technopolis group

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Evaluation of the Fund for International Collaboration (FIC)

Final Evaluation Report

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Note to report:

The Department for Business, Energy and Industrial Strategy (BEIS) was dissolved on 7 February 2023, with its functions split into three new departments. Responsibility for R&I passed to the newly created Department for Science, Innovation and Technology (DSIT). For simplicity, the report refers to DSIT throughout, even though BEIS was the department responsible at the time of the Fund's establishment.

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Executive Summary

The Fund for International Collaboration (FIC): FIC was a UK Research and Innovation (UKRI) fund to develop strategic partnerships with global research and innovation (R&I) leaders and address a key gap in the national R&I funding portfolio. Its **high-level objectives** were:

1. To enable UK researchers and innovators to collaborate with the best international partners, to carry out world-leading R&I which delivers new knowledge and societal and economic impact to the mutual benefit of the UK and partner countries.
2. To support wider Government objectives, including science diplomacy.

The Fund awarded £160m to 37 programmes. These were then implemented by UKRI councils and Innovate UK, in various combinations, and in collaboration with overseas funding agencies from 26 different countries. A total of 571 grants were awarded by these FIC programmes, alongside several other investments (e.g. in infrastructure).

These programmes and projects are coming to an end; around 75% of programmes and 95% of projects will have finished by the end of 2024. FIC is now considered a '**legacy Fund**', following an announcement in 2022 that it, alongside the Global Challenges Research Fund (GCRF) and Newton Fund, would not be continued. The International Science Partnerships Fund (ISPF) was announced in December 2022, and could be considered a successor. It brings together both Official Development Assistance (ODA) and non-ODA funding for R&I under a single structure. This new initiative is funded by the Department for Science, Innovation and Technology (DSIT) and is delivered by a consortium of R&I bodies including UKRI.

This evaluation: In 2020 UKRI commissioned Technopolis to undertake an **evaluation of FIC**. The aims were: (i) to demonstrate what the Fund has delivered, (ii) to help build the evidence base on "what works" in internationally collaborative R&I, and (iii) to inform future initiatives.

The evaluation was asked to consider **three broad themes** to address the aims of the evaluation and to understand how effectively FIC has met its objectives:

£	**Theme 1: Enabling funding**	Reducing barriers for accessing and applying for international collaboration R&I funding.
	**Theme 2: Developing partnerships**	Enabling, strengthening, deepening and broadening relationships: within the UK and internationally; at all levels (funders, institutions, individuals); within and beyond FIC.
	**Theme 3: Deepening R&I**	Supporting R&I within new and existing areas of strategic importance across the UKRI international portfolio.

For each theme, and in line with our FIC Theory of Change, we covered **effects at two levels**:

Tier 1: At the level of programmes and funders (UKRI councils and their equivalents overseas)	**Tier 2: At the level of projects and participants (researchers and innovators)**

The study took place in four phases, from 2020 to 2024. This report is the main output from the fourth phase, **the final evaluation,** but also draws on key evidence from previous phases. The current phase employed a mix of research methods and evidence sources, including: bibliometrics; analysis of secondary data; consultation with 30 stakeholders via interview; a survey of UK leads for FIC programmes; surveys of 346 successful and unsuccessful UK applicants to FIC programmes, as well as international participants in UK-led grants; and the further development of seven longitudinal case studies that focus on the UK's evolving relationships with international funders across different countries that have partnered in FIC programmes.

Headline findings

Rationale and mechanism. There are different ways in which governments support international collaboration, and most countries have a varied portfolio of initiatives (from participation in international research infrastructures and multi-country R&I programmes, to the opening of national programmes to international participation). The premise is that international collaboration in R&I allows a country to tap into expertise and research capital elsewhere, expanding the frontier of what would be possible nationally.

The internationalisation of R&I has been observed across different countries and fields/sectors, and is increasingly needed to address global or societal challenges. International engagement provides a vital underpinning to research excellence, and there is a wide consensus that it improves the quality and impact of research. It can also be important for accessing unique resources or capabilities, maintaining involvement in, or accessing new networks or markets.

Bibliometric evidence (from this study and other literature) suggests that international collaboration tends to score more highly on citation metrics (a proxy of impact). Evidence from survey analysis and case studies also suggest that FIC has facilitated access to infrastructure and skills that was critical to research being undertaken, and not available nationally.

In the following pages we summarise the various achievements of FIC. Based on evidence from the process and impact evaluation, these appear to be driven by two key characteristics:

- FIC complemented the existing international collaboration activities of UKRI councils and Innovate UK by providing a dedicated Fund targeting priority countries and encouraging **funder-to-funder relationships.** This has materialised in the ability to mobilise additional resources (from international funders), and to focus research in areas of common interest, which has subsequently provided a degree of sustainability in the relationship (through further joint activities and institutional agreements that will continue beyond FIC).
- FIC sat alongside other initiatives to support international collaboration and is relatively small in scale, but it provided **resources in a time of tight budgets,** and in the form of '**neutral funding**' that made it easier for cross-council collaboration.

As such, the Fund's main added value has been more a matter of focus than scale, as it is aimed at enhancing funder level relationships that are more strategic**.** This offered the opportunity to build deeper, more stable and longer-lasting relationships for UK research and innovation communities than may have been possible through existing (bottom-up) relationships developed amongst individual researchers and innovators. The evidence from the evaluation suggests that this has been achieved, albeit with varying success across the Fund.

Objective and themes: The figures below present the headline findings from the evaluation of FIC, structured according to its two main objectives and three headline themes.

Q. To what extent (and how) has FIC enabled collaboration between the UK and the best international R&I partners?	
Findings for Objective 1	
£	**Theme 1: Enabling funding**
Funders & Programmes	• **FIC increased the pool of resources made available via UKRI to conduct projects with international partners, to some extent.** With a budget of £160m, FIC programmes awarded nearly 600 grants, alongside several other investments (e.g. in infrastructure). As was recognised in the original business case, FIC resources were relatively small in comparison with pre-existing investments made by UKRI in projects with participation from FIC priority countries (~3% of grant value, 2019 to 2023). However, it provided additional funding (at a time of tight budgets) to pursue opportunities that are unlikely to have moved forward otherwise. (See Section 3.1). • Two-thirds (67%) of programme leads reported that their **FIC programme had been 'very significant' or 'essential' for their council's wider international strategy and ambitions**. (See Section 3.1) • **FIC successfully attracted additional resources** to fund international collaboration in R&I. In addition to UKRI's £160m investment, FIC attracted £211m from programme partners (plus other contributions in-kind) and leveraged £29m through individual projects (with half coming from overseas sources). (See Section 3.2)
Projects & Participants	• At project level, FIC also unlocked access to resources that may not have been available otherwise. The majority of FIC participants (59%) stated via survey that **the international collaboration projects supported by FIC would not have gone ahead without the Fund** or (in 18% of cases) that it would have gone ahead but with fewer or no international partners. Similar responses are obtained from unsuccessful applicants, with 60% reporting (a year after application) that they had still not been able to continue their FIC project idea. (See Section 3.1) • FIC projects have **also enabled further resources to collaborate internationally,** beyond the life of the Fund. One-third (35%) of participants reported that they had secured additional funding or investment afterwards to develop their project further (beyond FIC). (See Section 3.2)

	Theme 2: Developing partnerships
Funders & Programmes	• **FIC has strengthened partnerships between participating UK and overseas funders,** both within FIC programmes and then also beyond. • **FIC's additionality has been highest among partnerships that were relatively new** (e.g. with particular funders in Japan, Singapore and Canada) and where FIC has provided a substantial (funded) opportunity to collaborate. Elsewhere FIC has made contributions to maintaining and strengthening established relationships, demonstrating that successful international collaboration is built over time. Most UK programme leads report significant improvements in mutual understanding and alignment with their overseas FIC partners, as well in their ability to identify strategic opportunities for future collaboration. (See Section 4.1) • **At the interim evaluation stage (2021), sustainability was unclear,** with uncertainty around dedicated UKRI funding, and opportunities identified that could not yet be taken forward. **At the final evaluation stage, the picture is much more positive,** with many examples of UK funders having now taken concrete actions to carry forward collaborations with their FIC partners (beyond FIC), with new agreements in place and joint programmes under development or underway. In many of these cases (7 of the 8 specific examples collected), **the follow-up programmes that are underway are being supported through the new ISPF**, which includes most FIC priority countries within its scope. This Fund is being led by DSIT, but delivered by a consortium of R&I bodies including UKRI. (See Section 4.2) • Along with other cross-UKRI Funds, FIC has helped to embed and develop cross-council working. More than half of FIC programmes (21 of 37) involved more than one UKRI council and feedback from programme leads and wider stakeholders suggests that this has supported a more collaborative approach to idea development and commonly led to **improvements in cross-council understanding** of priorities, agendas, cultures, and ways of working. (See Section 4.3)
Projects & Participants	• Through FIC projects, **UK participants have reported a substantial increase in their ability to access knowledge, facilities, and sources of funding overseas**, while also **significantly improving the skills and capabilities needed to work internationally**. These were all areas identified at the baseline as being strong motivators for applying for FIC funding. At the same time, unsuccessful applicants have reported little or no movement in their skills and capabilities in these areas. (See Section 5.1) • UK participants reported that ~**60% of FIC project partners were from overseas, with the majority of collaborations being new (77%)** based on Gateway to Research data. Nearly all of those surveyed reported that this international collaboration had led to a better understanding of their partners' capabilities. Most also reported improved understanding of their research agendas, priorities and ways of working. (Sections 5.2 and 5.3) • Where FIC projects have ended (~85% of those surveyed in April 2024), **the majority (73%) of UK participants have been able to continue their relationship with their overseas partners through further grants** (nearly double the rate seen amongst unsuccessful FIC applicants). (Section 5.4)

Theme 3: Deepening R&I	
Projects & Participants	• **Despite delays in timelines reported for around half of FIC projects** (often due to the COVID-19 pandemic), the majority have now completed. Most of these (81%) report having fully achieved their objectives, while a similar proportion of those that are ongoing report that they are on track to achieve their objectives fully by the end of the project. (Section 6.1) • **At least 990 publications in peer-reviewed journals have emerged from FIC projects so far**, with a rate of production (publications per £ invested) that is slightly higher than for other UKRI grants with international partners. • While most UK participants already co-published internationally before FIC, bibliometrics indicates that **the Fund has had a positive influence on the degree of international co-authorship**. For instance, prior to FIC (2014 to 2018), 38.7% of UKRI papers from (what would become) FIC researchers included at least one author from a FIC priority country. This degree of co-authorship has increased over time and was 43.5% in 2019 to 2023. Furthermore, this degree of co-authorship is even higher when just considering those papers resulting from projects with FIC funding during this period (57.0%). This does not fully establish a causal effect from FIC, but does indicate that the Fund has supported an increase in international collaboration while not replacing pre-existing activity. (See Section 6.2) • **It is still early to observe the impact of FIC publications**, but bibliometric data for UK and UKRI papers (2014 to 2018) suggests that international co-authorship will contribute positively and deliver more citations (often used as a measure of impact). Initial indications from early FIC papers (2019 to 2021) suggest that this will be the case here too, but it not possible to conclude with certainty at this point. (See Section 6.2) • **FIC projects have also produced other R&I outputs**, particularly new research databases and models, creative products and research materials, with further outputs still expected to emerge. (See Section 6.3) • **Results related to innovation and commercialisation are less conclusive**, in part because only a small part of the Fund was supporting companies (~13% of FIC participants). Among the few projects developing technologies, there has been good progress along Technology Readiness Levels (TRLs), with finished projects advancing 2.5 TRLs on average since the time of application (compared with 1.3 TRLs for unsuccessful applicants that continued via other means). However, this is based on a small number of projects (<30 in each case), and so should be treated with caution. Evidence on progress towards commercialisation is scarce and there are few examples of commercial exploitation. (See Section 6.4)

Q. To what extent and how has FIC supported wider government objectives?
Evidence from funder level case studies developed through the evaluation has showcased that FIC is delivering on this objective by: • Acting as a platform to systematically identify joint opportunities and capabilities, as well as strategic areas of collaboration between funders. • Providing an opportunity to increase or sustain awareness of the UK as a potential partner. • Providing funding to fulfil common aspirations and political commitments. • Leveraging and adding value to other initiatives to support R&I collaboration (in particular the UK Science & Innovation Network, SIN). • Supporting wider diplomatic efforts. (See Section 7.1)

Learnings

Future initiatives

Funding

- Co-funding international research leads to more equitable partnerships, and stronger programmes with larger budgets.
- Flexibility to spend funds in partner countries is also perceived as a positive feature of an international R&I fund.

Timing

- If there is a desire to develop newer or more ambitious opportunities, there is also the need to give more lead time to the development of partnerships and programme ideas.
- Different funding agencies also work on different timescales to the UK, and this needs to be taken into account (including via advance warning of funding, but also a degree of flexibility and responsiveness in Fund design and implementation).

Continuity of funding is important

- Long-term funding is important to enable partnerships to be built upon and strengthened, not lost.
- In that vein, ISPF has been positively received among FIC programme leads as it is expected to help to sustain and maintain many FIC relationships.

There is also the expectation that DSIT involvement in this new Fund will offer opportunities for country / government-level relationship benefits, while still maintaining the flexibility needed to engage with international partners and to design programmes and activities that reflect the needs and opportunities that UKRI councils and other partners identify.

Evaluation

- **The development of the FIC evaluation over time, alongside the implementation of the Fund** (Evaluation Framework in 2020, Baseline and early findings in 2021, Interim evaluation in 2023 and a Final evaluation in 2024) has allowed it to:
  - Collect timely evidence on key indicators (including baselines)
  - Incorporate learnings from early stages of the evaluation (in relation to findings and the methodological approach)
  - Provide early evidence to inform investment decisions.
- The experience of conducting this evaluation also shows that there is **a trade-off in multi-stage evaluations**: as more time passes it is possible to capture more (and more robust) evidence on outputs and outcomes, but it becomes increasingly difficulty to capture comprehensive primary data (especially at institutional level), as people change positions or move to different activities and priorities once programmes close. This may call for:
  - The implementation of a dynamic approach to capturing primary data as the end of a Fund and its programmes approaches (rather than at a single point, at the final evaluation stage)
  - Focusing later stages of evaluation on mobilising secondary data sources, and limiting primary data collection
  - Resourcing evaluation studies such that the majority of efforts are dedicated to earlier stages (early findings and interim evaluation)
- The above may also support evidence needs, as decisions around new iterations of a Fund, programme or related investments are likely to align with interim (rather than final) stages of an evaluation.

1 The evaluation of the Fund for International Collaboration (FIC)

1.1 The Fund

The Fund for International Collaboration (FIC) was a UK Research and Innovation (UKRI) Fund that aimed to enable the development of strategic partnerships with global R&D leaders and address a key gap in the national research and innovation (R&I) funding portfolio. It sat alongside other cross-UKRI Funds and formed part of a package of measures to maintain the UK's global R&I leadership and deliver against ambitions of the 2017 Industrial Strategy[1].

FIC was established to serve as a facilitator and enabler of international R&I collaboration, providing long term funding to UKRI councils and Innovate UK in order to advance, enhance or expand their international collaboration activities. Its **high-level objectives** were:

1. To enable UK researchers and innovators to collaborate with the best international partners, to carry out world-leading R&I which delivers new knowledge and societal and economic impact to the mutual benefit of the UK and partner countries.
2. To support Department for Science, Innovation and Technology (DSIT) and wider Government objectives, including science diplomacy.

