2019).[61]

The Foundation Evaluation concluded that the programme processes work well and that it has managed to deploy a range of tools within a short space of time. However, it also highlighted some difficulties relating to the creation of new expertise and collaborations, the set-up times for new calls, and research information systems. The initial ICAI review identified several challenges relating to the complexity of the GCRF structure and objectives, while the follow-up review found evidence of learning and progress towards recommended solutions.

Some of the key issues were:

- Coordination in the context of a large number and diversity of funders in the UK and internationally, with their own priorities and systems. ICAI highlighted an 'overly decentralised structure' and insufficient strategic direction in the programme. Following ICAI recommendations, the programme introduced several changes — including redefined thematic portfolios, research hubs and 'challenge leaders' — which the follow-up review concluded would allow the programme to proceed in a more targeted and strategic manner.
- Maintaining coherence in the face of a large number and diversity of instruments, from pump-priming seminars to international centres of excellence, provides challenges to the coherence of the programme and ability to measure very diverse effects. The subsequent commissioning of the 2018 Foundation Evaluation was seen as an important step, albeit too late in the programming cycle.
- The number and diversity of partner countries with different priorities and capabilities. In its initial review, ICAI suggested that a more strategic approach to choosing partner countries and institutions might lead to more effective partnerships. Since then, UKRI has organised a series of engagement events and also increased the involvement of partner countries in the programme through e.g. membership of research hubs, an international peer review college and by allowing non-UK project leads.

[59] Barr et al., Op. Cit.,.
[60] ICAI (2017), Global Challenges Research Fund: A rapid review, September 2017
[61] ICAI (2019) ICAI Follow-Up of: Global Challenges Research Fund, July 2019.

UK Global Challenges Research Fund (GCRF) — Summary of key findings

- The GCRF is a large complex programme with implementation delegated to a large number of UK delivery partners, using a variety of instruments and working with overseas partner countries.
- It is a dual-purpose programme aiming to support excellent R&I and address international development challenges.
- Early rounds of the programme focussed on existing strengths and established partnerships, whereas subsequent rounds allowed for more long-term planning.
- Early reviews noted the successful implementation of a range of programmes but also the organisational challenges related to complexity, coordination, and strategic direction.
- A later follow-up review has since found evidence of learning and adaptability, as the programme had made changes to address many of the earlier-identified challenges.

C.4 Overview of evaluation methods

C.4.1 Overview

In this section, we summarise the findings of a review of 11 recent evaluations of programmes that support international collaboration. The evaluations vary in scope and focus, but they each contain elements that are of relevance to the evaluation of FIC.

Key findings from these evaluations are summarised below. More detail is provided in the sections that follow, while a summary overview of the key features of each of the evaluations (and references to the evaluations themselves) are provided in Appendix C.6.

Main methods and strategies used

Our analysis has revealed a variety of approaches, but several common points were identified:

- Many evaluations of international programmes have a broad scope, with questions concerning process, design, and management featuring prominently, alongside questions of effectiveness and impact. These programmes tend to be complex and often go beyond 'business as usual' for the funding organisations concerned — therefore learning is an important objective.
- Most robust evaluations used a mixed-methods approach, combining qualitative and quantitative methods, each with their own strengths and limitations, to allow a full assessment of the programme's performance.
- Bibliometrics and online surveys are the most common tools used to collect systematic evidence of programme effects, but these are often complemented by more in-depth engagement with stakeholders to understand programme process and wider impact.

Main challenges and how they have been addressed

- Evaluations of programmes supporting international collaboration face additional challenges:
- Programme complexity, with divergence between programme elements depending on the delivery partners and bilateral agreements, makes it challenging to obtain consistent and comprehensive programme documentation and monitoring data. Engagement with programme management is necessary.
- Attribution of outcomes to the specific programmes is challenging as many programmes have complex sets of aims with many influences. Several approaches to building counterfactuals have been identified. Quasi-experimental matching approaches appear to have been particularly well suited to assessing the added value of dedicated programmes to support international collaboration.
- Wider impact beyond the immediate beneficiaries — on institutions, policies, societal challenges — cannot easily be captured by metrics alone. Case studies appear to be the most appropriate way to address these, although evidence from other data streams can also be leveraged and contribute to these. Where evidence of programme effects on overseas participants is needed, strategically selected case studies are often a better option than incomplete and potentially biased survey data.

C.4.2 Detailed findings

C.4.2.1 Scope and evaluation questions

The evaluations of international collaboration schemes that have been reviewed had a broad focus on questions of process, effectiveness and impacts. Unlike the proposed evaluation of FIC, they typically did not focus on efficiency, value for money or economic impact, possibly because of the challenges of doing so credibly in the context of complex programmes.

Design and process. These issues feature prominently in many of the evaluations of international programmes considered, reflecting the fact that such programmes often go beyond 'business as usual' for the funding organisations concerned. Many evaluations investigate the relevance and appropriateness of international support schemes, often in relation to the wider portfolio of support available from the funders. Others look at the specific implementation and management model of complex programmes and the division of responsibilities between different actors in the implementation process. Finally, issues like communication and visibility are of interest to several funding bodies.

The proposed evaluation of FIC includes a specific process evaluation, with evaluation questions that address the appropriateness of the Fund's design and processes for achieving overall aims and objectives. While the study specifications have highlighted particular areas for assessment (the timing of Waves, the use of assessment criteria, the expenditure profile and the importance of brand recognition), the evaluation is also asked to explore other aspects of design and processes that are felt to have worked well or not — based on feedback from the various stakeholder groups involved — and to provide lessons for future programmes.

Effectiveness. This is a focus of most of the evaluations considered and, depending on the programme, typically includes one or more of the following elements:

- International collaboration — did programmes support new or intensified collaboration?

- Sustainability — did collaboration endure beyond the duration of the funded programme?
- Knowledge production — did the supported researchers/projects produce more and/or better research?
- Careers — did participation in the programmes lead to different/more promising careers?

Many evaluations also considered wider impacts of the programmes beyond the immediate national beneficiaries. For example:

- Internationalisation — the extent to which programmes support internationalisation of national communities more widely (e.g. Swiss bilateral programme; AHP)
- Institutions — the extent to which grants support host institutions in which beneficiaries are located (e.g. AHP, PIRE)
- Policies — how programmes help shape national policies and priorities (e.g. EU-INCO) or contribute to achieving policy aims (CH bilateral)
- Societal challenges — several evaluations looked at contributions to societal challenges (e.g. PIRE), including development challenges (GCRF, Newton Fund)
- Overseas partners — the effect on overseas partners was not a primary concern in most evaluations, except for ODA programmes (GCRF, Newton Fund)

The evaluation of FIC is also asked to assess a series of effectiveness/impact questions, which relate to the aims and objectives of the Fund. This includes assessing the extent to which FIC has: reduced barriers to international collaboration; enabled, strengthened, deepened and sustained international collaboration; delivered new knowledge; created wider socio-economic impact; and strengthened the UK's voice in R&I policy.

C.4.2.2 Methods used

Most evaluations use a mixed methods approach, including the following common elements:

- **Document reviews** covering programme documents and monitoring data to assess processes and immediate outputs. Some evaluations were also able to draw on previously collected evidence (e.g. FWF, Newton).
- **Surveys** were often the main primary data collection method used to evidence effects as well as perceived benefits and gather views on the programme design. As such they were often addressed to programme participants (PIs and other partners) and a control group (unsuccessful applicants or other comparison groups). Other surveys were targeted at host institutions (e.g. AHP, NSF IRFP, NSF PIRE) or, in one case, Foreign investors (NSF PIRE).
- **Interviews** were used in most evaluations, often as a supplement to survey and case study evidence or to address wider questions of process, relevance and impacts. Consequently, interviews were more often conducted with programme owners, managers, and delivery partners (e.g. FWF, Newton Fund), policy stakeholders (e.g. FWF, INCO) and stakeholders in partners countries (e.g. INCO).
- **Bibliometrics** were also used in several evaluations, especially those focussed on fundamental research. When used, bibliometrics often provided the main evidence of effectiveness (e.g. FWF, NSF PIRE, HFSP), including on research (productivity and quality) and

collaboration (international co-publications). Bibliometrics have also been used as an input to case studies (AHP).

- **Impact case studies** are often used to address wider impacts which cannot easily be captured through surveys of direct participants or bibliometrics measures. Different ways of selecting cases are used, e.g. focus on the most successful examples (HFSP), or on thematic or geographical coverage (Newton Fund).

In addition, the reviewed evaluations provided a few examples of less traditional methods:

- **Focus groups** (FWF) and **SWOT analyses** (INCO) to analyse future scenarios and options
- **Expert review** to provide overall assessment of complex, policy-driven programmes (INCO)
- **Altmetrics** used exploratively to complement more traditional bibliometric analysis (FWF)

In the table below, we match some of the methods and indicators used in the reviewed evaluations against the types of outputs, outcomes and impacts relevant to the FIC evaluation. References to the evaluations are provided in C.6.

Table 9 Summary table of relevant indicators

Outputs, outcomes, and impacts	Indicators/metrics	Evaluations
New and enhanced partnerships	• International co-publications attributed to projects (c: comparison group; other funders) • Geographical distribution of international co-authors (c: comparison group) • Participants approached by international partners (c: comparison group) • Sustainability of collaborations beyond project period	• FWF (bibliometrics) • PIRE • FWF (bibliometrics) • HFSP (survey + Bibliometrics) • FWF (survey)
New knowledge and understanding created	• Number of publications attributed to project (c: comparison group) • Quality/impact of publications attributed to project (c: comparison group) – Mean field-normalised citation rates – Median of field-normalised citation rates – Highly cited papers (top 10% reference set) – Social media impact • Quality of publications by co-author country – Share of highly cited papers – Mean-field normalised citation rate • Nature of publications (e.g. 'frontier'/interdisciplinary)	• FWF • NSF PIRE • HFSP (bibliometrics)
Increased mobility between UK and partner countries	• Foreign researchers attracted to country • Research stays abroad by length/destination (c: comparison group)	• AHP (desk research) • FWF (survey)
Increased collaborative activity between countries	• Aggregate co-publications with partner countries (c: benchmark countries)	• CH bilateral (bibliometrics)
Improved performance of participants	• Number and quality of publication output of participants (c: participants in comparison group/in field), using the quality/impact metrics listed above	• PIRE (bibliometrics) • HFSP (survey)

Outputs, outcomes, and impacts	Indicators/metrics	Evaluations
	• Career trajectory (salary; role; international collaboration) (c: unsuccessful applicants; national cohort) • Programme influence on careers	
Improved visibility and recognition of UK	• International participants' perception of research and education system	• Globalink (interviews)
Closer alignment of policies		• EU INCO

Source: Technopolis (2020)

C.4.2.3 Practical challenges

The complex nature of many programmes supporting international collaboration poses several challenges for effective evaluation.

Programme documentation and data. It is often difficult for the evaluator to obtain complete and consistent programme documentation. This is especially true where programme implementation is delegated to different delivery partners (e.g. Swiss bilateral programmes, Newton Fund, GCRF), as each delivery partner adapts their part of the programme to the communities they serve. In addition, as many of the programmes rely on bilateral agreements with overseas funding bodies, different parts of the programme are likely to have different thematic focus and procedures, depending on mutual interests in each case. It can be a further challenge to obtain information about overseas *participants* and in some cases impossible to know who they are (NSF PIRE). Overall, this can lead to a lack of consistency when attempting to aggregate data at the programme or fund level.

In-depth interviews with programme owners and managers are often necessary to gather available data and gain full understanding of the programme's components.

Surveys. In primary data collection, evaluations tend to achieve lower response rates from surveys addressed to control groups who do not themselves benefit from the programmes. This is true for unsuccessful applicants as well as participants in matched projects (e.g. HFSP).

Surveying overseas partners can be doubly challenging: as described, it can be difficult to identify them (and find contact details), and the response rates among those who receive the survey suffer as they don't have any direct relationship with the funding organisation whose programme is being evaluated. Further, when the population of overseas participants is not known, it is not possible to construct a representative sample or mitigate against any bias caused by non-response (NSF PIRE).

Impact case studies tend to be used where effects in partner countries are of interest.

Attribution and counterfactuals. The challenges of attributing effects to specific interventions and finding suitable counterfactuals are evident in most evaluations (in general), but our review of evaluations of international collaboration programmes has revealed some nuances. Attribution can be particularly difficult in these programmes as they often have a set of complex aims spanning different policy domains (R&I, trade, development aid, foreign policy) and subject to a multitude of outside influences.

In the evaluations, we saw the use of at least three types of control groups:

- Unsuccessful applicants. As in other programme evaluations, successful applicants are often compared to unsuccessful applicants, before and after the intervention, to gauge the effect of a grant. To make the comparison as accurate as possible, some evaluations only use high-scoring unsuccessful applicants (e.g. Newton Fund eval framework, HFSP).
- Wider population. Effects on beneficiaries or their scientific output are compared to a wider population. For example, comparing scientific publications attributed to a programme to other publications in the same subject areas, or career progression of participants to others with a similar background. This is possible where the wider population is known and where data is available (e.g. bibliometric databases or career surveys), but it can be a resource-intensive task (see e.g. HFSP).
- Project matching. Several evaluations (FWF, PIRE) have adopted a quasi-experimental approach using statistical matching techniques to identify a group of projects that resemble the supported projects (size, theme, etc.) but do not require international collaboration. This is particularly helpful when trying to assess the added value of dedicated support for internationalisation as compared to more generic types of support.
- Country-level comparisons. Some evaluations attempted to gauge the impact of support schemes by comparing measures of collaboration between the home and the target countries to a set of benchmark countries (e.g. Swiss Bilateral programmes). Here, the attribution is necessarily much more tenuous, as any effects of specific support schemes cannot be isolated from various other influences.

C.5 Concluding remarks

Our review has shown that international collaboration is an increasingly central part of research and innovation and is supported in a variety of ways, through joint 'big science' projects, through scientific diplomacy and bilateral agreements, large multi-country collaborative programmes, as well as the opening up of national programmes to international research. In addition, initiatives aimed to support internationalisation, e.g. through travel grants and exchange schemes, complement the portfolio offered by many national funding bodies.

FIC is unusual by bringing together a broad offer under a single umbrella, but our review of four similar programmes revealed that several countries do have increasingly complex programmes or portfolios of programmes. Key takeaways included:

- Other countries and programmes face organisational challenges in balancing adaptability to specific communities with a need for coordination, efficiency, and accountability. Different approaches have been adopted.
- Successful programmes build on strong bilateral agreements with firm funding commitments. Agreements can consolidate and become more efficient over time as trust builds and procedures become embedded.
- The collaborative programmes reviewed usually led to collaborations and high-quality research, but the sustainability of collaborative activity depends on the type of support and availability of follow-on funding.

The review of recent evaluations of programmes supporting international collaboration also showed a variety of approaches, but some common lessons stand out:

- Most robust evaluations used a mixed methods approach, combining qualitative and quantitative methods, each with their own strengths and limitations, to allow a full assessment of the programme's performance.

- Programme complexity is also a challenge for evaluators, with divergence between programme elements depending on the delivery partners and bilateral agreements making it challenging to obtain consistent and comprehensive programme documentation and monitoring data.
- Many evaluations had a strong focus on process questions and engaged closely with programme owners and managers to gain an understanding of the complex programme dynamics.
- Attribution of outcomes to the specific programmes is challenging as many programmes have a complex set of aims with many influences. Several approaches to building counterfactuals have been identified, building on bibliometric methods and surveys.
- Wider impact beyond the immediate beneficiaries — on institutions, policies, societal challenges — cannot easily be captured by metrics alone. Case studies (combining narrative and metrics) are often used to explore these kinds of benefits and contributions.

C.6 Annexed summary of evaluations

Table 10 Summary table of evaluations

Name (evaluation)	Overview	Qualitative methods	Quantitative methods	Assessment of robustness
Evaluation of Switzerland's bilateral cooperation programmes in science and technology (2020) Link: https://www.newsd.admin.ch/newsd/message/attachments/60510.pdf (Accessed 16 July 2020)	Scope: • Bilateral programmes 2008-2018 Evaluation focus: • Appropriateness of the programme management model • Fit with other national schemes • Scheme visibility within national community • Effect on R&I and contribution to policy aims	Document review: • Strategies • Contracts • Project reports Interviews: • Programme officials • Grant recipients Case studies: • Bilateral programmes in benchmark countries	Survey: • Grant recipients • Unsuccessful applicants Bibliometric analysis: • Change in Swiss collaborative publications with priority countries • Benchmarking against comparator countries	Mixed methods approach with primary a focus on process questions Assessment of programme effects primarily based on self-reporting through participant survey with no control group.
NSF's Partnerships for International Research and Education (PIRE) (2015) Link: https://www.abtassociates.com/projects/evaluation-of-partnerships-for-international-research-and-education-pire (Accessed 16 July 2020)	Scope: • 59 PIRE projects across four cohorts. Evaluation questions: • Effects on research • Effects on careers • Effects on institutions • Contribution to societal challenges	Surveys (open questions): • Principal investigators • Postdocs • Graduate students • Under-graduates • Foreign senior investigators • Institutional admins	Surveys: • Career outcomes (under graduates, graduates and post-docs) Bibliometric analysis • Project-level (vs. matched projects) • Participant-level (vs. participants from matched projects) • Foreign contribution to publications (PIRE vs. matched projects) • Projects with developing country participation vs. other.	Comprehensive study focussed on qualitative methods Control group for bibliometric analysis constructed through a group of match projects (similar along a set of characteristics, except international aspect) Career outcomes assessed against secondary data (national survey)
Portfolio Evaluation FWF International Programmes. Final report (2017)	Evaluation questions: • Appropriateness of FWF international portfolio	Document analysis Interviews (8):	Surveys: • Participant PIs • Comparison group PIs	Robust evaluation with emphasis on bibliometric indicators of scientific quality, using a quasi-experimental for

Name (evaluation)	Overview	Qualitative methods	Quantitative methods	Assessment of robustness
Link: https://www.zsi.at/en/object/publication/4904 (Accessed 16 July 2020)	• Appropriateness of programme design and management • Impacts of international programmes • Should international programmes be continued?	• FWF staff • ministry stakeholders Focus groups: • Scenario workshops	Bibliometrics: • Collaboration patterns • Citation impact – mean field-normalised citation rate (MFCR) – share of highly cited papers Altmetrics (exploratory): • Correlation between bibliometric and altmetric scores Secondary data analysis (iFQ survey)	comparing relevant outputs of International Projects and Stand-alone Projects
Evaluation of the Mitacs Globalink Program: A Qualitative Study (2015) Link: https://www.mitacs.ca/en/newsroom/publication/evaluation-mitacs-globalink-program-qualitative-study (Accessed 16 July 2020)	Scope: two-way mobility of students and researchers: • Research Internship (GRI) • Graduate Fellowship (GGF) • Research Award (GRA) Evaluation questions: • Programme expectations and satisfaction • Outcomes: – Collaborations – Research – Professional development – Attraction and retention	Interviews: • 55 interviews with five groups of participants. Thematic coding using Atlas.ti software	n/a	Primarily aimed to inform policy/programme decisions Based solely on interviews with participants, no control group or quantitative data analysis to triangulate.
Review of the Human Frontier Science Program (2018) Link: https://www.hfsp.org/node/12547#book/ (Accessed 16 July 2020)	Scope: • Postdoctoral Fellowships • Career Development Awards • Research Grants Evaluation questions: • Achievement of the program's targeted outcomes	Interviews: • 12 members of the review committee (peer reviewers) Case studies • 5 case studies of successful projects (selected based on bibliometric and peer review scores)	Online surveys: • participants • unsuccessful applicants Bibliometric analysis: • comparative analyses of publications acknowledging HFSP support • longitudinal analyses of HFSP's effect (participants vs. unsuccessful applicants)	Robust multi-method study with emphasis on bibliometric study. Survey limited by low response rate for non-successful applicants.

Name (evaluation)	Overview	Qualitative methods	Quantitative methods	Assessment of robustness
	• Added value of HFSP compared to national programmes			
Evaluation of the Alexander von Humboldt Professorship — International Award for Research in Germany (2017) Link: https://www.humboldt-foundation.de/web/evaluation-alexander-von-humboldt-professorship.html (Accessed 16 July 2020)	Scope: • period 2008-2015 • 50 award winners Evaluation questions: • attracting excellent scientists to the German research location on a sustainable basis • supporting universities and research institutions in their strategic • Strengthen international networking of German researchers	Interviews (6): • Survey follow-up Case studies (14): • Site visits (1-2 days) • Interview with awardee + institution	Online surveys: • Award winners (44) • Uni management (44) • Uni departments (23) Bibliometric (in context of case studies): • Individual publication profile (awardees) • Structural analysis (research groups)	
Ex-post Evaluation of International Cooperation Activities of the Seventh Framework Programme's Capacities Programme (2015) Link: https://ec.europa.eu/research/iscp/pdf/projects/fp7_expostevaluation_inco.pdf (Accessed 16 July 2020)	Scope: • 10 INCO instruments • 131 projects (of 156) Evaluation questions: • Common activities • Access to third country programmes/facilities • Participation patterns • Participation drivers • Effect on other foreign policy areas • Effect on national R&I agendas • Communication and management	Expert review Interviews: • project coordinators • project partners • EC officers • Government bodies SWOT analysis	Portfolio analysis: • Collaboration patterns (geography, theme)	Expert review primarily based on qualitative evidence.
Newton Fund process evaluation (2018)	Scope: • Newton Fund 2014-2018	Document review:	Online survey:	

Name (evaluation)	Overview	Qualitative methods	Quantitative methods	Assessment of robustness
Link: https://www.newtonfund.ac.uk/nf/assets/File/BEIS%20Newton%20Fund%20Process%20Evaluation%20report%20for%20publication%20on%20NF%20site.pdf (Accessed 16 July 2020) Mid-term Evaluation of the Newton Fund (2018) Link: https://www.newtonfund.ac.uk/files/newton-fund-mid-term-evaluation-report/ (Accessed 16 July 2020)	Evaluation questions (process) • Delivery of policy priorities • ODA eligibility • Match funding Evaluation questions (midterm): • Relevance • Effectiveness • Efficiency and Value for Money • Impact • Sustainability • Complementarity and coordination	• Business cases; meeting minutes; progress reports; country strategies; contracts; procurement Interviews (50): • Programme owner (BEIS) • Delivery partners • In-country teams Case studies (24): • 24 'thematic impact studies' in 8 countries Telephone survey (204)	• award-holders in all countries (862/3, • 200 responses)	
Evaluation framework for Innovate UK's Newton Fund programme (2019)		Interviews: • Direct beneficiaries • Indirect beneficiaries Impact case studies	Secondary data analysis: • Programme data • Monitoring data Surveys: • Beneficiaries • Non-beneficiaries (high-scoring unsuccessful applicants)	
Evaluation of NSF's International Research Fellowship Program (2012) Link: https://files.eric.ed.gov/fulltext/ED546146.pdf (Accessed 16 July 2020)	Evaluation questions: • Post-award international collaboration • Post-award career • Perceived outcomes of participation • Effect beyond participants		Online surveys: • Awardees (81% response) • Unsuccessful applicants (55%) • Hosts (61%)	

Technopolis (2020); Note: all links accessed 16th July 2020.

C.7 Annexed pros and cons of international collaboration

Table 11 Summary of the pros and cons of international collaboration

Pros/benefits	Cons/barriers
• International collaboration enables things that cannot be done nationally: – Addressing global societal challenges (e.g. Climate change, sustainable development) – 'Big science' projects allow pooled investment at scale (CERN, ESA, SKA etc.) • International collaboration increases research quality – Internationally co-authored *papers* have higher citation impact ('impact premium') compared to single-country papers [1] – Some evidence that international *projects* produce fewer but better publications [2] – Exposure to international competition raises the level domestically [3] • Mobility: 'Brain circulation' has multiple benefits – Improves academic performance and professional development [4] – Has a positive effect on knowledge and technology transfer [5] • Large literature on internationalisation of corporate R&D driven by multinational firms[6] – Attracting MNE investment in R&D is found to be very beneficial to the host country/location. • SMEs benefit from international collaboration – SMEs often rely more on financial support for international collaboration [7] – SMEs benefits through access to collaborators, supply chains, markets and clients – Evidence of improved firm performance (products, revenues, employment) from participation in international projects [8]	• Financial – International collaboration can be expensive • Administrative and legal – Ensuring funding and compliance systems match up • Practical – Travel requirements – working across different time zones • Cultural – Understanding the collaborators' expectations and ways of working

References

[1] Adams, J. (2013, May 30) "The fourth age of research", Nature

[2] Evaluation of the Austrian FWF international portfolio (2017)

[3] Technopolis and SOE (2020), impact assessment of Norway's participation in FP7 and H2020

[4] Guthrie S., et al. (2017), International mobility of researchers: A review of the literature

[5] Edler et al. (2011), "International scientists' mobility and the locus of knowledge technology transfer", Research Policy

[6] E.g. OECD (2017), "The Links between Global Value Chains and Global Innovation Networks"

[7] E.g. Technopolis (2017), The role of EU funding for UK research and innovation

[8] E.g. EUREKA impact assessment (2017) — Technopolis (2020), op. cit.

Appendix D FIC Portfolio analysis

FIC provides an overarching structure for a variety of programmes that are then implemented by UKRI and the constituent Councils and overseen by the FIC Board. This appendix provides and introduction and overview to this FIC portfolio.

FIC's overall £160m budget is mainly allocated through a competitive process in two steps:

- UKRI's constituent Councils (individually or in partnership) were eligible to bid for funds to deliver individual FIC programmes. These bids were examined and assessed by the FIC Board, which sought to build a programme portfolio that captured a diversity of international partners and research areas. The first Wave of programmes was selected in the Summer of 2018 and the second Wave of programme proposals was considered by the FIC Board in January 2019.
- The selected programmes are then implemented by the Councils through calls for proposals or specific infrastructure investments. As of March 2021, 424 grants and innovation projects had been awarded[62] and three investments in infrastructure had been made. Further awards and investments are expected.

A separate mechanism — the Strategic Opportunities Stream — exists for opportunities that do not fit with the timescales of the standard FIC programme/proposal selection process, with ringfenced FIC funding available to support such activities. There is a slightly different process in place, where opportunities are identified, elaborated and assessed outside of the main two-Wave competitive bidding process.

D.1 FIC Programmes

A total of 31 programmes were selected from Waves 1 and 2, each with a budget between £650k and £12m (£144m in total). As of March 2021, two additional programmes had also been awarded through the FIC Strategic Opportunities Stream, with a total value of over £9.4m (further awards may be made here).

FIC covers the entire remit of UKRI and supports a range of research and innovation activities. The programmes funded are diverse, including challenge-driven programmes as well as others that are less prescriptive (e.g. the Global Incubator Programme). Many programmes are multidisciplinary in nature and around half involve more than one Council.

Table 12 summarises the number of programmes that are led by each Council[63], as well as the key features of these programmes (whether they involve other Councils, which Wave they were awarded in and whether they are bilateral or multilateral programmes).

Table 12 FIC Portfolio of programmes

Lead Council	Number of programmes led	No. of Councils involved		Wave			Involvement of partner countries	
		Single	Multiple	Wave 1	Wave 2	Strategic Opportunities Stream	Bilateral	Multilateral
AHRC	**3**	1	2	2	1		3	0
BBSRC	**3**	2	1	2	1		1	2
ESRC	**5**	0	5	2	3		4	1

[62] As notified by Councils through the FIC Tracker, March 2021.

[63] Note that EPSRC and Research England are not listed in the table, as neither organisation is leading a programme.

Lead Council	Number of programmes led	No. of Councils involved		Wave			Involvement of partner countries	
		Single	Multiple	Wave 1	Wave 2	Strategic Opportunities Stream	Bilateral	Multilateral
Innovate UK	**5**	5	0	3	2		4*	1
MRC	**6**	3	3	2	2	2	5	1
NERC	**6**	1	5	3	3		5	1
STFC	**3**	3	0	2	1		2	1
UKRI	**2**	0	2	1	1		2	0
Total	**33**	**15**	**18**	**17**	**14**	**2**	**26**	**7**

Source: Technopolis, based on UKRI data (Master Tracker, as of March 2021).
* Includes one programme that consists of multiple bilateral partnerships between the UK and different countries.

FIC has been set up to support international collaboration, particularly in identified priority countries. Table 13 shows the countries involved in FIC programmes across the different Councils. Amongst priority countries, the USA, Canada and Japan are active in most programmes.

Table 13 FIC Portfolio of programmes — partner countries

Lead Council	Number of programmes led	Programmes involving priority countries													Programmes involving other countries			
		USA	Canada	Japan	China	India	Israel	Australia	Ireland	Norway	Singapore	South Korea	Sweden	Switzerland	Germany	Brazil	Finland	
AHRC	**3**	1			1				1									
BBSRC	**3**	3			2		2											
ESRC	**5**		2	3											1	1	1	France (1), Netherlands (1), Poland (1)
Innovate UK	**5**	2	2			1	1				1							Any EUREKA member country (1)*
MRC	**6****	1	2	1		1		1				1			1			
NERC	**6**	3	2			1				1			1			1	1	Cote d'ivoire (1), Chinese Taipei (1), Turkey (1)
STFC	**3**	2				1		1							1			
UKRI	**2**			1	1													
Total	**33**	**12**	**8**	**5**	**4**	**4**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**0**	**3**	**2**	**2**	

Source: Technopolis, based on UKRI data (Master Tracker, as of March 2021).
* This might include priority countries (e.g. Switzerland are participating), but these are not included within the counts shown.

D.2 FIC Projects

As of March 2021, 424 grants and innovation projects had been awarded by 27 FIC programmes (as notified by programmes through the FIC tracker). Of these, 356 grants/projects (or 92% of the total) have been found within Gateway to Research (GTR, data extracted in

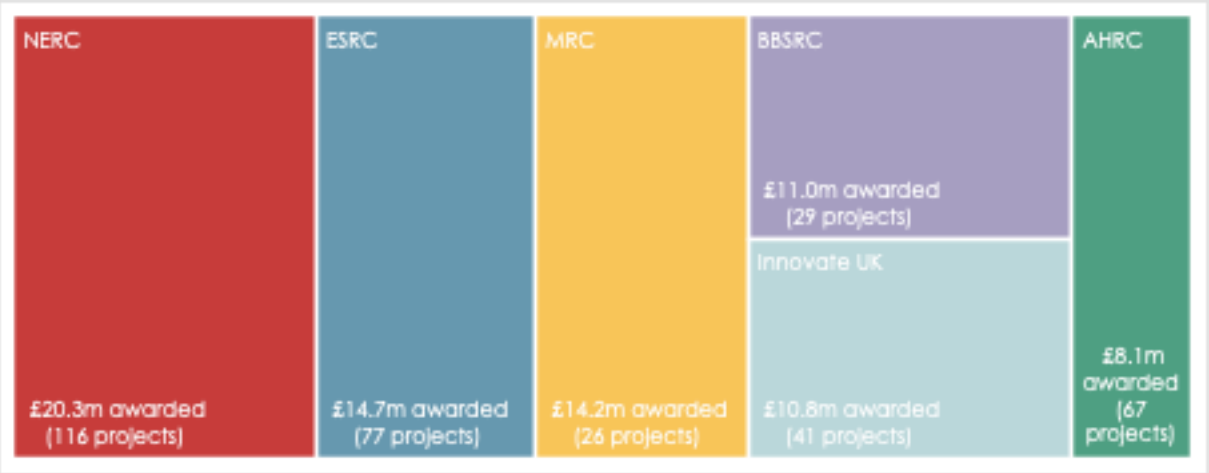
April 2021). This includes grants / projects for all 27 programmes that have made awards. The slight difference in numbers between the two sources is likely to represent recent awards that have not yet been recorded in GtR, but have been notified in the FIC Tracker as being in progress.

Based on information provided in GtR, we can provide the following profile of the FIC grant / project portfolio:

- One-third of the grants/projects (33%) began in 2019, 60% in 2020 and 7% in 2021.
- On average, each grant/project lasts for just over two years, but this varies between 4 weeks and nearly 6 years for individual grants/projects.
- The largest number of awards (n=78) has been made so far in relation to the UK-Canada Globalink PhD Exchange Scheme (FIC2-05), while other programmes have awarded between 1 and 34 grants/projects each.
- The majority of grants/projects are marked as 'active', as of April 2021, with only 44 (11%) recorded as 'closed'.
- The average award is £222k, although this varies significantly between individual grants/projects, from £2k to £1.9m.

The distribution of award value across funding bodies is shown in the figure below.

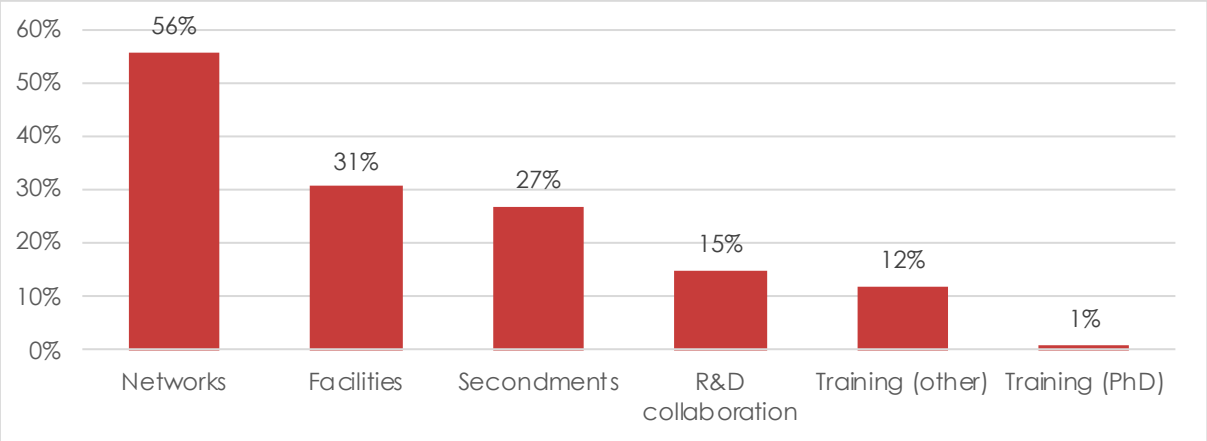
Figure 1 Value of FIC awards by Council



Source: Technopolis, based on UKRI data (Master Tracker, as of March 2021) and matched to Gateway to Research (April 2021).

The classification of awarded grants/projects in GtR is presented in Table 14 (note that multiple categories can be selected). This shows that the majority of projects (56%) are classified as 'networks', while more than a quarter are classified as 'facilities' (31%) and 'secondments' (27%). Just 15% (53 projects) are classified as R&D collaboration, while smaller numbers are classified as 'training'. Table 15 then shows the total value of grants within each classification.

Table 14 FIC project classification – proportion of projects (n=356)



Source: Technopolis, based on UKRI data (Master Tracker, as of March 2021) and Gateway to Research.

Table 15 FIC project classification – total value of grants

Source: Technopolis, based on UKRI data (Master Tracker, as of March 2021) and Gateway to Research.

The projects are also classified in GtR against 320 different topic areas (again, with multiple selections allowed). Most commonly (15 or more projects each) this includes: Artificial intelligence; Climate and climate change; Economic and social history; Human-computer interactions; Social policy; Heritage management; and Science and technology studies.

D.3 FIC Project Participants

There have been 1,090 participations by organisations in the 356 FIC projects in GtR (i.e. 3 organisations per project on average). This includes 577 unique organisations (i.e. once we exclude multiple participations across different projects). Amongst these 577 organisations, those appearing most frequently (i.e. with the most participations across the 356 projects) include the Universities of Cambridge, Oxford, Edinburgh and Glasgow (who account for 19-21 projects each).

One drawback of the GtR database it that it does not distinguish between the different types of participating organisations. However, we have attempted to establish a basic distinction between academic institutions and businesses.

The identification of companies amongst the organisations involved in FIC grants followed a three-step process:

1. Matching with the Global Research Identifier Database (GRID)[64]:

   GRID is a publicly available database of global research-related organisations. For this analysis, release 2021-03-05 was used covering a total of 100,467 institutions of which 29,065 are companies. The organisation names of companies in GRID were matched with the names of organisations associated with FIC using fuzzy matching to account for minor discrepancies in their spelling.

2. Matching with FAME and PitchBook

   Business data linked to FIC participants was extracted from FAME[65] and PitchBook[66] (see below for a more detailed description of this process). In cases where either of the two sources identified companies not already identified as such by GRID, these were added to the list of companies.

3. Identification based on legal form

   As a final step, organisations that included relevant legal forms in their names such as Ltd or Plc were also counted as companies.