The Fund emerged in recognition of the importance of supporting internationally collaborative R&I, and the desire to offer funding for collaboration with particular geographies that were not explicitly covered by other UKRI initiatives. As stated in its original Business Case, **FIC was intended to complement existing UKRI Funds for international partnerships**, the Newton Fund and Global Challenges Research Fund (GCRF), which were constrained by being Official Development Assistance (ODA). It would provide a dedicated UKRI funding mechanism to support partnerships with countries like the US, Canada, or Japan (and support non-ODA eligible activities with China and India). It would not replace or replicate the UK's participation in European Union (EU) programmes, but rather welcome programmes including EU countries.

The FIC business case also noted that (with a budget of £160m) **the Fund would not represent a significant change in the public R&I funding available in the UK**, noting that "the research councils spent over £1.1bn on international activities in 2016/17 alone". Similarly, it would not represent a shift in the way that international collaborations are pursued in the UK: "UKRI councils, universities and businesses will still seek new opportunities using existing allocations. Rather, the Fund will seek to build off existing strengths and address a clear gap in the research funding landscape where there is no non-ODA funding administered at the system-wide level."

In 2022 it was announced that FIC, GCRF and the Newton Fund, would not be continued beyond their current commitments. **A new International Science Partnerships Fund (ISPF)** was also announced in December 2022, which would bring together both ODA and non-ODA funding under a single structure. Funded by DSIT, and with an initial budget of £337m (FY 2022/23 to 2024/25), ISPF is being delivered by a consortium of leading R&I bodies including UKRI.

[1] The Industrial Strategy has since been superseded by the UK Science and Technology Framework (March 2023), in which investment in R&I and the development of international partnerships remain key strands for the achievement of UK's ambition to become a Science and Technology Superpower by 2030.

1.2 Study objectives and phases

In 2020 **UKRI commissioned Technopolis to undertake an evaluation of FIC**. The aims were: (i) to demonstrate what the Fund has delivered, (ii) to help build the evidence base on "what works" in internationally collaborative R&I, and (iii) to inform improvements to FIC, or future initiatives.

The study has been undertaken over four phases, in the period from June 2020 to December 2024. The planning phase concluded with the delivery of an Evaluation Framework report (December 2020), the baseline and interim process evaluation phase reported in October 2021 and the interim impact evaluation report was delivered in July 2023. The current report presents the results of the fourth and final phase of the study, the final evaluation, while also drawing on key evidence obtained, and conclusions reached throughout the previous phases.

A series of evaluation questions were developed for the study, with the FIC objectives and the aims of the Fund in mind. For the impact evaluation, there were three key questions, which required assessment of the extent to which (and how and why/not) FIC has delivered across each of the main areas of intended impact: (i) enabling collaboration between the UK and the best international partners; (ii) delivering knowledge, economic and societal impact; and (iii) supporting wider government objectives. In addition, there were several supplementary areas of investigation, which included: unintended outcomes and impacts; the effectiveness of the approach to supporting internationally collaborative R&I; and if/how FIC has provided insight to support the targeting of future international collaboration. A series of process evaluation questions were also addressed through an earlier phase of the evaluation.

To address the aims of the evaluation and to understand how effectively FIC had met its high-level objectives, **the evaluation was also asked to consider three broad themes**. These are shown in Figure 1, alongside the FIC objectives and headline impact evaluation questions.

Figure 1 FIC objectives, themes, and key evaluation questions

<table>
<tr><th colspan="3">Objective 1: To enable UK researchers and innovators to collaborate with the best international partners, to carry out world-leading R&I which delivers new knowledge, and societal and economic impact to the mutual benefit of the UK and partner countries.</th></tr>
<tr><td rowspan="2">Impact Evaluation Questions

To what extent (and how) has FIC enabled collaboration between the UK and the best international R&I partners?</td><td>£</td><td>Theme 1: Enabling funding – Reducing the barriers for accessing and applying for international collaboration R&I funding.</td></tr>
<tr><td>  </td><td>Theme 2: 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.</td></tr>
<tr><td>To what extent (and how) has FIC delivered knowledge impact, economic impact (for the UK and high performing R&I nations) and societal impact?</td><td>  </td><td>Theme 3: Deepening R&I – Supporting R&I within new and existing areas of strategic importance across the UKRI international portfolio.</td></tr>
<tr><th colspan="3">Objective 2: To support DSIT and wider government objectives, including science diplomacy.</th></tr>
<tr><td colspan="3">To what extent (and how) has FIC supported wider government objectives?</td></tr>
</table>

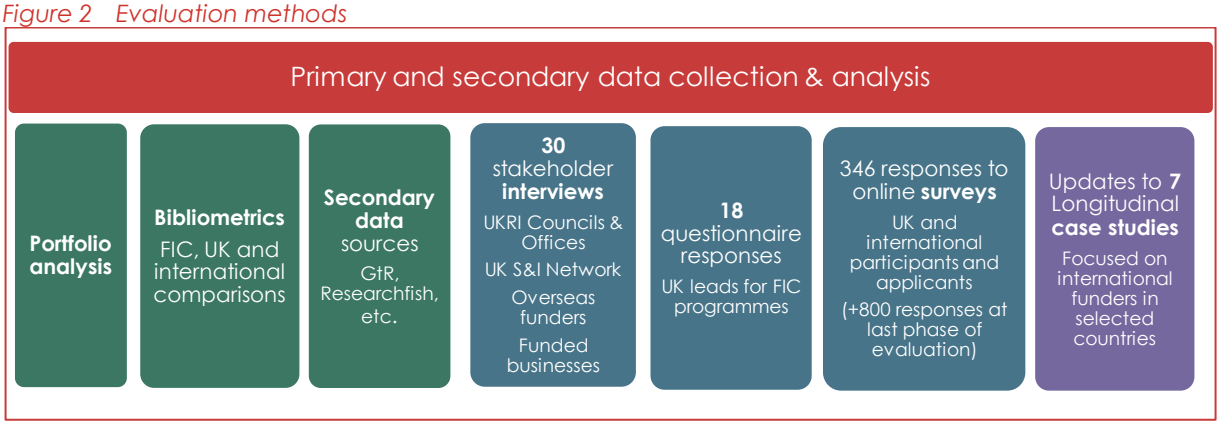
1.3 A mixed methods approach grounded in a Theory of Change

The final evaluation is based on **six main groups of data collection and analysis activities** (see Figure 2), with these activities taking place between March and September 2024. Similar data collection and analysis also took place in previous phases of the evaluation.

The multi-phase nature of the evaluation means that it has been possible to mobilise rich information across the different phases, with **more evidence emerging as the Fund, programmes, projects and evaluation have progressed**, in particular around outputs (e.g. publications) and outcomes. This also means that many quantitative indicators (e.g. bibliometrics) have become more robust over time, as data points have increased.

However, as was expected in a study of this nature, **response rates and institutional knowledge have declined over time as programmes and projects have come to a close**. This is mitigated by the fact that a large amount of information has been collected throughout the different phases of evaluation, and highlights the importance of well- resourced early findings / interim stages to multi-phase evaluations. Mobilising secondary data sources also becomes an increasingly important mechanisms to capture evidence over time.

Figure 2 Evaluation methods



During the final evaluation phase, a total of **30 stakeholders were consulted via interviews**, including programme leads and others from UKRI, leads from overseas funding agencies partnering in FIC programmes, representatives from UKRI International offices, individuals from commercial businesses funded via FIC, representatives from DSIT and members of the UK Science and Innovation Network (SIN). UK programme leads were also consulted via a questionnaire (responses received from 18 FIC programmes in this phase). Over 200 individuals were also consulted in previous phases of the evaluation through interviews and workshops.

A further 346 individuals input to the study in 2024 via surveys (14% of the population that were approached). This is in addition to 900+ responses to surveys during the previous phases.

The evaluation ran a series of different surveys over the different phases of the study. There were three main groups that were targeted (UK participants and international participants in FIC funded projects, plus unsuccessful applicants), with two cohorts within each (an earlier cohort that were un-/successful before March 2021 and a later cohort that were un-/successful after). Both cohorts in each group were asked to complete a baseline and early progress survey (Cohort 1 received this in 2021, while Cohort 2 received this in 2022). Cohort 1 was also approached for an interim survey in 2022. For the final phase of the evaluation, both cohorts were approached with the same questionnaire (final survey) in 2024.

The following table summarises the responses (and response rate) within these different groups and cohorts to the different questionnaires. For the final evaluation, a response rate between 17% and 19% was achieved for the six groups of participants. These represent good response rates, based on previous experience of surveying UKRI stakeholders. Additionally, a small decrease in response rates across a longitudinal study is expected, as projects finish and as individuals move roles (or change contact details). The report seeks to triangulate survey results with other sources of evidence where possible (at least at the level of themes and sub-themes).

The response rates for unsuccessful applicant groups are lower than their participant equivalents. This was also expected, as these individuals have not been supported by the Fund and may therefore feel less obligated or have less interest in supporting the evaluation.

Overall, the majority (94%) of UK and international participants responding to the final survey were affiliated to universities, research institutes and public research organisations (as self-reported by respondents), while 6% were from businesses. Based on an analysis of email addresses and organisation names, we estimate that businesses accounted for 13% of all the UK and international participants in FIC programmes that were initially approached for the survey. Businesses are therefore likely to be slightly under-represented within the responses. The number of responses from businesses (e.g. 9 for the final UK participant survey) are also too small to present analysis of individual questions by organisation type.

Figure 3 Summary of survey response rates, by group, cohort and questionnaire

		Population	Baseline & early progress survey	Interim survey	Final survey
UK participants Principal Investigators (PIs) and Co-Investigators (CoIs) in FIC programmes	Cohort 1	636	151 (24%) in 2021	150 (24%) in 2022	175 (18%) in 2024
	Cohort 2	372	102 (27%) in 2022	84 (23%) in 2022	
International participants in FIC programmes	Cohort 1	364	103 (28%) in 2021	84 (23%) in 2022	103 (19%) in 2024
	Cohort 2	182	35 (19%) in 2022		
Unsuccessful applicants to FIC programmes	Cohort 1	687	146 (21%) in 2021	83 (12%) in 2022	68 (17%) in 2024
	Cohort 2	232	30 (13%) in 2022		

Sub-groups of the 1,314 respondents (across all surveys, cohorts and phases) are used in different parts of the analysis presented in the report, depending on their relevance. In each case, the group, cohort and survey are clearly indicated, along with the number of responses (which is sometimes less than the overall totals, as not all respondents answered all questions).

Finally, **a series of longitudinal case studies have been developed over the course of the evaluation,** each focusing on a specific international funder in a priority country (and on the FIC programmes in which they are collaborating with the UK). These cases have explored, amongst other things, the three main themes of the FIC evaluation (i.e. how FIC has enabled funding, deepened R&I, and strengthened partnerships between the UK and partners).

Case development has followed a longitudinal design, involving data collection (desk research and interviews) at three points in time (baseline, interim and final evaluation), enabling the study to provide early evidence, as well as illustrate dynamic aspects and change over time. Originally, five cases were being developed (each focusing on a specific funder in China, the US, Canada, India, and Japan) and a first iteration of each of these cases was summarised within and appended to the Baseline Evaluation Report (2021).

These case studies proved very useful in demonstrating in more depth particular examples of the findings emerging from elsewhere, offering deep dives into programme level evidence (where there are no programme level evaluations planned). As such, for the interim evaluation (2022/23), an expanded group of seven case studies were developed. This included an updated view of the original five, plus a first iteration of two additional cases (each focusing on a specific funder within Singapore and Switzerland). For the final evaluation, we have returned to all seven cases to understand what has changed since the interim assessment. These updates are presented in Appendix C and drawn upon in the main text.

Our approach also includes quantitative and qualitative methods to assess the additionality and deadweight of the Fund and to explore:

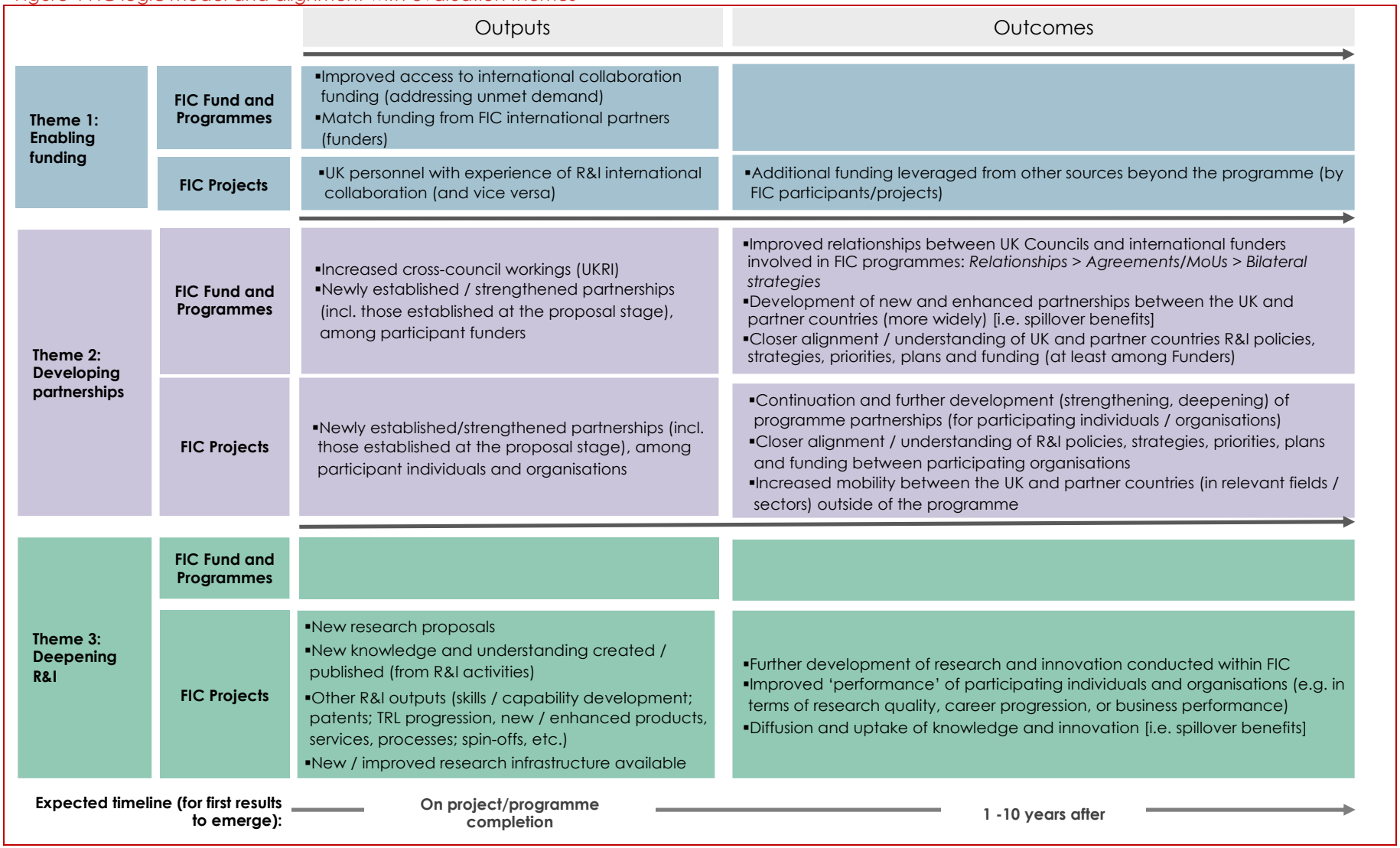
- What FIC offers that is different from other activities to support international R&I collaboration.
- How outputs and outcomes emerging from FIC programmes and projects compare with a counterfactual scenario, either in a qualitative way (via analysis of results enabled by FIC that would not have been possible by other means) or in a quantitative way (presenting comparisons with benchmarks or control groups whenever possible or relevant). This is not a Quasi-experimental design and results reflect an approximation of the counterfactual scenario rather than offering conclusive casual links. The triangulation of evidence from different sources helps to strengthen this analysis.
- How outputs and outcomes emerging from FIC programmes and projects compare with other government interventions, in particular with respect to other UKRI programmes/grants in general and those that include international collaboration.

In line with this approach, our analysis focuses on what FIC has delivered in comparison with other means of supporting international R&I collaboration (i.e. Business as Usual). It does not draw comparisons with other specific programmes, since we concluded during the scoping stage (and in the Evaluation Framework report) that there were no appropriate comparators (programmes) for FIC, in the UK or internationally. Additionally, comparisons with programmes supporting national collaborations were not deemed appropriate given that, by their nature, they are different in scope. Finally, the study does not explore, in a systematic way, what the results would have been of delivering FIC in a different way (e.g. with a different budget or with different countries in scope), as this would require a full 'options appraisal' (outside of scope).

The evaluation has been guided by a Theory of Change (ToC) for the Fund, which was developed by the evaluators in consultation with UKRI. The ToC is a programme theory that explains how the intervention is expected to produce its results. It has a logic model as a starting point, which sets out how the various inputs and activities of FIC are expected to result in a series of short-term outputs, which then lead intended outcomes in the medium- to long-term.

The logic model (see Figure 4) follows a two-tier structure, to distinguish between the activities, outputs and outcomes of the Fund and its programmes, and those of the individual FIC projects. This version also shows alignment with the main themes guiding the evaluation. The focus of the evaluation is Fund-level results. However, some key results of the Fund materialise at project level, and so the evaluation has also collected evidence in this second tier.

Figure 4 FIC logic model and alignment with evaluation themes



2 Process Evaluation

The FIC process evaluation was undertaken in an earlier phase (2021), soon after the Fund had been established. Key findings are summarised below, with further detail in Appendix B.

FIC provided an additional, dedicated Fund that addressed a gap in the UK funding system, offering the opportunity to pursue activities that would not otherwise have been progressed. It emerged in recognition of the importance of supporting internationally collaborative R&I to expand access to ideas, talent and investment, and the desire to offer (non-ODA) funding for collaboration with key priority countries that were not explicitly covered by other UKRI Funds. While councils already collaborated with most of these leading research nations, funding was (increasingly) limited and international opportunities were de-prioritised.

International collaboration in R&I allows the UK to tap into expertise and research capital elsewhere, expanding the frontier of what would be possible nationally. The internationalisation of R&I has been observed across different countries and fields/sectors, and is increasingly needed to address global or societal challenges. International engagement provides a vital underpinning to research excellence, and there is a wide consensus that it improves the quality and impact of research. It can also be important for accessing unique resources or capabilities, maintaining involvement, or accessing new networks or markets.

FIC sat alongside other initiatives to support international collaboration. There are different ways in which governments support international collaboration and most countries have a varied portfolio of initiatives. In many cases though, this does not include stand-alone programmes with earmarked budgets (like FIC). However, FIC is a relatively small investment in comparison with other UK initiatives to support international collaboration (e.g. contributions to Horizon Europe or the European Space Agency) and its achievements should be viewed in this context.

FIC complemented the existing international collaboration activities of councils by providing a dedicated Fund targeting priority countries and encouraging funder-to-funder relationships. It offered the opportunity to fund international collaboration that would not be possible via other means, and at a scale that is not usually feasible. Also, other than ODA programmes, there was no other UKRI Fund dedicated to developing relationships at the funder level and so FIC offered the opportunity to build deeper, more stable and longer-lasting relationships.

The experiences of FIC programme selection suggested that advance knowledge of funding helps establish the best portfolio of programmes to support objectives. Councils regularly highlighted that the timetable for wave 1 programme selection was too short, with only limited opportunity to identify, discuss and prepare programme ideas. As a result, there was a tendency to propose programmes based on established funder relationships and initiatives, already well-developed ideas, and where spend could commence quickly.

A clearer strategic steer could help councils targeting and selecting opportunities. FIC's relatively small budget contrasted with a high level of demand and lots of potential opportunities for international programmes. Additional guidance (on goals and priorities to align with, the rationale for prioritising countries, and the likely scale of programmes that would be funded) would have helped steer councils towards the most appropriate ideas to develop and propose, helping the Fund to better achieve its aims.

The Strategic Opportunities Stream was a welcome addition to a Fund that intended to capitalise on emerging opportunities, but there was a lack of transparency or awareness. There was widespread support for such an agile stream that could react quickly to emerging opportunities and challenges, support wider diplomatic activities and government priorities, or that might help address challenges associated with fixed FIC spending timetables.

Project applicants reported high levels of satisfaction with FIC programme processes. Two FIC-specific elements that were highlighted were support to engage with potential overseas partners and the benefits of allowing single submissions for multi-council/country awards.

3 Impact Evaluation: Enabling funding (Theme 1)

Our 2018 study for DSIT on the main drivers and barriers to international collaboration[2] identified **demand in the UK to do more collaboration with strategic partner countries, but also barriers to doing so.** Individual research organisations and businesses reported doing less than they wished because of a number of different types of barriers and transaction costs, including principally financial barriers and internal resource constraints, but also the availability of collaboration frameworks and information about partners, as well as issues related to mobility and recruitment. This was confirmed at the baseline stage of the FIC evaluation, where financial considerations, the existence of collaboration frameworks, and information about overseas markets and actors were the top 3 barriers reported by UK participants in FIC programmes[3].

Our 2018 report to DSIT also identified **at least three areas where the government could influence and facilitate international collaboration**: improving the frameworks for international collaboration (e.g. through overarching agreements that establish basic rules and ways of working); further funding for collaborative R&I; and improved information about international programmes and potential partners. FIC sought to tackle all these areas (to some extent), including by reducing the barriers to accessing and applying for international R&I funding. This section presents evidence of progress and achievement in relation to this theme.

3.1 FIC has increased the funding available in the UK to conduct research with key priority countries, but its scope is limited by its size

With a budget of £160m, FIC has increased the pool of resources made available via UKRI to conduct projects with international partners. As of July 2024, 571 grants with a value of £114m had been awarded by FIC programmes, alongside other investments (e.g. in infrastructure).

The evaluation has found that **many of the projects that have been supported are unlikely to have gone ahead, at least with international collaborators, were it not for the Fund**:

- Over half of UK participants in FIC programmes (59% of 249 respondents from cohorts 1 & 2) stated via the baseline survey that they would not have continued with their project idea at all in the absence of FIC funding. Another 18% said that they would likely have continued with their project through other means, but with fewer or no international partners.
- In line with this, 60% of 164 unsuccessful applicants (cohorts 1 & 2 consulted through baseline surveys) reported (shortly after being unsuccessful) that they had not continued with the project ideas proposed to a FIC programme, while 15% had carried on with fewer or no international partners. When we followed-up with cohort 1 unsuccessful applicants ~1 year later, 54% (of 89) still reported that they had not continued with their FIC project idea at all, and the latest round of surveys (in 2024) suggests little has changed since (59% of 68 respondents across both cohorts had not continued with their FIC project idea).

These results show the importance of FIC funding to pursue the ideas put forward by applicants, and that suitable alternative sources of funding were not identified in many cases. This aligns with evidence presented in the FIC business case that "there were over 700 international project proposals put to the UKRI councils in 2016/17 that met the quality threshold but were not funded due to limited budgets… [demonstrating] a large excess of demand."

[2] Technopolis (2018) Drivers and Barriers for Collaboration, prepared for BEIS (not published).
[3] Based on the baseline survey of UK participants, cohort 1. More recent participants (cohort 2) pointed to the same three top barriers, alongside internal resources (i.e. internal resources and skills to establish international collaboration) in their baseline survey.

FIC resources were relatively small, however, in comparison with pre-existing investments made by UKRI in relation to priority countries (reflecting expectations set in the business case).

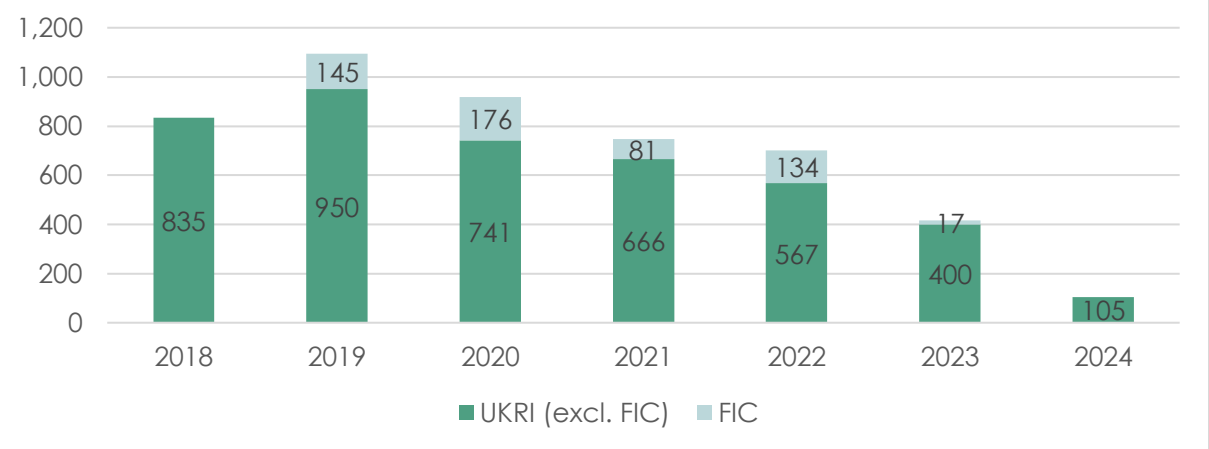
FIC focused on collaboration with global R&I leaders. UKRI (in consultation with DSIT) identified a list of key target partner countries, which then guided programme development and selection for FIC. The resulting portfolio of 37 programmes involved partners from across 26 different countries, but they all included at least one of the "priority countries".

As shown in Figure 5 and Figure 6, in the five-year period 2019 to 2023, UKRI (excluding FIC) awarded a total of £3.6bn to 3,324 projects with the participation of at least one partner from a FIC priority country (as reported in the grant information (people tab) in Gateway to Research (GtR)). In the same period FIC awarded £113m to 553 projects[4] (3% and 17% of the UKRI figures respectively). This is a reflection of the size of the FIC investment, but also of the UK R&I system (and its active participation in international collaboration). It is also important to note that the level and intensity of collaboration with FIC priority countries will vary. In particular, it is likely that some wider UKRI grants will have only limited priority country involvement within wider consortia.

The average value of FIC grants is also considerably lower than the average value of UKRI grants with participation of at least one partner from a FIC priority country (£205k versus £1.1m, 2019 to 2023). This reflects in part the features of certain programmes within the FIC portfolio (e.g. the UK-Canada Globalink PhD exchange Scheme, which has awarded over 150 grants, mostly of £5k to £15k) or intentions to support initial engagements that could help to cement future collaboration (e.g. Arts and Humanities Research Council (AHRC) partnership development and networking grants).

Despite the relatively small investment made through FIC, however, the data does show that since 2019 the Fund added resources to a declining pool of funding available for collaboration with FIC priority countries.

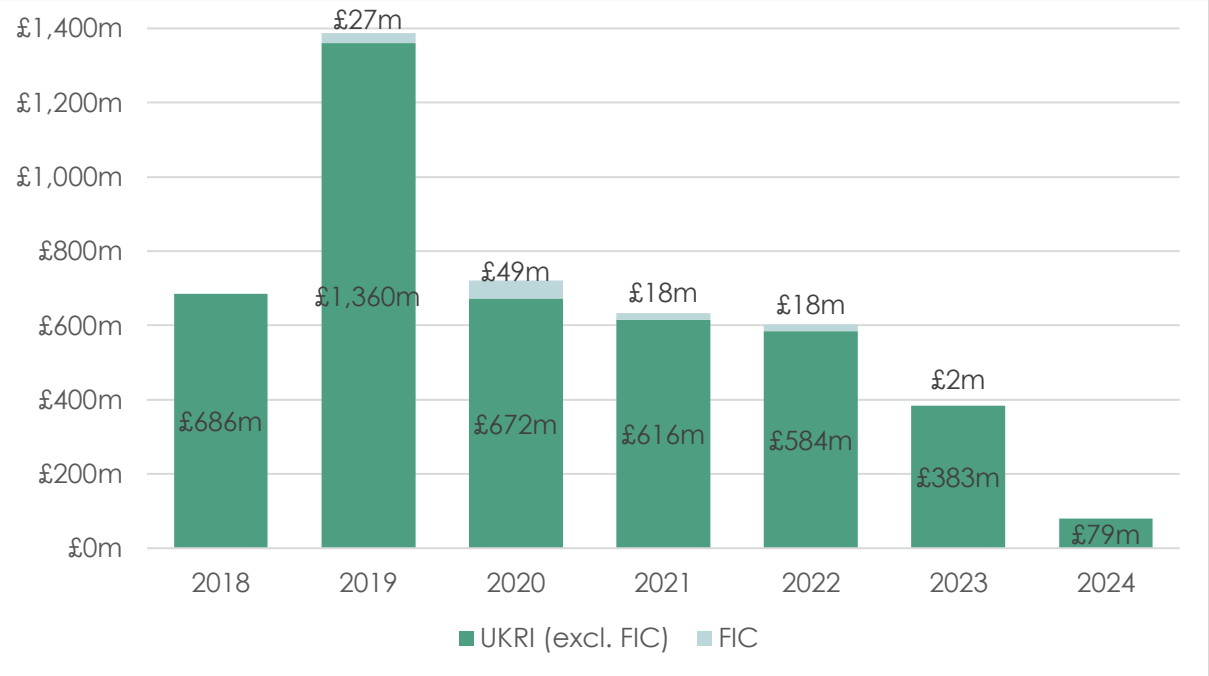
Figure 5 Number of FIC grants and number of UKRI grants (excluding FIC) with at least one (named) international partner in a FIC priority county, 2018 – 2024



Source: GtR (people tab). Based on start year. Excludes FIC programmes with no grants.

[4] Of the 571 grants recorded in the December 2023 FIC tracker, 553 could be found in GtR. The remaining 18 are excluded from this analysis.