Identifying universities was then achieved using their names and cross-referencing with organisations identified as companies above.

Based on this approach, half (53%) of the organisations recorded against FIC projects could be assigned to one of these organisation types. Two thirds of organisations (68%, 209) are from universities or academic institutions, while one third (32%, 97) are from business.

[64] Digital-science, Data-science; Science, Digital (2021): GRID release 2021-03-25. Digital Science. Dataset. https://doi.org/10.6084/m9.figshare.14316596.v1

[65] See: https://www.bvdinfo.com/en-gb/our-products/data/national/fame

[66] See: https://PitchBook.com

Appendix E Collaboration with other countries

E.1 Identification of international partners in Council strategies

We have analysed the text of published Council delivery plans over time for mentions of individual countries[67]. The analysis has been limited to just the Research Councils, as they have each produced delivery plans for the same periods (2015/16, 2016/17-2019/20 and for 2019)[68]. For simplicity, we refer in the analysis to the year before the plan started, when they were likely to have been developed (i.e. in 2014, 2015 and 2018). All of the delivery plans will have been written in advance of any FIC programmes starting, although the 2018 plan may have been produced at a time when FIC programme bids were being developed / awarded.

Table 16 shows that the number of countries mentioned (other than the UK) and the total number of mentions of these countries has increased over the three plans, from 100 mentions across 14 countries in 2014, to 180 mentions across 32 countries in 2018, suggesting an increase in international outlook or activity amongst Councils (particularly in relation to DAC countries[69]). Mentions of FIC priority countries over the period have been more variable, reducing between the first two plans, before increasing again in 2018. Overall across the period, the increase in coverage of FIC priority countries has not kept pace with the increase in mentions of other (non-priority) countries.

Table 16 Mentions of other countries within Council delivery plans

	2014	2015	2018
Number of countries mentioned	14	35	32
Number of mentions of any country	100	131	180
Number of FIC priority countries mentioned	9	8	9
Number of mentions of a FIC priority country	67	47	90

Source: Technopolis, based on analysis of Council Delivery Plans

Table 17 provides a more detailed breakdown for individual FIC priority countries. It shows that the United States, China and India appeared most frequently in Research Council delivery plans throughout the period, although the increase in mentions has been greater elsewhere (e.g. Japan, Australia, Ireland).

Table 17 Mentions of individual priority countries within Council delivery plans

Number of mentions of a FIC priority country	2014	2015	2018
USA	35	20	53
China	13	10	8
India	12	7	5

[67] Based on the ISO 3166 list of countries, plus some common variations e.g. UK, U.K., USA, U.S., United States, etc.

[68] Research England has only produced a delivery plan for 2019. IUK has produced a delivery plan for 2015/16 and 2019, but not for the 2016/17-2019/20 period (it instead produced two documents, covering a year each). UKRI also introduced a first delivery plan for 2019.

[69] The OECD Development Assistance Committee (DAC) list of low and middle income countries that are eligible to receive Official Development Assistance (ODA). The total number of these DAC countries mentioned in the plans has increased from 3 in 2014, to 17 in 2018. During this period BEIS launched two major ODA funds (the Newton Fund in 2014 and the Grand Challenges Research Fund in 2016).

Japan	1	3	9
Canada	1	2	4
Sweden	1	2	3
Australia	0	0	4
Ireland	0	1	3
Norway	0	2	0
South Korea	2	0	0
Switzerland	1	0	1
Singapore	1	0	0
Israel	0	0	0

Source: Technopolis, based on analysis of Council Delivery Plans

E.2 Identification of international partners through MoUs

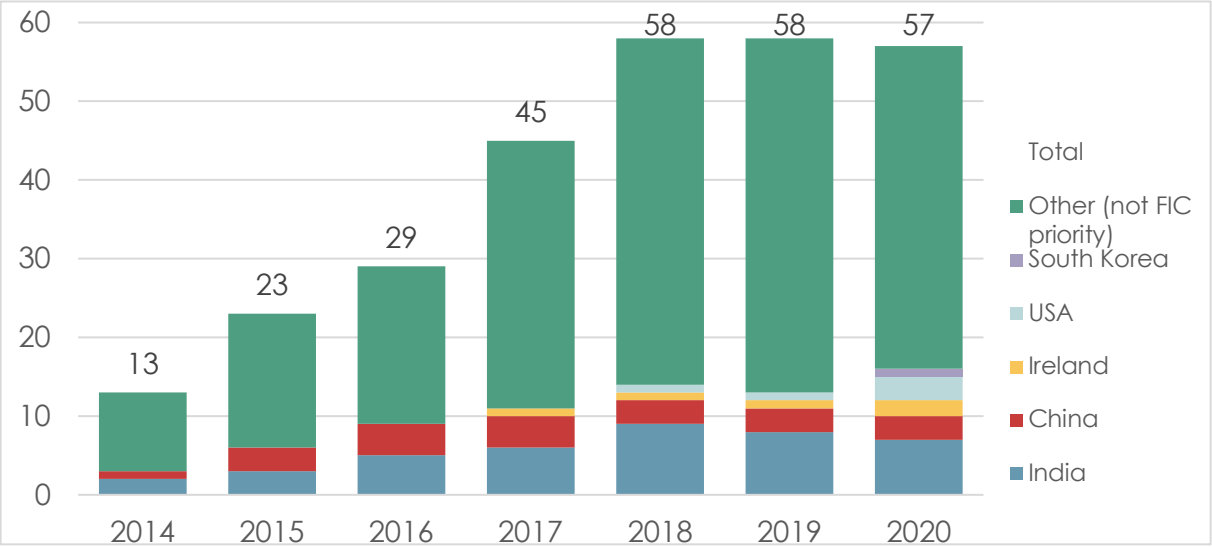
UKRI's log of MoUs (originally developed by the Newton Fund and now being extended in a process coordinated by the UKRI European Partnerships team) currently contains 82 items. This includes items classified as funding agreements (x11), MoUs (x4), other overarching agreements (x17), or agreements tied to a specific activity (x46), plus 3 that are unclassified. Of these, 23 are held centrally (by RCUK or UKRI), while the others relate to individual UKRI Councils[70]. The agreements are with organisations in 25 different countries, including six of the FIC priority countries (India x10, China x8, USA x5, Ireland x2, South Korea x1 and Canada x1).

The following chart shows the evolution in the number of agreements over time. Specifically, it details the total number of logged agreements that are 'live' each year (based on start and end dates, where available), including the number that are with individual FIC priority countries. Only five of the six priority countries mentioned above are included, as the start date of the one Canadian example is not yet confirmed.

UKRI has plans to maintain and update this log of MoUs on an ongoing basis and so the study should be able to track progress over time (in later iterations of the evaluation), compared with this initial baseline position.

[70] IUK x13, MRC x12, STFC x12, AHRC x6, BBSRC x5, ESRC x5, NERC x4 and EPSRC x2

Figure 2 Total number of active agreements between UKRI/Councils and other countries/funders



Source: Technopolis analysis of UKRI data. Graph excludes agreements with a start date after 2020 or an end data before 2014, as well as those with no date indicated.

E.3 Resources available to fund international collaboration

FIC has increased the pool of resources made available via UKRI to conduct projects with international partners, but the resources are relatively small in comparison with pre-existing investments, as shown in Table 18. In 2020, for instance, UKRI (excluding FIC) funded a total of 1,205 grants (for a value of £533m) that included the participation of at least one FIC priority country, while FIC funded 115 grants for a value of £22m.

Table 18 Number and value of grants allocated to grants / projects with at least one FIC priority country

Number of grants	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
UKRI (excluding FIC)	917	1,030	1,124	869	773	1,205	266
FIC					57	115	13
Value of grants	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
UKRI (excluding FIC)	£713m	£853m	£1,035m	£779m	£1,200m	£533m	£270m
FIC					£5m	£22m	£2m

Source: Technopolis (2021) based on data from GtR. URKI figures exclude FIC. Years based on the start date of the project.

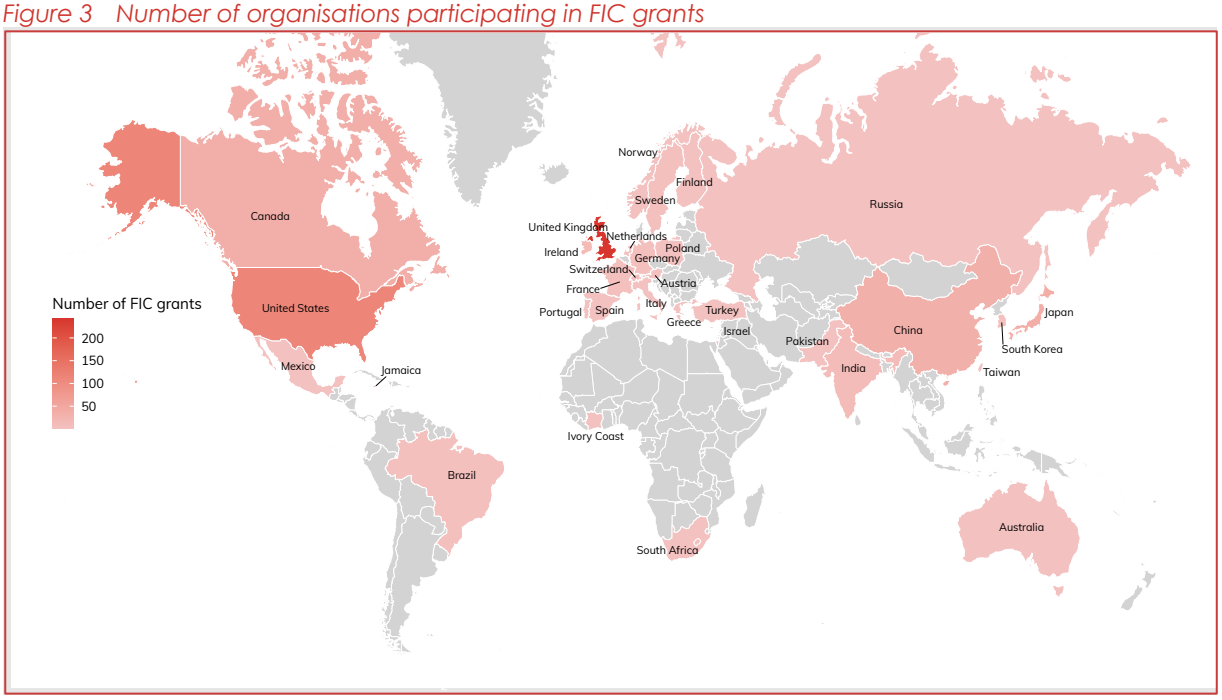
E.4 Partnerships within FIC projects

For 93% of FIC participants it was possible to determine a country of origin based on address data available in GtR. For cases where address data did not specify a country, this was achieved by geocoding, i.e. using descriptive address information to programmatically find the corresponding geographical location from which a country of origin can be determined. This allows FIC grants to be linked to the countries of origin of its participants.

According to this, around half of the participations in FIC grants are from the UK (57% of the 1,045 participations where the country is known). Similarly, around half of the *unique* organisations participating in FIC grants are from the UK (42% of the 539 with a country indicated). The remaining organisations come from 31 other countries (see distribution in the figure below), most commonly the United States (112), Japan (39), Canada (36) and China

(35). The number of participating organisations from the other FIC priority countries (excluding Singapore, where there are no participants in these grants) totals 40. The most frequently participating overseas organisations are the Universities of British Colombia and Toronto (12 and 11 projects each).

Figure 3 Number of organisations participating in FIC grants



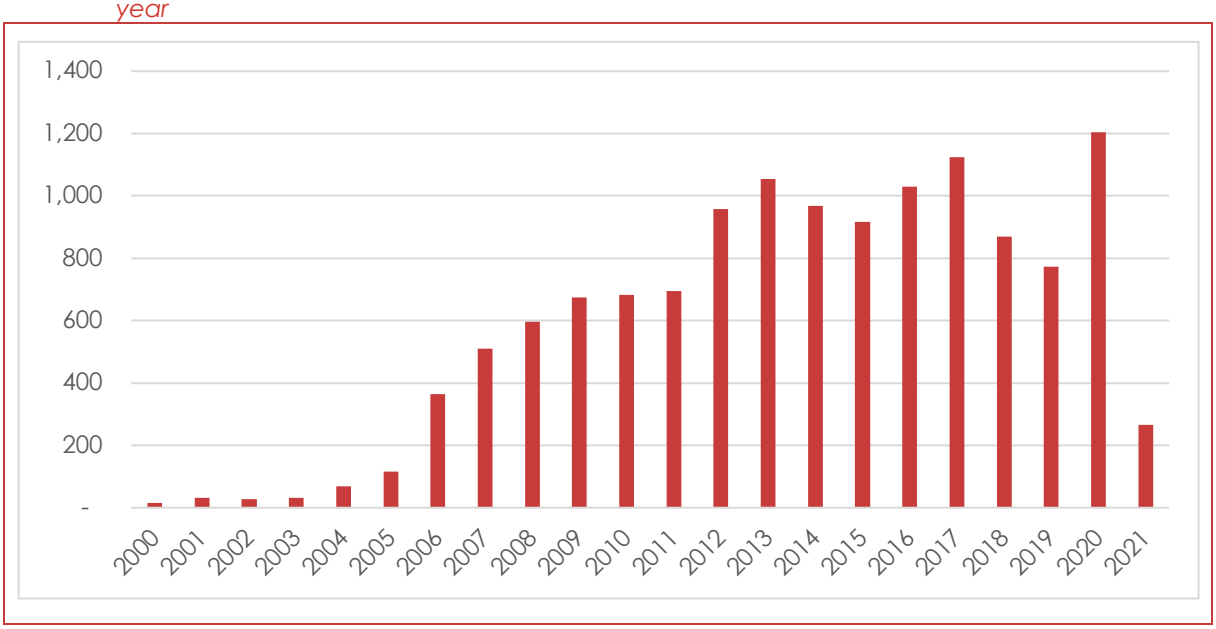
Source: Technopolis, based on UKRI data (Master Tracker, as of March 2021) and Gateway to Research.

Across the 356 FIC projects recorded in GtR there are 2,259 combinations of bilateral partnerships (i.e. between two different organisations in a consortium). We have searched for each of these same combinations of partners in Gateway to Research outside of FIC, but before the start of the FIC project, and identified earlier collaborations between the same parties in only 16% of cases. Therefore, in the majority of cases (84%), FIC is providing a first opportunity for collaboration between organisations, at least in terms of grants awarded through UK Councils.

E.5 Collaboration in UKRI grants

The same approach described above can be used to determine the country of origin for all organisations available in GtR. Approximately 57,000 organisations are listed in the GtR database, and in 60% of these cases (34,000) we have been able to determine the country of origin. Based on this, 13,286 UKRI grants include at least one partner from a FIC priority country, which represents around 11% of all grants. Using their starting years, the occurrence of these grants through time can be visualised, as shown in Figure 4. This shows that collaborations with priority countries have tended to increase over time, with notable peaks in 2013, 2017 and 2020.

Figure 4 Number of UKRI grants with collaborations with partners from priority countries, per grant start year



Source: Technopolis analysis based on GtR, grants starting before 2000 are not displayed

Table 19 provides further details on (all UKRI) collaborations with priority countries for two key timeframes, one prior to FIC (2008-2018) and one coinciding with FIC (2019-2020). Proportionally, grants starting in 2019-2020 feature fewer collaborations with priority countries as compared to the 2008-2018 period.

Table 19 Summary of collaborations with priority countries for select timeframes

Timeframe	Total number of grants	Grants with collaborations with priority countries	Proportion of grants with collaborations with priority countries
2008-2018	78,378	9,564	12.2%
2019-2020	24,209	2,150	8.9%

One partial explanation can be offered by the data shown in Table 20, which shows the incidence of grants featuring collaborations with *any* country outside the UK for 2008-2018 and 2019-2020. This shows that grants in the 2019-2020 period appear to feature fewer collaborations with international (i.e. non-UK) partners in general.

Table 20 Summary of collaborations outside the UK for select timeframes

Timeframe	Total number of grants	Grants naming at least one international partner	Proportion
2008-2018	78,378	14,051	17.9%
2019-2020	24,209	2,810	11.6%

Considering the differences between 2008-2018 and 2019-2020 for specific countries, there are few major changes. In 2008-2018 and 2019-2020 the US featured in 64% and 70% of UKRI grants with at least one partner from a priority country. For all other countries (except India and Ireland for which relative involvement remained constant), involvement dropped in relative terms. The biggest decline occurred for Australia which dropped from 12% of grants including priority countries in 2008-2018 to 5% in 2019-2020.

Appendix F R&I outputs emerging from FIC programme

This appendix presents the results of an analysis of R&I outputs linked to FIC grants so far. It is based on GtR data extracted in March 2021. Specifically, data on R&I outputs in GtR is derived from Researchfish, a system used to collect information on outputs, outcomes and impacts that have arisen from funded research of UKRI Research Councils. Researchers self-report outcomes on Researchfish on an ongoing basis but these are submitted during an annual Submission Period taking place in March. Therefore, this analysis does not cover any outputs that occurred after March 2021, which became available in GtR in April 2021. Note that the Bibliometric analysis (presented in Appendix H) uses February 2021 as cut-off date.

Given the small number of projects that have so far concluded (44 of the 356 FIC projects in Gateway to Research are marked as 'closed'), we would not expect many outputs to have been recorded at this stage. Nevertheless, Researchfish does already contain some data for 118 FIC projects across 15 programmes (i.e. one-third of FIC grants in Gateway to Research).

F.1 Collaborations

One of the types of outputs recorded in Researchfish is collaborations. This refers to *new* collaborations established through the grants, but not to the collaborations between the organisations already included in the grant. Researchfish distinguishes between the following types of partners:

- Academic/University: educational institutions, including secondary level & above
- Private: all private companies including social enterprises, but excluding Hospitals and Universities
- Charity/Non-profit: organisations set up to raise/distribute/invest funds for charitable purposes
- Hospital: all health care providers with clinical practice as their primary focus
- Public: excluding hospitals and Universities
- Learned Society: groups aimed at promoting academic disciplines/professions

In total, the 44 FIC projects have so far recorded 136 new collaborations across these groups (see Table 21), with over half (54%) accounted for by academic institutions and universities. The highest number of new collaborations (n=52) have been established through the SSH Pump-Priming with Japan programme, the majority of which (73%) were with academic institutions and universities.

Table 21 Collaborations per programme by type of partner

Programme	Academic /University	Charity/ Non-Profit	Hospitals	Learned Society	Private	Public	Total (n = 44 projects)
FIC-18 SSH Pump-Priming with Japan	38	2	1	0	3	8	52
FIC-21 UK-China Creative Industries Collaboration	6	4	0	0	19	4	33
FIC- 20 UK-US Collaboration for Digital Scholarship in Cultural Institutions	14	7	0	0	3	2	26
FIC-ADD-2 UK-Japan SSH Connections Awards	8	2	0	0	0	0	10

FIC-22 UKRI-JSPS Joint Call	6	0	0	0	1	1	8
FIC-12 UK-USA Breakthrough Technologies to Advance Crop Breeding	1	0	0	1	4	0	6
FIC-16 UK-Korea Health Sciences Collaboration	1	0	0	0	0	0	1
Total (n = 44 projects)	*74*	*15*	*1*	*1*	*30*	*15*	*136*

The country of origin of the partners involved in these new collaborations were predominantly from the UK (37%) or Japan (32%), as can be seen in Table 22.

Table 22 Collaborations per programme by country of origin of partner

Programme	**Canada**	**China**	**France**	**Japan**	**South Korea**	**Norway**	**UK**	**US**	***Country not available***	**Total (n = 44 projects)**
FIC-18 SSH Pump-Priming with Japan	1	0	1	28	0	1	18	0	3	52
FIC-21 UK-China Creative Industries Collaboration	0	19	0	0	0	0	13	0	1	33
FIC- 20 UK-US Collaboration for Digital Scholarship in Cultural Institutions	0	0	0	0	0	0	11	14	1	26
FIC-ADD-2 UK-Japan SSH Connections Awards	0	0	0	8	0	0	2	0	0	10
FIC-22 UKRI-JSPS Joint Call	0	0	0	7	0	0	1	0	0	8
FIC-12 UK-USA Breakthrough Technologies to Advance Crop Breeding	0	0	0	0	0	0	5	1	0	6
FIC-16 UK-Korea Health Sciences Collaboration	0	0	0	0	1	0	0	0	0	1
Total (n = 44 projects)	*1*	*19*	*1*	*43*	*1*	*1*	*50*	*15*	*5*	*136*

F.2 Funding leverage

FIC has awarded £153.4m to programmes so far (33 programmes through the two main waves of competition, plus two programmes through the strategic opportunities stream). Based on indications at the time of bidding, these programmes will secure £205 in match funding (in cash or in kind) from overseas partners.

Based on more recent information provided by programmes (through the FIC tracker, March 2021) there have been 21 calls where awards have been made, with a total value of £94.7m (i.e. about two-thirds of programme budgets now allocated). Information also recorded on match funding awarded to these active grants suggests that this currently totals £197m[71],

[71] Where figures were not recorded in GBP, these were converted based on the exchange rate on 1st March 2021.

although there are also indications of other contributions (in-kind) that have not been monetised (FIC tracker, March 2021).

Additionally, 21 projects (out of 356 funded so far) have already recorded the leveraging of £3m in additional funding, according to data recorded in GtR and Researchfish. The majority of follow-on funding (89%) was provided by public sector bodies.

Table 23 Leverage reported by projects, per FIC programme

Programme	Total GBP*	Projects
FIC- 20 UK-US Collaboration for Digital Scholarship in Cultural Institutions	£410,411	4
FIC-18 SSH Pump-Priming with Japan	£556,303	5
FIC-21 UK-China Creative Industries Collaboration	£1,734,510	5
FIC-22 UKRI-JSPS Joint Call	£316,708	1
FIC-ADD-2 UK-Japan SSH Connections Awards	£69,282	6
Total	*£3,087,214*	*21*

* Any leverage in foreign currencies were converted into GBP using historical exchange rates

F.3 Other knowledge outputs

Finally, Researchfish collects data on the following types and sub-types of knowledge outputs:

Output type	Sub-types	Output type	Sub-types
Intellectual property	• Patent application published • Patent granted • Trademark • Copyrighted (e.g., software)	Research tools & methods	• Biological samples • Cell line • Technology assay or reagent • Model of mechanisms or symptoms (human) • Model of mechanisms or symptoms (mammalian in vivo) • Model of mechanisms or symptoms (in vitro) • Model of mechanisms or symptoms (non-mammalian in vivo) • Physiological assessment or outcome measure • Improvements to research infrastructure • Antibody
Research databases & models	• Database/collection of data • Data analysis technique • Computer model/algorithm • Data handling & control	Software & technical products	• Webtool/Application • Software • e-Business Platform • Grid Application • Physical Model/Kit • New Material/Compound • New/Improved Technique/Technology • Systems, Materials & Instrumental Engineering • Detection Devices

So far, FIC projects have recorded the following outputs across these categories:

12x research databases and models

The majority of these refer to either databases or collections of data.

One example is an aggregated dataset of digitised records created by the Global Digitisation Dataset project in 2019, funded by the AHRC under the UK/US Digital Scholarship in Cultural

Institutions networking fund[72]. The records come from the project's members: HealthTrust, National Library of Scotland, British Library and the National Library of Wales. Each record in the dataset contains limited bibliographic metadata, along with a link to the item. The dataset was created as a proof of concept, merging records of digitised texts from different organisations. [Grant reference: AH/S012397/1]

A second example is a database that collects data from different sources about treaty ports and customs locations along the Northern border of China (including present day Mongolia), divided by provinces and smaller localities. It provides the dates when the treaty ports and the customs were opened, the type of communication network they were linked by (i.e. railway, waterway, paths), and if those localities were on the border for trade and/or served as network hubs. It was compiled in a spreadsheet. This is an output of an ESRC-funded grant linked to the UK-Japan SSH Connections Awards. [Grant reference: ES/S013393/1]

5x research materials

One of the materials produced by the Pump-Priming with Japan programme is a method that uses physical materials to model prototypes for VR development. The corresponding project showed how this was also an effective means for including children in the design of location-based VR experiences. The method was subsequently used by the project's PI working with MA Information Experience Design students and primary school children in London as a means of co-designing a location-based VR experience. The ideas from the workshop were developed into a VR experience that crossed physical and virtual spaces and was disseminated at the V&A Museum of Childhood Festival, Summer 2019.[73] [Grant reference: ES/S014136/1]

A second example, from the Collaboration for Digital Scholarship in Cultural Institutions programme, is a method for publishing and aligning conservation vocabularies in a sustainable way with minimal commitment of long-term resources[74]. This has also been the core workflow for a new grant application currently under development which implements the method. [Grant reference: AH/S012486/1]

4x software and technical products

One grant under the UK-China Creative Industries Collaboration programme produced two of these products. One being a custom-made calibration software for a 5.1 cardioid microphone developed as part of the same project and the other being a 3D-printed 5.1 surround sound microphone prototype with cardioid capsules. The latter was demonstrated to partners in Shanghai, and calibration measurements made. [Grant reference: AH/T001267/1]

2x copyrighted intellectual property

Two FIC grants have recorded copyrighted intellectual property.

Supported through the UK-Japan SSH Connections Awards, a project on imperial competition in Northeast Asia, involving Britain and the US as well as the Northeast Asian powers 1894-1953 produced a set of maps of treaty ports, customs, railways, population data and several other aspects. These visualisations of historical information allow researchers as well as non-academics to have a better understanding of trade, networking, migration, etc. The introduction of interactive digital maps has provided scholars with new methods to present and view complex statistical and geographical data in a simple and accessible way. It helps

[72] See: https://data.nls.uk/data/metadata-collections/gdd-project/

[73] See: https://ukjapanvr.wordpress.com/2019/05/05/story-worlds/

[74] See: https://www.ligatus.org.uk/lcd/output/142

to visualise a broad range of research data in an effective way lending it to broader use in research, teaching and dissemination to the wider public. [Grant reference: ES/S013393/1]

The second IP output, associated with the UKRI-JSPS Joint Call, is software for an analytical device that allows the generation of low concentrations of polar oxygenated volatile organic compounds (OVOCs) in ambient air. This has been licensed to an instrument manufacturer and is now offered for sale worldwide. Licensing income of £60,000 has been received, plus an in-kind donation of a new £200k mass spectrometry instrument. [Grant reference: NE/S012273/1]

1x spinout

This is a company that commercializes speciality fibres with enhanced response for distributed acoustic sensing. It was set up in 2019, so was likely aided by, but not created with support from the programme (the FIC-22 UKRI-JSPS Joint Call). [Grant reference: NE/S012877/1]

F.4 Company performance (baseline)

Out of 577 unique participants associated with FIC grants in GtR, 17% (98) could be identified as companies.

Business data linked to FIC participants was extracted from FAME[75] and PitchBook[76] that respectively cover over 11m companies in the UK and Ireland and over 3.1m companies globally. FAME was primarily used to obtain annual figures for turnover, profit, and the number of employees for the period 2010-2020. PitchBook, on the other hand, was used to retrieve data on venture capital, private equity, and M&A deals for the same timeframe.

In both cases, relevant data was extracted based on the list of organisations associated with FIC grants. The process by which FAME and PitchBook link inputs to their respective databases is not public information. Therefore, to exclude any incorrect returns in the results, these were compared to the original list of organisations using fuzzy matching. This allowed any mismatches between original company names and the results from FAME or PitchBook to be dropped. Key indicators from the results of both sources are presented below.

Table 24 Key financial indicators

Key indicators	2018	2019	2020
Turnover (annual average)	£2,595,747	£3,119,470	£6,276,222
Profit (annual average)	£229,867	£317,607	£689,505
Number of employees	4,421	3,976	7,484

Source: FAME, information available for 71 companies.

Table 25 Key indicators on venture capital, private equity, and M&A deals

Key indicators	2018	2019	2020
Number of deals	12	10	20
Number of companies with deals	9	7	14
Total value of deals(Billion GBP)	£2,641.35	£2,689.88	£31,818.97

Source: PitchBook, information available for 25 companies.

[75] See: https://www.bvdinfo.com/en-gb/our-products/data/national/fame

[76] See: https://PitchBook.com

The performance of participating organisations will be tracked over time and compared with a control group of unsuccessful or non-applicant companies in the interim and final impact evaluations.

Appendix G Case studies

G.1 United States National Science Foundation (Geosciences)

G.1.1 Introduction and context

The **National Science Foundation (NSF)** is a federal agency of the United States (US) government that supports fundamental research in all non-medical fields of science and engineering. Its US$8.5bn budget for 2021 (£6.14bn[77]) funds approximately 27% of all federally supported basic research conducted at academic institutions in the United States.[78]

The NSF **Geosciences Directorate (NSF GEO)** — one of the agency's seven research Directorates[79] — supports research spanning the Atmospheric, Earth, Ocean and Polar sciences. It comprises four Divisions: Atmospheric and Geoscience, Division of Earth Sciences, Division of Ocean Sciences and the Office of Polar Programmes. NSF GEO provides approximately 64% of US federal funding for basic research at academic institutions in the geosciences. The Directorate's annual budget amounts to around US$900m (£650m), split between large strategic projects, research centres and facilities, infrastructure and research grants, and supports around 12,500 researchers per year.[80]

Overall, NSF is a key partner in FIC, with nine FIC programmes involving NSF Directorates. NSF GEO is a partner in the following three FIC programmes:

- The *Delivering Healthy Soils: Signals in the Soil* programme (FIC-26, Wave 1) led by NERC and the NSF Engineering Directorate (NSF ENG), with participation by BBSRC, EPSRC, STFC, NSF GEO, NSF Biosciences Directorate (NSF BIO), NSF Computer and Information Science and Engineering (NSF CISE), and the US Department of Agriculture's National Institute of Food and Agriculture (USDA-NIFA). Funded through £8.3m from UKRI and £6m (plus in-kind contributions) in match funding from the US.
- The *Changing North Atlantic Ocean and its Impact on Climate* programme (FIC2-02, WAVE2) led by NERC and NSF GEO's Division of Ocean Sciences, with participation by the Met Office Hadley Centre. Funded through £5.1m from UKRI and £12.8m (plus NSF ship-time costs) in match funding from the US.
- The *Climate, Environment and Health* programme (FIC-23, WAVE1) is delivered through the Belmont Forum[81]. It involves NERC, MRC and ESRC from the UK, as well as NSF GEO, the US National Oceanic and Atmospheric Administration, the US National Institutes of Health, and other Belmont Forum members. Funded through £2.8m from UKRI, plus £6.7m in match funding from international partners.

The case study was developed based on desk research and consultation with twelve representatives from NSF, NERC, BBSRC, the UKRI North America Office, and the UK S&I Network.

[77] Throughout case study, USD were converted to GBP using the conversion rate of 22 March 2021: US$1 = £0.72

[78] https://www.nsf.gov/about/glance.jsp (accessed 9th March 2021)

[79] https://www.nsf.gov/about/research_areas.jsp (accessed 8th March 2021)

[80] https://www.nsf.gov/geo/about.jsp (accessed 20th January 2021)

[81] The Belmont Forum is a partnership of 22 funding organisations, international science Councils, and regional consortia committed to the advancement of transdisciplinary science providing knowledge for understanding, mitigating and adapting to global environmental change. The Forum funds translational environmental change research through Collaborative Research Actions. Both NSF and NERC are full members.

A full list of interviewees is given in section G.1.6. The case focuses primarily on the *Signals in the Soil* (FIC-26) and *Changing North Atlantic Ocean* (FIC2-02) programmes[82].

G.1.2 Pre-FIC (relationships)

NSF and UKRI have a long-standing, strong, mature relationship and a long history of collaboration in supporting research through bilateral activities and multilateral arrangements. In 2013, NSF and Research Councils UK (UKRI's predecessor) signed a high-level Memorandum of Understanding (MoU) stating their intention to investigate opportunities for collaboration.[83] This MoU is very broad in nature — more so than MoUs between NSF and other international funders — and hence enables partnering across many research areas. Under the MoU, several lead agency agreements between research Councils and NSF Directorates were established. These allow UK-US joint proposals to undergo a single peer review process, thus avoiding "double jeopardy" and facilitating collaboration. Hence, trust and "familiarity" between UKRI Councils and parts of NSF had been established prior to FIC. As one interviewee commented: "We had quite a rich, deep relationship. The lead agency arrangements are a reflection of the strength of that partnership: you're trusting another organisation and their peer review system to deliver outputs and outcomes that you would normally expect from your own system. That gives the sense of the relationship's maturity."

The relationship between NERC and NSF GEO has a long history, for example a barter arrangement for research vessel time has been in place since the 1970s. Much of the research within NERC's and NSF GEO's remits is inherently international, with issues such as climate change and investments such as large research infrastructures spanning international borders and requiring multilateral collaboration. As one interviewee explained: "These are questions that almost force you to join together to try to resolve them. Because when you're trying to run a picket fence across the entire ocean and see how much water is going North or South, that is more than one agency, or one nation can do on their own. Joining forces helps." To facilitate international collaboration, NERC and NSF GEO co-founded the Belmont Forum in 2009[84] and established a lead agency agreement in 2015[85]. Since then, these organisations have partnered on a number of joint research programmes, including multilaterally on topics such as food security and land use change, coastal vulnerability and freshwater security, and e-infrastructure and data management through the Belmont Forum[86], as well as bilaterally through the Thwaites Glacier programme[87].

Frameworks for collaboration were also set up between other research Councils and their NSF counterparts. For example, BBSRC established a lead agency agreement with the Directorate for Biological Sciences (NSF BIO) and collaborated with NSF BIO multilaterally through the European ERA-NET co-funds[88]. UKRI's interest in partnering is underpinned by NSF's scale of funding and the high quality of research it supports, as well as the organisations' shared values

---

[82] Some information on the *Climate, Environment and Health* programme (FIC-23) is included where this was accessible through desk research. However, given the agreed number of interviews for the evaluation, the FIC-23 programme leads were not directly consulted.

[83] https://esrc.ukri.org/files/funding/funding-opportunities/bilateral-agreements/nsf-rcuk-lead-agency-memorandum-of-understanding-pdf/ (accessed 8th March 2021)

[84] https://nerc.ukri.org/research/partnerships/international/belmont/ (accessed 15th April 2021)

[85] https://nerc.ukri.org/funding/available/researchgrants/international/ (accessed 8th March 2021)

[86] https://nerc.ukri.org/research/partnerships/international/belmont/; https://www.belmontforum.org/data/ (accessed 8th March 2021)

[87] https://nerc.ukri.org/research/funded/programmes/thwaites/ (accessed 8th March 2021)

[88] For example the ERASynBio project: https://bbsrc.ukri.org/research/international/engagement/era-nets/era-syn-bio/ (accessed 8th March 2021)

and common approach to research and research funding (for example based on transparency, openness and merit). The common language was also highlighted as helpful in supporting collaboration. NERC representatives agreed that "NSF GEO is our number one international partner."

NSF GEO also collaborates with other international partners, for example through the Belmont Forum. However, the partnership with NERC is unique in being underpinned by a bi-directional lead agency agreement, where NSF GEO co-funds projects that were reviewed by another funder.

G.1.3 Programme origins and development

Of the three FIC programmes which involve NSF GEO, two build on existing funder-to-funder relationships and collaborations: the *Changing North Atlantic Ocean* programme (FIC2-02) enables the continuation and extension of an existing joint initiative, while the *Climate, Environment and Health* programme (FIC-23) takes place within the established processes of the Belmont Forum. The third programme, *Signals in the Soil* (FIC-26), represents a new relationship: the opportunity originated with a personal contact between individuals at NERC and NSF ENG, two organisations that had not partnered previously. However, NSF ENG was already familiar with the UK research funding system through its lead agency agreement with EPSRC.

While many connections between research Councils and NSF were already established, the larger scale of funding provided through FIC served as a focal point for discussion at the funder-to-funder level. This allowed true co-development of programmes, in contrast to other routes to international collaboration in which UKRI Councils first specify a funding programme before an "international add-on" can be considered. FIC also incentivises Councils to explore new or expanded partnership options, and facilitates multi-Council working by providing a common budget that is not tied to individual Councils. In addition, FIC as a dedicated international funding stream, provided UK Councils with "a spotlight and challenge to think about internationalising key parts of the portfolio which [they] probably weren't able to do previously". Interviewees from UKRI also felt that FIC served as an important signal of the UK's interest in collaboration with non-ODA countries, balancing out the substantial funds dedicated to ODA countries over the last years.

The three programmes align with the UK and (current) US national priorities of addressing societal challenges related to climate change and of supporting green growth.