Figure 6 Value (£m) of FIC grants and value (£m) of UKRI grants (excluding FIC) with at least one (named) international partner in a FIC priority county, 2018 – 2024

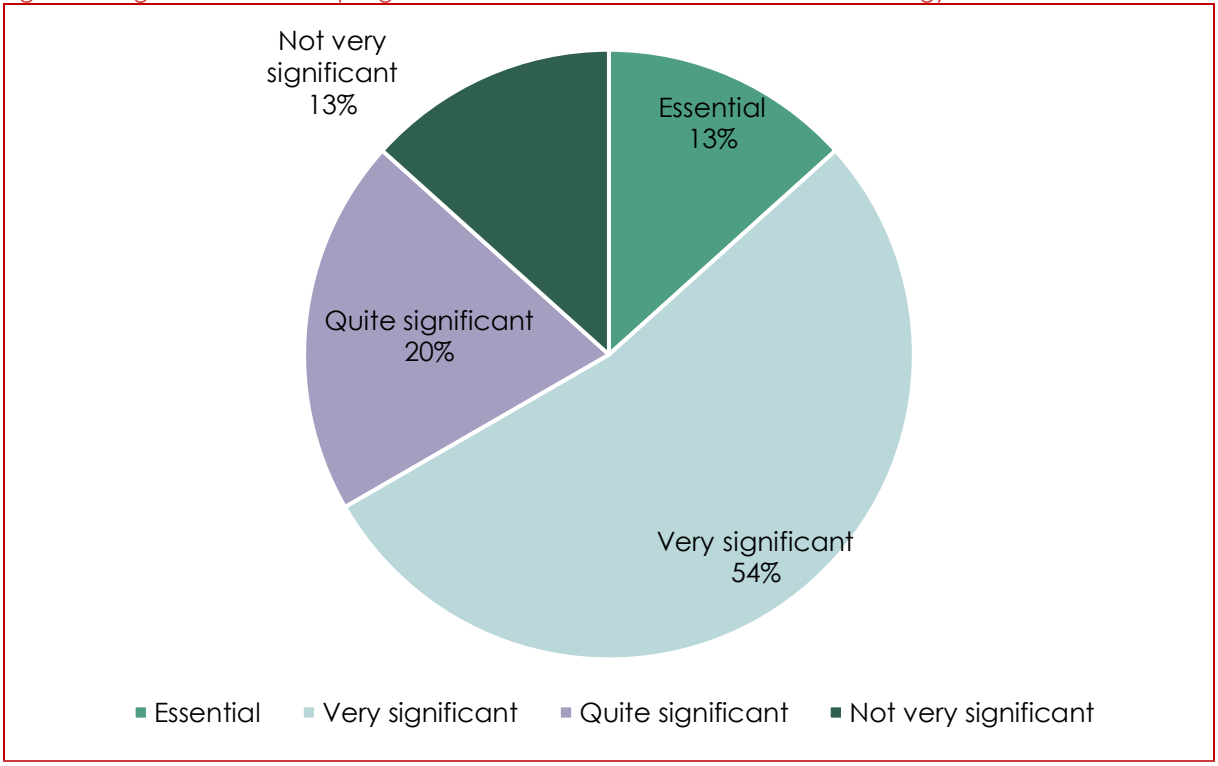


Source: GtR. Based on start year. Excludes ~£40m in FIC programmes with no grants.

In terms of geographic spread, the Fund has meant the biggest relative increase in resources (grant value) available for collaborations with partners located in South Korea and Japan (5.8% and 2.6% respectively of UKRI grant value during 2019 to 2023 relates to FIC), with smaller increases for other FIC priority countries. These results reflect both the scale of FIC investment and the scale of wider UKRI investment with each country, with these two factors playing out differently in each case. For example, while the FIC investment in Japan was double that in South Korea, wider UKRI investment in Japan over the same period was around five times higher than in South Korea. As a result, the relative increase in resources to South Korea due to the Fund (6%) was actually much higher than for Japan (3%).

These various analyses provide evidence of the relatively small investment made through FIC, compared with wider UKRI. However, **the Fund's added value seems to be more a matter of focus than scale**. Interviews with International Leads from UKRI councils, undertaken across different phases of the evaluation, highlighted the fact that FIC was geared towards supporting funder level relationships, which were expected to be more strategic and long-lasting. No other UKRI Fund (except ODA Programmes) was dedicated to developing relationships at the *funder* level (i.e. between one or more UKRI councils and their counterparts abroad). This offered the opportunity to build deeper, more stable and longer-lasting relationships for UK R&I communities than might have been possible through (bottom-up) relationships being developed amongst individual researchers and innovators. This is reflected in the views of the FIC programme leads, two thirds (67%) of whom reported that their FIC programme had been 'very significant' or 'essential' to their council's wider international strategy.

Figure 7 Significance of FIC programme on council's wider international strategy



Source: Programme lead survey 2024. N=15

FIC has also enhanced the ability of respective funders to steer resources (top-down) towards areas of (mutual) strategic importance. The has meant being able to provide more strategic steer to the R&I activities conducted with key partner countries, focusing on areas of common interest and potential mutual benefit (including climate change & health, healthy ageing, and business internationalisation, to name a few that have been addressed through FIC programmes). As such, FIC has provided the opportunity to target efforts to deliver on funder objectives, as well as identify opportunities for medium to long-term collaborations (rather than one-off or dispersed efforts), helping to initiate, consolidate, strengthen and / or expand funder-to-funder relationships. It has also provided a platform for setting up joint frameworks to facilitate collaboration between researchers, maximising opportunities identified bottom-up (via researcher-to-researcher links). As such, with a relatively small investment, FIC could be catalytic where it has managed to solidify funder-level relationships and where funding is then available to support the opportunities identified. This is explored further under Theme 2 (developing partnerships) in Section 4.

3.2 FIC has successfully delivered and attracted further additional resources to fund international collaboration in R&I

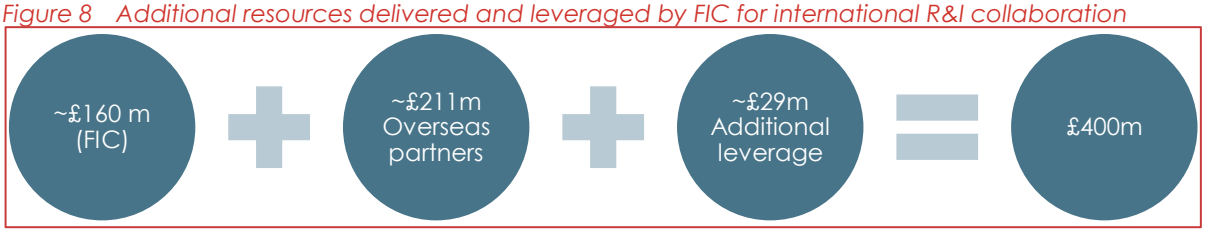
FIC awarded £160m to 37 programmes (31 via two waves of competition, plus 6 via the Strategic Opportunities Stream[5] or as follow-up initiatives). At bid stage, these programmes had attracted match funding commitments from overseas partners (cash or in kind) of £220m[6].

There were 60 calls and competitions by FIC programmes where awards were made, with a total value of over £127m (alongside a small number of other direct awards and several investments in infrastructure). Information recorded by programmes suggests that **£211m of match funding was awarded to active / completed grants** (although there are also other contributions (in-kind) that have not been monetised, as well as five programmes where data on match funding is not yet available).

Additionally, 29% of UK participants in FIC programmes (n=173) stated via the final survey that they had leveraged additional resources for their FIC project, beyond the value of the grant and any match-funding required by the rules of the call. The 173 respondents reported an average £50.1k in additional leveraged funding per grant, which had been obtained (on average) from the following sources: 31% from their own organisation; 21% from UK-based funding sources; and 49% from overseas funding sources. If applied to the full portfolio of FIC projects (n=571), this would suggest **total additional leverage to FIC projects of £28.6m** (£50.1k per grant based on the survey, applied to all 571 awards). This assumes that the experiences of the 173 respondents to the survey are broadly representative.

All in all, this would mean approximately **£400m in resources overall for international R&I collaboration as a result of FIC.**

Figure 8 Additional resources delivered and leveraged by FIC for international R&I collaboration



Source: FIC tracker December 2023 and final survey of UK participants (2024)

In addition, where projects have finished, the relevant UK participants were asked through the survey whether they had **secured further funding or investment afterwards to develop their project further (i.e. beyond FIC).** One third (35% of 124 respondents to the final survey of UK participants) said that they had, quoting a figure of £468k on average[7], with 19% coming from overseas sources. Data reported in Researchfish suggests an even higher figure, with 108 FIC grants[8] having reported a total of £103m in further funding to continue or advance their research (an average of £954k for each of these projects, or an assumed average of £180k per project across the full FIC portfolio of 571 awards).

[5] A separate FIC mechanism, set up for opportunities that did not fit with the timescales of the standard waves.
[6] Where figures were not recorded in GBP, these were converted based on the exchange rate on 31.12.2023
[7] This calculation excludes one outlier: £22m in additional funding reported by the £1m UK-OSNAP project, NE/T08938/1
[8] Excluding an outlier - £127m in additional leverage reported by one project that relates to a large European Commission grant for a project involving 100 institutions.

4 Impact Evaluation: Developing partnerships between funders (Theme 2)

FIC sought to enable, strengthen, deepen, and broaden relationships: both within the UK and internationally (with the best international partners); at all levels (funders and institutions, as well as R&I communities); and both within and beyond FIC. In this section we explore the development of partnerships at the funder level. Section 5 then looks at the development of partnerships within projects and between individuals and teams.

4.1 FIC has strengthened existing partnerships between UK and overseas funders, demonstrating that successful international collaboration is built over time

Evidence from this and the previous phases of the evaluation has shown that **FIC has supported the development and strengthening of partnerships** in the following ways:

The continuation of partnerships via follow-on funding into new or existing areas of collaboration

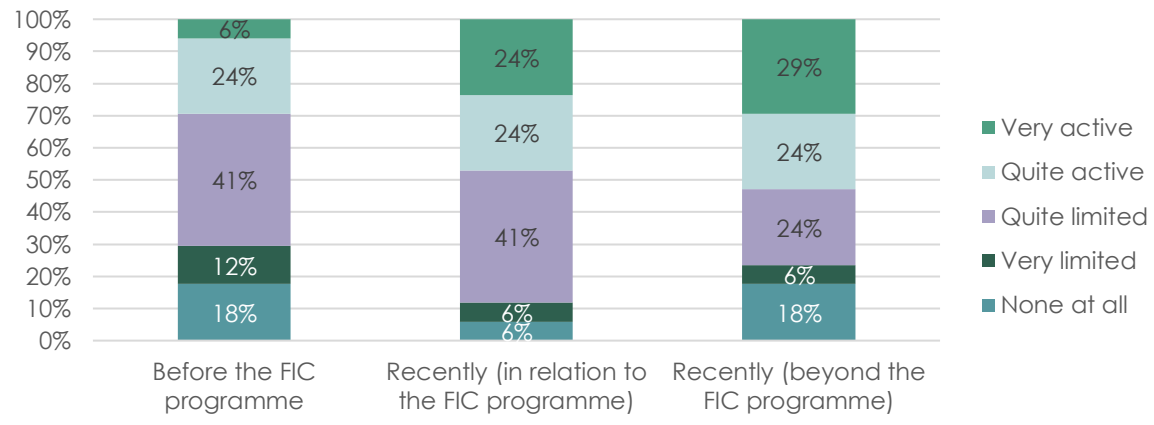
A first opportunity to have a concrete (funded) opportunity to collaborate

Bringing together organisations that had not collaborated before

In the survey of UK leads for FIC programmes that was undertaken for the final evaluation, we sought to understand the past level of interaction and exchange between their council and the overseas funder(s) involved in their FIC programme. The results (see Figure 9) show a broad spread of situations across the portfolio, although it is notable that only one programme lead reported a 'very active' prior relationship with their overseas partner.

The UK programme leads were also asked to reflect on how their relationships had developed, and specifically to rate the current / recent level of interaction and exchange with these overseas partners, both in relation to the relevant FIC programme, but also beyond this. The results show a positive shift, with around half of the leads now reporting a quite or very active level of interaction with their FIC programme partners (48% in relation to the FIC programme, 53% beyond the FIC programme), compared with 30% before FIC. Importantly, the response was similar in relation to interactions *within* and *beyond* FIC, demonstrating the importance of the Fund (and individual programmes) as a means to enable and encourage wider discussions.

Figure 9 Extent of interaction and exchange between UK and overseas funders



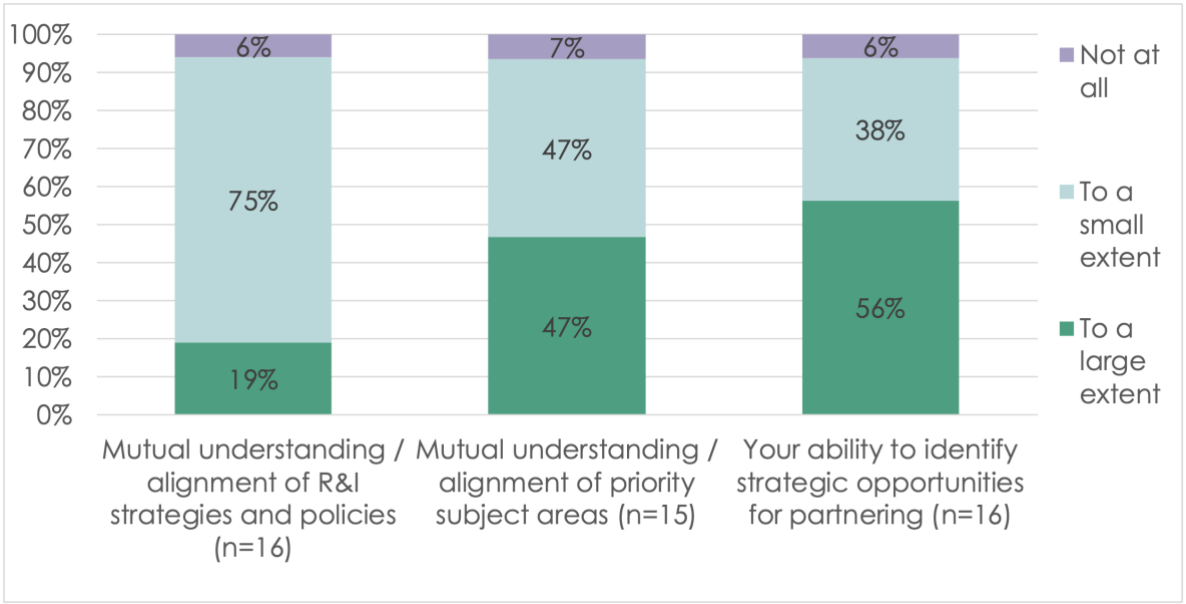
Source: Programme Lead survey, 2024, N=17. Only includes respondents providing all 3 ratings.

As summarised by the Natural Environment Research Council (NERC) programme lead for the Changing North Atlantic Ocean and its Impact on Climate programme:

> *"Overall, I find it hard to think of how the outcome could have been better, really. It feels to me like we've reached a point in the road where hopefully this way of joint working will become normalised. It's a huge change. To give you an idea, I spent probably a decade talking with NSF staff about partnering in principle - and in the last five years, suddenly we are just doing it. And now we're doing it again."*

We also asked the UK programme leads specifically about three areas of understanding and alignment with their overseas FIC partners, and the extent to which these had improved through their programme. The responses (see Figure 10) suggest **widespread improvements to mutual understanding and alignment with their overseas partners**, with more than 93% reporting a small or large improvement in each of the three areas shown.

Figure 10 Extent to which FIC has improved mutual understanding and alignment between funders



Source: Programme Lead survey, 2024. Number of respondents varied by question, as indicated.

We have looked in more detail at a selection of the funder-to-funder relationships through a series of longitudinal case studies developed for the evaluation, covering funders in seven different priority countries. The latest iteration of these cases (updated for the final evaluation) can be found in the Appendix C.

Table 1 shows an assessment of **FIC's additionality for funder-level relationships** in each case, as well as a summary of progress in terms of further strengthening these partnerships (which in some cases has evolved further since the last phase of the evaluation).

This assessment demonstrates that FIC's additionality is varied and also suggests that it is often higher when the partnerships (extent of collaboration before FIC) are relatively new, as is the case in relation to funders examined in Canada, Singapore and Japan for example.

Table 1 FIC additionality in relation to the development and strengthening of funder-level partnerships

Case study	Maturity of partnership (prior to FIC)	National joint strategies prior to FIC	Level of FIC additionality	Progress so far in strengthening partnerships
Enterprise Singapore	**Relatively new** Creation of Enterprise Singapore in 2018 offered new opportunities for closer working with the UK. Initial business delegation visits had taken place.	**No**	**High** FIC funding has allowed a first opportunity to collaborate (via Eureka), and to test the appetite for collaboration between Singaporean and UK firms. This has led to a new 3-year bilateral programme that has provided funding and continuity to FIC programmes. Increase of 0.5% in overall UKRI funding to grants with partners from Singapore due to FIC.	• New 3-year-bilateral agreement signed in 2022 to fund joint R&I projects in priority areas through annual calls (one general call opened in 2022, one sector-specific joint call (Net Zero) opened in 2023 and another general call in 2024). • Singapore formally joined Eureka network, enabling it to collaborate more consistently with the UK and other involved countries. • Inaugural UK-Singapore Business Partnership Forum held June 2023. • In September 2023, a new UK-Singapore Strategic Partnership was signed, setting the direction for relationships for the medium term.
Japan Science and Technology (JST) Agency	**Relatively new** Japan has low levels of international research collaboration activity historically (and mainly focused on the US and China). The extent of cooperation with the UK had increased gradually over recent years, but still remained relatively limited (particularly in the social sciences and humanities).	**No.** But broader agreement on cooperation in science and technology in place between the two countries.	**Medium / High** Collaboration between countries is driven by FIC and the possibilities of alignment with existing priority areas for Japan. Increase of 2.6% in overall UKRI funding to grants with partners from Japan due to FIC.	• Increased awareness of commonalities in their institutional and national strategic priorities around AI research. • Greater awareness of and trust in mutual processes and priorities, but a lack of available funding so far to take this forward. • Joint UK-Japan programme on the impacts of COVID-19 launched in 2021. Not directly related to the FIC programmes, but thought to have been aided by the good-will and relationships created.

Case study	Maturity of partnership (prior to FIC)	National joint strategies prior to FIC	Level of FIC additionality	Progress so far in strengthening partnerships
Canadian Institutes for Health Research (CIHR)	**Relatively new** Several collaborative initiatives involving the UK, but mainly through multilateral programmes and fora. Extent of collaboration with UK has increased gradually in recent years, as a result of new agreements.	**Yes.** Science, Technology and Innovation (STI) Memorandum of Understanding (MoU) between DSIT and Department of Foreign Affairs, Trade and Development of Canada, 2017; High-Level Agreement between the Canada Research Coordination Committee and UKRI, 2019	**Medium / High** Limited resources available to collaborate before FIC. FIC funding provided the ability to participate in an international initiative (with various countries) with a greater overall scale of funding. Increase of 1.5% in overall UKRI funding to grants with partners from Canada due to FIC.	• Contribution towards increased scale and strength of the relationship in terms of number of collaborative programmes. • Affirmation of alignment intergovernmental priorities. • Supported the appointment of a new role within the UKRI North America Office, Head of Canadian Partnerships. • The Medical Research Council (MRC) and CIHR engaged in ongoing discussions on timing and focus of future possible collaborative programmes. • The Research in Climate Change Adaptation and Mitigation 5-year-joint initiative was launched in January 2023, with involvement of the UK, and other worldwide partners. • UK - Canada updated MoU on Science, Technology and Innovation signed in January 2024
United States National Science Foundation – Geosciences (NSF GEO)	**Mature** Long history of collaboration in supporting research through bilateral and multilateral arrangements	**Yes.** UK/USA Agreement on Scientific and Technological Cooperation (2017); UKRI-NSF MoU (2013, renewed 2018)	**Medium / Low** Enabled development of a model for collaboration at the funder level which is facilitating the design and implementation of further joint programmes. Increase of 1.2% in overall UKRI funding to grants with partners from the USA due to FIC.	• Consolidated model for the design and implementation of thematic collaboration programmes. • Clearer understanding of research priorities of partner divisions. • Helped identify areas of expansion for Lead Agency opportunities and streamlined operational processes. • In 2023, the partnership developed through the FIC programme formed the basis for a second joint programme, Climate consequences of rapid ocean changes, funded by the ISPF and NSF (and which involves a second NSF GEO directorate that NERC had not previously worked with)

Case study	Maturity of partnership (prior to FIC)	National joint strategies prior to FIC	Level of FIC additionality	Progress so far in strengthening partnerships
Ministry of Science and Technology – Department for Biotechnology India (MOST DBT)	**Mature** Long history of collaboration in supporting international research	**No.** However institutionalised dialogues have taken place via the India-UK Science & Innovation Council (SIC) (2006), and UK-India Science & Innovation Task Force (2014)	**Medium / Low** FIC has allowed collaboration in research areas of common interest that are non-ODA focused (e.g., UK-India COVID-19 Partnership Initiative). Increase of 0.9% in overall UKRI funding to grants with partners from India due to FIC.	• New forms of collaboration and topics beyond Sustainable Development Goals tested. • Enabled relationship to be maintained through a period with relatively little other funding available for international collaboration. • Strengthened understanding of the R&I ecosystem, priorities, and capabilities. • Planned Global Incubator Programme between Innovate UK and India (based on FIC pilots elsewhere) now launched, but with a different Indian partner and not as part of FIC.
Swiss National Science Foundation (SNSF)	**Mature** Long history of collaboration in supporting research through bilateral activities and multilateral arrangements	**Yes.** UKRI-SNSF MoU (2022).	**Medium / Low** Other sources of funding available to progress similar activities (e.g., Scientific Exchanges). FIC allowed a first collaboration between the research agencies. Increase of 0.3% in overall UKRI funding to grants with partners from Switzerland due to FIC.	• Increased familiarity and ongoing conversations on how to progress the partnership. • Strategic areas of collaborative work identified for future collaboration. • UK and Swiss government signed an MoU in 2022 to endorse their support to further collaboration.
National Natural Science Foundation of China (NSFC)	**Mature** Long history of collaboration in supporting international research	**Yes.** UK-China Joint Strategy for Science Technology and Innovation cooperation, 2017	**Low** Other sources of funding available to progress similar agendas (e.g. the Industrial Strategy Challenge Fund). Increase of 1% in overall UKRI funding to grants with partners from China due to FIC.	• For Chinese partner, opportunity to fund interdisciplinary collaborative research (and opportunity to test and learn from application and assessment processes). • No follow-on initiative with NSFC at this stage. • UKRI has continued to collaborate with China (but not yet NSFC) through ISPF funding.

Source: Technopolis analysis of case studies.

Across the case studies, **pre-existing funder-level relationships were flagged as an enabler to strengthening partnerships**, providing further evidence that successful partnerships take time to materialise and develop (see Table 2 below, which summarises key enabling factors and barriers). There is often a trade-off, however, where strong pre-existing relationships tend to lower FIC's additionality, but facilitate programme design and implementation.

The support received from the UK's Foreign, Commonwealth and Development Office (FCDO) SIN (in particular in the cases of Japan and Switzerland) was also highlighted as a facilitator for initial mediation with overseas partners and for the identification of collaborative opportunities.

In the case of India, the support from the UKRI India office was also highlighted as an enabling factor. This office played a central and important role in building relationships between the UKRI councils and MOST DBT, and also prepared the ground for more substantial discussions directly with UKRI councils. Through their long-standing relationship with MOST DBT, UKRI India has a portfolio of options for collaboration in areas of mutual interest that can be mobilised when funding is available.

The existing and good relationships mean not only having well-established points of contact, but also an alignment of processes and values (e.g. in the case of Canada). Good funder-level relationships also made it easier to manage certain barriers or challenging aspects of the collaboration under FIC (such as the risk of raising expectations with overseas partners through the FIC process requiring involvement from overseas partners already at the bidding phase), as was highlighted by partners consulted for the India case study.

Short proposal times (for the initial FIC programme bidding phase) and restrictions imposed by the response to the COVID-19 pandemic (across all countries) also regularly emerged as barriers to collaboration, along with the need to reconcile different ways of working.

Table 2 Enabling factors and barriers to strengthening funder-level partnerships

Case study	Enabling factors	Barriers
NSF GEO (US)	• **Pre-existing relationships** and established collaboration processes between NSF and UKRI. • Another enabler was that NERC joined a call of an existing research programme with annual calls for proposals. • Scale of funding made available by FIC which incentivised engagement at the funder level. • Support of UKRI North America Office in early phases of the programme. • **Flexibility** of the FIC vis-a-vis extensions for research projects. • Complementary funding agency regulations and processes (e.g., UKRI's ability to convene and fund researcher workshops and NSF providing travel budget as part of the research grants).	• **Short proposal times** hinder extending participation to additional NSF directorates/divisions and other US research funders. • **COVID-19** related delays to the start of research and travel restrictions precluding face-to-face meetings

Case study	Enabling factors	Barriers
NSFC (China)	• **Well-established relationship** and collaboration processes. • Similar remit and ways of working.	• **Short proposal times.** • **Challenges around negotiating co-funding** before knowing if FIC funding would be available.
JST (Japan)	• High level of engagement and communication between programme managers, helping to build understanding and overcome challenges • Support from SIN officer in Japan • Initiation of FIC wave 2 (building on wave 1 success).	• Language (an early challenge that was tackled through regular interaction and additional efforts from both funders). • **Reconciling different systems for reviewing** open calls (overcome). • COVID-19 and the inability to travel to meet with partners.
CIHR (Canada)	• **Alignment of research values, operational process** and strategic priorities at funder and national level. • **Pre-existing relationships** through multilateral partnerships.	• **FIC spend profile** (time limit), creating mismatches with Canadian funding timelines and reducing time available to promote opportunities and assess proposals.
MOST DBT (India)	• **Well-established and trusted partnership** with DBT. • Support from UKRI India (building relationships and identifying collaborative opportunities at an early stage).	• **Risk of raising expectations** on partner side due to FIC process which requires involvement from overseas partners already at the bidding phase. • **Uncertainty about long-term funding** is a risk to further consolidation and development of partnerships. • Partnership relied heavily on a small number of specific key individuals, whose departure would risk the success of the joint activities.
Enterprise Singapore	• Eureka Framework. • Shared interest of both countries to deepen their relationships. • **Demand:** Positive response of Singaporean firms to calls showing interest in collaborative R&D projects with the UK.	• COVID-19. The second call was in 2020 and travel restrictions limited in-person business interactions. • Underestimated level of response from both UK and Singaporean firms to both programmes, reducing the available funding per firm.
SNSF (Switzerland)	• **Commitment from SNSF to the partnership** to match funding. • **The Biotechnology and Biological Sciences Research Council's (BBSRC's) prior experience in running Partnering Awards calls.** • Fluid communication throughout the process between UKRI International Office (including SIN representatives) and SNSF officials.	• Administrative due to undergoing organisational changes affecting timeliness of the agency's response.

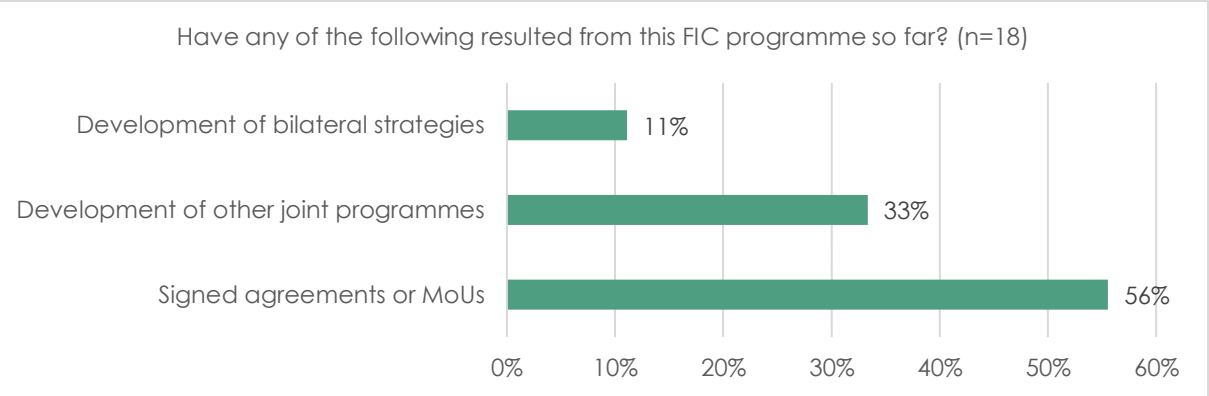
Source: Technopolis analysis of case studies.

4.2 Concrete action has already been taken to further some funder-level collaborations (beyond FIC)

All UK FIC programme leads were asked as part of the final evaluation whether there had been any **follow-on activities from their programme, in terms of joint agreements, strategies or programmes with overseas funders**. Unfortunately some of the original FIC programme leads are no longer in place, and a view across the entire portfolio could not be obtained. However, responses from around half of the programmes provide a good indication of overall results, as well as a range of examples of the types of follow-on activities that have been realised.

Over half (56%) of the programme leads responding reported the signing of agreements or MoUs, while a third (33%) reported the development of joint programmes. Two of the programmes responding (out of 18) reported the development of bilateral strategies. Overall, 11 of the 18 leads (61%) selected one or more of these options.

Figure 11 Whether joint agreements, strategies or programmes with partners have resulted from FIC



Source: Programme Lead survey, 2024.

Where leads pointed to FIC having already resulted in a follow-on agreement, strategy or programme, they were asked to provide further details. The following examples were provided.

Table 3 Examples of follow-on agreements, plans and programmes between funders

Programme	Example
FIC 16: UK-Korea Health Sciences Collaboration (MRC)	Following the FIC programme, MRC, the **Korean Health Industry Development Institute (KHIDI)** and **Innovate UK** have collaborated on an **ISPF** call on digital health. This provides an opportunity to further strengthen the relationship and follows on from a re-signing of an MoU between KHIDI and MRC.
FIC-05: AIT/ Watchman/ NEO (STFC)	FIC enabled the Science and Technology Facilities Council (STFC) to expand work at the Boubly Underground Laboratory and has resulted in partnerships with a network of universities and National Laboratories funded by the **National Nuclear Security Administration (NNSA).** The Partners are collaborating on a plan for the Lab to host larger scale experiments (which will require global participation and significant investment from EU and US partners). STFC and NNSA have signed MoUs relating to the development of neutrino detection technologies for nuclear security science and senior representatives from STFC, NNSA, the UK Ministry of Defence, and the Office of Science in the US meet quarterly.
FIC 2-14: UK-India Extreme Photonics Innovation Centre (EPIC) (STFC-Central Laser Facility)	Secured **ISPF** funding to expand activities within EPIC to machine-learning assisted bio-imaging involving the Tata Memorial Hospital, Mumbai. Also discussing a joint programme on Petawatt laser science with the Tata Institute of Fundamental Research (India), which could be funded partly through the Business and Innovation Directorate at STFC or through other private investments.