The ***Delivering Healthy Soils: Signals in the Soil*** programme aims to develop new solutions for delivering healthy and resilient soils to improve food security, climate change mitigation and public health. The programme integrates basic soil science with sensor, network, and data approaches to improve research and monitoring capabilities and thus lead to a better understanding of soil health.

UK policy has increased its focus on soil health in recent years. The Government's 25 Year Environment Plan identified improved soil health and soil management as key commitments to deliver significant progress against by 2030. Greater productivity of agricultural land and improvement of soil health was also highlighted as a key innovation challenge and policy deliverable in the Clean Growth Strategy, the Department for Environment, Food and Rural Affairs (Defra)'s 25-year plan, the Scottish Government's soil framework, and the Welsh Soil

Action plan. And the 2020 Agriculture Act recently added "soil protection and improvement" to the list of purposes for which farmers can be given financial support[89].

The *Signals in the Soil* programme is expected to contribute to achieving these policy objectives. The programme builds on NERC and BBSRC initiatives, such as the Soil Security Programme[90] and the NERC/BBSRC Sustainable Agriculture Research & Innovation Club[91], as well as STFC's food network+[92]. *Signals in the Soil* also complements other UK investments, such as the Industrial Strategy Challenge Fund for Transforming Food Production[93], and international UKRI programmes in ODA countries, for example China[94].

Signals in the Soil was established prior to FIC, as part of NSF's long-term strategic plan for annual investment in soils research and innovation. NSF invested around US$7m in 21 projects through a call for proposals in 2018[95,96].

While NERC had a strong relationship with NSF through NSF GEO, it had not previously worked with NSF ENG. The announcement of FIC provided an opportunity for NERC to bring other UK research Councils into the partnership and broaden discussions with NSF. As one interviewee remarked: "Clearly, soil science is an area that spans [UKRI Councils'] remit. And it just made perfect sense to work together with our number one partner organisation [NSF] through the FIC mechanism." The partners co-designed the 2019 call for project proposals, which was also supported by USDA. In 2020, NSF and USDA launched a further call, without UKRI participation (as FIC funding only covered the 2019 call).[97]

FIC allowed the partnership to proceed at a larger scale and with a broader scope than would have been possible through NERC's budget. As one interviewee highlighted, FIC funding enabled "genuine research partnership" by allowing the UK to bring "real substantive funds" to the table. In addition, FIC facilitated cross-Council working: it provided an incentive for Councils to prioritise and engage in the soil research space by introducing a strong international partner, and offered a "common pot" of funding budget; the partnership would have been difficult to construct if contributions from participating Councils had to be secured. Thus, *Signals in the Soil* brought together UKRI Councils that had not previously partnered with NERC in the soil research space, for example EPSRC and STFC. As one interviewee explained: "FIC enabled bringing in all those different disciplines, which made it a game changer and really brings that technology to fruition."

The ***Changing North Atlantic Ocean* programme (FIC2-2)** measures currents in the sub-polar North Atlantic Ocean to inform climate predictions for the UK and Northern Hemisphere and thus improve modelling of the impacts of subpolar variability on climate change. This addresses a priority action for ocean science recommended by the G7 Science Ministers in 2016,

[89] https://commonslibrary.parliament.uk/research-briefings/cbp-8702/ (accessed 10th March 2021)

[90] https://soilsecurity.org/sarisa-programme/ (accessed 10th March 2021)

[91] https://nerc.ukri.org/innovation/activities/food/saric/ (accessed 10th March 2021)

[92] https://www.stfcfoodnetwork.org (accessed 10th March 2021)

[93] https://www.ukri.org/our-work/our-main-funds/industrial-strategy-challenge-fund/clean-growth/transforming-food-production-challenge/ (accessed 10th March 2021)

[94] For example the UK-China virtual joint Centre for Improved Nitrogen Agronomy and the UK-China Critical Zone Observatory; https://www.rothamsted.ac.uk/international/china/cinag; http://www.czo.ac.cn (accessed 10th March 2021)

[95] https://www.eurekalert.org/pub_releases/2020-02/nsf-ns7021320.php (accessed 10th March 2021)

[96] https://nsf.gov/pubs/2018/nsf18047/nsf18047.jsp?org=NSF (accessed 10th March 2021)

[97] https://www.nsf.gov/pubs/2020/nsf20548/nsf20548.htm (accessed 10th March 2021)

(enhancing global sea and ocean observation to monitor climate change).[98] It also supports the UK's interest in supporting international collaboration in this space. For example, the 2018 Government Office for Science "Future of the Sea" report highlighted that significant benefits to UK marine science can be realised though collaboration with international partners on shared challenges. The Government's 25 Year Environment Plan sets out that it "makes sense to work with others to achieve our objectives of securing clean, healthy, productive and biologically diverse seas and oceans", given the transboundary nature of the marine environment.[99] The UK was already working with EU partners through OSPAR[100].

The FIC *Changing North Atlantic Ocean* programme provided a platform for NERC to continue a (pre-FIC) collaboration with NSF GEO: the programme builds on existing infrastructure, the OSNAP observing system, an array of fixed ocean moorings and autonomous underwater vehicles running along a line from Scotland to Canada via Greenland. This infrastructure was launched in 2014, financed by NERC and NSF GEO through blue skies funds. Insights from data gathered by OSNAP prior to FIC departed from the prevailing view and resulted in a high-profile publication in the journal Science[101]. To build on these important insights, and given the natural variation of currents in the subpolar North Atlantic, a decade of measurements is required to take full advantage of OSNAP and maximise insights. However, NERC's original investment in OSNAP only covered four years of data collection. An extension of this funding through the same route was unlikely as funding for the *continuation* of an observing programme does not align with funding criteria for discovery projects.

The FIC programme enables data capture for the full ten years and allows further analysis and interpretation of the data to generate new insights. FIC came at a crucial time for OSNAP: the large scale, and associated cost, of the observing system meant that it was dependent upon contributions from NERC; without the FIC budget, the project would likely have been shut down. The proposal for the *Changing North Atlantic Ocean* programme was developed in discussions between NERC and NSF GEO leads for OSNAP. The two funders were familiar with each other through the lead agency agreement, but had not previously co-designed and co-commissioned a directed marine science programme.

FIC provided an important signal to NSF: it demonstrated the UK's commitment to partnership by making available a substantive budget. The scale of the opportunity enabled NSF GEO to engage in funder-to-funder discussions and co-design a directed programme. This process would not have been triggered by smaller investments, such as had been provided on a project-by-project basis through the lead agency agreement. FIC thus served as an effective focal point for developing the partnership.

Discussions pre- (and post-) FIC award were facilitated by the UKRI North America Office, at times face-to-face in Washington DC, which supported the relationship (for example by providing information of how other parts of NSF had successfully worked with UKRI) and helped to build trust.

---

[98] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/706956/foresight-future-of-the-sea-report.pdf (accessed 9th March 2021)

[99] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf

[100] The cooperate to protect the marine environment in The OSPAR Convention (1992) is the mechanism by which 15 countries and the EU cooperate in the Northeast Atlantic. https://www.ospar.org/convention (accessed 9th March 2021)

[101] Lozier, MS et al (2019) A sea change in our view of overturning in the subpolar North Atlantic. Science 363: 516-521.

The ***Climate, Environment and Health*** **programme (FIC-23)** aims to generate new knowledge, evidence and tools that enable health systems globally to prepare for and manage population health risks as a result of climate change. This will inform efforts such as the UK Government's UK-wide Climate Change Risk Assessment, carried out every five years as mandated by the 2008 Climate Change Act. The programme complements other initiatives, such as the Wellcome Trust's "Our Planet, Our Health" priority area and programmes delivered through H2020 Environment, Climate and Health investments. In addition, *Climate, Environment and Health* complements and builds on existing NERC-MRC co-investment in atmospheric pollution and human health with China and India, delivered through the Newton Fund.

FIC funding was an important signal to the Belmont Forum and re-asserted the UK's commitment: while NERC had been a founding member and a strong voice within the group, it had not been able to provide budget for a call in several years. NERC led the scoping for a *Climate, Environment and Health* programme through the Belmont Forum in the run up to the FIC call. As processes for multilateral collaboration were already well established within the forum, the partnership was able to proceed very quickly.

A.1.1 Progress, enabling factors, barriers, risks and lessons learnt

G.1.3.1 Programme progress

- Implementation of the *Signals in the Soil* and *Changing North Atlantic Ocean* programmes is progressing well to date, without any major challenges (albeit with some delays due to the COVID-19 pandemic). Programme leads were positive about the number and quality of proposals submitted to the open calls, and satisfied with the project implementation to date.

The NSF-UKRI-USDA ***Signals in the Soil*** open call for proposals was launched in spring 2019. In response, 63 joint UK-US project applications were submitted, of which 26 were fundable. The NSF-led review awarded funding to the ten highest scoring proposals, allocating funding of £7.94m from FIC, US$7.2m from NSF, and US$800,000 from USDA. The projects naturally "*spanned the engineering, biology and environmental sciences quite nicely*". The COVID-19 pandemic led to a disruption of project implementation: the research was due to start in January 2020; however, the COVID-19 pandemic has led to substantial delays as equipment in university labs could not be accessed at the start of the growing season. The partners also organised a programme workshop for September 2020, bringing together the research teams, funders, and other stakeholders. While an in-person meeting in Washington DC had been planned, the COVID-19 pandemic necessitated a switch to a virtual platform. The workshop included an afternoon with agribusinesses, organised by the Science and Innovation Network (SIN) US network, introducing the research community to the US innovation base.

In addition to the open call, a scheme for early career researchers from the UK to visit the US partner was established, for example to carry out joint work, learn new techniques and deepen the collaboration. The scheme will be financed from FIC underspend, and is matched by funding from NSF to allow US scientists to travel to the UK.

The NERC-NSF ***Changing North Atlantic Ocean*** programme enabled the upkeep of the OSNAP observing system — which would have not been possible without collaborating internationally — and has continued measurements of ocean currents through £1.7m from FIC and US$15.5m from the Ocean Science Division within NSF GEO. An open call for proposals to address two challenges specified in the call text was launched in autumn 2019, to which five proposals were submitted, three of which were judged fundable. The NERC-led review process selected two of these, one for each challenge, which were funded with £2.4m from FIC and US$1m from NSF GEO. As a representative from NSF commented: "We are funding important science. On the

whole, I would say this [the research funded through the call] is probably the most timely part of the wider programme I am responsible for, trying to understand what's happening in the North Atlantic in terms of climate dynamics. I'm feeling very positive about the whole portfolio."

The Belmont Forum programme on ***Climate, Environment and Health*** launched a call for proposals in March 2019, involving 13 funders from nine countries, including four US agencies[102]. Nine projects were funded in total and started in January 2020. Of these, seven include UK research teams and four are led by UK PIs. FIC provided £3.4m in funding, with match funding of £6.7m from across eight other funding agencies.

G.1.3.2 Enabling factors, barriers and risks

Enabling factors of successful partnership include the pre-existing relationship and established collaboration processes between NSF and UKRI, the larger scale of FIC which incentivises engagement at the funder level, and the support provided primarily by the UKRI North America Office, but also by the SIN. However, uncertainty about whether the UK will support follow-on activities and sustain the new research links is holding up Councils' engagement in further partnership discussions.

Interviewees agreed that the processes and trust built prior to FIC through the lead agency agreement were important enablers for the development and implementation of the FIC programmes. The common basis allowed the partners to move forward quickly. As a UK representative commented: "There are not that many international partners with which we would work jointly to the same degree. With another partner, we might have had to start with a relatively blank piece of paper around assessment processes and approaches, et cetera. But with NSF, we came into the FIC programmes with a lot of that already very well worked out." The strength of the existing relationship was also acknowledged by NSF representatives, pointing out that the lead agency agreements reflect "how much trust we have in in the UK system being as thorough and fair as ours".

Within this context, FIC was described as a "helpful tool" to further cement the relationship between the UK and US funders, and the research communities, by enabling partnership programmes at a greater scale, which in turn incentivises NSF counterparts to "look beyond their usual portfolio" and engage to co-develop programmes. At the same time, UKRI representatives raised questions about how the partnerships developed as a result of FIC-funded projects would be sustained going forward, for example whether there would be future FIC rounds and whether existing FIC programmes would be eligible for further funding. This uncertainty was described as a barrier to follow-on discussions with NSF counterparts and was seen to pose a reputational risk.

UK interviewees also commented that the UKRI North America Office had provided important support for the FIC programmes by liaising with NSF staff (for example "it would have been virtually impossible to do it without them"). The UKRI Office has well-developed relationships with the NSF International Office and can set up in-person meetings with NSF programme staff. Interviewees highlighted that the UKRI North America Office was especially helpful in sorting out unresolved details after FIC was approved; these were the result of the relatively short timeframe within which the FIC proposals needed to be developed. The *Signals in the Soil* programme was also supported by the SIN, through the organisation of a session with US businesses during a (virtual) programme workshop in 2020.

[102] https://www.belmontforum.org/cras/#ceh2019 (accessed 10th March 2021)

No major barriers to collaboration with NSF were identified. While there are some differences in how UKRI Councils and NSF Directorates are set up and how funding decisions are made[103], these did not impact on programme development. Two complicating factors were highlighted:

- Timing: During the proposal stage, the timeframe for submission limited the extent of which programme details could be discussed. This led to some differences in expectations which surfaced after the bid was approved, which were successfully addressed through liaison of the UKRI North America Office. One interviewee remarked that if there were to be a Wave 3 of FIC, they would plan a two day in-person meeting with the international partner to discuss proposal details and avoid misunderstandings. UKRI would also have liked to consult more broadly with the research community relevant to the *Signals in the Soil* in order to shape the call; however, the number and breadth of project proposals submitted indicates that the call was well targeted and designed.
- The COVID-19 pandemic: External to FIC, COVID-19 has not only delayed some of the research projects but also impacted on the level of relationship-building between funders, and between the research communities. With the pandemic preventing face-to-face meetings, workshops and discussions are having to take place virtually. As a result, conversations with funders not directly involved in the management of the joint programmes and opportunities to set up introductory meetings with new stakeholders in NSF have been limited. Informal "coffee break conversations" in the margins of programme meetings were highlighted as important venues for floating new ideas, making new contacts and networking.

G.1.4 Programme activities, outputs and outcomes

Objective 1: Enabling international collaboration

Theme 1: Enabling funding

FIC has enabled the strengthening of the partnership between UKRI and NSF, beyond individual research projects funded through lead agency agreements, by allowing joint programmes at larger scale and with broader scope. While interviewees acknowledge that the increase in joint funding was incremental rather than radical, the design of FIC has made partnering easier, internationally as well as across UKRI Councils.

The implementation of these first FIC programmes is opening avenues for future partnering: both UKRI and NSF interviewees compared the current FIC programmes to "pilots", which were successful in establishing partnership processes and enhancing the understanding of each other's ways of working. This experience can now serve as a model (and incentive) for future partnerships, including at an extended scale, for example with other NSF Divisions or US agencies. NSF staff involved in current programmes can relay their experience to colleagues; as one interviewee stated: "If there are further discussions, I will be pulled into them, and I will bring up FIC and how it has worked, I would point them in that direction. There is some corporate memory now."

Based on their positive experience of the partnership, NSF has signalled an interest in partnering with UKRI on future *Signals in the Soil* calls, and a new focus area has been explored in discussions. This interest is also demonstrated by the fact that the agency earmarked additional

[103] for example NSF Divisions manage their portfolio of grants more independently, while UKRI Councils tend to work more across teams

funds to enable US-to-UK early career researcher visits, mirroring FIC's early-career researcher visit scheme. Similarly, the Belmont Forum is considering a second *Climate, Environment and Health* call, which UKRI would be encouraged to join. NSF GEO have signalled an interest in partnering on other research areas based on the experience with the *Changing North Atlantic Ocean* programme, and the partners are exploring options for extending the FIC partnership to a multilateral programme, including other US agencies and countries. Future joint funding hence depends on the availability of UKRI funding, rather than on the international partner's willingness to engage.

Theme 2: Deepening R&I

Research projects within the *Signals in the Soil* and *Climate, Environment and Health* programmes started in January 2020, but research was delayed due to the COVID-19 pandemic. Once initiated, most projects are slated to run for 3-4 years.

Projects funded through the *Changing North Atlantic Ocean* programme started in September 2020, with a first review meeting in summer 2021. Throughout the COVID-19 pandemic, the programme was able to sustain the OSNAP observing systems, and insights into circulations in the subpolar North Atlantic over the past two-year period are expected in the near future. It is hence too early to identify discoveries.

Theme 3: Developing partnerships

FIC is helping to cement the existing UKRI-NSF relationships by providing at-scale funding that enables "genuine research partnership" and pump-primes conversations. This closer working at programme-level has allowed NSF leads to experience UKRI's processes first-hand and thus increase trust in the system. For example, NERC led the open call review for *Changing North Atlantic Ocean*, which the NSF lead was able to observe in action: "I remember feeling quite impressed, it [the review] was a robust process. The applications were strong and so the competition was tough, and then the review process was thorough and fair. So I felt that it went really, really well." This experience has deepened trust in the robustness and rigour of the UK funding system, and incentivised further partnership ("with or without FIC").

FIC has also opened the door to engagement with new organisations: in addition to strengthening the partnership with NSF, the *Signals in the Soil* programme led to engagement between NERC and a new partner, USDA. FIC may assist in expanding the partnership network further in the future. As one UK programme lead commented: "FIC has opened doors. It is quite a high-profile mechanism now with our partners, we're building up this confidence [in the partnership]. We can work with our counterparts in the US, and with the UKRI North America Office, and explore the boundaries a bit more." However, owing to the pandemic, this organic relationship building — which benefits from face-to-face contact — has been limited so far. Interviewees hoped that this situation will change in the coming months, so that UKRI can take advantage of the "opened doors".

Within the UK, FIC has contributed to a greater level of multidisciplinary research and working across UKRI Councils. As one interviewee noted: "*Signals in the Soil* has demonstrated the ability to do multidisciplinary research in this space, with all those different research Councils coming together and producing very novel research into soil health, which is relevant to delivery plans of each of the research Councils as well as the delivery plan of UKRI. […] We are now working with [other Councils] to develop new ideas and new programme activities within the perspective of soil more generally. And without FIC, we wouldn't have been able to do this as straightforwardly as we are at the moment." Referring to *Signals in the Soil*, another interviewee summarised: "It is true to say that sometimes international collaboration can indeed facilitate linking up on a national level."

Objective 2: Supporting BEIS and wider objectives including science diplomacy

As set out under Theme 1 of Objective 1, relationships built through the joint development and delivery of the FIC programme have led to discussions on extending the partnerships to include other priority areas of NSF and UKRI.

In addition, the FIC funding *mechanism* has attracted attention and interest at NSF: while the FIC brand has limited visibility within NSF, its novel approach to funding international partnerships, ("a different sort of fund") has registered among agency leadership. At the programme level, one interviewee noted: "I think NERC being able to engage through the FIC process, a funding stream dedicated to international collaboration it can bid into, is very helpful. And I wish that there was something like that on this side."

FIC also serves as "a useful calling card" for the SIN, and has been profiled as an example of the UK's commitment to partnership in discussions with US research and innovation stakeholders, including the US Department of Energy, State Department, and White House Office of Science and Technology Policy. As one interviewee explained: "It certainly helps that we can point to actual practical cooperation that's happened already, as well as future opportunities for funding that may become available for US researchers to collaborate with the UK."

G.1.5 Conclusions

FIC has strengthened the existing partnership between UKRI and NSF GEO (and other NSF Directorates) by enabling joint funding programmes at larger scale and with broader scope than had been possible through the lead agency agreement.

All three FIC programmes included in this case study have implemented calls for proposals and awarded project funding (as well as providing funding for infrastructure). The research projects are in their early stages, with some delays caused through the COVID-19 pandemic. At this stage, scientific outputs and outcomes have not yet accrued.

The process of implementing the FIC programmes has led to an increase in familiarity and trust in each other's research funding systems and laid the groundwork for discussions and future partnering at strategic level. This has opened the door to engagement with other NSF Directorates as well as other funders in the US. However, further partnership discussions and relationship building are currently on hold, due to both the COVID-19 pandemic and uncertainty over future FIC funding rounds. The FIC funding mechanism has also lowered the barrier to joint working across multiple UKRI Councils by providing a common budget. This allows a focus on the "best science" rather than operational considerations.

FIC is supporting wider diplomatic efforts and relationships in the US. The Fund has registered among the agency's leadership as a "different sort of fund from the UK" for international partnering. FIC is also serving as an example of the UK's commitment to international collaboration in engagement with other US government stakeholders.

G.1.6 Sources

- FIC quarterly monitoring report, (including programme data such as funding commitments and number of project awards)
- Call texts for project proposals
- Policy documents as referenced in footnotes
- Information from 12 stakeholder interviews:

Name of interviewee	Organisation		Name of interviewee	Organisation

Sarah Webb	UKRI/NERC		Jessica Surma	UKRI/NERC
Amanda Collis	UKRI/BBSRC		Baris M Uz	US NSF GEO
Kate Hamer	UKRI		Roxanne Nikolaus	NSF International Office
Simon Kerley	UKRI/NERC		Chloë Somers	UKRI North America Office
Weihao Zhong	UKRI/NERC		Myriam Telford	UKRI North America Office
Michael Webb	UKRI/NERC		Chris Dain	UK S&I Network in the USA

G.1.7 Programme overview

Programme name	**Delivering Healthy Soils: Signals in the Soil**	**The Changing North Atlantic Ocean and its Impact on Climate**	**Climate, Environment and Health**
FIC ID	FIC-26	FIC2-02	FIC-23
FIC Wave	1	2	1
FIC Bid Amount (incl. OpEx)	£8.3m	£5.1m	£11.9m
UK partners	NERC (lead) BBSRC EPSRC STFC	NERC (lead) Met Office Hadley Centre	NERC (lead) MRC ESRC
Partner Countries	USA	USA	USA Norway Finland Sweden Turkey Brazil Cote d'Ivoire Chinese Taipei
Overseas Partners	NSF ENG (lead) NSF GEO NSF BIO USDA – NIFA	NSF GEO	NSF GEO NOAA NIH European Commission Other Belmont Members
Match Funding (at bid)	£6m (cash)	£8m (cash)	Not Stated
Number of calls that have made awards (Dec 2020)	1	1*	1
Value of these calls	£7.7m	£2.8	£3.4m
Number of awards made through these calls	10	2	7
Final match funding awarded to active grants	£6m (plus in-kind contributions)	£12.8m (plus NSF ship-time costs)	£6.7m

* In addition to this call, there has been an infrastructure investment of £1.7m.

G.2 National Natural Science Foundation of China

G.2.1 Introduction and context

The National Natural Science Foundation of China (NSFC) was established in 1986 to manage the National Natural Science Fund, and is responsible for supporting basic research, fostering scientific talent, and promoting socioeconomic development. Its annual budget in 2019 was 31.1bn RMB (£3.5bn) and it makes around 45,000 new awards each year.[104] This budget is expected to grow in coming years as part of wider increases in research and innovation investment within China.

As a consequence of recent reforms, NSFC was placed under the purview of the Chinese Ministry of Science and Technology (MOST) in 2018, having previously reported directly to the State Council. The Foundation has also updated its funding principles and practices as part of major reforms that are aimed at "building [a] national natural science funding system for the new era". [105] This includes piloting a greater emphasis on transdisciplinarity and application-driven basic research within certain programs, to test application and review procedures.

NSFC is a partner in the Fund for International Collaboration (FIC) via the ***UK-China Healthy Ageing Flagship Challenge* programme (FIC2-21)**, awarded through Wave 2 of FIC. UKRI's contribution to this flagship programme was planned to be delivered through an "integrated package of research and innovation activities", including up to three strands of activity:

4. An interdisciplinary academic research programme
5. A 'Joint centre of Excellence' (an innovation programme)
6. Centre partnerships, fellowships or mobility

NSFC participates in the first of these activities (the academic research programme, which is the focus of this case study), partnering with ESRC and MRC in the UK. Innovate UK is then working with the Chinese MOST on the innovation programme (the second strand of the Flagship).[106] The planned 'centre partnerships' element was not eventually taken forward because the partnership ran out of funds and the other programme activities were sufficient to achieve their objectives. Both academic and innovation components contain some element of mobility including planned SME partnering missions and student exchanges.

A joint call between ESRC, MRC and NSFC was launched in 2019, as part of the Health Ageing programme, and five collaborative research projects were selected for funding, starting in August 2020. UKRI committed £5m to the call, while NSFC committed 2.5m RMB per project, equivalent to £1.4m[107] in total across the five selected projects.[108] These projects, all of which involve close collaboration between UK and Chinese researchers, seek to make novel interdisciplinary contributions to the evidence base on healthy ageing, providing evidence for key stakeholders in policy and practice in the UK and China and enhance interdisciplinary collaborations and partnerships.

---

[104] http://www.nsfc.gov.cn/english/site_1/about/6.html (accessed 23rd March 2021)

[105] "National Natural Science Fund Guide to Programs 2019", National Natural Science Foundation of China

[106] FIC2-21 Bid

[107] Due to differences in grant models and eligible costs (i.e. NSFC doesn't pay researcher salaries, these are covered by the University directly), UKRI considers this to be approximately equal match funding.

[108] https://www.ukri.org/news/new-ukri-china-projects-tackle-the-challenges-of-ageing-societies/ (accessed 8th February 2021)

The case study was developed based on desk research and consultation with five representatives from NSFC, ESRC, UKRI China, and UK S&I Network. A full list of interviewees is given in section G.2.7.

G.2.2 Pre-FIC (relationships)

The **UK and China** have collaborated on science and innovation for several decades, with the first UK-China S&T Cooperation Agreement signed in 1978. Subsequent key milestones have included the initiation of UK-China Joint Commission meetings on STI Cooperation in 1998, the establishment of the UK-China Cooperation Framework in 2009, and the launch of the UK-China Research and Innovation Partnership Fund (Newton Fund) in 2014.

Whilst the long-running Joint Commission meetings between the UK and China take place at ministerial level (between BEIS and MOST), **UKRI and NSFC** have also more recently established biennial funding agency meetings to identify areas of common interest, discuss programme design and mechanisms, and agree on priorities for the next two years. The two funding bodies have also developed a set of standard operating procedures for the joint commissioning of research, written down in a 'guidebook' that can be shared with staff in both organisations.

NSFC has collaborated with UKRI on 27 joint calls and initiatives, both on a bilateral and multilateral basis, with more than 170 individual grants and joint investment of more than £92m from the UK and £43.3m from China. Examples of past joint-funding initiatives include:

- Individual calls for proposals, for example a joint call with EPSRC on carbon capture and storage (CCS),[109] as an international element of the UK's Energy Programme
- The Newton Fund — also known as the "UK-China Research and Innovation Partnership Fund"[110] — in which NSFC was a partner in several initiatives, including NERC-MRC-NSFC Atmospheric Pollution & Human Health in a Chinese Megacity (APHH), STFC-NSFC Precision Agriculture for Family-farms in China (PAFiC),[111] the ESRC-NSFC Call for Collaborative Research: Developing financial systems to support sustainable growth in China,[112] and the BBSRC-ESRC-MRC-NSFC call on antimicrobial resistance[113]
- Multilateral initiatives, for example a joint call on sustainable cities organised through European Joint Programme Initiative (JPI) Urban Europe.

NSFC and UKRI have gradually increased collaboration, initially with a focus on the physical sciences but then also with ESRC (since 2012) and AHRC (since 2018). The Newton Fund represented a further expansion of funding and also coincided with the launch of the biennial meetings between UKRI and NSFC in 2014. Overall, the relationship between the two funders was considered by those consulted for this case study to be very well-established.

The **research and innovation communities** in the two countries are also very well connected. Bibliometric indicators show a significant increase in collaborative activity: in 2019, a total of 16,267 papers, representing 11% of the UK's total output, were co-authored with China-based researchers, as compared to just 3,324 in 2010. China is now the UK's second most frequent

[109] "Call for Proposals: Collaborative UK-China Research Projects in Carbon Capture and Storage Technologies

[110] https://newtonfund.ac.uk/about/about-partner-countries/china/ (accessed 8th February 2021)

[111] "Newton Fund Evaluation: Thematic Impact Study Report — China", May 2018, Coffey and RSM.

[112] https://esrc.ukri.org/research/future-of-social-science-insights-opportunities-and-expectations/newton-fund/ (accessed 8th February 2021)

[113] https://newtonfund.ac.uk/news/latest-news/100816/ (accessed 8th February 2021)

collaborator, after the United States, up from 9th in 2010.[114] The large number of responses to the 2019 Healthy Ageing joint call — 154 initial expressions of interest and 35 full proposals — further illustrates the high demand for collaboration between the two countries.

Beyond the UK, NSFC has also established a large portfolio of other international partnerships, with 93 Cooperative Agreements or MoUs in place with partners in 49 countries and regions.[115,116] Funding mechanisms for international activities include 'Joint Research Projects' (bottom-up collaboration for NSFC-funded researchers in areas of mutual interest) and 'Major International Joint Research Projects' for more strategic initiatives.[117] In 2020, NSFC's international programme focused on the response to COVID-19, including joint research programmes with partners in the US, Germany, South Korea and the BRICS countries, among others.[118]

G.2.3 Programme origins and development

The Healthy Ageing FIC programme sits within a wider UK-China strategic initiative. In December 2017, shortly after the launch of the UK Industrial Strategy, the two countries announced a new "UK-China Joint Strategy for Science, Technology and Innovation Cooperation", which aimed to enhance dialogue and collaboration on basic research and innovation on a range of priority issues. This new strategy outlined several collaborative mechanisms and actions, including an agreement to launch annual 'Flagship Challenge Programmes' to address jointly identified priorities.[119] The first two priorities to be identified were Agritech (in 2018) and then Healthy Ageing (in 2019).

The FIC UK-China Healthy Ageing Flagship Challenge programme therefore originated within this UK-China Strategy process. Although ultimately a political decision, the process of selecting the theme of the challenge involved consultations at multiple levels, including via the UKRI and NSFC biennial meetings, as well as with the UK Science and Innovation Network (SIN), BEIS and MOST.

After the new Flagship Challenge Programme was announced, the role of the UKRI's China office was to follow up and ensure commitment from the partners. The office negotiated the specific terms of the programme on their behalf, for example the number of grants to fund and the selection process. The UKRI programme lead, ESRC, then led on commissioning the joint research.

Overall, **collaboration with China** is seen as an important priority for the UK, given the scale of R&I investment, the scale of testing and delivery in China, access to Chinese markets, as well as the expertise of Chinese R&I, which has increased dramatically in quality as well as in scale. Collaboration with China is also seen as an important way of engaging with Chinese research funders and, by extension, to Chinese R&I ecosystems more broadly.

The **topic of healthy ageing** is highly relevant to both China and the UK, and both countries have launched major initiatives in this area in the years preceding the joint programme.

---

[114] Johnson et al. (2021), *The China Question: Managing risks and maximising benefits from partnership in higher education and research*, Harvard Kennedy School and King's College London, March 2021, p. 19.

[115] http://www.nsfc.gov.cn/english/site_1/international/D2/2018/01-25/87.html (accessed 8th February 2021)

[116] http://www.nsfc.gov.cn/english/site_1/about/6.html (accessed 8th February 2021)

[117] http://www.nsfc.gov.cn/english/site_1/international/D3/2018/01-25/86.html (accessed 8th February 2021)

[118] http://www.nsfc.gov.cn/english/site_1/covid19/N1/index.html (accessed 8th February 2021)

[119] "UK-China Joint Strategy for Science Technology and Innovation Cooperation", Department for Business, Energy & Industrial Strategy (BEIS) and Ministry of Science and Technology (MOST)

In the UK, Ageing Society was one of four overarching 'Grand Challenges' identified in the UK's Industrial Strategy, with the target ('mission') to ensure five extra healthy, independent years of life for people by 2035. Among other initiatives, £98m has been invested in the Healthy Ageing Industrial Strategy Challenge Fund (ISCF) to this end.[120] ESRC's 2019 Delivery Plan also identifies 'Changing populations', including healthy ageing, as one of six priority areas and the Council led the call for the Healthy Ageing Social, Behavioural and Design Research Programme (SBDRP) as part of the ISCF challenge in 2020.

Similarly, ageing and demographic changes are important issues in China, with implications across a number of policy areas. The Chinese government launched the Healthy China 2030 plan in 2016, with scientific development as one of four 'core principles' aimed at improving health and mitigating healthcare costs in the context of industrialisation, an ageing society and increased prevalence of non-communicable diseases.[121] The subsequent Healthy China 2030 action plan, published in 2019, contains a number of concrete measures to reach this goal.

In addition to the specific thematic focus, the FIC programme also offered the opportunity to encourage **interdisciplinary research** (in this case combining medical and social science research), which was one of the major reforms that NSFC was seeking to pilot through selected programs. NSFC is in the process of establishing its mechanisms to commission interdisciplinary research and so the joint call was a way to further develop this new area of collaborative work and potentially to learn from UKRI about designing and implementing interdisciplinary calls.

The expected **benefits for the respective R&I communities** from the programme were outlined in the call for proposals: applicants to the UKRI-NSFC Joint Call were encouraged to take advantage of research strengths across the two nations and thereby enable advances that wouldn't be possible without collaborating. This listed the following specific strengths:[122]

- Expertise in China: local surveys, innovative pilot studies, fast technology development
- Expertise in UK: research ethics, end of life care, data resources
- Shared UK-China expertise: cohort studies, cross-national comparative learning, reform of healthcare systems

In addition, the expected benefits of the collaborative projects were stated as including:[123]

- Novel contributions to the evidence base on healthy ageing
- Evidence for key stakeholders in policy and practice in the UK and China
- New and enhanced existing interdisciplinary collaborations and partnerships
- Enhanced capacity through the sharing of infrastructure and data, and opportunities for early career researchers

G.2.3.1 Additionality and alternative sources of funding

The stakeholders consulted for this case stressed that the **availability of funding** is an important prerequisite for maintaining meaningful partnerships — discussing joint priorities without funding to invest is less interesting — and this was often seen as more important than the specific

[120] https://www.gov.uk/government/publications/industrial-strategy-the-grand-challenges/industrial-strategy-the-grand-challenges (accessed 8th February 2021)

[121] Tan, Liu and Shao (2017), Healthy China 2030: A Vision for Health Care, Value in Health Regional Issues 12C, 112-114

[122] UKRI-NSFC Joint Call, Op. Cit, p. 4

[123] Programme Bid, p. 5.

modalities of funding. This is especially true for the Flagship Challenge programme, where the overall scope had been sanctioned politically, independently of any specific funding source.

The specific FIC investment was also designed to be **complementary** with other ongoing collaborative activities between UK and Chinese partners, including the DfID Global Health partnership and the DIT/FCO healthcare team in China.[124]

A large proportion of recent funding for collaboration between the UK and China has come from the Newton Fund and the Global Challenges Research Fund (GCRF), both of which require spending to comply with requirements for Official Development Assistance (ODA). FIC is seen as a complement to these sources, as it does not come with these same requirements and is able to fund different activities and opportunities that would otherwise be missed. Looking forward, it is also likely that China will no longer qualify for ODA funding and so FIC is seen as playing an important role in supporting China's transition away from these funds.

Industrial Strategy Challenge Fund (ISCF) programmes (which, like FIC, also provide non-ODA funding) have also been used to fund collaboration between the UK and China, for example in relation to the Agritech Flagship Challenge programme.[125] However, ISCF was considered by interviewees to have more onerous reporting and administrative requirements than FIC, which can be prohibitive for relatively small joint initiatives.

G.2.4 Progress, enabling factors, barriers, risks and lessons learnt

G.2.4.1 Summary of progress

Following the successful award of FIC funding for the Healthy Ageing programme, UKRI and NSFC organised a joint workshop in June 2019 to further define the topic of the joint call. This meeting confirmed both the importance of the topic of healthy ageing and the need for interdisciplinary collaboration.[126] The joint call for proposal was issued in July 2019 and specified that proposals should aim to "enhance the evidence base on understanding and addressing health and social challenges facing ageing societies through interdisciplinary collaborations", with a requirement that the team includes both social and biomedical science disciplines.[127]

The commissioning process was described by those consulted as relatively unproblematic, although changes had to be made in response to the (then) emerging COVID-19 pandemic in early 2020. The call solicited a large response from the research community, with 154 initial Intentions to Submit (ItS) in September 2019 and about 35 full proposals the following month. The panel meeting, originally planned to take place in the UK in March, was postponed and eventually had to be organised over Zoom, something the partners had never done before. The success of these online meetings demonstrated that funding partners would not need all meetings to be in-person in future. A joint kick-off meeting is also planned for the five projects after 12 months, and it is likely that this will now also take place online.