Programme	Example
FIC2-06: Digital Transformation in Humanities Research: UK-Irish Collaboration in the Digital Humanities (AHRC)	Scoping work underway for a bilateral focused on UK-Ireland collaboration in the creative industries.
FIC 21: UK-China Creative Industries Collaboration (AHRC)	The **Shanghai Theatre Academy** have served as a project partner on several large research grants within the programme, providing an opportunity to partner with UK teams on joint R&I projects. The programme has served to strengthen AHRC's existing relations with the Academy and they are working to develop the concept of a joint UK-China Creative Industries R&I Hub in Shanghai.
FIC STR 01: MRC-AMED Regenerative Medicine and Stem Cell Research Initiative (MRC)	Following FIC, have since collaborated with the Japan Agency for Medical Research and Development (with match funding) on two further funding activities through **ISPF** – one on neuroscience and one on engineering biology. Both were developed and delivered at pace due to the foundations developed during FIC.
FIC2-19: UK-US Business Innovation Bridge (Innovate UK)	**Innovate UK** are discussing 2 follow-on programmes with 2 separate entities in the US, as a direct result of this partnership: - A second collaboration on offshore wind with the existing FIC partner (the **National Offshore Wind Research and Development Consortium**) - A new collaboration with the Advanced Research Projects Agency–Energy (US), which is in an advanced stage of discussions.
FIC 12: Breakthrough Technologies to Advance Crop Breeding (BBSRC)	BBSRC is developing a call that involves the organisations from the FIC programme (**NSF and the US Department of Agriculture (USDA)**), plus an additional German funder. The call scope and the activity itself are direct outcomes from the increased interaction with the US funders and the interaction with the research community. Due to this follow-up activity, the funders will continue working closely together, while the researchers will have the opportunity to access further funding in the area and continue their joint work.
FIC 20: UK-US Collaboration for Digital Scholarship in Cultural Institutions: Reimagining the Future of the World's Leading Museums (AHRC)	A new MoU between AHRC and the **US National Endowment for the Humanities**. It is anticipated that this will cover post-FIC activity between the two research funders. Through the programme's workshops, calls and wider engagement activity, AHRC has also started to build relationships with the **US NSF** and the **Getty Conservation Institute**.

Source: Programme Lead survey. Includes examples from both the interim (2022) and final (2024) survey.

Evidence collected via the in-depth case studies also shows that FIC programmes have led to the identification of future opportunities for collaboration, as well as the initiation of some follow-up joint activities (see Table 4).

Table 4 Evidence of the sustainability of funder-level partnerships

Case study	Assessment	Evidence of sustainability
Enterprise **Singapore**	**High/ Highly likely**	Innovate UK and Enterprise Singapore have continued to strengthen their collaborative partnership. In 2022, the two organisations signed a new 3-year bilateral agreement to continue developing existing programmes with a more strategic focus. Further calls with Singapore have also been launched (now funded through Innovate UK's core budget) and the partners are currently supporting their fourth cohort of businesses. Enterprise Singapore's medium-to-long-term budget and planning (five-year budget allocation) and Innovate UK's core budget will ensure continuity and the possibility to expand their areas of collaborative work. In September 2023, the Prime Ministers of the UK and Singapore also signed a new UK-Singapore Strategic Partnership, setting the direction for medium term cooperation on security, research and innovation. The relationship between Innovate UK and Enterprise Singapore is seen as a cornerstone of this wider developing diplomatic relationship.
NSF GEO (US)	**High/ Highly likely**	The Changing North Atlantic Ocean and its Impact on Climate was the first example of a programme co-designed by NERC and the Physical Oceanography Directorate of the NSF Ocean Sciences Division. The successful working relationship and trust built during its implementation formed the basis for a follow-on joint programme (Climate Consequences of Rapid Ocean Changes) in 2023 (funded through **ISPF** in the UK). This new initiative also extended the partnership to include a second NSF GEO Directorate that NERC had not previously partnered with. The close working relationship and strategic discussions established during implementation of the FIC programme ensured that NERC and NSF were ready to submit a proposal when ISPF was announced. The implementation of the Signals in the Soil programme has allowed NERC to build close relationships with key individuals in the NSF Directorate for Engineering and at the USDA, which will facilitate discussions on future partnerships, including with other NSF directorates (e.g. for Biological Sciences). The programme also served to scope out an emerging multi-disciplinary research area, working with world-leading experts in the US. This has informed UK policy and helped to embed soils into the new cross-council theme 'Building a green future' under the 'Land use for net zero' programme, supporting the government's adaptation programme to tackle climate impact.
CIHR (Canada)	**Medium/ Likely**	MRC and CIHR have strengthened relationships and aligned priorities. Both agencies are in ongoing conversations about developing future programmes. Joint working and increased understanding / awareness is thought to have supported the launch of other initiatives (more easily) between the UK and Canada (e.g. participation in the Canada-led International Joint Initiative for Research in Climate Change and Adaptation and Mitigation, through **ISPF**). The FIC programmes were also a fundamental driver to the appointment of a new role within the UKRI North America Offices, Head of Canadian Partnerships. This appointment will help to continue to strengthen and build on relationships through further collaborations and ensure coordination and coherence in the portfolio of future UK-Canadian collaborations.

Case study	Assessment	Evidence of sustainability
NSFC (China)	**Medium/ Likely**	The UKRI 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. The programme's focus on interdisciplinarity (medical and social sciences in this instance) is a relatively new area for NSFC; NSFC established a new Department of Interdisciplinary Sciences in November 2020, and UKRI and NSFC held a joint workshop on interdisciplinary research in May 2022 (outside of the FIC programme) and continued discussions at the UKRI-NSFC strategic biennial meeting in 2023. The processes already in place enable the partners to identify future strategic opportunities for collaboration. For instance, following the 10th China-UK Joint Commission on Science, Technology and Innovation Cooperation in 2021, the theme 'One Health' was identified as a new UK-China Flagship Challenge. With funding from **ISPF**, UKRI is now collaborating with the Chinese Ministry of Science and Technology to support projects addressing One Health approaches to epidemic preparedness and AMR.
MOST DBT (India)	**Medium/ Likely**	There is considerable demand in India for collaboration with the UK and FIC has opened new opportunities for this bilateral relationship beyond ODA funding (i.e. as a more equal partnership). Opportunities for sustained collaboration in non-ODA areas have started to emerge and will require long-term funding to consolidate. Additional initiatives such as the "2030 Roadmap for India-UK future relations" are also strengthening collaboration between the countries and preparing the groundwork for future collaborative activities. The text of this roadmap outlines plans for collaboration across a number of policy areas, including R&I.
JST (Japan)	**Low/ Uncertain**	Though there is a history of collaboration between the UK and Japan prior to the FIC programme, the relationship between UK and Japanese research partners in the social sciences and humanities (i.e., with AHRC and the Economic and Social Research Council (ESRC)) has emerged more recently. According to ESRC, the relationship with JST was very much driven by FIC and could not be supported through core budgets. Despite increased interest on both sides in future collaboration between the two organisations, there has not been funding available in the UK to support this, and there are no concrete plans for joint work in the future. ESRC has however collaborated with the Japanese Society for the Promotion of Science, along with AHRC, on a set of 10 projects to explore the challenges and impacts of the COVID-19 pandemic (launched 2021).
SNSF (Switzerland)	**Low/ Uncertain**	A joint statement and MoU between UKRI and SNSF, as well as an MoU between the UK and Switzerland have set out intentions for deeper collaboration, and further joint activities have commenced, but not involving FIC programme partners. UKRI and SNSF interviewees report that discussions on further collaboration are ongoing but are currently complicated by the upcoming Spending Review in the UK and the recent announcement of the UK's association to Horizon Europe (the FIC programme had been viewed as a proof-of-concept for collaboration between the two countries at a time when there was uncertainty about UK and Swiss access to Horizon Europe).

Source: Technopolis analysis of case studies.

At the interim evaluation stage (2021), we found that a number of FIC programmes had already led to the identification of future opportunities for collaboration between UKRI councils and overseas funders. However, in most of these cases, uncertainty around future funding was felt to be preventing these opportunities from being realised. At the final evaluation stage, there was little evidence of the same uncertainties, and as can be seen from the examples in the tables above and below, **many new initiatives have now been able to move forwards**.

In many of these cases (7 of the 8 examples collected where new programmes are already underway), the **follow-up programmes are being supported through the new ISPF,** which includes most FIC priority countries in its scope**.** This Fund is being led by the DSIT, with an initial budget of £337m (FY 22/23-24/25), but delivered by a consortium of R&I bodies (including UKRI), who are then given the freedom to design programmes and activities that align with Fund objectives and priorities, but that also reflect the needs and opportunities that they identify.

ISPF was regularly mentioned during consultations for the final phase of the FIC evaluation. The new Fund was usually regarded positively, particularly in helping to maintain many of the relationships that were created or strengthened through FIC. Indeed, several interviewees mentioned that FIC (alongside GCRF and the Newton Fund), plus the further development of international teams in councils / UKRI alongside these Funds, had helped demonstrate that UKRI can deliver international collaborative activity well, which may have supported its position as the main delivery partner for ISPF. The devolved delivery model of ISPF (DSIT setting the overarching aims and scope, Partner Organisations being best placed to identify opportunities) was also commended as a sensible approach to delivering the Fund.

Consultees also highlighted that the large multi-partner portfolio being created through ISPF, plus the close involvement of UK government, offered opportunities to further pursue country and government-level relationship building. However, it was too early in the new Funds' activities to know whether this potential would be realised.

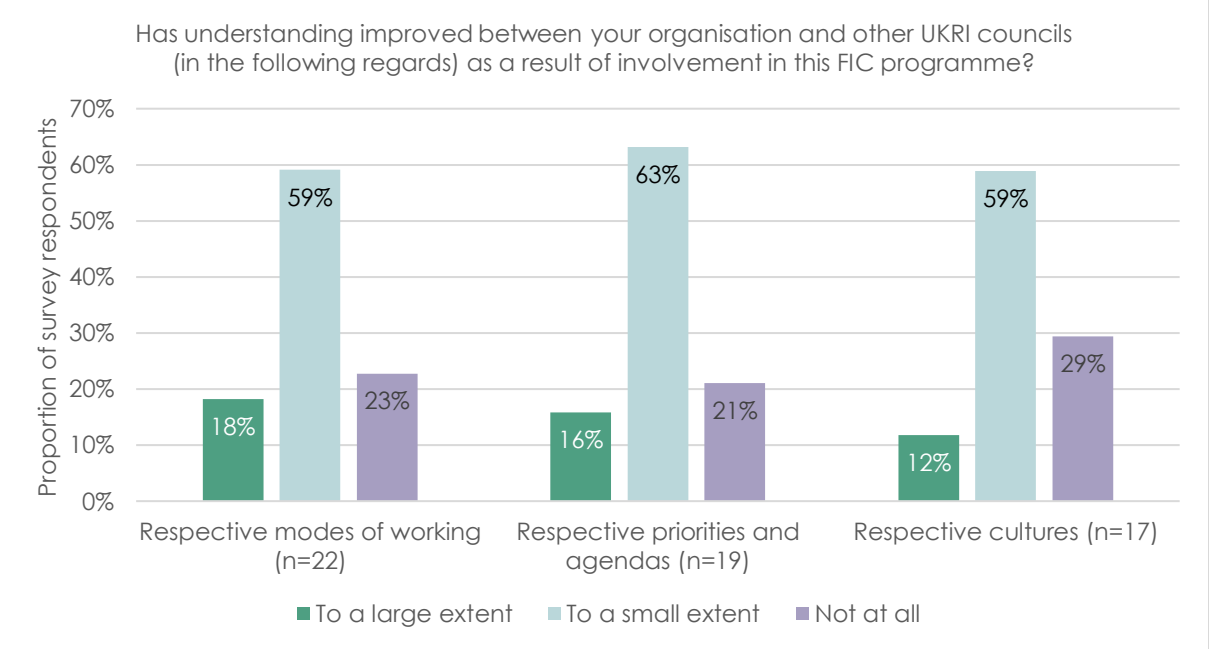
4.3 FIC has also strengthened relationships between UK funders by supporting cross-council programmes

Another element of funder-to-funder relationships that FIC supported relates to **collaboration between the UKRI councils themselves**, with more than half of programmes in the FIC portfolio (21 of 37) involving two or more UKRI councils.

Councils were encouraged to bid jointly for FIC funds, with programme proposals that included multidisciplinary or multi-council activity explicitly considered to be desirable (and scored more highly). The councils were accustomed to working together, including on international endeavours outside of FIC, and had been doing so for many years. However, they also reported (at the time of the FIC baseline evaluation) that the opportunities of FIC had encouraged and incentivised them to come together more than usual (more closely, more broadly) to think about where they could work together, both within FIC and beyond. Interviewed council international leads also highlighted that FIC had supported a more collaborative approach to developing ideas for international collaboration across UKRI.

UK FIC programme leads were subsequently asked about the extent to which understanding has improved between their council and other UKRI councils as a result of involvement in their FIC programme. A majority (70%+ in each case) reported at the interim evaluation stage[9] that there had been improvements in understanding of respective modes of working, of priorities and agendas, and of respective cultures, making them better placed and prepared to work together successfully in future.

Figure 12 Extent to which understanding has improved between UKRI councils as a result of FIC



Source: Programme Lead survey, 2022. Number of responses varies by question.

[9] This question was again addressed to programme leads at the final evaluation stage. However, only a small number of the individuals concerned (n=5-9) felt able to respond.

5 Impact Evaluation: Developing partnerships within projects (Theme 2)

As well as seeking to enable, strengthen, deepen, and broaden relationships between UK and overseas funders (as discussed in the previous section), FIC also aimed to improve individual relationships through the projects and other activities that it supported. This section explores the benefits being realised by FIC participants through these international partnerships.

5.1 Participation in FIC projects has led to increased UK access to broader knowledge and research infrastructure, as well as the development of skills needed to work collaboratively internationally

Access to critical knowledge and expertise, research infrastructure as well as contacts, networks and markets, were strong motivations to take part in grants funded by FIC programmes. In the initial phase of the evaluation (baseline survey), we found that a large majority of UK participants from cohort 1 (78%–94%) agreed or strongly agreed that each of these factors had driven them to work with overseas partners. Similar results were also observed among international participants in grants funded by FIC programmes (baseline survey). This confirmed the assumption that international collaboration in those projects was seen (at least at the outset of the projects) as an important factor to pursue the project objectives.

Additionally, the baseline evaluation found that UK and international participants (cohort 1) were also motivated by a desire to explore how collaboration would work in practice, with 90% and 95% (respectively) agreeing or strongly agreeing that partnering in their FIC project provides a good opportunity to understand how to collaborate in the future.

In the current phase of the evaluation, we invited UK participants (of finished projects) to reflect on their skills and capabilities in relation to working collaboratively in international teams. They were asked to assess three different points in time (just before the FIC project, at the end of the project, and currently), using a score from 1 to 5 (where 1 is "poor" and 5 is "excellent"). Table 5 below shows that **there has been an increase (of between 0.8 and 1 points) across all categories (relative to the point of application).**

Table 5 Change in skills and capabilities to work in international teams (FIC participants)

	At the point of application	At the end of the project	Current position
Ability to access new or better knowledge from overseas	3.1	4.1 ++	4.1 ++
Ability to access new or better facilities, tools and techniques from overseas	2.6	3.5 +	3.5 +
Ability to navigate different working and research cultures	3.2	4.1 +	4.1 +
Ability to identify sources of funding internationally	2.5	3.2 +	3.3 +
Overall ability to work collaboratively in international teams	3.4	4.3 +	4.3 +

Source: Final survey of UK participants. Finished projects only. n=125. ++ indicates an increase of 1 point or more, + indicates a lower increase, = indicates no change (with respect to the baseline).

For comparison, we asked a similar question to unsuccessful FIC applicants. Their responses suggest some improvement (on average) over time across three of the five areas explored in the question, but the difference is much smaller (an improvement of 0.1 to 0.3 points in each case). In the other two areas, their position has remained the same, or even fallen slightly.