[124] Programme bid

[125] For example "UK-China: precision for enhancing agricultural productivity": https://apply-for-innovation-funding.service.gov.uk/competition/482/overview (accessed 20 March 2021)

[126] UKRI-NSFC Joint Call: Understanding and Addressing Health and Social Challenges for Ageing in the UK and China

[127] Call text, p. 2

Five projects were selected for funding and started in October 2020. The implementation of these projects is also likely to be affected by COVID-19, for example their ability to conduct fieldwork. However, as COVID-19 hit during the application process, project PIs were asked to write a statement for the peer review stage on the potential effect of the pandemic on their projects, and potential changes they might have to make as a result.

G.2.4.2 Enablers, barriers and risks

The key **enablers** identified by stakeholders for the successful launch and implementation of the Healthy Ageing programme were related to the well-established relationship between the partners. This included the ongoing dialogue, the biennial meetings, and the established standard procedures. The role of the UKRI China office was also noted as particularly instrumental in ensuring clear communication with NSFC. More broadly, the fact that NSFC has a similar working style and structure to UKRI and is considered a reliable partner, able to secure match funding, greatly facilitates collaboration, including on the FIC programme.

As a consequence, there were few **barriers** encountered so far in collaborating with NSFC in this particular case. Even so, the experience has not been without challenges. The very short timeline for the development of the FIC programme bid was reportedly quite challenging. The bidding process also required that negations be undertaken with the overseas partner in order to prepare the bid, and thus before it is known whether funding will be available. Stakeholders highlighted that failure to secure funding in such circumstances could potentially risk having an adverse effect on relationships. Similarly, the lack of certainty about the availability of future FIC funding was also seen as a potential barrier for planning future collaboration.

As described above, COVID-19 has also presented challenges, which have been overcome during the commissioning process, but may yet have an effect on the research. More broadly, there is an increasing awareness amongst UK partners of the need to manage a range of risks in the collaboration with China, for example around sensitive science and engineering subjects. This was most recently highlighted in a report, 'The China Question' from March 2021.[128]

G.2.4.3 Lessons learned

The primary lesson learned so far from the *Healthy Ageing Flagship Challenge* programme has been the re-confirmation that established relationships and procedures are important for successful implementation of joint programmes. This is particularly true when there is limited time available. Overall, there were few suggestions that changes were needed.

The challenges presented by the COVID-19 pandemic have also demonstrated that it is possible to continue managing collaboration and organise joint funding initiatives remotely.

G.2.5 Programme activities, outputs and outcomes

Objective 1: Enabling international collaboration

Theme 1: Enabling funding

FIC has enabled the strengthening of the pre-existing partnership between UKRI and NSFC, by continuing the gradual increase in collaborative activities that has been happening for many years, and supporting the implementation of the wider UK-China Joint Strategy for STI

[128] Johnson et al., op cit.

cooperation. It has also specifically enabled the opportunity to fund interdisciplinary collaborative research and to test and learn from new application and review procedures.

There is no evidence that the programme has leveraged further funding at this stage, beyond the match-funding provided by NSFC for the projects. However, there is an expectation that the research partnerships will provide a foundation for future collaborations between the respective communities involved, while the Joint Commission and biennial meetings between the UK and China will continue to provide a forum for planning for future collaboration.

Theme 2: Deepening R&I

The FIC Healthy Ageing programme is supporting collaborative research in an area of strategic importance for both the UK and China. Healthy Ageing was the second priority area jointly identified by the UK and China under the UK-China Joint Strategy for Science, Technology and Innovation Cooperation and both countries have launched major initiatives in this area in recent years. In the UK, Ageing Society was also one of the four 'Grand Challenges' identified in the Industrial Strategy, while the 2019 Delivery Plan for ESRC (programme lead) identified 'Changing populations', including healthy ageing, as one of six priority areas to address.

Applicants to the Joint Call were encouraged to take advantage of research strengths across the two nations and thereby enable advances that wouldn't be possible without collaborating. As the funded projects only started in late 2020, none of the stakeholders consulted had an updated view yet on the potential impact of the research undertaken. However, it was suggested that as the programme is part of a political commitment to the Flagship Challenge programme under the joint strategic process, this should ensure an audience for policy-relevant findings emerging from the funded activities in due course.

Theme 3: Developing partnerships

The UK Councils have a well-established partnership with NSFC which predates FIC. The quality of the collaboration between UKRI and NSFC has tended to improve gradually with each new initiative, and this is also the case here, for example with respect to the peer review process. Though the FIC programme does represent a change from previous collaborative funding initiatives, its focus on interdisciplinarity (medical and social sciences in this instance) is a relatively new area for NSFC. Overall, the FIC programme was seen by those consulted to reinforce the existing partnership, rather than radically alter it.

The processes already in place enable the partners to identify future strategic opportunities for collaboration, but the ability to pursue them will depend on the availability of funding. Several interviewees expressed uncertainty about the upcoming UK government spending review in particular, and the lack of long-term certainty about funding commitments for international collaboration more generally, which may hamper efforts to further build on partnerships.

Objective 2: Supporting BEIS and wider objectives including science diplomacy

As described above, the UK has an established relationship with China at both government level (through the 'Joint Commission' strategic process) and at the level of funding bodies (between UKRI and NSFC, including through biennial meetings). This ensures that priorities and joint opportunities are systematically identified independently of any specific funding programme. The Chinese partners are also well aware of UK capabilities and strategic priorities.

The FIC programme described in this case study has contributed to government aims by supporting the implementation of the Flagship Challenge programme and thereby following through on political commitments. Through this programme, FIC also intersects with the work of the SIN in China.

G.2.6 *Conclusions*

The *'UK-China Healthy Ageing Flagship Challenge — Academic research programme'* has successfully implemented a call for proposals and launched five projects. In the process, the partners have been able to overcome challenges posed by the COVID-19 pandemic in adapting joint selection processes and allowing projects to adapt to new circumstances.

The programme is part of the overall UK-China Healthy Ageing Flagship Challenge programme, and as such it helps meet the political commitments made between the two countries' governments. This should also help to ensure the uptake of policy-relevant findings.

It is one in a series of collaborative initiatives undertaken jointly by UKRI and NSFC, and it has benefited from a very well-established relationship with clear standardised procedures in place. In this context, the programme has reinforced the existing partnership between UKRI and NSFC, and helped further improve the collaborative processes between the partners, for example with respect to peer review and support for interdisciplinary research. It has also helped meet the demand for collaborative opportunities from very active communities in both countries.

G.2.7 *Sources*

- FIC quarterly monitoring report, (including programme data such as funding commitments and number of project awards)
- Call texts for project proposals
- Policy documents as referenced in footnotes
- Information from 5 stakeholder interviews:

Name of interviewee	Role	Organisation
Woncong Li	Head of the Division of European Affairs, Bureau of International Corporation	National Natural Science Foundation of China (NSFC)
Alexa Mills	Senior Manager of International Strategy	ESRC
Helen Dewberry	First Secretary, Science and Technology, British Embassy Beijing	UK Science and Innovation Network (UKSIN)
Stephen Brennan	Lead on Healthy ageing	UK Science and Innovation Network (UKSIN)
Glen Noble	Acting Director	UKRI China

G.2.8 *Programme overview*

Programme name	UK-China Healthy Ageing Flagship Challenge — Academic research programme (ESRC-NSFC strand of the programme only)
FIC ID	FIC2-21
FIC Wave	2
FIC Bid Amount (incl. OpEx)	£5m
UK partners	ESRC (lead) MRC
Partner Countries	China
Overseas Partners	Natural Science Foundation of China (NSFC)

Match Funding (at bid)	3m RMB (per project) (£332.5k)
Number of calls that have made awards (December 2020)	1
Value of this call	£5m
Number of awards made through this calls	5
Final match funding awarded to grants	2.5m RMB (per project) (£277k)

G.3 Japan Science and Technology Agency

G.3.1 Introduction and context

The **Japan Science and Technology** (JST) Agency is a network-based research institute, and one of seven national R&D agencies that are overseen by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the Council for Science, Technology and Innovation (CSTI) in Japan. It has an annual budget of ~¥120bn (~£820m), much of which is used to deliver funding programmes for basic research, industry-academic collaboration, technology transfer and international collaboration. Its three core pillars of activity are[129]:

- Formulating visionary R&D strategies for co-creation of the future with society
- Creating knowledge and transforming it into economic and social value
- Promoting dialogue with society and cultivating human resources

The **Research Institute of Science and Technology for Society (RISTEX**) is a department within JST. It was established with the specific aim of drawing on the full breadth of research disciplines, including the social sciences and humanities, to understand how new technologies can best be harnessed to deliver the greatest benefit for society. RISTEX conducts interdisciplinary R&D and runs funding programmes with the aim producing and promoting innovative solutions to the issues that human society confronts.

JST-RISTEX is the overseas partner in the ***UKRI-JST Joint Call on Artificial Intelligence and Society* programme (FIC2-09)**, which is led in the UK by ESRC, with the support of AHRC. The programme seeks to fund collaborative research on the societal impacts of Artificial Intelligence (AI) technologies. It was awarded £2.08m from Wave 2 of FIC[130], with around £1.2m[131] in match-funding secured from JST. The programme launched a single call (April-October 2019), with six projects selected that will run from January 2020 to December 2021 (36 months).

This case study focuses on the relationship between UK Councils and JST-RISTEX through the FIC-supported UKRI-JST Joint Call on AI and society. It was developed based on desk research and consultation with three key stakeholders (representatives from ESRC, JST-RISTEX and the UK Science and Innovation Network). A list of interviewees is provided in section G.3.7.

G.3.2 Pre-FIC (relationships)

Japan invests heavily in science and innovation (3.5% of GDP), but this is predominantly focused domestically, with relatively low levels of international collaboration activity (for example it has one of the lowest international co-authorship and co-invention rates amongst OECD countries).[132] Currently, its main external research partners are the United States and China. The volume of joint research with the UK is comparatively low, although the quality of this research tends to be higher than with the United States or China (for both countries).[133] The

[129] https://www.jst.go.jp/EN/about/overview.html (accessed 28th January 2021)

[130] Plus £300k underspend from another FIC ESRC programme to fund a sixth grant.

[131] Due to differences in funding (i.e. in Japan overhead costs are met from a separate budget), UKRI considers this to be approximately equal match funding

[132] OECD (2017) Japan Policy Brief: Innovation https://www.oecd.org/japan/japan-strenghtening-innovation-for-productivity-and-greater-wellbeing.pdf (accessed on 15 March 2021)

[133]UK Science and innovation Network Country Snapshot: Japan https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/881014/Japan_snapshot.pdf (accessed 20th March 2021)

extent of cooperation between the UK and Japan has also increased gradually over the past two or three decades.

UK-Japan Joint Committee meetings on Cooperation in Science and Technology have been held since 1994, based on Co-operation in Science and Technology agreements that have been signed between the two countries. More recently, the Japan-UK Joint Declaration on Prosperity Cooperation (2017) set out the aim to establish a 'Lead Agency Arrangement' between UKRI and JST, as well as the Japan Society for the Promotion of Science (JSPS). However, as of March 2021, there was still no formal, established mechanism for collaboration between UKRI and these Japanese funding agencies. Stakeholders consulted for this case reported that the extent of engagement between the UK and Japan and the opportunity to consolidate earlier discussions through actions had been limited by the availability of funding.

JST's International Strategy (2017) and the latest annual plan (The HAMAGUCHI Plan, 2019) set out the importance of promoting international partnerships with both researchers and funding agencies abroad.[134,135] The agency has developed a series of international collaborations, both through specific agreements (for example it signed an Implementing Arrangement for research exchange with the European Research Council in October 2018) and through specific funding programmes, such as the Strategic International Collaborative Research Program (SICORP) and its predecessor the Strategic International Research Cooperative Program (SICP).[136, 137]

These last two programmes (SICP and SICORP) are specifically aimed at supporting bi-lateral and multi-lateral cooperation with a range of non-ODA countries (including the UK) through international joint research programmes.[138] UKRI research Councils (MRC, EPSRC, BBSRC and NERC) have all in the past delivered joint programmes with JST through this route, with activities focused on supporting technology and natural science research.

The relationship between UK and Japanese research partners in the social sciences and humanities (i.e. with ESRC and AHRC) has emerged more recently. This development has been supported through the first wave of FIC via *ESRC-AHRC UK-Japan SSH Connection grants* (FIC-18). ESRC reported that prior to this FIC programme they had not been able to launch a partnership with Japan due to funding constraints. ESRC had instead been focusing their international funding activities and strategies on collaborations with EU partners and ODA-eligible countries through the Newton Fund, notably China, India, Brazil and South Africa.[139] Whilst collaboration with Japan was identified as of interest to ESRC's research community, the inclusion of Japan as a priority country within FIC (and the additional funding offered through this new funding mechanism) provided the incentive for ESRC to pursue further its desire to develop collaborative activities with Japanese partners.

The *UKRI-JST Joint Call on Artificial Intelligence*, funded through FIC Wave 2, represents a further expansion of ESRC's relationship with Japan. It is the first joint call between ESRC and JST-RISTEX,

---

[134] JST (2017) Background of the Revision of the International Strategy. https://www.jst.go.jp/EN/about/intl_strategy/jst_intl_strategy4_ref_en.pdf (accessed 23rd March 2021)

[135] JST (2019) The HAMAGUCHI Plan. https://www.jst.go.jp/EN/about/pdf/En_Hamaguchi-plan_w_New_slogan.pdf (accessed 23rd March 2021)

[136] SICP stopped awarding new projects in 2013, and projects awarded from 2014 were managed under SICORP

[137] JST (n/a) Global Joint Research Brochure. https://www.jst.go.jp/inter/english/jst_inter_brochur_e.pdf (accessed 23rd March 2021)

[138] https://www.jst.go.jp/inter/english/index.html (accessed 27th January 2021)

[139] The recent focus of ESRC/AHRC international strategies (and investment from baseline resources) has been on maintaining existing collaborations with European partners. This critical, ongoing commitment has curtailed the development of relationships with new partners excluded from ODA funding streams.

and indeed the first ever international joint call run by JST-RISTEX (which had previously focused on domestic research programmes, with other JST departments responsible for international programmes). As a result, JST-RISTEX had had little interaction with ESRC before this programme and limited awareness of its priorities, policies and practices (or those of the UK more generally).

G.3.3 Programme origins and development

ESRC first approached JST-RISTEX about a potential collaboration in December 2017 when the SIN officer in Japan organised for the then Acting Chief Executive of ESRC, Professor Tony McEnery, and the Head of International Strategy, Lewis Preece, to visit Japan.[140] Through this visit and subsequent discussions, ESRC and JST-RISTEX identified their mutual interest in AI and its societal impacts. JST-RISTEX also made clear their aspiration to internationalise their domestic programmes and, after identifying AI and its impacts as a common priority for both countries, proposed the possibility of a joint call linked to their existing 'Human-ICT Ecosystem' domestic funding programme.

This 'Human-ICT Ecosystem' programme had been launched by JST-RISTEX in 2016 to look at how society or "we as humans" should co-exist with information technology as it continues to evolve in the future. As our consultee from JST-RISTEX acknowledged, "discussions in this field are meaningless if they are just confined to Japan, and there was a growing need to develop deeper discussions through international collaboration." The opportunity for a joint call with the UK therefore presented an opportunity for JST-RISTEX to elevate some of the discussions that had previously been confined to Japan into an international context.

To develop this opportunity further, ESRC and JST-RISTEX organised a joint expert workshop in September 2018, with UK and Japanese researchers and stakeholders in attendance. The workshop explored the issues in this area and identified themes and approaches that would derive the greatest value from UK-Japanese collaboration. The outputs of this workshop, including the identified gaps, synergies and shared priorities, was then used as the basis for defining the scope of the *UKRI-JST Joint Call on Artificial Intelligence and Society*.

The increasing prevalence of AI, machine learning and automation in many aspects of everyday life is already generating a wide array of economic, cultural and social challenges and opportunities. The impact of these technologies could be highly disruptive, both at the individual level and at the wider social and economic level. However, the extent and nature of these impacts are still uncertain. The *UKRI-JST Joint Call on AI and Society* seeks to address this uncertainty around the impacts of AI by supporting collaborative R&D projects.

For ESRC, the successful initiation and development of the *UKRI-JST Joint Call on AI and Society* was in part attributed to the existence of another FIC programme, the Wave 1 *SSH Pump-Priming* programme (FIC 18)[141]. Although a separate programme, the launch and success of the Pump-Priming programme is considered to have been valuable for establishing the Joint Call on AI programme, in that it signalled the commitment of the UK and ESRC to collaborating

[140] UK Science and Innovation Network Case Study: SIN Japan assists first ESRC-JST Joint Call for £3m on AI and Society. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/797730/2_Impact_Case_Study_-_SIN_Japan_ESRC_Call.pdf (accessed 28th January 2021)

[141] The wave 1 programme SSH Pump-Priming (FIC-18), £2m funding to improve connectivity between UK and Japanese in the area of social sciences, arts and humanities through networking grants, 49 successful awards each receiving up to £50,000. Japanese co-funding was provided at the project level, for example via cash and "in-kind" contributions from Japanese institutions.

with Japanese partners and demonstrated that UK partners could access funds to meaningfully pursue collaborative opportunities.

G.3.4 Progress, enabling factors, barriers, lessons learnt

G.3.4.1 Programme progress

Since the original bid for FIC funding, there have been no changes to the planned delivery or organisation of the programme, and both UKRI and JST-RISTEX have met their expected financial commitments. The *UKRI-JST Joint Call on AI and Society* programme ran one funding call (May-July 2019) which received 30 applications, of which 7 were considered fundable and six were funded. These projects commenced in January 2020 and are expected to last 3 years.

Both ESRC and JST-RISTEX agreed that the high number of proposals and enquiries received indicated that both the choice of partner and the timing of the programme were appropriate. Notably, some applicants to the programme were collaborating with partners that they had initially met at the preliminary 2018 expert workshop to help scope the Joint Call. This demonstrates that relationships between the research communities can be established and built upon even outside of the funded grants, through scoping activities or other engagement.

G.3.4.2 Enabling factors and barriers

The successful development and launch of the programme was, for both ESRC and JST-RISTEX, attributed to the high level of engagement and communication between the respective programme managers. Regular, open communication enabled both organisations to build their understanding of their respective requirements and overcome challenges that arose.

The first such challenge was a potential language barrier. As our consultee from JST-RISTEX noted, communicating in English is "naturally stressful for both parties, and there must have been some misunderstandings." However, the "patience and detailed explanations given by ESRC staff to their non-English speaking Japanese counterparts" enabled the success of the joint call. ESRC similarly valued the time and efforts that their Japanese partners invested in ensuring the call would be a success.

A challenge then faced in delivering the programme was to reconcile the different systems for reviewing open calls in Japan and the UK. As the *UKRI-JST Joint Call on AI and Society* builds on an existing domestic programme, JST-RISTEX had existing systems in place for peer review that differed somewhat from UKRI and ESRC requirements. Overall, however, there was a greater degree of similarity in the peer review process than either partner had expected. The one main exception related to the selection of the peer reviewers. However, after understanding each other's models and requirements, ESRC and JST-RISTEX were able to reach a mutual understanding and successfully launch the call. Although this process took some time, it did not impact the timeline of the programme. It was also time well invested, as the result was high quality projects and a high level of agreement between the UK and Japanese reviewers. JST-RISTEX has now also proposed a lead agency agreement to support any new joint call for proposals, which should further streamline the delivery of a joint call.

The COVID-19 pandemic has hampered the progress of the awarded projects. Whilst they are progressing, the inability to travel has made it more difficult for some projects to build close relationships among researchers. Whilst all travel expenses will be carried over to the next fiscal year, some principal investigators have expressed a wish to extend the overall project period. This is currently under consideration within JST and ESRC and will require coordination to ensure funded projects are not misaligned. Whilst UKRI typically encourages participants to apply for project extensions 3-4 months before the end of the project, the approval process within JST-

RISTEX could take longer. Whilst this should not affect the projects within this call, it was identified as a valuable insight for future collaborations with JST.

From the perspective of ESRC, the SIN officer in Japan was very helpful in facilitating conversations between ESRC and JST-RISTEX at the more senior level, particularly during the early stages of initiating the collaboration. The SIN officer also provided ESRC with insights into wider contextual factors and the R&I system within Japan.

ESRC, the SIN Office in Japan and JST-RISTEX have since had long conversations about characteristics of the Japanese funding system with implications for potential joint calls or programmes in future. For example, the timeline of the funding cycle in Japan and the fact that funding is allocated on a one-year cycle means that projects need to start at a certain time. As ESRC were aware that the second wave of FIC funding would become available during the development of the *UKRI-JST Joint Call on Artificial Intelligence*, they were able to engage with JST-RISTEX over a longer period that aligned with their funding timelines. Better understanding the Japanese funding cycle will have implications for future joint programmes.

G.3.5 Programme activities, outputs and outcomes

Objective 1: Enabling International Collaboration

Theme 1: Enabling funding

At this stage, there are no concrete plans or examples of projects or innovations supported by the programme that have secured further investment or leveraged additional funding beyond the initial support from UKRI and JST-RISTEX.

Theme 2: Deepening R&I

As of March 2021, the six projects have been running for ~1 year. As such, there is a limited amount to report in terms of discoveries and advances so far. However, both ESRC and JST-RISTEX agree that the projects are progressing well and that the programme is supporting new collaborations between the countries. The programme has also received good feedback from the research community and there is a sense that the projects are finding innovative ways of working under COVID-19 restrictions to continue to build their international relationships.

Overall, the programme has been valuable thus far for uncovering, through detailed research, the similarities and differences in the social receptiveness to AI between Japan and the UK. JST-RISTEX also highlighted that within the 'Legal Systems and Artificial Intelligence' project[142], the UK team have developed an Online Dispute Resolution (ODR) tool which can be adapted to Japanese conditions. If successfully applied, this new system could lead to digital transformation in the Japanese legal sector. In future, the projects are expected to provide a platform for effective and sustained dialogue with a wide range of stakeholders and ultimately produce insights with opportunities for practical implementation and policy recommendations.

Theme 3: Developing partnerships

The success of the *UKRI-JST Joint Call on Artificial Intelligence and Society* programme has brought to light the growing interest in joint research between researchers in Japan and the UK. This has led to further discussions between ESRC and JST-RISTEX about the possibilities and opportunities for new joint programmes in future. These discussions include possibilities in the area of AI and society, but also around the topics of citizen engagement and the relationship

[142] https://gtr.ukri.org/projects?ref=ES%2FT006315%2F1 (accessed 23rd March 2021)

of science and technology with society. As of March 2021, these are still preliminary discussions with the aim of preparing for potential programmes to be proposed in 2022.

The relationship between JST-RISTEX and ESRC has also developed in such a way that representatives from JST-RISTEX have approached ESRC for feedback and insights on the development of a new national programme in Japan. Although this is not expected to be a joint call, the request is indicative of the growing relationship between the two agencies.

Objective 2: Supporting BEIS and wider objectives including science diplomacy

Both ESRC and JST-RISTEX agree that the collaboration has enabled a better understanding of their partner's respective R&I systems and priorities. In particular, both partners have now seen evidence of the synergies in their priorities and alignment of their broader strategies, including the degree to which both countries focus heavily on AI research and their levels of investment in this area. Moreover, our consultee from JST-RISTEX "realised that there are no major differences between Japan and the UK; rather, they have many points in common. For this reason, I would like to continue to explore the possibility of further joint calls with the UK."

From the perspective of the SIN officer, the portfolio of FIC programmes with Japan has also supported international diplomatic activities in Japan and improved the credibility and the strength of the UK-Japan science relationships. Given the small size of the current programmes, the impact is expected to be limited, but it has been a valuable signifier of the UK's interest to collaborate with Japan.

Both the ESRC programme lead and the SIN officer agreed that the *UKRI-JST Joint Call on AI and Society*, along with the other FIC programmes currently being delivered with Japanese partners, should provide a positive foundation for future collaboration. However, the degree to which the relationships with JST-RISTEX and other Japanese funding agencies can be developed further around strategic research priorities was viewed as being contingent upon the availability of further funding dedicated to longer-term collaborative activities.

G.3.6 Conclusions

The *UKRI-JST Joint Call on AI and Society* is the first collaboration between ESRC and JST-RISTEX. Despite interest from the UK research community in partnering with Japan, the volume of collaborative activity between the two countries was historically low and ESRC had previously been unable to launch a joint programme due to financial constraints. The availability of FIC funding has enabled ESRC to pursue collaborations with both JSPS and JST-RISTEX and further demonstrate UK commitment to fostering collaborations with Japanese partners.

In designing and delivering the *UKRI-JST Joint Call on AI and Society*, ESRC and JST-RISTEX have realised the commonalities in their institutional and national strategic priorities in relation to AI research. Through the *UKRI-JST Joint Call*, these funding bodies have built stronger mutual understanding of their respective national R&I systems, as well as their operational procedures and requirements in delivering open funding calls. The level of interest in the call and the success of the programme thus far has affirmed a growing desire among researchers in both Japan and the UK for joint research programmes.

The experiences and success of the programme has increased interest in future collaborations between the two agencies, and discussions are already underway to explore a range of possible opportunities for future joint programmes. Moreover, the relationship has extended to the point at which JST-RISTEX have since sought ESRC's feedback and support in developing further domestic programmes.

Given the relatively small size of the programme, the extent of the impact upon the wider diplomatic relationships between the UK and Japan are expected to be limited. However, this

programme has, along with other FIC programmes in collaboration with Japan, provided a valuable foundation upon which URKI, JST and other funding agencies in Japan may build.

G.3.7 Sources

- FIC2-09: UKRI-JST Joint Call on Artificial Intelligence and Society Programme Bid (April 2019)
- FIC quarterly monitoring report (including programme data such as funding commitments and number of project awards)
- Call texts for project proposals
- Policy documents as referenced in footnotes
- Information from 3 stakeholder interviews:

Name of interviewee	**Organisation**
Sean Nolan	ESRC
Hirao Takanori	JST-RISTEX
Griff Jones	UK S&I Network in Japan

-

G.3.8 Programme overview

Programme name	**UKRI-JST Joint Call on Artificial Intelligence and Society**
FIC ID	FIC2-09
FIC Wave	2
FIC Bid Amount (incl. OpEx)	£2.08m*
UK partners	ESRC (lead) AHRC
Partner Countries	Japan
Overseas Partners	Japan Science and Technology (JST), Research Institute of Science and Technology for Society (RISTEX)
Match Funding (at bid)	¥56m (Cash) (£370k)
Number of calls that have made awards (Dec 2020)	1
Value of this call	£2.4m
Number of awards made through this call	6
Final match funding awarded to grants	£1.2m

- ** Plus £300k underspend from another FIC ESRC programme.*

G.4 Ministry of Science and Technology, India (Department of Biotechnology)

G.4.1 Introduction and context

The **Department of Biotechnology (DBT)**, within India's Ministry of Science and Technology, was set up in 1986 to promote the adoption of biotechnology. It supports research, infrastructure and human resource development, and also has responsibility for international collaboration and the development of Bio Safety Guidelines for cell-based vaccines.[143]

The department has an annual budget of approximately 25bn Rupees, or £250m. More than half of this is dedicated to Research and Development (R&D), human resources and facilities, while another 30% is used to support 16 autonomous institutions under its purview, and 10-12% is allocated to Industrial and Entrepreneurship Development.[144]

DBT is involved in three FIC programmes, in partnership with several UKRI Councils. These are:

- The '*Tackling Anti-Microbial Resistance (AMR) in the Environment*' programme (FIC-25), which aims to inform the development of strategies to limit environmental contamination by waste from antimicrobial manufacturing. NERC and ESRC are the programme partners.
- The 'UK-*India Covid-19 Partnership Initiative*' (FIC-STR-02), which will support comparative research of South Asian populations in the UK and India. It aims to explore the role of external factors and demographic variables in influencing the spread of COVID-19, and help to improve understanding, prevention or management of the outbreak among South Asian populations in both countries. This programme is funded under the Strategic Opportunities Stream of FIC, with MRC and ESRC as partners.
- The '*Global Incubator Programme*' (FIC2-20), which will support innovative SMEs by providing access to overseas incubator space, as well as in-country support to help overcome barriers and accelerate growth in priority markets. The programme is implemented as a series of separate bilateral calls between Innovate UK and partners in Canada, Singapore, the United States, and India (DBT).

In total, DBT has committed around £9m, in cash or in kind, to joint calls across the programmes, while UKRI has awarded £11m to the three programmes through FIC.

The case study was developed based on desk research and consultation with seven representatives from DBT, IUK, NERC, MRC, UKRI India and UK S&I Network. A full list of interviewees is given in section G.4.7

G.4.2 Pre-FIC (relationships)

There is a recognition among UKRI Councils, especially MRC, that India will be a major research powerhouse in the future. This is something that the UK community also recognises. For example, in a recent survey conducted with academics in the biomedical research field, India was placed as a top 5 priority country for collaboration in the next 10 years.[145] From the innovation side, there is also recognition that India is increasingly becoming a dynamic and open market, and that there is an appetite from businesses in both the UK and India to keep on exploring commercial opportunities.

The UK and India are historically connected and research collaboration between the two countries was already well-established before FIC. This has been supported via several

[143] http://www.dbtindia.gov.in/about-us/mandate

[144] Annual report 2019-20, p. 210

[145] Related by interviewee, not published

Memorandums of Understanding (MoUs) and agreements[146], as well as the institutionalised dialogues that have taken place via the India-UK Science & Innovation Council (SIC) meetings since 2006.[147]

Bilateral collaboration between the two countries has also increased substantially over the last decade, with joint investment in research increasing from less than £1m in 2008 (the year Research Councils UK first established an office in India), to more than £300m in 2018[148] (when FIC started). A key milestone in the development of bilateral relationships during this period was the UK-India Science & Innovation Task Force in February 2014, where key funding bodies from both countries identified a set of grand challenges to be addressed through collaborative Research and Innovation (R&I)[149]. These grand challenges included:

- Sustainable Cities and Urbanisation
- Public Health and Well Being
- Energy-Water-Food Nexus
- Understanding oceans (added in 2016)

These formed the basis for the priorities of the Newton-Bhabha Fund (Newton Fund in India), to which the UK committed £104m, enabling a substantial increase in collaborative R&I between the two countries.[150]

DBT is one of the key Indian partners in the Newton-Bhabha Fund, and through this scheme (and other initiatives) it has already collaborated with a number of partners in the UK. For instance, it partners with Cancer Research UK (CRUK) on the India-UK Cancer Research Initiative, and has implemented collaborative programmes with several UKRI Councils, the Foreign, Commonwealth and Development Office (FCOD), and the UK Academies.[151] There are also examples of initiatives which are relevant to current FIC programmes, including a collaboration between the MRC and DBT to establish two multi-million pound centres on anti-microbial resistance in 2015, with funding from the Newton Fund.[152]

As a result, by 2018 the UK had become the most significant international partner for DBT.[153] However, it is worth noting, that prior to FIC, neither NERC nor Innovate UK, who lead UK involvement in two of the FIC programmes, had a close relationship with the DBT BIRAC. NERC had previously taken part in multilateral initiatives which also involved the DBT[154] but did not have an established, direct relationship with the organisation, having worked more closely with the Indian Ministry of Earth Sciences. Innovate UK had worked with DBT under Newton (R&I

[146] https://www.gov.uk/government/publications/uk-and-india-mous-and-agreements/uk-india-announcements

[147] See e.g. "The 6th India-UK Science &Innovation Council (SIC) Meeting was held in New Delhi on 26th July 2018", https://dst.gov.in/pressrelease/6th-india-uk-science-innovation-Council-sic-meeting-was-held-new-delhi-26th-july-2018

[148] UK Science & Innovation Network Country Snapshot: India's Science and Innovation Landscape, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/926180/SIN_Country_Snapshot_-_India_2020.pdf

[149] https://blogs.fcdo.gov.uk/ritasharma/2014/04/11/uk-india-research-innovation-partnership-set-to-grow/?utm_source=KE&utm_medium=website&utm_campaign=snapshot

[150] Newton Fund Evaluation: Thematic Impact Study Report — India, July 2018

[151] http://dbtindia.gov.in/schemes-programmes/international-cooperation/bilateralmultilateral-cooperations

[152] https://webarchive.nationalarchives.gov.uk/20200923120845/https://mrc.ukri.org/news/browse/new-multimillion-india-uk-research-centres/

[153] Newton Fund Evaluation, Op. Cit.., p. 7

[154] NERC - Towards a Sustainable Earth (ukri.org), NERC - Atmospheric Pollution (ukri.org)

Bridges and Industrial Waste programmes), but hadn't worked directly with BIRAC (the independently operated innovation funding arm of DBT).

G.4.3 Programme origins and development

The FIC programmes involving DBT build on existing priorities within the UK and India, as well as some previous collaborative efforts between the two countries.

The **Tackling AMR in the Environment** programme focuses on environmental contamination by waste from antimicrobial manufacturing, with the aim of contributing to global efforts to help contain resistant bacterial infections of humans and animals. Antimicrobial Resistance (AMR) is a longstanding mutual priority for both UK and Indian governments. For instance, DBT launched its 'Mission program on Antimicrobial Resistance' in 2018/19, aiming to "develop indigenous and cost-effective therapies against AMR; categorise an AMR-specific pathogen priority list for India; establish a Bio-repository for AMR-specific pathogens; and develop rapid and cost-effective diagnostic kits to identify AMR-specific pathogens."[155] The department is also a member of the Global AMR R&D Hub, as is the UK and the Wellcome Trust.[156] AMR is also cross-disciplinary priority in the UK and UKRI has a portfolio of investments in AMR spread across many of its Councils.[157] This includes investments in the NERC Centre for Ecology and Hydrology, which — among other things — works to monitor the concentrations of antibiotics in river water.[158]

Prior to this FIC programme, ESRC (and MRC) had already collaborated with DBT on the topic of AMR on through several jointly-funded projects, while NERC had worked with the Indian Ministry of Earth Sciences on related topics such as sewage and farming. The *environmental* dimension of AMR, however, was identified as a gap in previous bilateral research efforts. Unlike NERC's previous collaborative programmes in India, this topic focussed on microbiology, and it was therefore appropriate to engage with the DBT. Conversations between NERC and DBT were facilitated by the UKRI office in India, and the organisations decided to join forces and put together a bid for FIC.

The **UK-India Covid-19 Partnership Initiative** also emerged out of a shared priority, with both UKRI and DBT having invested significantly to support the response to the COVID-19 pandemic.

The UK had identified that black and Asian minority ethnic communities were disproportionately affected by COVID-19[159] and discussions with DBT counterparts revealed that there was a good opportunity to establish a programme or project to share and analyse comparative data, in order to understand mortality and mobility in the UK and India. UKRI developed the idea from the UK side and presented it to DBT as a joint activity. The Strategic Opportunities Stream of FIC meant that it was possible to implement the programme quickly in response to unfolding events.

From the UK perspective, in addition to the need to support the response to the pandemic, the establishment of the programme was a recognition that India is regarded as an important strategic partner with increasing investment and the potential to be among the future global

---

[155] http://dbtindia.gov.in/sites/default/files/uploadfiles/Mission%20Programmes.pdf (accessed 8th February 2021)

[156] https://globalamrhub.org/about/board-of-members/ (accessed 8th February 2021)

[157] https://mrc.ukri.org/research/initiatives/antimicrobial-resistance/ (accessed 8th February 2021)

[158] https://www.ceh.ac.uk/news-and-media/news/80-percent-cut-antibiotics-thames-avoid-surge-superbugs (accessed 8th February 2021)

[159] UKRI has been funding relevant research across multiple areas, including several projects that focus specifically on the increased risk amongst specific ethnic groups in the UK https://strategicfutures.org/TopicMaps/UKRI/research_map.html (see under 'Infection Risk Groups'

leaders in related areas of research. It was therefore important to ensure that the UK research community establish good links with Indian counterparts.

The **Global Incubator Programme** is a new concept for Innovate UK. The programme focuses more on (reciprocal) market access than on R&I collaboration. The programme builds upon previous 'missions' to key markets (the 'Global Expert Missions'[160]), which tended to be one-week visits to explore market opportunities. In contrast, the FIC programme offers a more immersive experience, allowing companies to interact with an innovation ecosystem through the local incubator (in a country) for three to six months. This is a step away from a more 'traditional' way of supporting companies (based on grants and projects) towards a more active approach to exploring commercial opportunities.