Table 6 Change in skills and capabilities to work in international teams (unsuccessful applicants)

	At the point of application	Current position
Ability to access new or better knowledge from overseas	3.7	3.6 -
Ability to access new or better facilities, tools and techniques from overseas	3.0	3.1 +
Ability to navigate different working and research cultures	3.8	3.8 =
Ability to identify sources of funding internationally	2.9	3.2 +
Overall ability to work collaboratively in international teams	4.1	4.2 +

Source: Final survey of unsuccessful applicants. n=68. ++ indicates an increase of 1 point or more, + indicates a lower increase, = indicates no change, - indicates a decrease.

5.2 FIC has facilitated new collaborations among researchers and innovators, including with partners overseas

UK participants (cohorts 1 & 2) were asked in the baseline survey to indicate how many of their UK-based and overseas partners were existing and how many were new. As shown in Table 7, **43% of all partners counted were new overseas partners. On average, that equates to 1.9 new overseas partners per project.** There are also new partnerships supported among UK organisations (17%, 0.8 on average), so a total of 61% of partners were new overall.

Table 7 New and existing partners

Your partner organisations/university departments	UK-based partner	Overseas partner
Existing partner (i.e. those that your organisation/university department had collaborated in an R&I project with before this application)	22% of partners 1.0 partners per project average	17% of partners 0.8 partners per project average
New partner (i.e. those that your organisation/university department had not collaborated in an R&I project with before this application)	17% of partners 0.8 partners per project average	43% of partners 1.9 partners per project average

Source: Baseline surveys of UK participants cohort 1 (n=150) and cohort 2 (n=102).

This is further corroborated by analysis of GtR, undertaken at the interim stage. Across the 506 FIC projects recorded in GtR at that time, there were 4,166 combinations of bilateral partnerships (i.e. between two different organisations in a consortium). We searched for each of these same combinations of partners in GtR outside of FIC, but before the start of the FIC project, and identified earlier collaborations between the same parties in only 23% of cases. Therefore, **in the majority of cases (77%), FIC provided a first opportunity for collaboration between organisations (at least in terms of grants awarded through UKRI councils)** (Table 8).

The difference between these statistics and the figures provided by respondents to the survey may be driven by the fact that the GtR analysis focuses on previous collaborations funded only by UKRI, while respondents to the survey could also be including previous collaborations funded via other means (e.g. EU Framework Programmes).

Table 8 Summary of first-time collaborations between FIC project partners

Type of collaboration	Instances of collaborations in FIC	Proportion
Collaborations also occurring at an earlier date in GtR	963	23%
Collaborations occurring for the first time in FIC	3,203	77%
Total	*4,166*	*100%*

Source: Technopolis (2023) using GtR.

5.3 There is evidence of gains in terms of better understanding of partners' research agendas and capabilities, and improved skills and capabilities of working in international teams

Almost all UK participants and international participants (94% and 98% respectively) stated in the final survey that participation in their project (funded by a FIC programme) has led to a **better understanding of their partners' capabilities,** to a great extent or to some extent. Furthermore, FIC projects are also reported to have provided the opportunity to learn about their partners' ways of working, as well as their research agendas and priorities, with close to 100% of UK and international participants stating that this had been achieved.

These are strong results in their own right, but also represent intermediate steps that could lead to further fruitful collaboration. In fact, respondents also stated that participation in their FIC project has **increased the likelihood of collaborating with their partners again in the future** (e.g. 67% of UK participants responded 'to a great extent'). A slightly smaller (but still large) percentage of participants also stated that their project has led to the identification of further opportunities to collaborate (e.g. 54% of UK participants responded 'to a great extent').

Table 9 Improvements in understanding and likelihood of collaborating

	UK Participants			International participants		
So far, participation in the project has led to…	**To a great extent**	**To some extent**	**Not at all/Not yet**	**To a great extent**	**To some extent**	**Not at all/Not yet**
An improved ability to work together	64%	32%	3%	68%	29%	3%
A better understanding of their ways of working	67%	26%	6%	74%	24%	3%
A better understanding of their research agendas/priorities	65%	29%	4%	69%	29%	1%
An increased likelihood of collaborating again in the future	67%	27%	4%	65%	24%	11%
The identification of further opportunities to collaborate	54%	38%	8%	71%	25%	4%

Source: Final evaluation survey of UK participants (n=125) and international participants (n=72).

5.4 FIC has supported further opportunities for international collaboration, beyond the Fund

Building on the results presented in the previous section, **74% of UK participants in FIC projects that have now finished stated in the survey that they have been able to continue their relationship with overseas partners** (beyond the project itself) through further grants or other means. Of those who indicated a source of further funding to support this partnership (16 of the 81 respondents with a continuing relationship), most indicated either UKRI (n=8) or an overseas government department or agency (n=7).

By comparison, just 43% of unsuccessful applicants (n=81) reported at the interim survey that they had been able to pursue their relationship with overseas partners from their FIC application through other grants or other means. This provides evidence of FIC having strengthened the relationships of UK and overseas participants within their projects.

Other evidence from the final survey suggests that FIC participants are now active in international collaboration more generally, not just with their FIC partners. The number of respondents (n=37) is quite small (as we only asked this question of those whose project had finished, and the information may be difficult to come by), but these respondents suggested that since their FIC project had ended, they had (on average) submitted around 1.2 further proposals with overseas partners from their FIC project, as well as around 2.5 proposals with other overseas partners (not involved in the FIC project). The increased skills and knowledge obtained through their FIC experience (evidenced above) may partly explain this level of international collaboration activity beyond FIC partners.

Table 10 Average number of research proposals that your organisation or university department submitted…

	During the FIC project	Since the FIC project has ended
… with your **overseas partner** organisations/university departments from the **FIC project**	0.6	1.2
…with other **overseas partner** organisations/university departments (**not those in the FIC project**)	2.0	2.5

Source: Final survey of UK Participants. Finished projects only. (n=37, only includes respondents able to estimate all four parts of the question)

6 Impact Evaluation: Deepening R&I (Theme 3)

The Fund sought to enable UK researchers and innovators to carry out world-leading R&I within new and existing areas of strategic importance across the UKRI international portfolio, delivering new knowledge, and societal and economic impact. This section looks at evidence as to the progress of the R&I being funded, as well as the outputs and outcomes of this work.

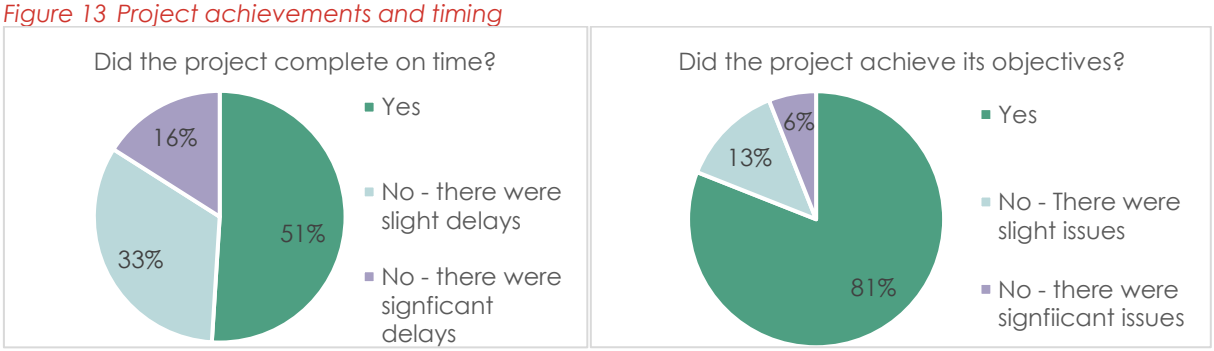
6.1 The majority of projects have achieved (or are on track to achieve) their objectives, albeit often with some delays

In line with the assumptions stated in the ToC, we did not expect to find evidence of the achievement of R&I outputs across all projects at this stage (as not all projects have finished, and it can take time for final results to emerge).

Almost three quarters (71%) of UK participants responding to the final survey reported that their FIC project had now finished. Of these, around half (49%) reported some delays or issues with their timetable (often due to the COVID-19 pandemic), although in most cases these were reported as "slight" rather than "significant". Despite this, the great majority **(81%) of FIC participants reported that their (finished) project had achieved its objectives**, while only 6% reported significant issues here (see Figure 13).

Amongst those whose projects were still ongoing (n=49), the results were similar, with 82% reporting that they were on track to achieve objectives (despite 36% reporting slight / significant delays).

Figure 13 Project achievements and timing



Source: Final survey of UK participants (finished projects only) (n=124).

6.2 There are an increased number of publications being developed in collaboration with FIC priority countries

One of the expected R&I outputs of FIC projects was publications co-authored between researchers and innovators in the UK and priority countries. We collected baseline data to track how this evolved over time, allowing us to measure progress through the different phases of the evaluation. The box below briefly introduces the approach to bibliometrics, before the findings are then discussed.

Box 1 Introduction to bibliometrics

The bibliometric analysis on progress so far was undertaken in August 2024. It includes the 231 FIC grants with relevant papers published by the end of 2023 that are indexed in Scopus. This covers 990 publications with at least one author affiliated with a UK institution.[10] At the interim evaluation stage, the same analysis was based on 301 publications from 122 grants.

Even though this is the final iteration of this evaluation project, the bibliometrics findings presented can still be considered as preliminary because the FIC supported papers published until 2023 will represent only a fraction of total papers that will result from the programme eventually. Some projects are still ongoing, and even where they are finished, papers may still be published 2 or 3 years after the end date (as findings become available after the end of research and/or due to lags in the publication process). We should also expect that a portion of supported publications are not yet reported in GtR and/or authors may not have clearly acknowledged a FIC grant number in the publications. As such, **when reading results, it is important to have in mind that the papers captured so far are concentrated on only a sub-set of grants**[11] (and possibly a sub-set of their eventual output).

To explore the effect of FIC on international collaboration in papers, we draw several comparisons and analyse results for:

- The UK (based on papers with at least one author affiliated to a UK institution)
- UKRI (based on papers that were developed with funding from UKRI)
- FIC papers (which includes papers with at least one author affiliated with a UK institution and FIC researcher).

UK and UKRI papers provide a benchmark for the degree of international collaboration and how that changes overtime, providing context to understand the figures for FIC papers. We also draw international comparisons with Germany, France and Italy for further (international) context

We first focus the analysis only on FIC researchers (UK participants named on FIC grants). This bibliometric analysis (see Table 11) shows that **FIC researchers were already active in international co-authorship before FIC, but their international co-authorship *within* FIC projects is higher than before, and in comparison with other sources of UKRI funding.**

For instance, prior to FIC (2014 to 2018), 38.7% of UKRI papers from FIC researchers included at least one author affiliated to an institution in a FIC priority country. This degree of co-authorship has increased over time and is 43.5% in the period 2019 to 2023. Furthermore, this degree of collaboration is even higher with FIC funding (57.0%) (see cells shaded in blue in Table 11). This analysis suggests that in the absence of FIC, researchers would have been active in co-

[10] The bibliometric analysis is based on data extracted from GtR and Researchfish in August 2024 (to allow for sufficient time for data cleaning and analysis to inform the first iterations of the report). At this point there were 2,240 publications recorded in Researchfish associated to FIC (considerably higher than the 195 publications found at the baseline stage, or the 822 publications found at the interim stage). 1,443 out of the 2,240 publications were found in Scopus. The other 797 could not be found for many reasons (a non-indexed document type, journal not indexed in Scopus, lack of information, etc.). Most of the outputs in GtR not indexed in Scopus refer to document types with lower coverage in Scopus, such as: Books, conference proceedings abstracts, working papers, etc. From the 1,443 articles matched to Scopus, 1,116 were kept for the analysis. The 327 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) (highlighting the fact that researchers may over represent their publication records associated to specific grants in Researchfish). Publications after 2023 were also not included. From these 1,116 articles, 990 were published by at least one author affiliated with a UK institution and 847 with a FIC researcher. See Appendix E for further details.

[11] In particular, 224 publications relate to projects supported through the RE&S through AI Canada call 2019, 196 to the UK-Japan SSH Connections Call, and 111 to the Signals in the Soil October 2019 call.

authorship with those countries to some degree, but FIC has had a positive effect on increasing that degree of co-authorship.

The table also indicates that international co-authorship through FIC has not come at the detriment of other international co-authorship (with non-priority countries). UKRI-funded researchers have been active in international co-authorship prior to FIC and continue to be so with and without FIC funding (see cells shaded in green).

Table 11 Share of international co-publications (FIC researchers only)

	Full count (Yearly average)			Share of international co-publications (SIP) with FIC priority countries			SIP with all countries		
	2014-18	2019-23	D	2014-18	2019-23	D	2014-18	2019-23	D
UK papers	3,153	4,047	893	39.1%	45.1%	6.0 pp	55.6%	62.1%	6.5 pp
Papers funded by UKRI	1,301	1,969	668	38.7%	43.5%	4.8 pp	54.6%	59.5%	4.9 pp
Papers funded by FIC	0	169	N/C		57.0%	N/C		69.8%	N/C

Source: Technopolis and Science Metrix [Table XXII], based on data from GtR, Researchfish, and Scopus (2024). pp=percentage point

Bibliometric data also shows that the **UK overall** has increased its relative level of co-authorship (on papers) with FIC priority countries during the period of the Fund (6.5 percentage points higher in 2019-23 in comparison with 2014-18). It also shows that co-authorship within FIC papers is even higher than in comparison with other UK and UKRI (funded) projects (56.1% versus 44.2% and 38.2% respectively) (see Table 12, cells shaded in green).

Note also that co-authorship with FIC priority countries is higher across all UK groups in comparison with Germany, France, and Italy (and growing faster). Naturally FIC is not driving this overall increase (given its size), but it is clearly contributing in the right direction.

Table 12 Share of international co-publications (All researchers)

	Share of international co-publications (SIP_W) with FIC priority countries			SIP_W with all countries		
Country/funding sources	**2014-18**	**2019-23**	**D**	**2014-18**	**2019-23**	**D**
UK papers	**37.7%**	**44.2%**	**6.5 pp**	**58.7%**	**66.4%**	**7.7 pp**
Papers funded by UKRI	34.0%	38.2%	4.2 pp	51.2%	57.0%	5.8 pp
Papers funded by FIC		56.1%	NC		68.6%	NC
Comparator countries	**2014-18**	**2019-23**	**D**	**2014-18**	**2019-23**	**D**
Germany	31.3%	34.5%	3.2 pp	51.7%	55.9%	4.2 pp
France	30.0%	33.5%	3.5 pp	54.1%	58.5%	4.5 pp
Italy	25.8%	26.8%	1.0 pp	47.9%	49.7%	1.8 pp

Source: Technopolis and Science Metrix [Table II], based on data from GtR, Researchfish, and Scopus (2024). pp = percentage point. SIPw indicators are weighted to align with the distribution of FIC publications across the subfields of science.

There is the expectation that this degree of international co-authorship will contribute positively to the research and deliver more citations (which is often used as a measure of impact). It is very early to measure this effect for FIC, but bibliometric data for UK and UKRI suggests that this is the case.

The analysis (see Table 13) is based on the average of relative citations (ARC) of papers, a proxy for research impact[12]. The analysis shows that the ARC of papers conducted with international co-authorship tends to be higher (1.7 versus 1.3 for UK papers), and that this effect is even higher among papers that include at least one author affiliated to an institution in a FIC priority country (1.9). Moreover, the ARC is higher for UKRI papers (2.0 and 2.2 versus 1.8), suggesting that UKRI's assessment processes are able to identify and fund research of potential high impact from the outset.

At present, only papers published in 2021 or earlier have an ARC score (due to the time it takes for citations to arise), and so only some of the earlier outputs from FIC can be analysed. However, these already show an ARC of 1.9 for the 2019-21 period, across all three measures (not shown in the table).