Both Innovate UK and DBT (through its innovation arm BIRAC) had also already (separately) provided support for incubators, but UKRI had not had any collaboration with BIRAC in the 10 years preceding the programme. Previously available Official Development Assistance (ODA) funding had not been conducive to innovation programmes like the Global Incubator Programme, whose primary objective is to derive benefit to UK companies. Additionally, the fact that this programme would be implemented with non-ODA funding meant that there were fewer constraints in terms of the (technology) areas that could be covered, and that activities could have a commercial focus rather than focus mainly on societal benefits to partners. Furthermore, unlike the Global Expert Missions, the Global Incubator Programme could not be covered by Innovate UK's internal funds due to the scale. FIC thus enabled trialling this new approach and provided funding that would have not been available otherwise. If successful, it could serve as a model and be scaled up to other locations in the future.

Initial conversations with DBT revealed an interest to implement a joint initiative of those characteristics. In fact, DBT had previously discussed options for a similar programme with the Swedish innovation agency VINNOVA, but this had failed to materialise as the Swedish agency lacked the funding to take it. FIC provided the opportunity for Innovate UK to pursue this opportunity instead. It was also able to agree a new MoU with DBT, with the support of UKRI India. For Innovate UK, the programme now offers an opportunity to open markets for UK businesses and establish contacts with a new range of innovation stakeholders. India is seen as a particularly attractive partner, owing to the country's increasing number of start-ups and its entrepreneurial culture.

G.4.4 Progress, enabling factors, barriers, risks and lessons learnt

G.4.4.1 Progress

As of February 2021, the three FIC programmes involving DBT are all still in the early stages of implementation. Each has also been delayed (to a greater or lesser extent) by COVID-19 and uncertainties around UK funding commitments due to the 2020 Spending Review.

The **Tackling AMR in the Environment programme** was the furthest progressed. UKRI and DBT organised a workshop in Delhi in May 2019 to facilitate partnership development and networking between UK and Indian R&I communities[161]. The programme then ran a call for proposals, with five projects selected for funding (starting August-November 2020).[162]

[160] https://ktn-uk.org/programme/global-expert-missions/ (accessed 8th February 2021)

[161] https://nerc.ukri.org/research/funded/programmes/uk-india-amr/#xcollapse5

[162] http://gotw.nerc.ac.uk/list_them.asp?them=AMR+India

Project teams are still finalising their work plans and substantial research work has yet to start. However, UK researchers involved in the programme did proactively organise a meeting in late 2020 to discuss common interests, and several potential overlaps between their respective projects were identified. NERC had also scheduled a meeting for lead researchers from both UK and India in April 2021 (although this was postponed, due to Covid-19).

The '**UK-India Covid-19 Partnership Initiative'** call for proposals was issued in October 2020 with a deadline in December 2020. The selection panel met in February 2021 and then in May 2021 UKRI announced that four projects had been selected for funding.[163]

The **Global Incubator Programme** was yet to make the final selection for the Indian component of the programme (which will focus on medical devices to start with), although a decision was reported to be imminent.[164] As the programme revolves around mutual visits between UK and Indian partners, COVID-19 has caused a delay in programme implementation and it is possible that it will be organised as a virtual exchange programme.

G.4.4.2 Enablers and barriers

Stakeholders from across the three programmes agreed on some important enabling factors which had facilitated the design and early implementation of their programmes.

DBT was considered a trusted and reliable partner for its UK counterparts, and the established relationship made for a generally smooth collaboration process. UKRI partners had a high degree of confidence in DBT colleagues in terms of following through on commitments and showing the required flexibility to get agreements completed. DBT was also said to stand out amongst other Indian funding bodies in being open to collaboration on interdisciplinary programmes, including the social sciences as in the COVID programme, for example, widening the scope for potential collaborative opportunities.

UKRI India played a central and important role in providing mediation between the UKRI Councils and DBT, and also prepared the ground for more substantial discussions directly with the UKRI Councils. Through their long-standing relationship with DBT, UKRI India has a portfolio of options for collaboration on areas of mutual interest that can be mobilised when funding is available. Furthermore, during the development of the FIC bids a member of UKRI India was working at DBT two days a week, which proved to be an important enabler as this person was actively facilitating negotiations, helping UKRI to navigate DBT internal processes, detecting and unlocking potential problems in time, and raising UKRI's profile within the organisation. It was reported that DBT relies to a large extent on paper-based internal processes and that it can therefore be helpful to be there in person to help move things along. Since the establishment of the UKRI office in 2008, both organisations have also worked together to set up joint peer review processes, which also facilitates the assessment of project proposals. Finally, the UK Science and Innovation Network (SIN) reported that it had also played a role in narrowing down the topic for the COVID-19 initiative, providing advice to UKRI that factored into the joint call.

From a high-level perspective, collaboration with the UK is seen by DBT as more straightforward in comparison with collaboration with other European countries of similar size or the European Union (EU), given the quick turnaround time with regard to agreed joint calls, clearer alignment in terms of understanding each other's priorities and transparency and openness about how the cooperation can bring about mutual benefits. EU cooperation, in contrast, is driven by EU

[163] https://www.ukri.org/news/5m-to-understand-covid-19-severity-in-india-and-the-uk/

[164] Additionally, eight companies have been selected for the US part of the programme

policy and priorities set up in the Horizon 2020 framework programme, which makes it more difficult to jointly identify and define common areas of interest.

No particular barriers to implementation were identified, however interviewees did flag the potential risks involved in establishing FIC programmes. Specifically, the FIC funding process requires collaboration and negotiation with overseas partners to prepare programme ideas before funding has been secured. This poses a potential reputational risk, if that funding is then not forthcoming (i.e. because the programme bid was not subsequently selected for funding), and requires managing expectations very carefully at the bidding stage (which in turn is easier to do if pre-existing relationships are strong). In addition, a potential lack of subsequent funding risked stalling collaborative partnership building with India in future, potentially undoing some of the successes expected through the current FIC programmes. Several UK funders felt there was a real risk that other countries would take the UK's place among India's preferred partner countries if further funding were not forthcoming. It could also hinder any potential attempt to align policy and / or research and innovation priorities.

In the particular case of the UK-India Covid-19 Partnership Initiative, an additional delay on the financial decision could have caused DBT to lose interest and decide to withdraw.

Finally, it was noted that the partnerships between UKRI Councils and DBT relied heavily on specific key individuals, rather than explicit collaborative agreements. Their departure would therefore present a risk to the ongoing success of the joint activities.

G.4.4.3 Lessons learned

The programmes have been implemented as best they could under the circumstances and there were no specific aspects that stakeholders would have handled differently. The early implementation of these programmes had also demonstrated that the partners were able implement joint calls even in the challenging conditions imposed by the COVID-19 pandemic. There was also a recognition from this experience of the importance of building trusted relationships between partners to underpin international collaboration programmes.

G.4.5 Programme activities, outputs and outcomes

Objective 1: Enabling international collaboration

Theme 1: Enabling funding

There is considerable demand in India for collaboration with the UK, and FIC funding helps unlock new opportunities. In a situation where the future role of ODA-funding in India is uncertain, FIC provides a forward-looking alternative. It has also allowed the translation of initial interest (in a particular topic or mode of intervention) into concrete opportunities to collaborate. It is considered by stakeholders as a welcome addition to the funding landscape, in the context of UK-India relationships.

FIC has enabled new areas and types of collaborative activities between the UK and India, particularly around innovation and leading edge research and technology. It would not have been possible to fund these programmes previously available mechanisms and so FIC has opened new opportunities for this bilateral relationship. The Global Incubator Programme, if a success, could also serve as a model for further, scaled-up joint initiatives. It stands as an example of how FIC has enabled the trialling of new ways of working with international partners. This is being tested in four different countries (India, US, Canada and Singapore) which also allows further learning as to what works in different contexts.

Theme 2: Deepening R&I

The programmes are still in early stages of development, but so far they have demonstrated the willingness and ability of the UK and India to work collaboratively on topics of mutual

interest, such as the COVID-19 pandemic. In this particular case, the nature of the research means that this can only be done through international collaboration, which highlights the ability of FIC to support R&I outputs that would not have been possible otherwise.

Programme leads also estimate that more than half of these projects involve new collaborative relationships between UK and Indian partners.

Theme 3: Developing partnerships

The FIC programmes build on an established relationship between UKRI and DBT, and have allowed the UK to deliver on previously identified opportunities, test new ways of working, branch out to work in the innovation space, and provide rapid response to unfolding events. Additionally, it has also allowed NERC and Innovate UK to collaborate directly in a funded programme with DBT/BIRAC for the first time.

Prior to FIC, collaboration between the UK and India was increasingly being delivered via ODA funding — specifically through the Newton Fund and the Global Challenges Research Fund (GCRF) — as well as a small number of initiatives supported through UKRI Council's core funding. Building on these investments, FIC has provided opportunities for new forms of collaboration with India and on new types of topics, beyond the Sustainable Development Goals often addressed through ODA-dedicated funding and other development-oriented initiatives. Collaboration on the Global Incubator Programme, in particular, would not have been possible previously, and has allowed UKRI-India collaboration to move into the innovation space. FIC also provided the opportunity of side-stepping political sensitivities around 'aid' funding.

FIC also facilitated interdisciplinary collaboration between UKRI Councils. The central UKRI funding pot made the usual negotiations around the relative contributions and roles of individual Councils unnecessary, and further complemented previously established collaboration between the Councils, for example on AMR.

The expanded scope of collaboration that is then possible should enable engagement with a wider set of Indian stakeholders, including innovative private sector actors. This, in turn, has helped to strengthen understanding of the R&I ecosystem, including capabilities and R&I priorities as well as business environments.

Objective 2: Supporting BEIS and wider objectives including science diplomacy

The programmes are, to varying degrees aligned with political priorities in the UK and India. The AMR programme, for example aligns with other collaboration on AMR, including health partnership agreed at prime ministerial level on both sides.[165] The collaboration on FIC programmes have also helped to improve mutual understanding between the funding partners, and particularly NERC, Innovate UK and DBT.

DBT already considers the UK as a favoured partner, and joint calls with UK partners tend to generate a large number of applications. The FIC programmes are therefore helping to sustain a positive perception of the UK as a research and innovation partner. It could help increase awareness and interest and the Global Incubator Programme may also help to generate interest in investing in the UK. The fact that it is non-ODA funding also means that there is more space to explore areas of joint strategic importance. Stakeholders also highlight the need for more long-term funding to be able to consolidate the current (positive) position and remain India's partner of choice.

[165] https://www.gov.uk/government/news/uk-and-india-extend-health-partnership-to-deal-with-global-health-risks

G.4.6 Conclusions

FIC builds on an already strong relationship between UK and Indian R&I communities and stakeholders, and contributes to government priorities in areas such as AMR and pandemic response. It has been facilitated by the work of the UKRI office in India, while at the same time providing a tangible and concrete opportunity to advance in areas of common interest. The FIC programmes will also help to further strengthen and expand UKRI's partnership with DBT. The broader scope of FIC funding has also enabled UKRI Councils to initiate new collaborations with the department and allowed the UK to reach new partners.

Although the three FIC programmes with DBT are still at early stages of development, some collaborative research projects have already been funded and new collaborative relationships between researchers have been formed. The programmes also offer new opportunities for collaborative R&I projects in innovative and leading edge areas that could not have been funded using previously available funding mechanisms.

G.4.7 Sources

- FIC quarterly monitoring report, (including programme data such as funding commitments and number of project awards)
- Call texts for project proposals
- Policy documents as referenced in footnotes
- Information from 7 stakeholder interviews:

Contact	Organisation
Sarah Webb	NERC
David Golding	Innovate UK
Caroline Culshaw	NERC
Alex Harris	MRC
Dr Amit Parikh	MOST, Department of Biotechnology
Sukanya Kumar	UKRI India
Sarah Fallon	UK SIN Representative

G.4.8 Programme overview

Programme name	Tackling AMR in the Environment	Global Incubator Programme	UK-India Covid-19 Partnership Initiative
FIC ID	FIC-25	FIC2-20	FIC-STR-02
FIC Wave	1	2	n/a
FIC Bid Amount (incl. OpEx)	£3.5m	£3.328m	£4.16m
UK partners	NERC (lead) ESRC	IUK (lead)	MRC (lead) ESRC
Partner Countries	India	India Canada Singapore USA	India

Overseas Partners	MOST DBT	MOST DBT NRC Enterprise Singapore Incubators	MOST DBT
Match Funding (at bid)	£4.5m (in kind)	£3.2m (mix of cash and in kind) including £400k (India)	£4.16m (cash)
Number of calls that have made awards (Dec 2020)	1	0	0
Value of this call	£3.8m	0	0
Number of awards made through this calls	5	0	0

G.5 Canadian Institutes for Health Research

G.5.1 Introduction and context

The Canadian Institutes of Health Research (CIHR) is the federal funding agency for health research in Canada. It invests approximately C$1b (£580m) each year, of which around 70% is discretionary spending.[166] CIHR is comprised of 13 "virtual" Institutes, each of which is dedicated to a specific area (for example Aging, Genetics or Infection and Immunity) and supports researchers to pursue common goals through interdisciplinary research and the facilitation of connections with health professionals and policy-makers.

CIHR is one of three agencies funding research in Canada, alongside the Social Science and Humanities Research Council (SSHRC) and the Natural Sciences and Engineering Research Council (NSERC). CIHR accounts for around 40% of the overall tri -agency funding allocation.[167]

CIHR is a partner in the following three FIC programmes:

- The *UK-USA Neuroscience collaboration through Medical Research Council (MRC) participation in the NSF NeuroNex programme* (FIC-17). A National Science Foundation (NSF) led initiative to support the development of large collaborative networks of international partners to advance research into the brain, to which CIHR is also a member and has contributed C$2.5m.
- The *UK-Canada Diabetes Partnership Initiative (FIC 2-11)*. A programme to support the development of a new partnership between CIHR and the Medical Research Council (MRC) to fund collaborative research addressing key knowledge gaps relating to diabetes.
- The *UK-Canada Collaboration on Artificial Intelligence*: *Building competitive, resilient economies and societies* (FIC2-07). A collaboration between four UKRI Councils (AHRC, MRC, EPSRC and led by ESRC) and the Canadian Councils (CIHR, NSERC and led by SSHRC) to undertake interdisciplinary collaborative research and generate new insights into the implications of AI technologies for societies.

This case study was developed based on desk research and consultation with nine representatives from ESRC, MRC, EPSRC, CIHR, the UKRI International Office in North America, and the UK S&I Network in Canada. A full list of interviewees is given in section G.5.7.

G.5.2 Pre-FIC (relationships)

The UK and Canada have a relatively new collaborative relationship, evidenced through a series of bilateral agreements and MoUs, including a recent High-Level Agreement between the Canada Research Coordination Committee and UKRI (February 2019) which builds on the 2017 Science, Technology and Innovation MoU between BEIS and Department of Foreign Affairs, Trade and Development of Canada (September 2017).[168] The extent of collaboration between UK and Canadian researchers has also grown steadily over time, before the launch

[166] https://cihr-irsc.gc.ca/e/51250.html (Accessed January 29th 2021)

[167] The Social Science and Humanities Research Council, the Natural Sciences and Engineering Research Council of Canada, and the Canadian Institutes of Health Research

[168] Memorandum of Understanding between the Department of Foreign Affairs, Trade and Development of Canada and the Department for Business, Energy, and Industrial Strategy of the United Kingdom of Great Britain and Northern Ireland concerning Science, Technology and Innovation (2017), Letter of understanding between The Canada Research Coordinating Committee and the UK Research and Innovation concerning Cooperation for Research (2019)

of FIC. For example the proportion of MRC-associated papers with Canadian co-authors more than doubled from ~2.8% in 2006 to ~6.8% in 2016.

CIHR itself has a very international outlook and is currently engaged in over 40 international initiatives supported by bilateral and multilateral agreements with countries and international programmes across the globe.[169,170,171] Before its FIC involvement, CIHR has collaborated with UK funders through a series of multilateral programmes and fora, including the Global Alliance on Chronic Diseases, the Network of Centres of Excellence in Neurodegeneration, the Joint Programming Initiative in Neurodegeneration, and the Heads of International Biomedical Research Organisations forum.

Through these activities and others, CIHR has already established strong relationships with MRC and, to a lesser extent, with BBSRC, reflecting the alignment of their respective research areas[172]. Other UKRI Councils also have their own strong relationships with their counterpart agencies in Canada. Mostly notable, in the context of this case study, is the strong collaborative relationship between ESRC and SSHRC, facilitated in part by ESRC's Open Research Area agreement and other multilateral programmes such as the Trans-Atlantic Platform.

However, despite these previous interactions, UKRI interviewees noted that the focus on Official Development Assistance (ODA) funding had left little room for collaboration with Canadian partners outside of core grant funding.

G.5.3 Programme origins and development

The FIC programmes with CIHR involvement all complement pre-existing relationships or initiatives.

The **NeuroNex Programme** is a large, complex international funding activity led by the National Science Foundation (NSF) in the US. The first phase aimed to develop research infrastructure for neuroscience and funded technology and theory awards. The second phase then provided an opportunity for international partners to engage with the programme to support large collaborative networks of neuroscientists, behavioural scientists, and theorists, working in concert with technology and cyberinfrastructure developers. These four international, interdisciplinary networks are working to address grand challenges in the neurosciences and provide insights into the brain. Each network is supported by around £2.4m per year over five years (though current funding for UK participation extends for three years).

CIHR invested C$2.5m in the programme to support the Canadian components of the international research groups. Canadian researchers are collaborators in three of the four international research groups, of which two also include UK researchers. The UK participation in these networks is supported through the *UK-USA Neuroscience collaboration* (FIC-17) programme, which is led by MRC's Neurosciences team. In addition to NSF, UKRI and CIHR, the German Research Foundation and Fonds de Recherche du Québec are also participating.

---

[169] CIHR International Collaboration webpage. Available: https://cihr-irsc.gc.ca/e/27172.html. (Accessed 8th Feb 2021)

[170] The CIHR Strategic Plan 2014/15 – 2018/19

[171] CIHR Strategic Plan 2021-2031. Available: https://cihr-irsc.gc.ca/e/documents/cihr-strategic-plan-2021-2031-en.pdf (Accessed March 11th 2021)

[172] For example, the Canada-UK Partnership on Antibiotic Resistance (running since 2007) and the New Dynamics of Ageing Research Initiative (MoU, 2008)

MRC's participation in the NSF NeuroNex represents the first collaboration between CIHR and MRC's Neurosciences team. Neuroscience is a strategic priority for MRC, particularly in relation to the need to improve our knowledge of the living human brain to provide novel insights for developing new treatments for neurological disorders, and participation in these networks is expected to support the establishment of longer-lasting strategic partnerships between funding agencies and researchers, as well as the development of technological solutions and the provision of training opportunities for early-career researchers.

The **UK-Canada Collaboration on Artificial Intelligence** (FIC2-07) programme arose from ongoing dialogue between ESRC, AHRC and SSHRC about expanding the level of connection between UK and Canadian researchers in the social sciences and humanities, but through FIC this has been expanded to include other UK and Canadian agencies, including CIHR.

The impact of AI technologies is expected to be significant, with global GDP forecast to be 14% higher in 2030 as a result.[173] To prepare for this, both the UK and Canada are investing significantly in this area, in an attempt to maximise the economic benefits of these technologies. However, comparatively little consideration has been given to how these technologies can be developed in a way that ensures equal distribution of benefits and so that the economic impact extends to supporting fairer and more resilient societies.

In recognition of the transformative outcomes required to address this challenge, the FIC programme aims to support genuinely interdisciplinary collaborations across both the social sciences and humanities, as well as the physical, engineering and medical sciences. To this end, the programme represents the first interdisciplinary joint call across multiple UKRI Councils and all three Canadian grant agencies. The programme involves cross-UKRI involvement, led by ESRC, with further involvement from AHRC, EPSRC and MRC. Canadian participation involves all three research funding agencies, with SSHRC in the lead.

The programme builds on the strong existing relationship between ESRC and SSHRC, but is expected to provide a platform to expand the relationship across other Councils and disciplines. The programme is also expected to complement the collaborations and networking activities delivered through workshops in 2019 that were supported by the UKRI-CIFAR-CNRS call for "AI and Society".

The FIC programme supports collaborative research projects to generate new insights into the implications of AI technologies for societies. These projects will take a sector-based approach to take a holistic view across the entire technology development and diffusion cycle, such that they support the development of interdisciplinary collaborations and provide sector specific outputs relevant to policy makers, businesses and other key stakeholders.

The programme is intended to align with a wider portfolio of activity on artificial intelligence supported through the UKRI Strategic Priorities Fund and the Industrial Strategy Challenge Fund. In particular, the focus of this programme on the wider benefits to society and the economy addresses an area that is under-represented to date and also adds a comparative international angle to what has largely been a domestic programme of effort thus far.

The **UK-Canada Diabetes Partnership Initiative** (FIC2-11) involves CIHR establishing a new bi-lateral partnership with MRC, supporting collaborative research to cover key knowledge gaps pertaining to diabetes. The programme complements ongoing MRC-CIHR multilateral activities in other areas (though none of these have a specific focus on diabetes) and involves three

[173] PwC (2017) Global Artificial Intelligence Study: Sizing the prize

CIHR institutes; the Institute for Nutrition, Metabolism and Diabetes (INMD), the Institute of Infection and Immunity (III) and the Institute for Musculoskeletal Health and Arthritis (IMHA).

Diabetes is a pandemic of major public health importance with a global prevalence of around 8.5% in the adult population. Tackling it will therefore require global research collaboration and coordination. Around five million people in the UK currently suffer from diabetes, with a cost to the NHS of approximately £14bn per year, equating to 10% of the total NHS budget.

CIHR's Institute of Nutrition, Metabolism and Diabetes (INMD) invited MRC to participate in their 'CIHR-INMD Workshop: 100 Years of Insulin: What's Next?' in October 2018. The purpose was to seek international input on the foci, structure and partnership opportunities to inform the development of their '100 Years of Insulin' initiative.[174] However, having realised through the workshop that their research priorities were very much aligned, MRC and CIHR subsequently engaged in discussions around bilateral collaboration opportunities. The establishment of FIC enabled these discussions to evolve further.

The programme is expected to strengthen UK global leadership in diabetes research, establish sustainable UK-Canadian diabetes research collaborations and lay the foundation for future, larger transdisciplinary research collaborations in the area of diabetes prevention.

This programme is expected to lay the groundwork for more substantive collaboration between the agencies going forward. The CIHR President, Dr Michael Strong has prioritised international collaboration with the UK and has already visited the MRC's Executive Chair in December 2018 to discuss future collaborations. 'Health and Life Sciences' also feature prominently in the UK Government's Science and Innovation Network (SIN) priorities for Canada.

G.5.4 Progress, facilitators and barriers, lessons learnt

G.5.4.1 Programme progress

All three programmes with CIHR involvement have awarded projects, which are ongoing:

- The *UK-Canada Collaboration on Artificial Intelligence* (FIC2-07) ran one competitive call through which 10 projects were funded and began working in January 2020.
- The *UK-Canada Diabetes Partnership Initiative* (FIC2-11) ran one call through which six projects were funded and began in April 2020
- The *MRC participation in the NSF NeuroNex* (FIC-17) ran one call through which four collaborative networks were funded. The UK participates in three of the networks, two of which involve Canadian collaborators.

Interviewees reported that programmes are progressing well, but the start dates of some projects within *NeuroNex* and the *UK-Canada Diabetes Partnership Initiative* were delayed due to the COVID-19 pandemic, which has limited certain activities. It is too soon to understand the impact of this on overall project outcomes, but UKRI interviewees were confident that the researchers involved would be able to overcome these challenges in the longer-term.

G.5.4.2 Enabling factors, barriers and risks

Key **enablers** for successful programme implementation that were mentioned by interviewees included the commonalities and complementarities between Canada and the UK in terms of R&I capabilities, values and approaches, operational processes, strategic priorities at the

[174] https://cihr-irsc.gc.ca/e/51736.html (accessed April 2nd 2021)

funder and national level and areas of investment. Indeed, the UKRI programme lead for *UK-Canada Collaboration on Artificial Intelligence* highlighted that the "Canadian research systems exhibits a number of key characteristics which make it the natural partner". The high degree of alignment between the two countries, as well as the shared language, made the identification of opportunities of strategic interest, the leveraging funds and the implementation of programmes relatively straightforward.

The presence of FIC was an important influencing factor in instigating and supporting the development of these programmes. Representatives from CIHR noted that the availability of FIC (and Canada having been identified as a priority country for the Fund) allowed them to better explore the pipeline and identify areas of potential collaboration. The FIC process and timeline also provided CIHR with assurance that the discussions would likely result in joint work.

The establishment and early delivery of the FIC programmes was then in part facilitated by the pre-existing and longstanding trusted relationships. For CIHR and MRC, these relationships were built through the multilateral partnerships mentioned above, whilst the representative from ESRC noted that the establishment of the *UK-Canada Collaboration on Artificial Intelligence* went relatively smoothly because of their pre-existing relationship with SSHRC. Interviewees also noted that the successful implementation of the programmes was facilitated by the pre-existing relationships between individuals in the respective research communities.

A key facilitator in the establishment of the FIC programmes was the commonalities between UKRI and CIHR (and SSHRC) processes, practices and requirements in terms of programme operation and delivery (for example funding requirements or call and selection processes and requirements). Representatives from both UKRI and CIHR felt that these systems had worked well together and in some cases, better than expected, with one interviewee noting the call process "ran like clockwork". Where compromise was required, it was reported that open and transparent conversations, along with mutual assurance in the robustness of their partners' processes, had allowed issues to be resolved quickly and easily.

CIHR's and MRC's similar needs and processes also had an additional positive impact on the UK's participation in the *NeuroNex programme*. Specifically, CIHR's participation in the NeuroNex collaboration was a valuable facilitator to MRC's involvement and provided MRC with support in the form of another funding agency with similar research scope and areas (for example a greater focus on clinical research rather than basic research), and with similar operational requirements. For example, both CIHR and MRC required the panel review process to score project applications as part of the review and selection process that would then be used to finalise and approve funding decisions within each funder. This is not the approach NSF would normally take in reviewing and selecting projects, however the presence of another funder within the partnership with the same requirements facilitated this change.

No major **barriers** to collaboration with the CIHR were identified, although interviewees did note that the timeframes of FIC and COVID-19 could impact the progress and potential impact of the programmes in future. The full extent of these impacts will emerge in the coming years.

The spend profile and timeline of FIC was noted as a challenge for all three FIC programmes with CIHR involvement. The limited flexibility around the spend-profile for the programmes limited the time Councils had to prepare and deliver project call processes once FIC funding

was secured. Although the quality of the applications received was high, interviewees felt that the timeframes placed undue pressures on the panellists and delivery teams.[175]

In the case of the *UK-Canada Collaboration on Artificial Intelligence* call, interviewees from UKRI felt that more time would have enabled the programme to further promote the call across the researcher communities, which would have been particularly useful given the intended transdisciplinary nature of the projects. Although the programme did receive 113 applications, only 13 of these were deemed fundable.

On a different matter, during the establishment of the *UK-Canada Diabetes Partnership Initiative*, the budget for the call was found to not be enough in both the UK and Canada. CIHR proposed extending the budget of the programme, however UKRI was unable to make a decision in the four month period between the request and the panel meeting.

Related to this, the time limitations of FIC have hindered the UK's contribution to the NeuroNex programme. Due to the timeline of bidding for FIC funding, MRC made their proposal and estimate of funds needed before other countries had committed to joining the programme. The original UK budget for the FIC programme was underspent by ~£2.9m as the other international partners had not secured the same level of investment to support all fundable proposals. UK spend was also hampered by the shorter project duration in the UK (overseas projects often lasted six years compared the UK's three) due to the time limitation of the FIC funding. It is possible that UK researchers decided not to apply without the security of five years of funding for the duration of the networks. Those that did apply tended to have plans to secure alternative sources of funding to supplement FIC grant funding and allowing their participation for the duration of the lifetime of the networks. Similarly, representatives from CIHR expressed preference for longer collaborative grants within the *UK-Canada Diabetes Partnership Initiative*, however this was not feasible within the FIC timeframes.

The COVID-19 pandemic has also had some impact on the progress of these three FIC programmes, however the extent of this impact is not yet clear. In the case of the *UK-Canada Diabetes Partnership Initiative*, national lockdowns have had a dramatic impact on researchers' access to labs, whilst all three programme leads noted that the travel restrictions have limited the development of relationships between researchers. In all three cases, the UKRI programme leads will re-engage with the participating research communities in the coming months to better understand their progress and impact of the pandemic on their projects.

Finally, it should be highlighted that the representatives from UKRI Councils all noted that the FIC team have been very helpful and supportive in addressing concerns and overcoming challenges in the delivery of their programmes.

G.5.5 Programme activities, outputs and outcomes

Objective 1: Enabling International Collaboration

Theme 1: Enabling funding

At this stage, there are no concrete plans or examples of projects or innovations supported by the programme that have secured further investment or leveraged additional funding beyond the initial support from UKRI and CIHR. However, interviewees were already discussing the potential for the current FIC programmes to support further joint-investment with Canada.

[175] For example, the programmes did not have time to implement a letter of intent stage into the application process, or undertake an initial review of applications to minimise the number of applications that needed to then go through peer-review.

Canada's Fundamental Science Review, published in 2017, established the Canada Research Coordination Committee (CRCC) to support greater harmonisation, integration and coordination of the research-related programmes and policies of CIHR, SSHRC and NSERC, as well as the Canadian Foundation for Innovation. Its "International Framework: Statement of Objectives and Principles"[176] complements the agencies' individual international strategies and supports cross-agency initiatives with an international aspect. This will include through the New Frontiers in Research Fund, which is a five year £160.3m fund to support timely international and interdisciplinary research.[177] The processes and criteria for the funding have not yet been fully defined, and no funds have been allocated for international collaborative projects as of March 2021[178]. However, it is worth noting that prior to this Fund CIHR had no designated funding to support international collaboration, so this may represent a step change in opportunities for the UK going forwards.

Although it is a relatively new organisation, the CCRC could further facilitate cross-Council collaboration in Canada and in turn facilitate larger joint initiatives in collaboration with UKRI. The New Frontiers Fund for international collaboration could also provide a valuable mechanism for Canadian partners to fund future initiatives with the UK. With this in mind, interviewees noted that the degree to which UK partners could leverage these funds would depend on the availability and alignment of national funding.

Theme 2: Deepening R&I

As the FIC programmes presented here are still in their first year of delivery, there is no centralised information about the outcomes of funded projects. However, most interviewees agreed that the FIC programmes have enabled UK and Canadian researchers to work together on a larger scale, in a longer-term fashion than had previously been possible through core budgets.

Theme 3: Developing partnerships

Although the successful launch of the FIC programmes was in part attributed to the pre-existing relationships between funding agencies, they have also facilitated the formation of new relationships. For example, the *MRC participation in the NSF NeuroNex* marks the first collaboration between CIHR and MRC's Neurosciences department and with it the formation of new relationships with their counterparts in CIHR. An MRC interviewee also noted that the multilateral partnership had been able to support a programme that would not be possible to achieve at a bi-lateral level and has supported the development of new partnerships that could not have been achieved otherwise. However, they also noted that the use of an established programme had meant that there had been limited opportunity for developing or co-designing the programme, meaning it could have less impact than a multilateral programme co-designed by all agencies involved.

UK interviewees agreed that the greater familiarity with CIHR's systems and how they work would make future collaborations more streamlined. For example, the *NeuroNex* programme

[176] https://www.canada.ca/en/research-coordinating-committee/priorities/international-framework/statement-of-objectives-and-principles.html (Accessed 2nd April 2021)

[177] Managed by CRCC, the New Frontiers Fund comprises three stands of funding: 'Exploration' to support high-risk, high-reward research; 'Transformation' to support interdisciplinary and transformative research; and 'International' to enhances opportunities for Canadian researchers to participate in research with international partners.

[178] The New Frontiers Fund International stream has had one call to support Canadian researchers access Horizon 2020. https://app.powerbi.com/view?r=eyJrIjoiNTY3YjZhOGItNTYwMC00ZWFhLTk4NzQtM2EyYjg1MDkxMTZkliwidCI6ImZiZWYwNzk4LTlwZTMtNGJlNy1iZGM4LTM3MjAzMjYxMGY2NSJ9 (Accessed 2nd April 2021)

and the *Diabetes Partnership* has improved MRC's understanding of CIHR's operational processes.

For CIHR, FIC programmes have provided a valuable platform for discussions with UK partners. The strength of this relationship is evident in the fact that CIHR invited MRC to contribute to the development of their COVID-19 response strategy and related funding activities, and consulted MRC in the development of their 10 Year Strategic Plan.[179] CIHR are also now more aware of the UK as a potential partner and believe that there is an increased likelihood they would look to the UK for future international collaborations. Indeed, CIHR has already identified some potential areas for future collaboration with the UK in areas beyond the current FIC programmes, including genomics, anti-microbial resistance, sleep and heart research.

These FIC programmes have also provided opportunities to develop further multilateral collaborations. An opportunity for a trilateral programme arose from MRC's bi-lateral FIC funded *UK-Australia Built Environment and Prevention Research Scheme* with the National Health and Medical Research Council (NHMRC) of Australia. As CIHR are working heavily in this area, MRC proposed a tri-lateral programme focussed on the built environment and disease prevention. CIHR will launch the Healthy Cities Research Initiative in spring 2021, after which the Australian partners will confirm their participation. The hope was that MRC would then be able to join CIHR and Australia in a tri-lateral partnership. However, uncertainties around the spending review and the challenges around timelines have forced MRC to take a step back from the collaboration for the time being.

The programmes have also facilitated stronger cross-Council relationships within UKRI. For example, although MRC and ESRC have a history of collaboration, especially in the area of global health, the success of the *Diabetes Partnership* has strengthened the relationship between MRC and ESRC and increased the likelihood and openness to collaboration in the future. Similarly, as a result of the *UK-Canada Collaboration on Artificial Intelligence*, an ESRC interviewee noted that they were able to learn more about EPSRC and MRC in relation to their processes and policies, for example those relating to ethical approval and peer review requirements, as well as the Council level strategic priorities. The interviewee from ESRC also noted that this has been valuable to better understand and "build the 'infrastructure' for operational collaborations that are more complex".

Objective 2: Supporting BEIS and wider objectives including science diplomacy

Overall, interviewees agreed that FIC has been well received and perceived amongst Canadian partners and viewed as a signal of the UK's openness and desire to support international collaboration (something Canada is also working towards).

FIC has also provided a valuable mechanism to deliver the aspirations in the MoU signed between CRCC and UKRI, with FIC-supported programmes representing the flagship initiatives of this agreement. For example, the *UK-Canada Collaboration on Artificial Intelligence* addresses and aligns with the priorities set out within this agreement, and demonstrates a new level of collaboration between the two countries, with all major funding partners involved.

FIC has also improved the perceptions of the UK as a science and innovation partner due to the scale of funding URKI has been able to commit to international projects. For example, the UK was able to secure significantly more funding to *Neuronex* than any other international partner involved in the programme.

[179] https://cihr-irsc.gc.ca/e/51508.html (Accessed April 2nd 2021)

The FIC programmes delivered in partnership with Canada have been a fundamental driver to the appointment of a new role within the UKRI North America Offices, Head of Canadian Partnerships. This appointment, in part driven by the need for dedicated resource to support the delivery of the FIC programmes with Canada, will also serve to continue to strengthen and build on these relationships through further collaborations and to ensure coordination and coherence in the portfolio of future UK-Canadian collaborations.

While Canada would normally look to its partners in the US (and this will probably always be the case), FIC has made the UK stand out as a good alternative. The FIC programmes presented here, in addition to those with other Canadian partners, have provided the platform for further discussions. In the words of the UKRI Head of Canadian Partnerships, FIC has provided "something tangible to engage in and has opened the door to explore other areas", with the current programmes providing valuable learnings for both UK and Canadian partners to take forward into future collaborations. In this sense, UK interviewees agreed that FIC programmes have provided a platform to discuss and share learnings in relation to wider activities and strategies for international collaboration, outside of their existing programmes.

There is also interest in FIC as a mechanism for supporting international collaboration, with the UKRI Head of Canadian Partnerships noting that "there is real interest from Canadian counterparts to understand what FIC is and how FIC really works". Interviewees from both the UK and CIHR noted that the structure and implementation of FIC could provide valuable insights for the New Frontiers Fund, and demonstrated the value of having a funding mechanism aligned to support such international engagement activities. For Canadian partners, the New Frontiers Fund could also be one of the primary mechanisms for providing matched funds to future joint, international collaborative activities with the UK.

G.5.6 Conclusions

All three FIC programmes included in this case have been successfully implemented, run calls for proposals and awarded project funding. The research projects are in their early stages and as such there is limited evidence on scientific outputs or outcomes so far. The COVID-19 pandemic has also limited or delayed some partnership development benefits at the researcher level, and it may be some time before the full implications of this are clear. However, the benefits of FIC for funder-level relationships is already evident.

The *UK-Canada Diabetes Partnership Initiative* and *MRC's participation in the NSF NeuroNex* programme have strengthened the existing relationships between MRC and CIHR. In enabling the formation of new relationships and increased understanding of each other's priorities and processes, this has increased interest in and laid the groundwork for future collaborations.

As a cross-UKRI and cross-CRCC initiative, the *UK-Canada Collaboration on Artificial Intelligence* also marks a flagship cross-Council programme and has taken the collaboration with Canada to the next level.

As a result, although the relationship between the UK and Canada was already developing, FIC has provided the platform to increase the scale and strength of this relationship. FIC has provided a valuable mechanism to deliver against the aspirations of the MoU between UKRI and the CRCC, and sent a strong signal to Canadian funding agencies and wider stakeholders that the UK is committed to the partnership. The strategic challenges addressed within the FIC funded programmes align and address mutual intergovernmental priorities, and FIC has made the UK a more attractive partner for Canada, opening the door to other areas of collaboration.

G.5.7 Sources

- FIC quarterly monitoring report, (including programme data such as funding commitments and number of project awards)
- Call texts for project proposals
- Policy documents as referenced in footnotes
- Information from 9 stakeholder interviews:

Organisation	Name of interviewee		Organisation	Name of interviewee
UKRI/EPSRC	Andrew Bourne		CIHR	Mary-Jo Makarchuk
UKRI/MRC	Mark Palmer		CIHR	Daniele St-Jean
UKRI/ESRC	Manija Kamal		UKRI/UKRI North America Office	Sonny Rathod
UKRI/MRC	Charlotte Inchley		UK S&I Network in Canada	Sam Jeremy
UKRI/MRC	Alex Harris			

-

G.5.8 Programme overview

Programme name	UK-Canada Collaboration on Artificial Intelligence	UK-USA Neuroscience Collaboration through MRC participation in NSF NeuroNex	UK-Canada Diabetes Partnership Initiative
FIC ID	FIC2-07	FIC-17	FIC2-11
FIC Wave	2	1	2
FIC Bid Amount (incl. OpEx)	£5.2m	£6.08m	£2.06
UK partners	ESRC (lead) AHRC EPSRC MRC	MRC (lead)	MRC (lead) ESRC
Partner Countries	Canada	Canada USA Germany	Canada
Overseas Partners	SSHRC (lead) NSERC CIHR	NSF (lead) CIHR FRQ DFG	CIHR
Match Funding (at bid)	C$5.2 (£3m) (cash)	NSF £47m Plus unspecified additional contribution from other funders	£1.6m (cash)
Number of calls that have made awards (Dec 2020)	1	1	1
Value of the call	£3m	£6m	£2m
Number of awards made through the call	10	4	6
Final match funding awarded to active grants	£3m	At least £33.5 million from NSF, ~£1.5 million from CIHR, ~£1.5 million from FRQ and £5.8 million from DFG	£1.6m

Appendix H Bibliometrics

H.1 Bibliometric and other databases

Bibliometric indicators. For the purpose of this project, Science-Metrix used the Scopus bibliometric database, produced by Elsevier. Scopus provides comprehensive coverage of the scholarly literature by indexing more than 43 million publications, published in some 50,000 peer-reviewed journals and conference proceedings since 1996. Scopus also provides the names and affiliations of all authors appearing in peer-reviewed publications, making it possible to identify publications produced by individual researchers and the institutions with which they are affiliated. The funding acknowledgements section was also used to identify articles supported by specific funding bodies.

The document types included in the Scopus analysis are articles, reviews, short surveys and conference proceedings. Unless stated otherwise, the tables and figures deriving from Scopus data include all the aforementioned document types. The version of the production database proposed for this project has complete coverage of articles published up until 2020.

UKRI-/FIC-supported publications. Articles supported by UKRI funds were retrieved from the Gateway to Research portal (version of February 2021) and matched to the Scopus database (recall > 90%, precision > 98%). The acknowledgements section of the Scopus database was also scanned using specific keywords to add papers to the list (precision > 98%). This additional step added close to 130,000 articles to those found in Gateway to Research.

From the 195 articles listed, 72 were matched to articles in the Scopus database, and 3 additional articles were found using the Scopus acknowledgements section and FIC-specific grant numbers, for a total of 75 articles. The 120 unmatched articles could not be found in the database for many reasons (a non-indexed document type, journal not indexed in Scopus, lack of information, etc.). A manual search using the title of these articles was made on 20% of them with no success. From the 75 articles matched to Scopus, only 49 were kept for the analysis. The 26 rejected articles were considered not FIC supported because the period between the grant start date and the publication date was too short (less than 6 months). From these 49 articles, 46 were published by at least one author affiliated to a UK institution and 43 to a FIC researcher.

European Commission Framework Programme (EC FP) supported publications. Articles supported by the EC FPs were retrieved from the OpenAire portal and matched to the Scopus database (recall > 89%, precision > 98%). The acknowledgements section of the Scopus database was also scanned, using specific keywords, for additional papers (precision > 99%). This added more than 100,000 articles to those found in OpenAire.

H.2 Preparation of the FIC-supported researchers list

The list of researchers supported by FIC was provided by UKRI. The information included Gateway to Research IDs, affiliated institutions and grant numbers. The original list comprised 965 researchers, 686 of whom were affiliated to at least one UK institution. UK-based researchers were matched to identification numbers of the Scopus database (AUID) using their UKRI publications and a Levenshtein algorithm (based on the minimal number of single-character changes necessary to transform one word into another) and a semi-automatic method designed by Science-Metrix to create researcher portfolios. From the 686 researchers, 609 had at least one article in Scopus and were kept for the analysis.

H.3 Affiliated institutions

A selection of institutions from the United Kingdom, partner countries and other countries were selected using the list of researchers associated with at least one FIC grant (which included

affiliated institution). In the United Kingdom, the 20 most publishing universities on the list, 5 mid-size institutions and 5 private organisations were selected. All the institutions from partner and other countries were selected, except for Japan for which the selection was limited to the 7 most publishing universities and 3 institutions. A total of 101 institutions were kept for the analysis.

H.4 Breakdown by FIC programmes

The low number of FIC-supported publications did not allow for a breakdown by programme at this stage.

H.5 Comparator groups

UK funding bodies. Many analyses include the breakdown of the UK scientific outputs based on their URKI and/or EC FP support. Different combinations were defined (for example, all UKRI-supported articles, all articles supported by UKRI and EC FP, etc.).

Partner countries. International co-publications with priority countries (Australia, Canada, China, India, Ireland, Israel, Japan, Norway, Singapore, South Korea, Sweden, Switzerland and the United States), altogether or separately, with or without private partnership, were included.

Synthetic control group. The synthetic control (SC) group consists of Germany, Italy and France. These countries are considered similar in size and scientific importance to the United Kingdom, but they do not have programmes similar to FIC.

Sectoral analysis. The share of international co-publication was prepared at the sectoral level (all sectors vs private sector), with partner countries, and with each partner country taken individually. Different combinations based on the geographical location of the private collaborator were made. Comparisons also include the SC group in place of the UK. The academic sector was not presented separately as it constitutes the main component of the overall scientific contribution. All publications involving at least one author from the private sector were considered private.

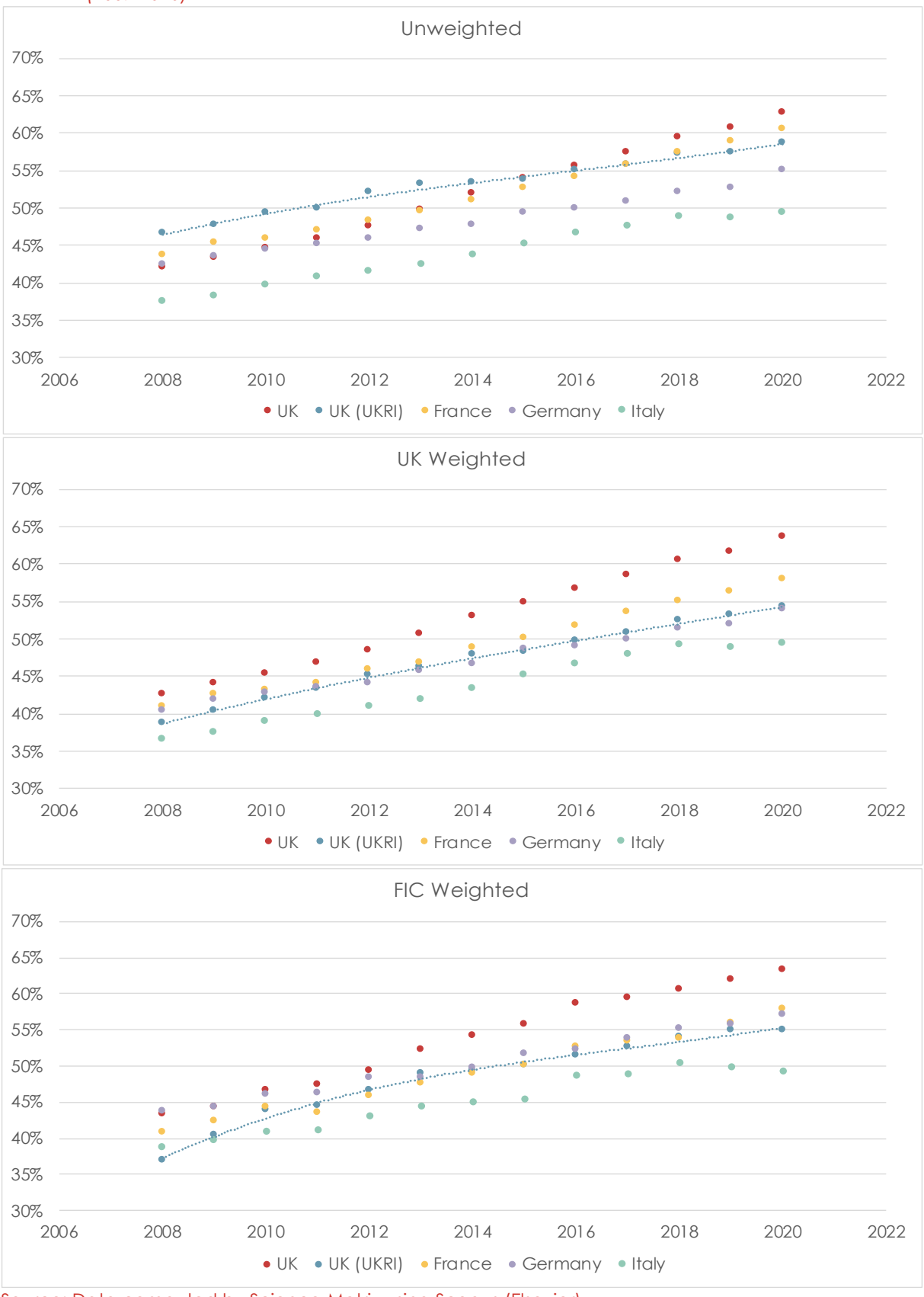
H.6 Weighting of indicators to reflect the distribution of FIC publications across subfields

The analysis presented in the main report were weighted to reflect the distribution of UKRI publications across scientific subfields.

Going forward and to draw conclusions about FIC we plan to weight the results to reflect the distribution of FIC publications across scientific subfields. Otherwise, comparisons with the various groups (subgroups of UK publications, papers by SCs) could have provided an unfair reference against which to compare FIC. FIC is not expected to produce publications in all fields of science, and its production may not be distributed the same way as, for example, national production in the United Kingdom, Germany, France or Italy. Currently, the difference in the distribution of FIC publications and UK publications across subfields does not diverge much. However, if for instance, the share of FIC researchers is higher in social sciences & humanities, the distribution may change with an increase in publications.

Differences in the SIP across the United Kingdom, UKRI publications and the SC group (Germany, France, and Italy) are presented the figure below. Data were also weighted based on the distribution of UK publications for comparison purposes. For the moment, the effect of the weighting is somewhat limited, but we can still observe some changes, particularly when comparing UK publications (dark blue) with UKRI scores (orange). When data are not weighted, the UKRI SIP was higher until 2014, but the scores for the United Kingdom and France then caught up. When the data are weighted based on UK or FIC publications, the UKRI SIP is lower than those of the United Kingdom and France.

Figure 5 Comparison of the share of international co-publications using different weighting methods (2007-2020)



Source: Data computed by Science-Metrix using Scopus (Elsevier)

Appendix I Survey analysis

I.1 UK Successful Applicants

		Percent	Number
1	I give consent for my response to this questionnaire to be processed and used according to the assurances on confidentiality and data provided in the box below.	100.00%	148
		answered	148
		skipped	0

Your organisation

2. In relation to the organisation for which you work (for the purposes of this project), what type of organisation is this? [Tick the option that best describes your organisation]

		Percent	Number
1	Micro business (less than 10 employees)	6.12%	9
2	Small- or medium-sized business (more than 10 and less than 250 employees)	5.44%	8
3	Large business (more than 250 employees)	0.00%	0
4	University	82.31%	121
5	Public Research Organisation	2.72%	4
6	Other (please specify):	3.40%	5
		answered	147
		skipped	1

Your experience submitting your application

3. We will begin by asking about the application process for this FIC project. To what extent were you satisfied with each of the following aspects of the application process?

	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Don't know / Not applicable	Response Total
The information provided in the call for proposals regarding requirements and the application process	41.1% (60)	49.3% (72)	4.8% (7)	1.4% (2)	0.0% (0)	3.4% (5)	146
The time available between the call for proposals and the deadline for submissions	25.5% (37)	44.1% (64)	8.3% (12)	15.9% (23)	3.4% (5)	2.8% (4)	145
The time taken between application submission and notification of results	24.7% (36)	49.3% (72)	15.1% (22)	8.9% (13)	0.7% (1)	1.4% (2)	146

3. We will begin by asking about the application process for this FIC project. To what extent were you satisfied with each of the following aspects of the application process?							
	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Don't know / Not applicable	Response Total
The feedback provided on your application	23.4% (34)	44.1% (64)	16.6% (24)	4.8% (7)	1.4% (2)	9.7% (14)	145
The time taken between notification of award and the commencement of the grant	22.8% (33)	43.4% (63)	13.1% (19)	13.8% (20)	5.5% (8)	1.4% (2)	145
						answered	146
						skipped	2

4. Were there any aspects of the application process that worked particularly well (compared with other experiences)? Please briefly explain			
		Percent	Number
1	Open-Ended Question	100.00%	83
		answered	83
		skipped	65

5. Were there any particularly challenging aspects to the application process (compared with other experiences)? Please briefly explain			
		Percent	Number
1	Open-Ended Question	100.00%	99
		answered	99
		skipped	49

Your partnership

6. How many other organisations (or university departments) are participating in this project (other than your own)?			
		Percent	Number
1	Open-Ended Question	100.00%	146
		answered	146
		skipped	2

7. Please use the table below to indicate: How many of these organisations (or university departments) are based in the UK or overseas, as well as The number that your organisation (or university department) had collaborated with prior to this application. [Note, the four numbers should sum to the total figure given above. If you are unable to provide an estimate, please enter 'Don't know'] Your overseas partner organisations / university departments...			
	UK-based partner	**Overseas partner**	**Response Total**
Existing partner (i.e. those that your organisation / university department had collaborated in an R&I project with before this application)	51.8% (99)	48.2% (92)	191
New partner (i.e. those that your organisation / university department had not collaborated in an R&I project with before this application)	39.6% (84)	60.4% (128)	212
		answered	142
		skipped	6

Your overseas partner organisations

8. To what extent do you agree or disagree with the following statements about the motivations for working with these particular overseas partners?							
	Strongly agree	**Agree**	**Neither agree nor disagree**	**Disagree**	**Strongly disagree**	**Don't know / n/a**	**Response Total**
One or more of these partners have access to knowledge and expertise that is critical in pursuing the project objectives	74.8% (110)	19.0% (28)	4.1% (6)	0.7% (1)	1.4% (2)	0.0% (0)	147
One or more of these partners have access to research infrastructure that is critical in pursuing the project objectives	46.3% (68)	32.0% (47)	12.9% (19)	7.5% (11)	0.7% (1)	0.7% (1)	147
One or more of these partners have access to contacts, networks and markets that are of interest to my organisation	55.1% (81)	30.6% (45)	6.8% (10)	4.8% (7)	1.4% (2)	1.4% (2)	147
Partnering in this project provides a good opportunity to understand how to collaborate in the future	61.2% (90)	28.6% (42)	6.1% (9)	2.0% (3)	1.4% (2)	0.7% (1)	147
						answered	147
						skipped	1

9. Again thinking about your overseas partners, to what extent has your FIC project led to the following changes so far? So far, participation in the project has led to...				
	To a great extent	**To some extent**	**Not at all / Not yet**	**Response Total**
an improved ability to work together	56.5% (83)	39.5% (58)	4.1% (6)	147
a better understanding of their capabilities	68.0% (100)	29.9% (44)	2.0% (3)	147
a better understanding of their research agendas / priorities	54.1% (79)	42.5% (62)	3.4% (5)	146

9. Again thinking about your overseas partners, to what extent has your FIC project led to the following changes so far? So far, participation in the project has led to...				
	To a great extent	**To some extent**	**Not at all / Not yet**	**Response Total**
a better understanding of their ways of working	57.2% (83)	37.2% (54)	5.5% (8)	145
an increased likelihood of collaborating again in the future	72.8% (107)	23.8% (35)	3.4% (5)	147
the identification of further opportunities to collaborate	55.8% (82)	30.6% (45)	13.6% (20)	147
advances in research / understanding, that would not have been possible without the overseas partner	68.7% (101)	23.1% (34)	8.2% (12)	147
advances in innovation / solutions, that would not have been possible without the overseas partner	52.4% (75)	31.5% (45)	16.1% (23)	143
			answered	147
			skipped	1

10. Could you provide an example of how the FIC project has facilitated a new partnership with an overseas partner organisation(s) / university department(s), or strengthened an existing partnership?			
		Percent	**Number**
1	Open-Ended Question	100.00%	107
		answered	107
		skipped	41

International collaboration

11. Please indicate the extent to which each of the following areas act as barriers to international research collaboration (in general).								
	5 "critical barrier"	**4**	**3**	**2**	**1**	**0 "not a barrier at all"**	**Do not know**	**Response Total**
Financial considerations (e.g. limited funding available to under-write cost of developing relationships, affordability of maintaining collaborations, high transaction costs)	38.6% (56)	29.7% (43)	16.6% (24)	7.6% (11)	2.8% (4)	3.4% (5)	1.4% (2)	145
Internal resources (e.g. shortage of people with the right skills to set up and operate such international research and innovation activities)	11.1% (16)	13.2% (19)	33.3% (48)	18.1% (26)	11.1% (16)	11.1% (16)	2.1% (3)	144
Information about overseas actors and markets (e.g. limited knowledge about which international organisations might be willing to collaborate; uncertainty about their capabilities / excellence)	7.6% (11)	21.4% (31)	30.3% (44)	16.6% (24)	13.1% (19)	7.6% (11)	3.4% (5)	145

11. Please indicate the extent to which each of the following areas act as barriers to international research collaboration (in general).								
	5 "critical barrier"	4	3	2	1	0 "not a barrier at all"	Do not know	Response Total
Collaboration frameworks (e.g. lack of international funding frameworks, bureaucratic and complex funding mechanisms)	30.6% (44)	35.4% (51)	16.7% (24)	8.3% (12)	4.9% (7)	1.4% (2)	2.8% (4)	144
Recognition of intellectual property rights	3.4% (5)	6.2% (9)	19.3% (28)	19.3% (28)	20.7% (30)	22.8% (33)	8.3% (12)	145
Enforcement of intellectual property rights	3.4% (5)	3.4% (5)	15.2% (22)	21.4% (31)	18.6% (27)	26.2% (38)	11.7% (17)	145
Regulatory issues (e.g. regulation of technology imports and exports)	5.6% (8)	8.3% (12)	17.4% (25)	18.1% (26)	13.2% (19)	25.0% (36)	12.5% (18)	144
Local conditions (e.g. poor communications or transport infrastructure, cultural / social factors, political instability, etc.)	4.1% (6)	9.7% (14)	16.6% (24)	20.7% (30)	20.7% (30)	22.1% (32)	6.2% (9)	145
Barriers to mobility and recruitment (e.g. visa requirements for visitors and staff)	9.7% (14)	15.2% (22)	23.4% (34)	20.7% (30)	11.7% (17)	10.3% (15)	9.0% (13)	145
Language / communication issues	4.8% (7)	9.0% (13)	19.3% (28)	13.8% (20)	19.3% (28)	33.1% (48)	0.7% (1)	145
Other	5.1% (4)	3.8% (3)	2.6% (2)	2.6% (2)	2.6% (2)	7.7% (6)	75.6% (59)	78
							answered	145
							skipped	3

12. To what extent and how does your FIC project overcome or lessen any of these (or other) barriers to international research collaboration?							
	5 "to a great extent"	4	3	2	1 "not at all"	0 (not a barrier)	Response Total
Financial considerations (e.g. limited funding available to under-write cost of developing relationships, affordability of maintaining collaborations, high transaction costs)	50.7% (74)	21.9% (32)	15.1% (22)	6.2% (9)	4.1% (6)	2.1% (3)	146
Internal resources (e.g. shortage of people with the right skills to set up and operate such international research and innovation activities)	18.5% (27)	22.6% (33)	25.3% (37)	14.4% (21)	7.5% (11)	11.6% (17)	146
Information about overseas actors and markets (e.g. limited knowledge about which international organisations might be willing to collaborate; uncertainty about their capabilities / excellence)	20.8% (30)	18.1% (26)	26.4% (38)	14.6% (21)	6.9% (10)	13.2% (19)	144

12. To what extent and how does your FIC project overcome or lessen any of these (or other) barriers to international research collaboration?							
	5 "to a great extent"	4	3	2	1 "not at all"	0 (not a barrier)	Response Total
Collaboration frameworks (e.g. lack of international funding frameworks, bureaucratic and complex funding mechanisms)	31.7% (46)	22.8% (33)	24.1% (35)	10.3% (15)	6.9% (10)	4.1% (6)	145
Recognition of intellectual property rights	3.4% (5)	6.2% (9)	19.3% (28)	11.7% (17)	20.0% (29)	39.3% (57)	145
Enforcement of intellectual property rights	2.1% (3)	5.5% (8)	14.5% (21)	12.4% (18)	24.1% (35)	41.4% (60)	145
Regulatory issues (e.g. regulation of technology imports and exports)	4.2% (6)	4.2% (6)	17.4% (25)	13.9% (20)	21.5% (31)	38.9% (56)	144
Local conditions (e.g. poor communications or transport infrastructure, cultural / social factors, political instability, etc.)	7.6% (11)	7.6% (11)	18.6% (27)	12.4% (18)	22.8% (33)	31.0% (45)	145
Barriers to mobility and recruitment (e.g. visa requirements for visitors and staff)	8.3% (12)	10.4% (15)	15.3% (22)	14.6% (21)	27.1% (39)	24.3% (35)	144
Language / communication issues	11.7% (17)	7.6% (11)	13.1% (19)	11.0% (16)	21.4% (31)	35.2% (51)	145
Other	5.1% (4)	0.0% (0)	3.8% (3)	5.1% (4)	9.0% (7)	76.9% (60)	78
						answered	146
						skipped	2

Your project and activities

13. What is likely to have happened with your FIC project idea in the absence of the funding secured? [You can select more than one option]				
			Percent	Number
1	We would have continued with the project idea, via other means, and with the same overseas partners		5.48%	8
2	We would have continued with the project idea, via other means, but with additional overseas partners		2.74%	4
3	We would have continued with the project idea, via other means, but with fewer overseas partners		2.74%	4
4	We would have continued with the project idea, via other means, but with no overseas partners		13.01%	19
5	We would have continued with the project idea, via other means, but with a different scale, scope and / or timetable		32.88%	48

13. What is likely to have happened with your FIC project idea in the absence of the funding secured? [You can select more than one option]				
			Percent	Number
6	We would not have continued with the project idea		55.48%	81
7	Other (please specify):		8.22%	12
			answered	146
			skipped	2
Other (please specify): (12)				

14. Could you please confirm which activities have taken place so far in the context of your FIC project? [Tick all that apply]				
			Percent	Number
1	Collaborative R&D activities		88.28%	128
2	Staff exchanges and secondments into the UK		13.79%	20
3	Staff exchanges and secondments out of the UK		12.41%	18
4	Conferences, seminars, and networking events		70.34%	102
5	Access to research infrastructure in the UK		41.38%	60
6	Access to research infrastructure internationally		48.28%	70
7	Other (please specify):		13.10%	19
			answered	145
			skipped	3
Other (please specify): (19)				

15. How many UK-based project participants in this project (if any) have taken part in 'Staff exchange and secondments' overseas so far? Please state the numbers according to the duration of the exchange / secondment. [We understand that these activities may have been delayed due to COVID].			
		Percent	Number
1	More than six months	41.18%	7
2	Less than six months	94.12%	16
		answered	17
		skipped	131

16. To what extent have staff exchanges and secondments (to or from the UK) so far led to each of the following, in relation to your overseas partners?				
	To a great extent	To some extent	Not at all / not yet	Response Total
An improved ability to work together	84.6% (22)	15.4% (4)	0.0% (0)	26

16. To what extent have staff exchanges and secondments (to or from the UK) so far led to each of the following, in relation to your overseas partners?				
	To a great extent	**To some extent**	**Not at all / not yet**	**Response Total**
A better understanding of their capabilities	80.8% (21)	19.2% (5)	0.0% (0)	26
A better understanding of their research agendas / priorities	80.0% (20)	20.0% (5)	0.0% (0)	25
A better understanding of their ways of working	80.8% (21)	19.2% (5)	0.0% (0)	26
An increased likelihood of collaborating again in the future	92.3% (24)	7.7% (2)	0.0% (0)	26
The identification of further opportunities to collaborate	88.5% (23)	11.5% (3)	0.0% (0)	26
Advances in research / understanding, that would not have been possible otherwise	76.9% (20)	23.1% (6)	0.0% (0)	26
			answered	26
			skipped	122

17. Approximately, how many individuals from the UK have taken part in international events organised by the FIC project (seminars, workshops, conferences, either face-to-face or virtual)? [Provide your best estimate in numbers]			
		Percent	**Number**
1	Open-Ended Question	100.00%	102
		answered	102
		skipped	46

18. Have there been additional resources leveraged for the FIC project, beyond the value of the grant and any match-funding required by the rules of the call?				
			Percent	**Number**
1	Yes		42.07%	61
2	No		57.93%	84
			answered	145
			skipped	3

19. Could you please indicate the source and value of the additional resources? [You can provide approximations or bands]			
		Percent	**Number**
1	Your own organisation £	72.50%	58
2	UK-based funding sources £	60.00%	48
3	Overseas funding sources £	75.00%	60
		answered	80
		skipped	68

Project progress

20. Overall, is the project progressing as expected?				
	Yes	**No – There are slight delays / issues**	**No – There are significant delays / issues**	**Response Total**
Is it on track to complete on time (according to the currently approved timetable)?	40.3% (56)	39.6% (55)	20.1% (28)	139
Is it on track to achieve its objectives?	69.6% (94)	23.7% (32)	6.7% (9)	135
			answered	140
			skipped	8

21. Has the coronavirus pandemic impacted your project in any of the following ways? [Tick all that apply]				
			Percent	**Number**
1	Delayed the start of the project		27.59%	40
2	Generated a delay to planned activities		69.66%	101
3	Led to a request for an extension on the project deadlines		44.14%	64
4	Led to a change in the thematic focus of the project		5.52%	8
5	Led to a change in partners		4.83%	7
6	Made us re-cast the mode of implementation of some of the originally planned activities (from face-to-face to online)		51.72%	75
7	Made us cancel some originally planned activities		35.17%	51
8	Made the overall (international) collaboration more difficult / challenging		49.66%	72
9	None of the above		9.66%	14
10	Other (please specify):		15.86%	23
			answered	145
			skipped	3
Other (please specify): (23)				

22. Could you please elaborate on any issues or delays encountered (cause and implications)?			
		Percent	**Number**
1	Open-Ended Question	100.00%	106
		answered	106
		skipped	42

Emerging results from the projects

23. How would you rate your skills and capabilities in relation to working collaboratively in international teams, before the FIC project and now? Use a scale from 1 to 5, where 5 is "excellent" and 1 is "poor". If there has been no change so far, please enter the same number in both columns.			
	At the point of application	**Current position**	**Response Total**
Ability to access new or better knowledge from overseas	50.2% (141)	49.8% (140)	281
Ability to access new or better facilities, tools and techniques from overseas	50.2% (139)	49.8% (138)	277
Ability to navigate different working and research cultures	50.2% (141)	49.8% (140)	281
Ability to identify sources of funding internationally	50.2% (141)	49.8% (140)	281
Overall ability to work collaboratively in international teams	50.2% (141)	49.8% (140)	281
		answered	141
		skipped	7

24. Do you expect your experience working with overseas partners within the context of this FIC project to lead to:				
	Yes	**No**	**Do not know**	**Response Total**
Promotion or permanent position (tenure)	22.9% (33)	52.1% (75)	25.0% (36)	144
Accelerated career progression	41.8% (61)	38.4% (56)	19.9% (29)	146
			answered	146
			skipped	2

25. Where applicable, could you please indicate the Technology Readiness Level (TRL) of your FIC project?			
	At the point of application	**Current position**	**Response Total**
TRL 3: Research: Experimental proof of concept	56.0% (42)	44.0% (33)	75
TRL 4: Development: Technology validated in lab	40.0% (18)	60.0% (27)	45
TRL 5: Development: Technology validated in relevant environment	25.9% (7)	74.1% (20)	27
TRL 6: Development: Technology demonstrated in relevant environment	24.1% (7)	75.9% (22)	29
TRL 7: Deployment: System prototype demonstration in operational environment	13.3% (2)	86.7% (13)	15
TRL 8: Deployment: System complete and qualified. System/model produced and qualified	12.5% (1)	87.5% (7)	8

25. Where applicable, could you please indicate the Technology Readiness Level (TRL) of your FIC project?			
	At the point of application	Current position	Response Total
TRL 9: Deployment: Actual system proven in operational environment	20.0% (1)	80.0% (4)	5
Not applicable	52.1% (50)	47.9% (46)	96
		answered	125
		skipped	23

26. Have any of the following results emerged from your FIC project so far? If so, could you please indicate the number. Otherwise type "0"			
		Percent	Number
1	Number of new or enhanced products, process or services	92.91%	118
2	Number of new research databases, models or tools	96.06%	122
3	Number of patents filed	88.98%	113
4	Number of patents granted	88.98%	113
5	Number of trademarks	89.76%	114
6	Number of copyrighted products (e.g. software)	89.76%	114
7	Number of spin out companies	90.55%	115
		answered	127
		skipped	21

27. Do you currently have any examples of significant discoveries and advances in understanding supported by the FIC project? If so, could you briefly describe these below (including potential areas of application)?			
		Percent	Number
1	Open-Ended Question	100.00%	84
		answered	84
		skipped	64

28. Do you currently have any examples of results from the FIC project being taken up and used beyond the project (either by your organisation or others)? If so, could you briefly describe below?			
		Percent	Number
1	Open-Ended Question	100.00%	82
		answered	82
		skipped	66

29. How important has the international collaboration element of this project been to the achievement of the outputs noted above (increased TRL, publications, new / improved products, significant discoveries, etc.)?				
			Percent	Number
1	Critical		56.64%	81

29. How important has the international collaboration element of this project been to the achievement of the outputs noted above (increased TRL, publications, new / improved products, significant discoveries, etc.)?				
			Percent	Number
2	Moderately important		21.68%	31
3	Slightly important		3.50%	5
4	Not at all		0.00%	0
5	N/a – no outputs achieved so far		18.18%	26
			answered	143
			skipped	5

Wider opportunities

30. Excluding this FIC project, please estimate the following:(If you are unable to provide an estimate, please enter 'don't know')			
	In the year before this application	After the FIC project was awarded	Response Total
The number of research proposals that your organisation or university department submitted with your overseas partner organisations / university departments from the FIC project	50.2% (130)	49.8% (129)	259
The number of research proposals that your organisation or university department submitted with other overseas partner organisations / university departments (not those in the FIC project)	50.6% (126)	49.4% (123)	249
		answered	133
		skipped	15

31. In each case, could you estimate the overall value of the grants awarded to UK partners of the proposals (above) that have gone on to be awarded funding?			
	In the year before application	After project was awarded	Response Total
Value to UK partners of successful proposals submitted with overseas partners from the FIC project	52.2% (96)	47.8% (88)	184
Value to UK partners of successful proposals submitted with other overseas partners (not those in the FIC project)	52.0% (92)	48.0% (85)	177
		answered	99
		skipped	49

32. Thinking about the call / competition as a mechanism to support international collaboration, to what extent do you agree or disagree with the following statements?						
	Strongly agree	**Agree**	**Neither agree nor disagree**	**Disagree Strongly disagree**	**Don't know / Not applicable**	**Response Total**
… offers a unique opportunity to strengthen linkages with overseas partners	70.8% (102)	24.3% (35)	2.8% (4)	1.4% (2)	0.7% (1)	144
… offers a unique opportunity to explore areas of common interest	69.9% (100)	25.9% (37)	2.1% (3)	1.4% (2)	0.7% (1)	143
… has led to the identification of wider research opportunities with partner countries	53.8% (77)	25.9% (37)	12.6% (18)	2.8% (4)	4.9% (7)	143
… has led to the identification of wider commercial opportunities with partner countries	26.6% (38)	16.1% (23)	23.8% (34)	6.3% (9)	27.3% (39)	143
					answered	144
					skipped	4

33. If relevant, could you please provide an example of how participation in the FIC project has led to the identification of wider research or commercial opportunities with partner countries?			
		Percent	**Number**
1	Open-Ended Question	100.00%	62
		answered	62
		skipped	86

34. What additional support would be needed to further strengthen and develop your relationship with the overseas partner organisations and university departments involved in your FIC project, after the project ends?			
		Percent	**Number**
1	Open-Ended Question	100.00%	80
		answered	80
		skipped	68

The Fund for International Collaboration

35. As noted in the introduction, the project and programme has been funded by the Fund for International collaboration (FIC). Prior to receiving this survey, were you aware of this Fund?				
			Percent	**Number**
1	Yes		36.11%	52
2	No		63.89%	92
			answered	144
			skipped	4

36. To what extent do you agree or disagree with the following statements about the Fund for International Collaboration (FIC)?							
	Strongly agree	**Agree**	**Neither agree nor disagree**	**Disagree**	**Strongly disagree**	**Don't know / Not applicable**	**Response Total**
FIC is a useful addition to the UK funding landscape	75.7% (109)	18.1% (26)	0.7% (1)	0.7% (1)	0.0% (0)	4.9% (7)	144
FIC is an effective mechanisms to support international collaboration	70.2% (99)	19.9% (28)	4.3% (6)	0.7% (1)	0.0% (0)	5.0% (7)	141
The existence of FIC has enabled the leverage of additional funds for this project	44.0% (62)	19.9% (28)	15.6% (22)	2.1% (3)	1.4% (2)	17.0% (24)	141
The existence of FIC has enabled conversations about future funding opportunities	51.4% (74)	26.4% (38)	11.1% (16)	1.4% (2)	0.0% (0)	9.7% (14)	144
						answered	144
						skipped	4

Additional company characteristics

37. In which sector is your company mainly active?			
		Percent	**Number**
1	Agriculture, Forestry and Fishing	0.00%	0
2	Mining and Quarrying	0.00%	0
3	Manufacturing	37.50%	6
4	Electricity, Gas, Steam and Air Conditioning Supply	0.00%	0
5	Water Supply, Sewerage and Waste Management	0.00%	0
6	Construction	0.00%	0
7	Wholesale and Retail Trade	6.25%	1
8	Transport and storage	6.25%	1
9	Accommodation and Food Service Sector	0.00%	0
10	Information and Communications	18.75%	3
11	Financial and Insurance Activities	0.00%	0
12	Real Estate Activities	0.00%	0
13	Professional, Scientific and Technical Activities	18.75%	3
14	Administrative and Support Service Activities	0.00%	0
15	Public Administration and Defence	0.00%	0
16	Education	0.00%	0
17	Human Health and Social Work Activities	0.00%	0
18	Arts, Entertainment and Recreation	6.25%	1
19	Other Service Activities	0.00%	0
20	Activities of Households as Employers	0.00%	0
21	Extraterritorial Organisations	0.00%	0

37. In which sector is your company mainly active?			
		Percent	Number
22	Don't know	6.25%	1
		answered	16
		skipped	132

38. Was your company established			
		Percent	Number
1	… before the 2018/19 financial year?	81.25%	13
2	… during the 2018/19 financial year	0.00%	0
3	… or after the 2018/19 financial year?	18.75%	3
		answered	16
		skipped	132

39. How many full-time equivalent staff did your company employ in total including yourself?			
	In the 2018/19 financial year, prior to your FIC project	In 2019/20	Response Total
None	100.0% (2)	0.0% (0)	2
1 to 3	71.4% (5)	28.6% (2)	7
4 to 9	36.4% (4)	63.6% (7)	11
10 to 49	57.1% (4)	42.9% (3)	7
50 to 249	33.3% (1)	66.7% (2)	3
250 to 499	0.0% (0)	0.0% (0)	0
500 to 999	0.0% (0)	0.0% (0)	0
1,000+	0.0% (0)	0.0% (0)	0
Don't know	0.0% (0)	0.0% (0)	0
		answered	16
		skipped	132

40. What was your company's approximate turnover…?			
	… in the 2018/19 financial year, prior to your FIC project?	… in 2019/20?	Response Total
Zero – no turnover	50.0% (2)	50.0% (2)	4
Less than £50,000 but not zero	60.0% (3)	40.0% (2)	5

40. What was your company's approximate turnover…?			
	… in the 2018/19 financial year, prior to your FIC project?	… in 2019/20?	Response Total
£50,000 to less than £100,000	50.0% (2)	50.0% (2)	4
£100,000 to less than £500,000	42.9% (3)	57.1% (4)	7
£500,000 to less than £2 million	50.0% (1)	50.0% (1)	2
£2 million to less than £10 million	50.0% (3)	50.0% (3)	6
£10 million to less than £50 million	50.0% (1)	50.0% (1)	2
£50 million or more	0.0% (0)	0.0% (0)	0
Don't know	50.0% (1)	50.0% (1)	2
		answered	16
		skipped	132

Final remarks

41. Do you have any other comments you would like to make?			
		Percent	Number
1	Open-Ended Question	100.00%	51
		answered	51
		skipped	97

42. Would you be by happy to be contacted by a member of the study team to explore your answers further?				
			Percent	Number
1	Yes		52.41%	76
2	No		47.59%	69
			answered	145
			skipped	3

43. Would you be happy for us to share your responses with UKRI?				
			Percent	Number
1	Yes		91.78%	134
2	No		8.22%	12
			answered	146
			skipped	2

I.2 International partners (IUK projects)

		Percent	Number
1	I give consent for my response to this questionnaire to be processed and used according to the assurances on confidentiality and data provided in the box below.	100.00%	12
		answered	12
		skipped	0

You and your organisation

2. Please enter your name:			
		Percent	Number
1	Open-Ended Question	100.00%	12
		answered	12
		skipped	0

3. Please select the competition that was mentioned in your invitation email:			
		Percent	Number
1	UK and Canada: enhancing industrial productivity	50.00%	6
2	CELTIC-NEXT autumn 2019: innovative 5G infrastructure and applications	16.67%	2
3	EUREKA collaborative R&D: AI and quantum technologies	8.33%	1
4	EUREKA collaborative R&D: photonics for advanced manufacturing	0.00%	0
5	EUREKA: Singapore open competition	0.00%	0
6	EUREKA GlobalStars Singapore CRD – Round 2	8.33%	1
7	UK-Israel open collaborative competition 2018	0.00%	0
8	UK-Israel open collaborative R&D competition 2019	8.33%	1
9	EUREKA GlobalStars Japan	8.33%	1
		answered	12
		skipped	0

4. In relation to the organisation for which you work (for the purposes of this project), what type of organisation is this? [Tick the option that best describes your organisation]			
		Percent	Number
1	Micro business (less than 10 employees)	25.00%	3
2	Small- or medium-sized business (more than 10 and less than 250 employees)	50.00%	6

4. In relation to the organisation for which you work (for the purposes of this project), what type of organisation is this? [Tick the option that best describes your organisation]				
			Percent	Number
3	Large business (more than 250 employees)		8.33%	1
4	University		8.33%	1
5	Public Research Organisation		0.00%	0
6	Other (please specify):		8.33%	1
			answered	12
			skipped	0
Other (please specify): (1)				

5. And in which country is it located?			
		Percent	Number
1	Open-Ended Question	100.00%	12
		answered	12
		skipped	0

Your partnership

6. How many UK organisations (or university departments) are participating in this project?			
		Percent	Number
1	Open-Ended Question	100.00%	12
		answered	12
		skipped	0

7. And how many of these had your organisation / department collaborated with prior to the application for this project?			
		Percent	Number
1	Open-Ended Question	100.00%	12
		answered	12
		skipped	0

Your UK partner organisations

8. To what extent do you agree or disagree with the following statements about the motivations for working with these particular UK partners?							
	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know / n/a	Response Total
One or more of these partners have access to knowledge and	75.0% (9)	16.7% (2)	8.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	12

8. To what extent do you agree or disagree with the following statements about the motivations for working with these particular UK partners?							
	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know / n/a	Response Total
expertise that is critical in pursuing the project objectives							
One or more of these partners have access to research infrastructure that is critical in pursuing the project objectives	33.3% (4)	33.3% (4)	33.3% (4)	0.0% (0)	0.0% (0)	0.0% (0)	12
One or more of these partners have access to contacts, networks and markets that are of interest to my organisation	41.7% (5)	41.7% (5)	16.7% (2)	0.0% (0)	0.0% (0)	0.0% (0)	12
Partnering in this project provides a good opportunity to understand how to collaborate in the future	58.3% (7)	33.3% (4)	0.0% (0)	8.3% (1)	0.0% (0)	0.0% (0)	12
						answered	12
						skipped	0

9. Again thinking about your UK partners, to what extent has your FIC project led to the following changes so far? So far, participation in the project has led to...				
	To a great extent	To some extent	Not at all / Not yet	Response Total
an improved ability to work together	75.0% (9)	25.0% (3)	0.0% (0)	12
a better understanding of their capabilities	75.0% (9)	25.0% (3)	0.0% (0)	12
a better understanding of their research agendas / priorities	41.7% (5)	50.0% (6)	8.3% (1)	12
a better understanding of their ways of working	50.0% (6)	41.7% (5)	8.3% (1)	12
an increased likelihood of collaborating again in the future	83.3% (10)	16.7% (2)	0.0% (0)	12
the identification of further opportunities to collaborate	75.0% (9)	8.3% (1)	16.7% (2)	12
advances in research / understanding, that would not have been possible without the overseas partner	58.3% (7)	33.3% (4)	8.3% (1)	12
advances in innovation / solutions, that would not have been possible without the overseas partner	66.7% (8)	25.0% (3)	8.3% (1)	12
			answered	12
			skipped	0

10. Could you provide an example of how the FIC project has facilitated a new partnership with a UK partner organisation(s) / university department(s), or strengthened an existing partnership?			
		Percent	Number
1	Open-Ended Question	100.00%	8

10. Could you provide an example of how the FIC project has facilitated a new partnership with a UK partner organisation(s) / university department(s), or strengthened an existing partnership?		
	Percent	Number
	answered	8
	skipped	4

International collaboration

11. Please indicate the extent to which each of the following areas act as barriers to research collaboration with the UK.	5 "critical barrier"	4	3	2	1	0 "not a barrier at all"	Do not know	Response Total
Financial considerations (e.g. limited funding available to under-write cost of developing relationships, affordability of maintaining collaborations, high transaction costs)	8.3% (1)	8.3% (1)	50.0% (6)	25.0% (3)	0.0% (0)	0.0% (0)	8.3% (1)	12
Internal resources (e.g. shortage of people with the right skills to set up and operate such international research and innovation activities)	0.0% (0)	16.7% (2)	8.3% (1)	50.0% (6)	8.3% (1)	16.7% (2)	0.0% (0)	12
Information about overseas actors and markets (e.g. limited knowledge about which international organisations might be willing to collaborate; uncertainty about their capabilities / excellence)	0.0% (0)	16.7% (2)	8.3% (1)	33.3% (4)	16.7% (2)	25.0% (3)	0.0% (0)	12
Collaboration frameworks (e.g. lack of international funding frameworks, bureaucratic and complex funding mechanisms)	16.7% (2)	8.3% (1)	33.3% (4)	25.0% (3)	0.0% (0)	16.7% (2)	0.0% (0)	12
Recognition of intellectual property rights	0.0% (0)	0.0% (0)	25.0% (3)	25.0% (3)	16.7% (2)	25.0% (3)	8.3% (1)	12
Enforcement of intellectual property rights	0.0% (0)	0.0% (0)	16.7% (2)	41.7% (5)	8.3% (1)	25.0% (3)	8.3% (1)	12
Regulatory issues (e.g. regulation of technology imports and exports)	0.0% (0)	18.2% (2)	9.1% (1)	18.2% (2)	18.2% (2)	27.3% (3)	9.1% (1)	11
Local conditions (e.g. poor communications or transport infrastructure, cultural / social factors, political instability, etc.)	0.0% (0)	8.3% (1)	25.0% (3)	8.3% (1)	16.7% (2)	41.7% (5)	0.0% (0)	12
Barriers to mobility and recruitment (e.g. visa requirements for visitors and staff)	0.0% (0)	8.3% (1)	16.7% (2)	25.0% (3)	25.0% (3)	25.0% (3)	0.0% (0)	12
Language / communication issues	0.0% (0)	8.3% (1)	0.0% (0)	0.0% (0)	8.3% (1)	83.3% (10)	0.0% (0)	12

11. Please indicate the extent to which each of the following areas act as barriers to research collaboration with the UK.								
	5 "critical barrier"	4	3	2	1	0 "not a barrier at all"	Do not know	Response Total
Other	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	12.5% (1)	25.0% (2)	62.5% (5)	8
							answered	12
							skipped	0

12. To what extent does your FIC project overcome or lessen any of these (or other) barriers to research collaboration with the UK?							
	5 "to a great extent"	4	3	2	1 "not at all"	0 (not a barrier)	Response Total
Financial considerations (e.g. limited funding available to under-write cost of developing relationships, affordability of maintaining collaborations, high transaction costs)	33.3% (4)	41.7% (5)	16.7% (2)	0.0% (0)	0.0% (0)	8.3% (1)	12
Internal resources (e.g. shortage of people with the right skills to set up and operate such international research and innovation activities)	8.3% (1)	25.0% (3)	41.7% (5)	16.7% (2)	0.0% (0)	8.3% (1)	12
Information about overseas actors and markets (e.g. limited knowledge about which international organisations might be willing to collaborate; uncertainty about their capabilities / excellence)	0.0% (0)	25.0% (3)	41.7% (5)	16.7% (2)	0.0% (0)	16.7% (2)	12
Collaboration frameworks (e.g. lack of international funding frameworks, bureaucratic and complex funding mechanisms)	8.3% (1)	33.3% (4)	16.7% (2)	33.3% (4)	0.0% (0)	8.3% (1)	12
Recognition of intellectual property rights	8.3% (1)	8.3% (1)	41.7% (5)	16.7% (2)	8.3% (1)	16.7% (2)	12
Enforcement of intellectual property rights	0.0% (0)	0.0% (0)	33.3% (4)	33.3% (4)	8.3% (1)	25.0% (3)	12
Regulatory issues (e.g. regulation of technology imports and exports)	0.0% (0)	8.3% (1)	33.3% (4)	16.7% (2)	25.0% (3)	16.7% (2)	12
Local conditions (e.g. poor communications or transport infrastructure, cultural / social factors, political instability, etc.)	0.0% (0)	0.0% (0)	8.3% (1)	25.0% (3)	25.0% (3)	41.7% (5)	12
Barriers to mobility and recruitment (e.g. visa requirements for visitors and staff)	0.0% (0)	0.0% (0)	8.3% (1)	41.7% (5)	16.7% (2)	33.3% (4)	12
Language / communication issues	0.0% (0)	0.0% (0)	20.0% (2)	10.0% (1)	30.0% (3)	40.0% (4)	10

12. To what extent does your FIC project overcome or lessen any of these (or other) barriers to research collaboration with the UK?							
	5 "to a great extent"	4	3	2	1 "not at all"	0 (not a barrier)	Response Total
Other	0.0% (0)	0.0% (0)	14.3% (1)	0.0% (0)	0.0% (0)	85.7% (6)	7
						answered	12
						skipped	0

Your project and activities

13. How many project participants from your organisation / department (if any) have taken part in 'Staff exchange and secondments' to the UK so far? Please state the numbers according to the duration of the exchange / secondment. [We understand that these activities may have been delayed due to COVID].			
		Percent	Number
1	More than six months	100.00%	12
2	Less than six months	100.00%	12
		answered	12
		skipped	0

14. To what extent have staff exchanges and secondments to the UK so far led to each of the following, in relation to your UK partner(s)? Please skip this question if no exchanges / secondments to the UK have taken place.				
	To a great extent	To some extent	Not at all / not yet	Response Total
An improved ability to work together	28.6% (2)	0.0% (0)	71.4% (5)	7
A better understanding of their capabilities	28.6% (2)	0.0% (0)	71.4% (5)	7
A better understanding of their research agendas / priorities	28.6% (2)	0.0% (0)	71.4% (5)	7
A better understanding of their ways of working	14.3% (1)	14.3% (1)	71.4% (5)	7
An increased likelihood of collaborating again in the future	28.6% (2)	0.0% (0)	71.4% (5)	7
The identification of further opportunities to collaborate	28.6% (2)	0.0% (0)	71.4% (5)	7
Advances in research / understanding, that would not have been possible otherwise	14.3% (1)	14.3% (1)	71.4% (5)	7
			answered	7
			skipped	5

Project progress

15. Overall, is the project progressing as expected?				
	Yes	No – There are slight delays / issues	No – There are significant delays / issues	Response Total
Is it on track to complete on time (according to the currently approved timetable)?	81.8% (9)	18.2% (2)	0.0% (0)	11
Is it on track to achieve its objectives?	90.9% (10)	9.1% (1)	0.0% (0)	11
			answered	11
			skipped	1

16. Has the coronavirus pandemic impacted your project in any of the following ways? [Tick all that apply]				
			Percent	Number
1	Delayed the start of the project		25.00%	3
2	Generated a delay to planned activities		33.33%	4
3	Led to a request for an extension on the project deadlines		50.00%	6
4	Led to a change in the thematic focus of the project		0.00%	0
5	Led to a change in partners		0.00%	0
6	Made us re-cast the mode of implementation of some of the originally planned activities (from face-to-face to online)		25.00%	3
7	Made us cancel some originally planned activities		33.33%	4
8	Made the overall (international) collaboration more difficult / challenging		50.00%	6
9	None of the above		8.33%	1
10	Other (please specify):		8.33%	1
			answered	12
			skipped	0
Other (please specify): (1)				

17. Could you please elaborate on any issues or delays encountered (cause and implications)?			
		Percent	Number
1	Open-Ended Question	100.00%	5
		answered	5
		skipped	7

Emerging results from the projects

18. How would you rate your skills and capabilities in relation to working collaboratively in international teams, before the FIC project and now? Use a scale from 1 to 5, where 5 is "excellent" and 1 is "poor". If there has been no change so far, please enter the same number in both columns.			
	At the point of application	**Current position**	**Response Total**
Ability to access new or better knowledge from overseas	50.0% (12)	50.0% (12)	24
Ability to access new or better facilities, tools and techniques from overseas	50.0% (12)	50.0% (12)	24
Ability to navigate different working and research cultures	50.0% (12)	50.0% (12)	24
Ability to identify sources of funding internationally	50.0% (12)	50.0% (12)	24
Overall ability to work collaboratively in international teams	50.0% (12)	50.0% (12)	24
		answered	12
		skipped	0

19. Do you currently have any examples of significant discoveries and advances in understanding supported by the FIC project? If so, could you briefly describe below?			
		Percent	**Number**
1	Open-Ended Question	100.00%	7
		answered	7
		skipped	5

20. Do you currently have any examples of results from the FIC project being taken up and used beyond the project (either by your organisation or others)? If so, could you briefly describe below?			
		Percent	**Number**
1	Open-Ended Question	100.00%	7
		answered	7
		skipped	5

21. How important has collaboration with the UK in this project been to the achievement of R&I outputs (increased TRL, publications, new / improved products, significant discoveries, etc.)?				
			Percent	**Number**
1	Critical		50.00%	6
2	Moderately important		41.67%	5
3	Slightly important		8.33%	1
4	Not at all		0.00%	0
5	N/a – no outputs achieved so far		0.00%	0
			answered	12

21. How important has collaboration with the UK in this project been to the achievement of R&I outputs (increased TRL, publications, new / improved products, significant discoveries, etc.)?		
	Percent	Number
	skipped	0

Wider opportunities

22. Excluding this FIC project, please estimate the following:(If you are unable to provide an estimate, please enter 'don't know')			
	In the year before this application	After the FIC project was awarded	Response Total
The number of research proposals that your organisation or university department submitted with your UK partner organisations / university departments from the FIC project	50.0% (12)	50.0% (12)	24
The number of research proposals that your organisation or university department submitted with other UK partner organisations / university departments (not those in the FIC project)	50.0% (12)	50.0% (12)	24
		answered	12
		skipped	0

23. Thinking about the programme / competition as a mechanism to support international collaboration, to what extent do you agree or disagree with the following statements? This programme / call...						
	Strongly agree	Agree	Neither agree nor disagree	Disagree Strongly disagree	Don't know / Not applicable	Response Total
... offers a unique opportunity to strengthen linkages with UK partners	66.7% (8)	33.3% (4)	0.0% (0)	0.0% (0)	0.0% (0)	12
... offers a unique opportunity to explore areas of common interest with UK partners	50.0% (6)	50.0% (6)	0.0% (0)	0.0% (0)	0.0% (0)	12
... has led to the identification of wider research opportunities with the UK	33.3% (4)	50.0% (6)	16.7% (2)	0.0% (0)	0.0% (0)	12
... has led to the identification of wider commercial opportunities with the UK	33.3% (4)	25.0% (3)	41.7% (5)	0.0% (0)	0.0% (0)	12
					answered	12
					skipped	0

24. If relevant, could you please provide an example on how participation in the FIC project has led to the identification of wider research or commercial opportunities with the UK?			
		Percent	Number
1	Open-Ended Question	100.00%	4

24. If relevant, could you please provide an example on how participation in the FIC project has led to the identification of wider research or commercial opportunities with the UK?		
	Percent	Number
	answered	4
	skipped	8

25. What additional support would be needed to further strengthen and develop your relationship with the UK partner organisations and university departments involved in your FIC project, after the project ends?			
		Percent	Number
1	Open-Ended Question	100.00%	6
		answered	6
		skipped	6

Final remarks

26. Do you have any other comments you would like to make?			
		Percent	Number
1	Open-Ended Question	100.00%	4
		answered	4
		skipped	8

27. Would you be by happy to be contacted by a member of the study team to explore your answers further?				
			Percent	Number
1	Yes*		66.67%	8
2	No		33.33%	4
			answered	12
			skipped	0
*If yes, please provide the best email address to contact you with: (7)				

28. Would you be happy for us to share your responses with UKRI?				
			Percent	Number
1	Yes		100.00%	12
2	No		0.00%	0
			answered	12
			skipped	0

I.3 International partners (Research Council projects)

		Percent	Number
1	I give consent for my response to this questionnaire to be processed and used according to the assurances on confidentiality and data provided in the box below.	100.00%	91
		answered	91
		skipped	0

You and your organisation

2. In relation to the organisation for which you work (for the purposes of this project), what type of organisation is this? [Tick the option that best describes your organisation]

		Percent	Number
1	Micro business (less than 10 employees)	0.00%	0
2	Small- or medium-sized business (more than 10 and less than 250 employees)	2.20%	2
3	Large business (more than 250 employees)	0.00%	0
4	University	82.42%	75
5	Public Research Organisation	10.99%	10
6	Other (please specify):	4.40%	4
		answered	91
		skipped	0

Other (please specify): (4)

3. And in which country is it located?

		Percent	Number
1	Open-Ended Question	100.00%	91
		answered	91
		skipped	0

Your partnership

4. How many UK organisations (or university departments) are participating in this project?

		Percent	Number
1	Open-Ended Question	100.00%	90
		answered	90
		skipped	1

5. And how many of these had your organisation / department collaborated with prior to the application for this project?

		Percent	Number
1	Open-Ended Question	100.00%	90

5. And how many of these had your organisation / department collaborated with prior to the application for this project?		
	Percent	Number
	answered	90
	skipped	1

Your UK partner organisations

6. To what extent do you agree or disagree with the following statements about the motivations for working with these particular UK partners?							
	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know / n/a	Response Total
One or more of these partners have access to knowledge and expertise that is critical in pursuing the project objectives	75.3% (67)	21.3% (19)	3.4% (3)	0.0% (0)	0.0% (0)	0.0% (0)	89
One or more of these partners have access to research infrastructure that is critical in pursuing the project objectives	50.6% (45)	32.6% (29)	11.2% (10)	2.2% (2)	2.2% (2)	1.1% (1)	89
One or more of these partners have access to contacts, networks and markets that are of interest to my organisation	57.3% (51)	25.8% (23)	11.2% (10)	2.2% (2)	2.2% (2)	1.1% (1)	89
Partnering in this project provides a good opportunity to understand how to collaborate in the future	75.3% (67)	20.2% (18)	4.5% (4)	0.0% (0)	0.0% (0)	0.0% (0)	89
						answered	89
						skipped	2

7. Again thinking about your UK partners, to what extent has your FIC project led to the following changes so far? So far, participation in the project has led to...				
	To a great extent	To some extent	Not at all / Not yet	Response Total
an improved ability to work together	77.5% (69)	21.3% (19)	1.1% (1)	89
a better understanding of their capabilities	70.8% (63)	29.2% (26)	0.0% (0)	89
a better understanding of their research agendas / priorities	73.9% (65)	25.0% (22)	1.1% (1)	88
a better understanding of their ways of working	69.8% (60)	26.7% (23)	3.5% (3)	86
an increased likelihood of collaborating again in the future	73.6% (64)	26.4% (23)	0.0% (0)	87
the identification of further opportunities to collaborate	75.3% (67)	24.7% (22)	0.0% (0)	89
advances in research / understanding, that would not have been possible without the overseas partner	67.4% (60)	29.2% (26)	3.4% (3)	89

7. Again thinking about your UK partners, to what extent has your FIC project led to the following changes so far? So far, participation in the project has led to...				
	To a great extent	To some extent	Not at all / Not yet	Response Total
advances in innovation / solutions, that would not have been possible without the overseas partner	53.4% (47)	38.6% (34)	8.0% (7)	88
			answered	89
			skipped	2

8. Could you provide an example of how the FIC project has facilitated a new partnership with a UK partner organisation(s) / university department(s), or strengthened an existing partnership?			
		Percent	Number
1	Open-Ended Question	100.00%	66
		answered	66
		skipped	25

International collaboration

9. Please indicate the extent to which each of the following areas act as barriers to research collaboration with the UK.								
	5 "critical barrier"	4	3	2	1	0 "not a barrier"	Do not know	Response Total
Financial considerations (e.g. limited funding available to under-write cost of developing relationships, affordability of maintaining collaborations, high transaction costs)	18.0% (16)	19.1% (17)	25.8% (23)	12.4% (11)	12.4% (11)	9.0% (8)	3.4% (3)	89
Internal resources (e.g. shortage of people with the right skills to set up and operate such international research and innovation activities)	10.1% (9)	22.5% (20)	22.5% (20)	15.7% (14)	6.7% (6)	20.2% (18)	2.2% (2)	89
Information about overseas actors and markets (e.g. limited knowledge about which international organisations might be willing to collaborate; uncertainty about their capabilities / excellence)	9.0% (8)	9.0% (8)	31.5% (28)	18.0% (16)	14.6% (13)	18.0% (16)	0.0% (0)	89
Collaboration frameworks (e.g. lack of international funding frameworks, bureaucratic and complex funding mechanisms)	15.7% (14)	29.2% (26)	27.0% (24)	15.7% (14)	5.6% (5)	5.6% (5)	1.1% (1)	89
Recognition of intellectual property rights	4.5% (4)	4.5% (4)	14.6% (13)	18.0% (16)	15.7% (14)	33.7% (30)	9.0% (8)	89
Enforcement of intellectual property rights	5.6% (5)	3.4% (3)	15.7% (14)	16.9% (15)	12.4% (11)	36.0% (32)	10.1% (9)	89

9. Please indicate the extent to which each of the following areas act as barriers to research collaboration with the UK.								
	5 "critical barrier"	4	3	2	1	0 "not a barrier"	Do not know	Response Total
Regulatory issues (e.g. regulation of technology imports and exports)	3.4% (3)	7.9% (7)	14.6% (13)	13.5% (12)	11.2% (10)	38.2% (34)	11.2% (10)	89
Local conditions (e.g. poor communications or transport infrastructure, cultural / social factors, political instability, etc.)	4.5% (4)	6.7% (6)	12.4% (11)	10.1% (9)	19.1% (17)	44.9% (40)	2.2% (2)	89
Barriers to mobility and recruitment (e.g. visa requirements for visitors and staff)	5.6% (5)	12.4% (11)	12.4% (11)	10.1% (9)	20.2% (18)	36.0% (32)	3.4% (3)	89
Language / communication issues	5.6% (5)	6.7% (6)	15.7% (14)	13.5% (12)	13.5% (12)	44.9% (40)	0.0% (0)	89
Other	1.6% (1)	1.6% (1)	6.3% (4)	1.6% (1)	7.8% (5)	20.3% (13)	60.9% (39)	64
							answered	89
							skipped	2

10. To what extent does your FIC project overcome or lessen any of these (or other) barriers to research collaboration with the UK?							
	5 "to a great extent"	4	3	2	1 "not at all"	0 (not a barrier)	Response Total
Financial considerations (e.g. limited funding available to under-write cost of developing relationships, affordability of maintaining collaborations, high transaction costs)	28.7% (25)	25.3% (22)	27.6% (24)	6.9% (6)	5.7% (5)	5.7% (5)	87
Internal resources (e.g. shortage of people with the right skills to set up and operate such international research and innovation activities)	17.2% (15)	23.0% (20)	27.6% (24)	12.6% (11)	8.0% (7)	11.5% (10)	87
Information about overseas actors and markets (e.g. limited knowledge about which international organisations might be willing to collaborate; uncertainty about their capabilities / excellence)	15.3% (13)	21.2% (18)	31.8% (27)	12.9% (11)	5.9% (5)	12.9% (11)	85
Collaboration frameworks (e.g. lack of international funding frameworks, bureaucratic and complex funding mechanisms)	28.4% (25)	25.0% (22)	26.1% (23)	5.7% (5)	8.0% (7)	6.8% (6)	88
Recognition of intellectual property rights	4.6% (4)	10.3% (9)	19.5% (17)	12.6% (11)	12.6% (11)	40.2% (35)	87
Enforcement of intellectual property rights	4.6% (4)	4.6% (4)	23.0% (20)	12.6% (11)	13.8% (12)	41.4% (36)	87

10. To what extent does your FIC project overcome or lessen any of these (or other) barriers to research collaboration with the UK?							
	5 "to a great extent"	4	3	2	1 "not at all"	0 (not a barrier)	Response Total
Regulatory issues (e.g. regulation of technology imports and exports)	6.9% (6)	5.7% (5)	18.4% (16)	9.2% (8)	16.1% (14)	43.7% (38)	87
Local conditions (e.g. poor communications or transport infrastructure, cultural / social factors, political instability, etc.)	4.6% (4)	9.2% (8)	23.0% (20)	6.9% (6)	19.5% (17)	36.8% (32)	87
Barriers to mobility and recruitment (e.g. visa requirements for visitors and staff)	3.4% (3)	10.3% (9)	20.7% (18)	10.3% (9)	20.7% (18)	34.5% (30)	87
Language / communication issues	4.7% (4)	8.1% (7)	24.4% (21)	9.3% (8)	11.6% (10)	41.9% (36)	86
Other	1.6% (1)	0.0% (0)	11.5% (7)	0.0% (0)	9.8% (6)	77.0% (47)	61
						answered	88
						skipped	3

Your project and activities

11. How many project participants from your organisation / department (if any) have taken part in 'Staff exchange and secondments' to the UK so far? Please state the numbers according to the duration of the exchange / secondment. [We understand that these activities may have been delayed due to COVID].			
		Percent	Number
1	More than six months	96.51%	83
2	Less than six months	96.51%	83
		answered	86
		skipped	5

12. To what extent have staff exchanges and secondments to the UK so far led to each of the following, in relation to your UK partner(s)? Please skip this question if no exchanges / secondments to the UK have taken place.				
	To a great extent	To some extent	Not at all / not yet	Response Total
An improved ability to work together	38.5% (20)	15.4% (8)	46.2% (24)	52
A better understanding of their capabilities	37.3% (19)	19.6% (10)	43.1% (22)	51
A better understanding of their research agendas / priorities	43.1% (22)	13.7% (7)	43.1% (22)	51
A better understanding of their ways of working	35.3% (18)	21.6% (11)	43.1% (22)	51
An increased likelihood of collaborating again in the future	45.1% (23)	11.8% (6)	43.1% (22)	51

12. To what extent have staff exchanges and secondments to the UK so far led to each of the following, in relation to your UK partner(s)? Please skip this question if no exchanges / secondments to the UK have taken place.				
	To a great extent	**To some extent**	**Not at all / not yet**	**Response Total**
The identification of further opportunities to collaborate	41.2% (21)	15.7% (8)	43.1% (22)	51
Advances in research / understanding, that would not have been possible otherwise	39.2% (20)	17.6% (9)	43.1% (22)	51
			answered	52
			skipped	39

Project progress

13. Overall, is the project progressing as expected?				
	Yes	**No – There are slight delays / issues**	**No – There are significant delays / issues**	**Response Total**
Is it on track to complete on time (according to the currently approved timetable)?	45.5% (40)	42.0% (37)	12.5% (11)	88
Is it on track to achieve its objectives?	66.3% (57)	25.6% (22)	8.1% (7)	86
			answered	88
			skipped	3

14. Has the coronavirus pandemic impacted your project in any of the following ways? [Tick all that apply]				
			Percent	**Number**
1	Delayed the start of the project		29.21%	26
2	Generated a delay to planned activities		70.79%	63
3	Led to a request for an extension on the project deadlines		51.69%	46
4	Led to a change in the thematic focus of the project		6.74%	6
5	Led to a change in partners		6.74%	6
6	Made us re-cast the mode of implementation of some of the originally planned activities (from face-to-face to online)		52.81%	47
7	Made us cancel some originally planned activities		51.69%	46
8	Made the overall (international) collaboration more difficult / challenging		52.81%	47
9	None of the above		6.74%	6
10	Other (please specify):		10.11%	9
			answered	89
			skipped	2
Other (please specify): (9)				

15. Could you please elaborate on any issues or delays encountered (cause and implications)?			
		Percent	Number
1	Open-Ended Question	100.00%	62
		answered	62
		skipped	29

Emerging results from the projects

16. How would you rate your skills and capabilities in relation to working collaboratively in international teams, before the FIC project and now? Use a scale from 1 to 5, where 5 is "excellent" and 1 is "poor". If there has been no change so far, please enter the same number in both columns.			
	At the point of application	Current position	Response Total
Ability to access new or better knowledge from overseas	50.0% (87)	50.0% (87)	174
Ability to access new or better facilities, tools and techniques from overseas	50.0% (87)	50.0% (87)	174
Ability to navigate different working and research cultures	50.0% (87)	50.0% (87)	174
Ability to identify sources of funding internationally	50.0% (86)	50.0% (86)	172
Overall ability to work collaboratively in international teams	50.0% (87)	50.0% (87)	174
		answered	87
		skipped	4

17. Do you currently have any examples of significant discoveries and advances in understanding supported by the FIC project? If so, could you briefly describe below?			
		Percent	Number
1	Open-Ended Question	100.00%	53
		answered	53
		skipped	38

18. Do you currently have any examples of results from the FIC project being taken up and used beyond the project (either by your organisation or others)? If so, could you briefly describe below?			
		Percent	Number
1	Open-Ended Question	100.00%	46
		answered	46
		skipped	45

19. How important has collaboration with the UK in this project been to the achievement of R&I outputs (increased TRL, publications, new / improved products, significant discoveries, etc.)?				
			Percent	Number
1	Critical		50.00%	44
2	Moderately important		35.23%	31
3	Slightly important		6.82%	6
4	Not at all		2.27%	2
5	N/a – no outputs achieved so far		5.68%	5
			answered	88
			skipped	3

Wider opportunities

20. Excluding this FIC project, please estimate the following:(If you are unable to provide an estimate, please enter 'don't know')			
	In the year before this application	After the FIC project was awarded	Response Total
The number of research proposals that your organisation or university department submitted with your UK partner organisations / university departments from the FIC project	50.3% (81)	49.7% (80)	161
The number of research proposals that your organisation or university department submitted with other UK partner organisations / university departments (not those in the FIC project)	50.3% (81)	49.7% (80)	161
		answered	83
		skipped	8

21. Thinking about the call / competition as a mechanism to support international collaboration, to what extent do you agree or disagree with the following statements? This call / competition...						
	Strongly agree	Agree	Neither agree nor disagree	Disagree Strongly disagree	Don't know / Not applicable	Response Total
... offers a unique opportunity to strengthen linkages with UK partners	69.3% (61)	28.4% (25)	1.1% (1)	1.1% (1)	0.0% (0)	88
... offers a unique opportunity to explore areas of common interest with UK partners	68.2% (60)	27.3% (24)	4.5% (4)	0.0% (0)	0.0% (0)	88
... has led to the identification of wider research opportunities with the UK	48.8% (42)	44.2% (38)	5.8% (5)	1.2% (1)	0.0% (0)	86
... has led to the identification of wider commercial opportunities with the UK	17.2% (15)	17.2% (15)	39.1% (34)	6.9% (6)	19.5% (17)	87
					answered	88
					skipped	3

22. If relevant, could you please provide an example on how participation in the FIC project has led to the identification of wider research or commercial opportunities with the UK?			
		Percent	Number
1	Open-Ended Question	100.00%	35
		answered	35
		skipped	56

23. What additional support would be needed to further strengthen and develop your relationship with the UK partner organisations and university departments involved in your FIC project, after the project ends?			
		Percent	Number
1	Open-Ended Question	100.00%	56
		answered	56
		skipped	35

Final remarks

24. Do you have any other comments you would like to make?			
		Percent	Number
1	Open-Ended Question	100.00%	29
		answered	29
		skipped	62

25. Would you be by happy to be contacted by a member of the study team to explore your answers further?				
			Percent	Number
1	Yes		50.56%	45
2	No		49.44%	44
			answered	89
			skipped	2

26. Would you be happy for us to share your responses with UKRI?				
			Percent	Number
1	Yes		86.52%	77
2	No		13.48%	12
			answered	89
			skipped	2

I.4 Unsuccessful UK applicants

Introduction

1. Please could you copy or type the name of that programme here for our reference:			
		Percent	Number
1	Open-Ended Question	100.00%	145
		answered	145
		skipped	1

2. Before proceeding, please read the information below on 'confidentiality and data' and indicate that you give consent to the following statement concerning the use of your data.			
		Percent	Number
1	I give consent for my response to this questionnaire to be processed and used according to the assurances on confidentiality and data provided in the box below.	100.00%	146
		answered	146
		skipped	0

Your organisation

3. What type of organisation is this? [Tick the option that best describes your organisation]			
		Percent	Number
1	Micro business (less than 10 employees)	4.14%	6
2	Small- or medium-sized business (more than 10 and less than 250 employees)	3.45%	5
3	Large business (more than 250 employees)	2.76%	4
4	University	85.52%	124
5	Public Research Organisation	2.76%	4
6	Other (please specify):	1.38%	2
		answered	145
		skipped	1
Other (please specify): (2)			

Your experience submitting your application

4. To what extent were you satisfied with each of the following aspects of the application process?							
	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Don't know / Not applicable	Response Total
The information provided in the call for proposals regarding requirements and the application process	9.7% (14)	57.2% (83)	19.3% (28)	9.0% (13)	4.1% (6)	0.7% (1)	145
The time available between the call for	9.7% (14)	49.0% (71)	22.8% (33)	13.1% (19)	5.5% (8)	0.0% (0)	145

4. To what extent were you satisfied with each of the following aspects of the application process?							
	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Don't know / Not applicable	Response Total
proposals and the deadline for submissions							
The time taken between application submission and notification of results	4.2% (6)	41.0% (59)	31.3% (45)	16.0% (23)	7.6% (11)	0.0% (0)	144
The feedback provided on your application	2.1% (3)	13.9% (20)	11.8% (17)	34.7% (50)	34.7% (50)	2.8% (4)	144
						answered	145
						skipped	1

5. Were there any aspects of the application process that worked particularly well (compared with other experiences)? Please briefly explain			
		Percent	Number
1	Open-Ended Question	100.00%	79
		answered	79
		skipped	67

6. Were there any particularly challenging aspects to the application process (compared with other experiences)? Please briefly explain			
		Percent	Number
1	Open-Ended Question	100.00%	110
		answered	110
		skipped	36

Your partnership

7. How many other organisations (or university departments) were involved in your FIC application (other than your own)?			
		Percent	Number
1	Open-Ended Question	100.00%	144
		answered	144
		skipped	2

8. Please use the table below to indicate: How many of these organisations (or university departments) are based in the UK or overseas, as well as The number that your organisation (or university department) had collaborated with prior to this application. [Note, the four numbers should sum to the total figure given above. If you are unable to provide an estimate, please enter 'Don't know'] Your overseas partner organisations / university departments...			
	UK-based partner	**Overseas partner**	**Response Total**
Existing partner (i.e. those that your organisation / university department had collaborated in an R&I project with before this application)	49.7% (87)	50.3% (88)	175
New partner (i.e. those that your organisation / university department had not collaborated in an R&I project with before this application)	36.7% (69)	63.3% (119)	188
		answered	143
		skipped	3

Your overseas partner organisations

9. To what extent do you agree or disagree with the following statements about the motivations for working with these particular overseas partners?							
	Strongly agree	**Agree**	**Neither agree nor disagree**	**Disagree**	**Strongly disagree**	**Don't know / n/a**	**Response Total**
One or more of these partners have access to knowledge and expertise that is critical in pursuing the project objectives	69.0% (100)	26.2% (38)	1.4% (2)	1.4% (2)	1.4% (2)	0.7% (1)	145
One or more of these partners have access to research infrastructure that is critical in pursuing the project objectives	47.6% (68)	32.9% (47)	14.0% (20)	2.1% (3)	1.4% (2)	2.1% (3)	143
One or more of these partners have access to contacts, networks and markets that are of interest to my organisation	50.3% (73)	33.1% (48)	12.4% (18)	1.4% (2)	2.1% (3)	0.7% (1)	145
Partnering in this project provides a good opportunity to understand how to collaborate in the future	53.8% (78)	30.3% (44)	9.0% (13)	2.8% (4)	1.4% (2)	2.8% (4)	145
						answered	145
						skipped	1

International collaboration

10. Please indicate the extent to which each of the following areas act as barriers to international research collaboration (in general).								
	5 "critical barrier"	**4**	**3**	**2**	**1**	**0 "not a barrier at all"**	**Do not know**	**Response Total**
Financial considerations (e.g. limited funding available to under-write cost of developing	47.9% (69)	24.3% (35)	14.6% (21)	6.3% (9)	4.2% (6)	2.8% (4)	0.0% (0)	144

10. Please indicate the extent to which each of the following areas act as barriers to international research collaboration (in general).								
	5 "critical barrier"	**4**	**3**	**2**	**1**	**0 "not a barrier at all"**	**Do not know**	**Response Total**
relationships, affordability of maintaining collaborations, high transaction costs)								
Internal resources (e.g. shortage of people with the right skills to set up and operate such international research and innovation activities)	8.4% (12)	18.2% (26)	21.7% (31)	23.8% (34)	12.6% (18)	14.0% (20)	1.4% (2)	143
Information about overseas actors and markets (e.g. limited knowledge about which international organisations might be willing to collaborate; uncertainty about their capabilities / excellence)	10.4% (15)	14.6% (21)	29.9% (43)	19.4% (28)	9.7% (14)	14.6% (21)	1.4% (2)	144
Collaboration frameworks (e.g. lack of international funding frameworks, bureaucratic and complex funding mechanisms)	47.2% (68)	23.6% (34)	14.6% (21)	6.9% (10)	4.9% (7)	2.8% (4)	0.0% (0)	144
Recognition of intellectual property rights	1.4% (2)	3.5% (5)	21.5% (31)	24.3% (35)	14.6% (21)	29.9% (43)	4.9% (7)	144
Enforcement of intellectual property rights	2.1% (3)	4.2% (6)	19.7% (28)	21.8% (31)	16.2% (23)	27.5% (39)	8.5% (12)	142
Regulatory issues (e.g. regulation of technology imports and exports)	2.8% (4)	10.6% (15)	16.2% (23)	14.8% (21)	14.1% (20)	29.6% (42)	12.0% (17)	142
Local conditions (e.g. poor communications or transport infrastructure, cultural / social factors, political instability, etc.)	2.1% (3)	6.9% (10)	15.3% (22)	15.3% (22)	19.4% (28)	38.9% (56)	2.1% (3)	144
Barriers to mobility and recruitment (e.g. visa requirements for visitors and staff)	7.7% (11)	11.2% (16)	23.1% (33)	16.1% (23)	14.7% (21)	21.7% (31)	5.6% (8)	143
Language / communication issues	3.5% (5)	6.9% (10)	9.7% (14)	25.0% (36)	12.5% (18)	41.7% (60)	0.7% (1)	144
Other	3.0% (2)	3.0% (2)	9.1% (6)	1.5% (1)	1.5% (1)	21.2% (14)	60.6% (40)	66
							answered	144
							skipped	2

Your follow-up activities

11. What has happened with your FIC application idea in the absence of the UKRI funding? [You can select more than one option]				
			Percent	Number
1	We have continued with the project idea, via other means, and with the same overseas partners		11.89%	17
2	We have continued with the project idea, via other means, but with additional overseas partners		5.59%	8
3	We have continued with the project idea, via other means, but with fewer overseas partners		2.80%	4
4	We have continued with the project idea, via other means, but with no overseas partners		9.79%	14
5	We have continued with the project idea, via other means, but with a different scale, scope and / or timetable		18.88%	27
6	We have not continued with the project idea		58.74%	84
7	Other (please specify):		12.59%	18
			answered	143
			skipped	3
Other (please specify): (18)				

Wider opportunities

12. Excluding this FIC application, please estimate the following:(If you are unable to provide an estimate, please enter 'don't know')			
	In the year before this application	After this application was unsuccessful	Response Total
The number of research proposals that your organisation or university department submitted with your overseas partner organisations / university departments from the FIC application	51.4% (126)	48.6% (119)	245
The number of research proposals that your organisation or university department submitted with other overseas partner organisations / university departments (not those in the FIC application)	51.5% (118)	48.5% (111)	229
		answered	130
		skipped	16

13. In each case, could you estimate the overall value of the grants awarded to UK partners of the proposals (above) that have gone on to be awarded funding?			
	In the year before application	After this application was unsuccessful	Response Total
Value to UK partners of successful proposals submitted with overseas partners organisations / university departments from the FIC application	52.8% (95)	47.2% (85)	180

13. In each case, could you estimate the overall value of the grants awarded to UK partners of the proposals (above) that have gone on to be awarded funding?			
	In the year before application	After this application was unsuccessful	Response Total
Value to UK partners of successful proposals submitted with other overseas partners organisations / university departments (not those in the FIC application)	52.3% (92)	47.7% (84)	176
		answered	96
		skipped	50

Additional company characteristics

14. In which sector is your company mainly active?				
			Percent	Number
1	Agriculture, Forestry and Fishing		0.00%	0
2	Mining and Quarrying		0.00%	0
3	Manufacturing		20.00%	3
4	Electricity, Gas, Steam and Air Conditioning Supply		13.33%	2
5	Water Supply, Sewerage and Waste Management		0.00%	0
6	Construction		0.00%	0
7	Wholesale and Retail Trade		0.00%	0
8	Transport and storage		6.67%	1
9	Accommodation and Food Service Sector		0.00%	0
10	Information and Communications		0.00%	0
11	Financial and Insurance Activities		0.00%	0
12	Real Estate Activities		0.00%	0
13	Professional, Scientific and Technical Activities		40.00%	6
14	Administrative and Support Service Activities		0.00%	0
15	Public Administration and Defence		0.00%	0
16	Education		0.00%	0
17	Human Health and Social Work Activities		0.00%	0
18	Arts, Entertainment and Recreation		6.67%	1
19	Other Service Activities		13.33%	2
20	Activities of Households as Employers		0.00%	0
21	Extraterritorial Organisations		0.00%	0
22	Don't know		0.00%	0
			answered	15
			skipped	131

15. Was your company established				
			Percent	Number
1	… before the 2018/19 financial year?		73.33%	11
2	… during the 2018/19 financial year		0.00%	0
3	… or after the 2018/19 financial year?		26.67%	4
			answered	15
			skipped	131

16. How many full-time equivalent staff did your company employ in total including yourself?			
	In the 2018/19 financial year, prior to your FIC application	In 2019/20	Response Total
None	100.0% (2)	0.0% (0)	2
1 to 3	57.1% (4)	42.9% (3)	7
4 to 9	33.3% (1)	66.7% (2)	3
10 to 49	33.3% (2)	66.7% (4)	6
50 to 249	50.0% (2)	50.0% (2)	4
250 to 499	50.0% (1)	50.0% (1)	2
500 to 999	50.0% (1)	50.0% (1)	2
1,000+	50.0% (1)	50.0% (1)	2
Don't know	50.0% (1)	50.0% (1)	2
		answered	15
		skipped	131

17. What was your company's approximate turnover…?			
	… in the 2018/19 financial year, prior to your FIC application?	… in 2019/20?	Response Total
Zero – no turnover	66.7% (4)	33.3% (2)	6
Less than £50,000 but not zero	25.0% (1)	75.0% (3)	4
£50,000 to less than £100,000	100.0% (1)	0.0% (0)	1
£100,000 to less than £500,000	33.3% (1)	66.7% (2)	3
£500,000 to less than £2 million	0.0% (0)	100.0% (1)	1

17. What was your company's approximate turnover…?			
	… in the 2018/19 financial year, prior to your FIC application?	… in 2019/20?	Response Total
£2 million to less than £10 million	50.0% (3)	50.0% (3)	6
£10 million to less than £50 million	50.0% (1)	50.0% (1)	2
£50 million or more	50.0% (1)	50.0% (1)	2
Don't know	66.7% (2)	33.3% (1)	3
		answered	14
		skipped	132

Final remarks

18. Do you have any other comments you would like to make?			
		Percent	Number
1	Open-Ended Question	100.00%	84
		answered	84
		skipped	62

Appendix J Indicator framework

The tables below provide the list of **indicators (and data sources)** that the evaluation is employing to assess FIC processes and provide evidence of achievement.

Specifically, Table 26 presents each of the subsidiary questions for the process evaluation, along with a list of relevant data sources and methods that will be used to provide an answer in each case. Table 27 (for the Fund) and Table 28 (for programmes/projects) then concern the impact evaluation and list all of the individual outputs and outcomes identified within the Logic Model and described in the Theory of Change. For each, a series of indicators are then listed, along with the relevant sources of data. Indicators for intended impacts are not included, as they are expected to emerge beyond the life of the evaluation and also prove very difficult to attribute to FIC. Instead, the indicators of output and outcome achievement should provide evidence with which to assess progress towards/prospects of realising longer-term impacts and objectives.

Individual indicators are labelled (where relevant) as to whether they relate to Academic [A] or Business [B] participants, or both. Those indicators where a counterfactual will be possible are marked [C]. Some indicators are not relevant at this early stage of FIC programme / project implementation, but will be assessed in future phases of the evaluation.

J.1 Process evaluation

Table 26 Approach to addressing the process evaluation questions

Sub-question	Methods/sources	Section in Main findings report
Assessment across the full FIC process		
1. What are the views of the different stakeholders involved on what is working more or less well regarding the delivery and implementation of the Fund and FIC programmes?	• Interviews (FIC team, Unsuccessful programme leads, Overseas agencies) • Workshops (International Committee, Programme leads) • Surveys (successful and unsuccessful UK applicants, International participants) • Case studies	• Section 2.6- 2.11 (Process) • Section 3.7 (Impact)
2. What were the unexpected facilitators or barriers to implementing and delivering FIC, if any (e.g. data sharing)?	• Interviews (FIC team, Programme leads, Overseas agencies) • Workshops (International Committee, Programme leads) • Surveys (successful and unsuccessful UK applicants, International participants) • Case studies	• Section 2.6-2.11 (Process) • Section 3.7 (Impact)
Specific aspects within the FIC process		
3a. In allocating FIC funding to specific R&I activities, how did UKRI use/interpret the overarching objectives of FIC to identify what internationally-collaborative R&I proposals were of highest priority? 3b. Was this approach to allocating FIC funding a success, in terms of maximising the impact of FIC?	• Desk review (Fund management information, Programme/project data) • Interviews (FIC team, Unsuccessful programme leads) • Workshops (International Committee, Programme leads)	• Section 2.7 (Process) • Section 3.4-3.13 (Impact)
4a. To what extent have targets for FIC's expenditure profile been met? 4b. If delays to the release of funding occurred, why? 4c. What has been the impact of the delays?	Desk review (Business case, Fund management information, FIC tracker) • Interviews (FIC team) • Workshops (Programme leads) • Case studies	• Section 2.2, 2.5 and 2.12 (Process)
5. To what extent did the timing and amount spent in the two Waves affect the ability to deliver the best quantity and quality of programmes for the FIC portfolio?	• Desk review (Fund management information, Additional question in FIC tracker) • Interviews (Unsuccessful programme leads) • Workshops (Programme leads) • Surveys (Successful UK applicants)	• Section 2.6 (Process) • Section 3.3 (Impact)

Sub-question	Methods/sources	Section in Main findings report
6a. To what extent has FIC succeeded in leveraging additional third-party investment and partner commitment (from the various organisations involved in the UK and overseas)? How much has materialised? 6b. Where funding/commitment has materialised, how was this achieved? 6c. If funding/commitment has not materialised, why not? 6d. Was awareness of by organisations in the UK and overseas a necessary part of the process, or would it have happened anyway?	Desk review (Fund management information, Programme/project data) • Workshops (Programme leads, International committee) • Interviews (Overseas agencies, FIC team) • Surveys (Successful UK applicants) • Case studies	• Section 3.2 (Impact)
Potential lessons		
7. What potential lessons are there for future Waves/similar funds?	• Evidence collated in answering the previous questions • Views and reflections from discussions with the UKRI study team	• Section 4 (conclusions and recommendations)

J.2 Impact evaluation

Table 27 Fund level (Tier 1) Indicators and data sources

		Indicators/Metrics **[A] Academics, [B] Businesses; [C] Counterfactual** **[B] Benchmarking with UK or UKRI Councils figures**	**Data sources**	**Sections in Main findings report**
Outputs				
Monitoring and evaluation results	1	Assessment of whether the M&E system is fit for purpose (i.e. providing a timely overview of programme situation, to take action; a good review of risks and mitigation strategies; a sufficient level of detail; mechanisms for sharing/learning/feedback)	Desk review (Fund management information), Interviews & Workshops (FIC team, International Committee, Programme leads (Councils))	• Section 2.10 (Process)
Improved access to international collaboration funding (addressing unmet demand)	2	Proportion of international project proposals put to UKRI Councils that meet quality threshold but are not funded	Desk review (Business Case), Secondary Data (GtR/JeS)	• Section 3.3 (impact) (exercise focuses on funding available through UKRI, plus unmet demand from FIC)
	3	Number and value of proposals above threshold but unfunded, FIC vs other similar schemes/grants (demand)	Secondary Data (GtR/JeS)	• Section 3.3 (impact) (FIC only)
	4	Number and % of grants (and grant value) awarded by UKRI with at least one international project partner, FIC vs UKRI overall, all countries vs FIC priority countries	Secondary Data (GtR/JeS)	• Section 3.3 (impact)
	5	Assessment of programme selection criteria and whether this is geared towards funding international collaboration proposals (in areas of mutual interest and benefit)	Desk review (Fund management information), Workshops with programme leads (Councils), Interviews with unsuccessful programme leads	• Section 2.7 (process)
	6	Assessment of additionality of the programme (FIC programme scores on the essential criteria of 'additionality, beyond existing international collaborations funded from core budgets')	Desk review (Fund management information)	• Section 2.7 (process)
	7	Views of Councils & Programme Leads on the additionality of the Fund (in terms of access to funding, duration, type and location of partners)	Workshops with programme leads (Councils), Interviews (Unsuccessful programme leads, Overseas funding agencies), Case studies (incl. interviews)	• Section 3.2-3.3 (impact)
	8	Views on the advantages, complementarities, synergies and overlaps between FIC and alternative funding for international collaboration	Interviews (FIC team, Unsuccessful programme leads, Overseas funding agencies) & Workshops (International Committee, Programme leads (Councils)), Case studies, Surveys (all)	• Section 3.2-3.3 (complemented with data on H2020)

		Indicators/Metrics **[A] Academics, [B] Businesses; [C] Counterfactual** **[B] Benchmarking with UK or UKRI Councils figures**	**Data sources**	**Sections in Main findings report**
	9	Views of project participants on the additionality of the Fund (access to funding, duration, type and location of partners)	Surveys (Successful UK applicants, Unsuccessful UK applicants, International FIC participants)	• Section 3.6-3.7 (impact)
Increased cross-Council workings (UKRI)	10	Number of FIC programmes involving more than one Council, and comparison with other NPIF investments (using publicly available data) [B]	Desk review (Fund management information)	• Section 2.9 (impact) (FIC only)
Match funding from FIC international partners (funders)	11	Value of match funding from FIC international partners (funders) *(Note: The Fund has not set a target for this value. Furthermore, the ability to attract match funding was stated as an assumption in the FIC Business Case, hence this should be considered as an output.])*	Desk review (Fund management information), Case studies (incl. interviews)	• Section 3.2 (impact)
Newly established/ strengthened partnerships (incl. those established at the proposal stage), among participant funders	12	Examples of newly established/strengthened partnerships (including those established at the proposal stage), among participant funders	Interviews (Unsuccessful programme leads, Overseas funding agencies) & Workshops (Programme leads (Councils)), Case studies (incl. interviews)	• Section 3.4 (impact)
Outcomes		**Indicator**	**Sources**	
Improved evidence base on: • What works in international collaboration funding • Criteria for targeting/encouraging international collaboration • Areas of strategic interest and alignment	13	Lessons learned as reported by the FIC team, international committee, programme leads, international partners and FIC project participants (from proposals submitted, selection process, progress tracking, risk assessment and this evaluation)	Interviews (FIC team, Overseas funding agencies) & Workshops (International Committee, Programme leads (Councils)), Case studies (incl. interviews), Surveys (Successful UK applicants, International FIC participants)	• Section 4 (recommendations)
	14	Extent to which learning from FIC have informed further iterations of the programme or similar interventions	Interviews (FIC team, Overseas funding agencies) & Workshops (International Committee, Programme leads (Councils))	• Not applicable (to be included in future iterations once funding decisions are taken)
Improved cross-Council relationships	15	Views on added value of FIC in terms of encouraging cross-Council relationships (better understanding of modes of working, priorities/agendas, culture)	Interviews (FIC team, Unsuccessful programme leads) & Workshops (International Committee, Programme leads (Councils))	• Section 2.9 (process)
Improved relationships between UKRI Councils and international funders involved in FIC programmes: Relationships >	16	Number of MoUs between UK funders and partner organisations (with FIC partner countries vs others) [C] (and assessment of FIC contribution)	Desk review (Additional question in FIC tracker), Workshop (International Committee), Case studies (incl. interviews)	• Section 3.4 (impact)
	17	Number of joint documents between UK funders and partner organisations (Bilateral Strategies, other) (and assessment of FIC contribution)	Desk review (Additional question in FIC tracker), Workshop (International Committee), Case studies (incl. interviews)	• Section 3.4 (impact) (assessment of FIC contribution to be explored

		Indicators/Metrics [A] Academics, [B] Businesses; [C] Counterfactual [B] Benchmarking with UK or UKRI Councils figures	Data sources	Sections in Main findings report
Agreements/MoUs > Bilateral strategies				in next iterations of the study)
	18	Number and value of joint programmes between UK funders and partner organisations, and specific examples [C] (and assessment of FIC contribution)	Desk review (Additional question in FIC tracker), Workshop (International Committee), Case studies (incl. interviews)	• No evidence / examples found yet (to be further explored in the next iterations of the study)
	19	Views of Councils & programme leads on extent of improved relationships with funders in partner countries (and vice versa)	Interviews (Overseas funding agencies) & Workshops (Programme leads (Councils)), Case studies (incl. interviews)	• Section 3.4 (impact)
	20	Examples of (evolution of) relationships between Councils and funders in partner countries, and narrative about its importance and significance	Interviews (FIC team, Overseas funding agencies) & Workshops (International Committee, Programme leads (Councils)), Case studies (incl. interviews)	• Section 3.4 (impact)
Development of new or enhanced partnerships between the UK and partner countries (more widely) [i.e. spillover benefits]	21	Share of international co-publications (post-project completion) by UK sector (public and private) with partner countries, and comparison between the UK and the synthetic control group [A&B] [C] [B]	Bibliometric data	• Section 3.9 (impact)
	22	% of FIC participants that agree that FIC has led to the identification of wider opportunities in partner countries, and selected examples [A&B]	Surveys (Successful UK applicants, International FIC participants)	• Section 3.9 (impact)
Closer alignment/understanding of UK and partner countries R&I policies, strategies, priorities, plans and funding (at least among Funders)	23	Examples of mentions of partner countries/organisations within Council strategies, and evolution over time (before, during and after FIC)	Desk review (Council strategies), Case studies (incl. interviews)	• Section 3.4 (impact)
	24	Views of Councils, programme leads and overseas funding agencies on degree of alignment/understanding of UK and partner countries' R&I policies, strategies, priorities, plans and funding	Interviews (Overseas funding agencies) & Workshops (Programme leads (Councils)), Case studies (incl. interviews)	• No evidence / examples found yet (to be further explored in the next iterations of the study)
	25	Views of Councils, programme leads and overseas funding agencies on their increased ability to identify strategic opportunities for collaboration	Interviews (Overseas funding agencies) & Workshops (Programme leads (Councils)), Case studies (incl. interviews)	• Section 3.5 (impact)
Improved visibility and recognition among international funders involved in FIC programmes (of UK R&I capabilities and of the UK as partner of choice or destination of choice for talent/investment)	26	Views of partner-country funders on the UK's capability (relevance, quality, openness) and on the UK as partner of choice	Interviews (Overseas funding agencies), Case studies (incl. interviews)	• Section 3.6 (impact)

Table 28 FIC project level (Tier 2) indicators and data sources

		Indicators/Metrics **[A] Academics, [B] Businesses ; [C] Counterfactual** **[B] Including Benchmarking with UK or UKRI Councils figures**	**Data sources**	**Sections Main Findings report**
Outputs				
New research proposals	27	Number of international collaboration proposals submitted to other programmes (not FIC) by FIC participants, with and without FIC partners, during and after FIC project [A&B] [C]	Surveys (Successful UK applicants, Unsuccessful UK applicants, International FIC participants)	• Section 3.12 (impact)
Newly established/ strengthened partnerships (incl. those established at the proposal stage), among participant individuals and organisations	28	Number of FIC participants collaborating with a new partner organisation for first time and comparison with similar international programmes (e.g. FP7) [A&B][B]	Surveys (Successful UK applicants, Unsuccessful UK applicants, International FIC participants)	• Section 3.8 (impact)
	29	Number of organisations collaborating for first time [A&B]	Secondary Data (GtR/JeS)	• Section 3.8 (impact)
	30	[Network analysis] Change in international collaboration network of FIC participants, before and during FIC project (organisations and individuals) [to show shifts in target country, volume] [A&B]	Bibliometric data	• Not applicable (baseline data collected and presented in Section 3.10)
	31	Number and share of UK FIC participants' publications that have at least one co-author from a FIC priority country, before and during FIC project [A&B]	Bibliometric data	• Not applicable (baseline data collected and presented in Section 3.10)
	32	% of FIC participants that agree that FIC has led to: Better understanding of collaborators' capabilities; Ability to work better together; Increase likelihood of collaborating in the future; Identification of new opportunities to collaborate [A&B]	Surveys (Successful UK applicants, Unsuccessful UK applicants, International FIC participants)	• Section 3.9 (impact)
	33	Examples of newly established/strengthened partnerships [A&B]	Interviews (FIC team, Overseas funding agencies) & Workshops (International Committee, Programme leads (Councils)), Case studies (incl. interviews), Surveys (Successful UK applicants, International FIC participants)	• Section 3.8 (impact)
UK personnel with experience of R&I international collaboration (and vice versa)	34	[Network analysis] Change in international collaboration network of FIC participants, before and during FIC project (individuals only) [to show shifts in target country, volume] [A&B] [C]	Bibliometric data	• Not applicable (baseline data collected and presented in Section 3.10)
	35	Share of mobility (i.e. researchers moving across borders) during funding (relative to before funding), by career stage (approximated by year of 1st paper in Scopus). (Analysis to include: mobility from the UK to partner countries and vice	Bibliometric data	• Not applicable (baseline data collected and presented in Section 3.10)

		Indicators/Metrics [A] Academics, [B] Businesses ; [C] Counterfactual [B] Including Benchmarking with UK or UKRI Councils figures	Data sources	Sections Main Findings report
		versa. And comparison between FIC-specific vs UK.) [A] [C] [B]		
	36	Number of FIC programmes/projects that include secondments or staff exchange	Desk review (Programme Project data), Secondary Data (Researchfish)	• To be further explored in the next iterations of the study
	37	Number of FIC participants that took part in secondments or staff exchange, overall and more than 6 months [A&B]	Surveys (Successful UK applicants, Unsuccessful UK applicants, International FIC participants)	• To be further explored in the next iterations of the study
	38	% of FIC participants that agree that secondment or staff exchange has led to: Better understanding of collaborators' capabilities; Ability to work better together; Increase likelihood of collaborating in the future; Identification of new opportunities to collaborate [[A&B]	Surveys (Successful UK applicants, International FIC participants)	• To be further explored in the next iterations of the study
	39	Number of FIC participants that participated in international events organised by the FIC programme (seminars, workshops, conferences, either f2f or virtual) [A&B]	Surveys (Successful UK applicants, Unsuccessful UK applicants, International FIC participants)	• To be further explored in the next iterations of the study
New knowledge and understanding created/ published (from R&I activities) Other R&I outputs (skills/ capability development; patents; TRL progression, new/enhanced products, services, processes; spin-offs, etc.)	40	Share of international co-publications by UK sector (public and private) with FIC partner countries (FIC-specific vs UK overall) [A&B] [C] [B]	Bibliometric data	• Not applicable (baseline data collected and presented in Section 3.10)
	41	Share of international co-publications by UK sector (public and private) with FIC partner countries, and comparison between the UK and the synthetic control group [A&B] [C]	Bibliometric data	• Not applicable (baseline data collected and presented in Section 3.10)
	42	Citation distribution index of international co-publications by UK sector (public and private) with FIC partner countries (FIC-specific vs UK overall) [A&B] [C] [B]	Bibliometric data	• To be further explored in the next iterations of the study
	43	Citation distribution index of international co-publications by UK sector (public and private) with FIC partner countries, and comparison between the UK and the synthetic control group [A&B] [C] [B]	Bibliometric data	• To be further explored in the next iterations of the study
	44	% of FIC participants that agree that FIC has led to: Better understanding of collaborators' capabilities [A&B]	Surveys (Successful UK applicants, International FIC participants)	• Section 3.9 (impact)
	45	Examples of discoveries and advances in understanding [A&B]	Interviews (Overseas funding agencies) & Workshops (Programme leads (Councils)), Case studies (incl. interviews), Surveys (Successful UK applicants, International FIC participants), Secondary Data (Researchfish)	• Section 3.10 (early examples, to be further explored in the next stages of the study)

		Indicators/Metrics [A] Academics, [B] Businesses ; [C] Counterfactual [B] Including Benchmarking with UK or UKRI Councils figures	Data sources	Sections Main Findings report
	46	FIC participants scoring against skills and capabilities of working collaborative in international teams. Likert Scale 1-5, before and after FIC [A&B] [C]	Surveys (Successful UK applicants, Unsuccessful UK applicants, International FIC participants)	• Section 3.8 (impact)
	47	Number of new or enhanced products, process or services [A&B][C][B]	Survey (Successful UK applicants), Secondary Data (Researchfish)	• Section 3.10 (impact)
	48	Average TRL progression (in FIC projects) [C] [A&B]	Surveys (Successful UK applicants, Unsuccessful UK applicants)	• Section 3.10 (impact)
	49	Research databases and models developed (as reported in Researchfish) [A] [C][B]	Secondary Data (Researchfish)	• Section 3.10 (impact)
	50	Research tools and methods developed (as reported in Researchfish) [A] [B]	Secondary Data (Researchfish)	• Section 3.10 (impact)
	51	Number of patents published, patents granted, trademarks and/or copyrighted (e.g. software)[A&B] [C][B]	Surveys (Successful UK applicants, Unsuccessful UK applicants), Secondary Data (Researchfish)	• Section 3.10 (impact)
	52	Number of spin offs [A&B] [C][B]	Surveys (Successful UK applicants, Unsuccessful UK applicants), Secondary Data (Researchfish)	• Section 3.10 (impact)
	53	Examples of outstanding developments and its current and future potential impact [A&B]	Interviews (Overseas funding agencies) & Workshops (Programme leads (Councils)), Case studies (incl. interviews), Surveys (Successful UK applicants, International FIC participants)	• Section 3.10 (impact)
New/improved research infrastructure available	54	Views from STFC & NERC programme leads on improved access to research infrastructures funded by FIC	Workshops with programme leads (Councils)	• To be further explored in the next iterations of the study
	55	Number of UK users actively making use of the facilities funded by FIC, before and after FIC	Workshops with programme leads (Councils)	• To be further explored in the next iterations of the study
	56	Views on (and description of) improved capabilities related to research infrastructures funded by FIC	Workshops with programme leads (Councils), Surveys[180]	• To be further explored in the next iterations of the study

[180] We will also ask STFC programme leads for details of the researchers and innovators involved in STFC programmes. If these contacts can be obtained, or approached through STFC, then a shorter variant of the main participant survey could also be issued to these individuals.

		Indicators/Metrics [A] Academics, [B] Businesses ; [C] Counterfactual [B] Including Benchmarking with UK or UKRI Councils figures	Data sources	Sections Main Findings report
Outcomes		**Indicator**	**Sources**	
Additional funding leveraged from other sources beyond the programme (by FIC participants/projects)	57	Number of successful international collaboration proposals submitted to other programmes (not FIC) by FIC participants, with and without FIC partners, during and after FIC project [A&B] [C]	Surveys (Successful UK applicants, Unsuccessful UK applicants)	• Section 3.12 (impact)
	58	Value of equity deals (attracted by FIC participants), before and after FIC, and comparison with control group, and selected examples [B] [C]	Secondary Data (Pitchbook)	• Not applicable (information to be collected in next stages of study)
	59	Further investment in innovations/projects developed within FIC [B]	Case studies (incl. interviews), Surveys (Successful UK applicants, Unsuccessful UK applicants)	• Not applicable (information to be collected in next stages of study)
Continuation & further development (strengthening, deepening) of programme partnerships (for participating individuals/organisations)	60	[Network analysis] Change in international collaboration network of FIC participants, before and after FIC project (organisations and individuals) [to show shifts in target country, volume] [A&B]	Bibliometric data	• Not applicable (baseline data collected and presented in Section 3.10)
	61	Number and share of UK FIC participants publications that have at least one or more international co-author, before and after FIC project [A&B] [C]	Bibliometric data	• Not applicable (information to be collected in next stages of study)
	62	Number of international collaboration proposals submitted outside of FIC (by FIC participants), with FIC partners [A&B] [C]	Surveys (Successful UK applicants, Unsuccessful UK applicants, International FIC participants)	• Section 3.12 (impact)
	63	% of FIC participants that agree that FIC has led (after the project) to: Better understanding of collaborators' capabilities; Ability to work better together; Increase likelihood of collaborating in the future; Identification of new opportunities to collaborate [A&B]	Surveys (Successful UK applicants, Unsuccessful UK applicants, International FIC participants)	• Not applicable (information to be collected in next stages of study)
Further development of research and innovation conducted within FIC	64	Percentage of projects that have progressed in TRL after FIC , and average TRL progression [C]	Surveys (Successful UK applicants, Unsuccessful UK applicants)	• Section 3.10
	65	Turnover and valuation of spin-outs emerging from FIC, over time [A&B]	Secondary Data (Researchfish), Secondary Data (Pitchbook)	• Not applicable (information to be collected in next stages of study)
	66	Value of licenses from patents emerging from FIC, over time [A&B]	Secondary Data (Researchfish), Secondary Data (Pitchbook), Surveys (Successful UK applicants)	• Not applicable (information to be collected in next stages of study)

		Indicators/Metrics [A] Academics, [B] Businesses ; [C] Counterfactual [B] Including Benchmarking with UK or UKRI Councils figures	Data sources	Sections Main Findings report
	67	Examples of further development of research and innovation conducted within FIC [A&B]	Surveys (Successful UK applicants, International FIC participants)	• Not applicable (information to be collected in next stages of study)
Improved 'performance' of participating individuals and organisations (e.g. in terms of research quality, career progression or business performance)	68	Citation distribution index of international co-publications (post-project completion) by UK sector (public and private) with FIC partner countries (FIC-specific vs UK overall) [A&B] [C] [B]	Bibliometric data	• Not applicable (information to be collected in next stages of study)
	69	Citation distribution index of international co-publications (post-project completion) by UK sector (public and private) with FIC partner countries, and comparison between the UK and the synthetic control group [A&B] [C] [B]	Bibliometric data	• Not applicable (information to be collected in next stages of study)
	70	% of FIC participants that agree that FIC and their experience working with international teams had led to: promotion, permanent position (tenure), accelerated career progression, and selected examples [A] [C]	Surveys (Successful UK applicants, Unsuccessful UK applicants, International FIC participants)	• Section 3.8
	71	Turnover, before and after FIC, and comparison with control group [B] [C]	Surveys (Successful UK applicants, Unsuccessful UK applicants), Secondary Data (FAME)	• Not applicable (baseline data collected)
	72	Productivity before and after FIC, and comparison with control group [B] [C]	Surveys (Successful UK applicants, Unsuccessful UK applicants), Secondary Data (FAME)	• Not applicable (baseline data collected)
Improved visibility and recognition of the UK researchers/businesses (their capabilities, partnership potential) among participating individuals and organisations in partner countries	73	% of FIC participants that agree that their (FIC) project has contributed to them becoming: more likely to collaborate with UK based researchers, more aware of funding opportunities in the UK, more aware of UK research capabilities [A&B] (and examples)	Survey (International FIC participants)	• Section 3.9 (impact)
	74	Views/perceptions from international partner organisations of the UK as a R&I partner and of UK R&I capabilities, funding system, strategic priorities	Interviews (Overseas funding agencies) & Workshops (International Committee), Case studies (incl. interviews), Survey (International FIC participants)	• Section 3.9 (impact)
Closer alignment/ understanding of R&I policies, strategies, priorities, plans and funding between participating organisations	75	% of FIC participants that have become more aware of R&I policies, strategies, priorities, plans and funding in the UK and abroad [A&B] due to their participation in FIC (and examples)	Surveys (Successful UK applicants, Unsuccessful UK applicants, International FIC participants)	• Section 3.9 (impact)

		Indicators/Metrics [A] Academics, [B] Businesses ; [C] Counterfactual [B] Including Benchmarking with UK or UKRI Councils figures	Data sources	Sections Main Findings report
Increased mobility between the UK and partner countries (in relevant fields/sectors) outside of the programme	76	Share of mobility (i.e. researchers moving across borders) post project completion (relative to before funding), by career stage (approximated by year of 1st paper in Scopus). Cross-ref: mobility from partner countries. FIC-specific vs UK overall. Mobility from the UK partner countries and vice versa) [A] [C] [B]	Bibliometric data	• Not applicable (baseline data collected)
Diffusion and uptake of knowledge and innovation [i.e. spillover benefits]	77	Citations in patents of publications emerging from FIC [A&B]	Secondary Data (Lens)	• Not applicable (information to be collected in next stages of study)
	78	Examples of diffusion and uptake of knowledge and innovation emerging from FIC [A&B]	Interviews (FIC team, Overseas funding agencies) & Workshops (Programme leads (Councils)), Case studies (incl. interviews), Surveys (Successful UK applicants, International FIC participants)	• Not applicable (information to be collected in next stages of study)

technopolis group

www.technopolis-group.com