The ARC for UK papers and UKRI papers (and early FIC papers) are all higher, on all three measures, in comparison with Germany, France, and Italy.

Table 13 ARC (2014 to 2018)

	ARC (1)	ARC (2) (for papers that include at least one international collaborator)	ARC (3) (for papers that include at least one international collaborator from a FIC priority country)
Country/funding sources			
UK papers	1.3	1.7	1.9
UKRI papers	1.8	2.0	2.2
Comparator countries			
Germany	1.1	1.5	1.7
France	0.9	1.4	1.6
Italy	1.1	1.4	1.6

Source: Technopolis and Science Metrix [Table III], based on data from GtR, Researchfish, and Scopus (2024). The ARC is calculated for groups/entities with a minimum of 30 papers that have a relative citation (RC) score. Only papers published in 2021 or earlier have an RC score.

The pattern in Table 13 also holds for FIC papers when looking at two other related metrics: Citation Distribution Index (CDI) and share of papers among the top 10% most highly cited papers (HCP10) (see Appendix E).

[12] The average of relative citations (ARC) is the average of the relative citation scores of all the articles published by a given entity. The ARC is normalised to 1 (world average for similar publications), meaning that an ARC above 1 indicates that the articles have higher-than-average impact, an ARC below 1 means that the articles have lower-than-average impact, and an ARC near 1 means that the publications have near-average impact.

6.3 Projects have also made progress in the development of other R&I outputs

FIC projects have also produced other R&I outputs, particularly new research databases and models, creative products and research materials. However, for some projects it is still too early to understand the outputs fully, and more are expected in future.

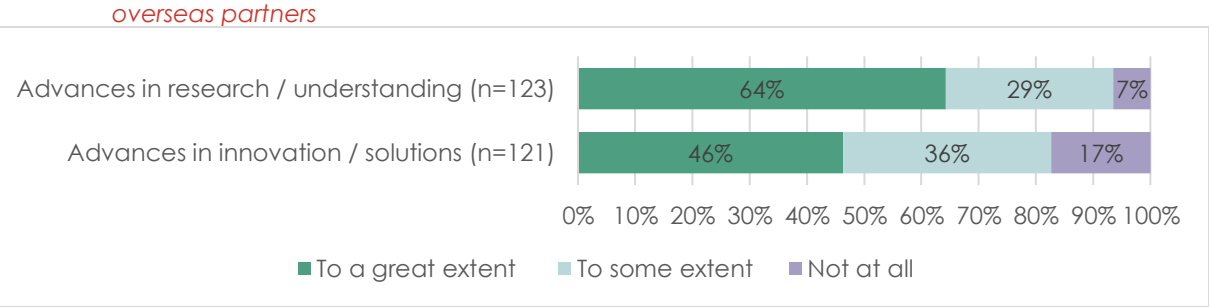
Table 14 Other R&I outputs

	Number of FIC projects reporting output	Average number of outputs (where reported)	Total number of outputs reported
Research databases and models	50	2.0	100
Creative products	42	2.6	109
Research materials	39	1.7	65
Software	26	1.3	35
Spinouts	4	1.3	5
Intellectual property	2	1.5	3
Products	1	2.0	2

Source: Technopolis (2024). Based on Researchfish data. Outputs have not been de-duplicated.

Nearly all UK participants in finished projects stated via that **collaboration had led to advances in R&I that would not have been possible without the overseas partners**.

Figure 14 To what extent has FIC led to advances that would not have been possible without the overseas partners



Source: Final survey of UK participants (finished projects only).

They also provided (through the survey) some examples of R&I outputs generated (so far) through their projects. These included:

- Proof and demonstration of the importance of soil physical structure in soil organic carbon dynamics, which will provide a basis for collaboration with industry.
- Mobility models, developed through the project, which have since been taken up by Transport for West Midlands for further development.
- Online abuse detection tools, which have been integrated into an abuse monitoring dashboard that is currently being trialled by various media organisations worldwide.
- Advances in understanding of environmental heat for maternal and child health, which have been taken up by health agencies and international agencies (the World Health Organisation, the United Nations International Children's Emergency Fund) for improving their health guidance.
- An expanded approach to archival cataloguing and metadata, with a toolkit that has been taken up by several archives (Wessex Film and Sound Archive, North West Film Archive, London Screen Archive Network).
- Propagation of human cells, while still maintaining their functionality. These can be used for drug screening, disease modelling and toxicology tests in academia and industry.

- A model to identify patients at high risk of osteoporosis using routinely collected data from Electronic Health Records.
- An online overview of available digital tools for artists and art institutions.
- Identification of genetic sequences that can be modulated for crop improvement.
- Co-moulding of continuous and discontinuous fibre composites in an open-edge mould suitable for low volume automotive applications.
- Creating the first genome for a beneficial insect (e.g. pollinators).

It is challenging to arrive at an appropriate comparison and benchmark to understand the extent to which other R&I outputs produced under FIC would have happened anyway, or to a similar extent, and we have tried to approximate this by drawing comparisons with UKRI grant data and with unsuccessful FIC applicants (via survey).

First, we compare the outputs that have emerged so far from UKRI grants that include participation from international partners (as reported in the grant information (people tab) in GtR) with outputs that emerged from FIC grants. This analysis is based on grants that started 2019 to 2023, to allow for comparability across those two samples. To further improve comparability, the data is presented in terms of outputs per £ million invested (based on the value of all grants in GtR), although it is important to note that the cost per 'unit' of research will vary.

Table 15 shows that **FIC is producing more outputs per £ million invested than other UKRI grants that include participation from at least one FIC priority country, in terms of new research databases and models, new research tools and methods, software and spin outs**. The rates are similar for publications, which are included here for completeness but are better understood based on the analysis in Section 6.2 (and where the existence of bibliometric data allows for a more careful treatment to the question of causality/attribution). FIC is also producing more outputs per £ million invested than other UKRI grants with any other country in all areas except new products. However, the average size of the FIC grants concerned is much larger.

Results need to be taken with caution, however, as they do not include the total cost of the projects, and it is expected that (some) FIC projects have received extra resources as part of the match funding made available by international partners (which would overestimate the figures below, as the denominator — value of grants — could be higher).

Table 15 Other R&I outputs, per £m invested

Number of… (per £m)	UKRI grants International (excl. FIC)	UKRI grants priority countries (excl. FIC)	All FIC grants
Publications	12.51	13.70	13.69
Research databases and models	0.60	0.85	0.88
Research materials	0.35	0.38	0.57
Software & Technical Products	0.21	0.30	0.31
Spinouts	0.02	0.02	0.04
Intellectual property	0.04	0.05	0.03
Products	0.03	0.04	0.02
Average grant value (of grants in GtR)	£106k	£785k	£205k

Source: Technopolis (2024). Based on Researchfish data. Outputs have not been de-duplicated.

Comparisons with the unsuccessful FIC applicants also show mainly positive results. Information collected via survey shows that FIC UK participants report a higher average number of outputs (so far) for five of the seven categories for which we collected information (the final two in the table below – copyrighted products and spin outs - are lower, but the numbers involved are very small). If we compare just with the unsuccessful applicants that have been able to continue with their project idea via other means, the results are more mixed, but FIC participants are still reporting a higher rate of outputs on 4 of the 7 categories.

Table 16 Average number of outputs reported

	UK participants (n=176)	UK Unsuccessful applicants (all) (n=68)	UK Unsuccessful applicants (who continued with project) (n=24)
Number of new or enhanced products, process or services	0.78	0.19	0.54
Number of new research databases, models or tools	0.71	0.49	1.38
Number of patents filed	0.05	0.01	0.04
Number of patents granted	0.03	0	0
Number of trademarks	0.03	0	0
Number of copyrighted products (e.g. software)	0.03	0.06	0.17
Number of spin out companies	0.01	0.01	0.04

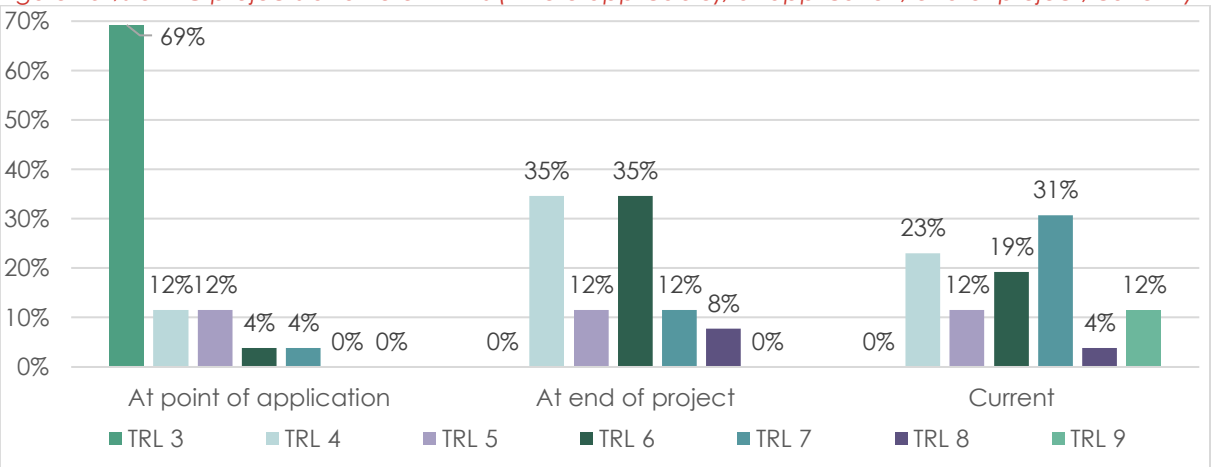
Source: Final surveys of UK participants and Unsuccessful applicants.

6.4 The number of projects realising commercial outcomes is limited

One way to assess progress of R&I towards commercialisation is to measure the extent to which the ideas and solutions supported by FIC have made progress in terms of their Technology Readiness Level (TRL) (understanding that not all the projects supported by FIC are focused on developing solutions that would have a market application[13]).

We collected this information for different points in time via the final survey. Figure 15 below shows that, as would be expected, there has been a shift over time towards higher TRLs among projects for which this metric is relevant, with a decreasing percentage of respondents stating that they are at low TRLs and an increasing percentage reporting higher TRLs (from the point of application, through to the end of the project and on to the current position). **The average TRL reported was 3.6 at application, 5.5 at the end of the project, and is 6.2 currently.** Results need to be taken with caution as they correspond to only 26 (finished projects).

Figure 15 % of FIC projects at different TRLs (where applicable), at application, end of project, currently

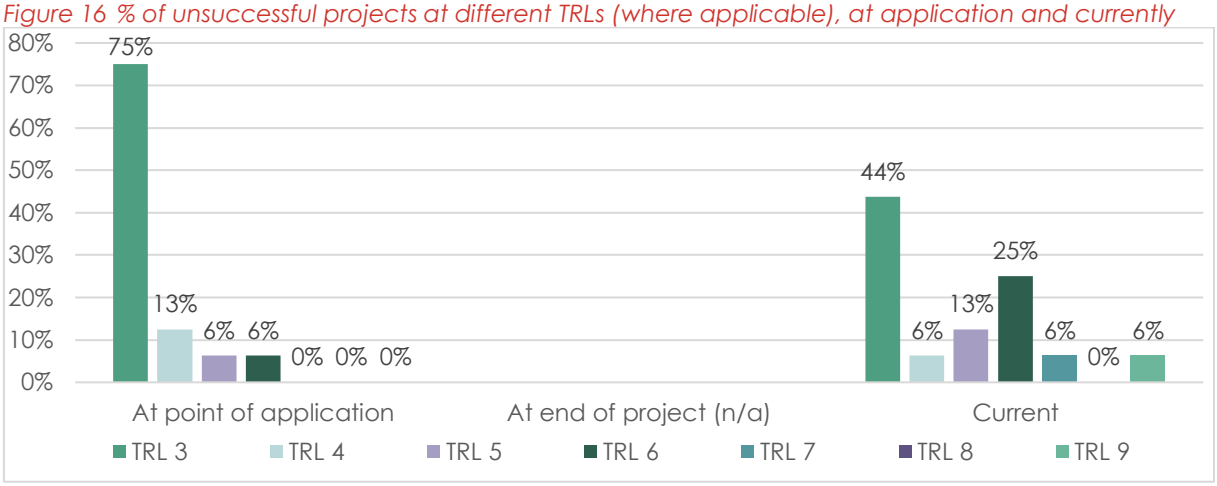


Source: Final survey of UK Participants. Finished projects only (n=26).

This is higher than the progress of unsuccessful applicants (that have continued their project through other means), from the point of application to now. In this case, the distribution of TRLs at the point of application looks very similar, but only half of respondents have reported any change in TRL levels since. The average TRL reported was 3.4 at the point of application and is 4.7 now (see Figure 16), so an increase of 1.3 TRLs, compared with the 2.5 TRL increase seen amongst participants, suggesting a positive impact of FIC.

[13] As an indication of the scale of relevant activities within the portfolio, business accounted for just 13% of all UK and international participants in FIC programmes (noting that TRL progression and market application will also be applicable to some other participants also).

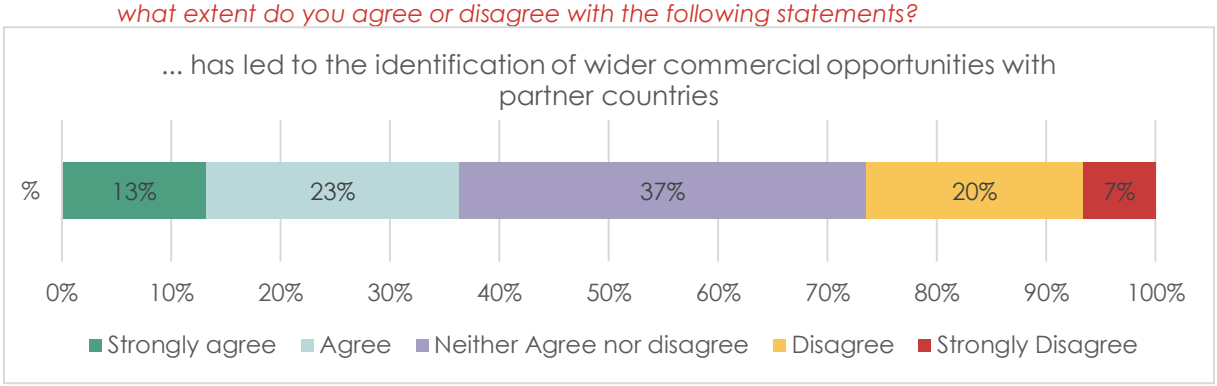
Figure 16 % of unsuccessful projects at different TRLs (where applicable), at application and currently



Source: Final survey of unsuccessful applicants, where they have continued their project idea via other means (n=16).

One third (36%) of UK participants strongly/agreed that FIC has led to the identification of wider commercial opportunities (see Figure 17). However, the number of respondents that had progressed to commercialisation so far (or close to it) (TRL 7-9) is still very small (n=12 amongst completed projects responding to the survey).

Figure 17 Thinking about the FIC programme as a mechanism to support international collaboration, to what extent do you agree or disagree with the following statements?



Source: Final survey of UK participants (n=121). Excludes Don't Know / NA

The insights above are further substantiated by the small number of respondents reporting that revenue was being produced from outputs developed with FIC projects. Only five respondents to the final survey of UK participants provided figures for revenue generated (£400k, £300k, £250k, £30k, £12k), but with no further explanation.

There were also limited examples from businesses provided via an open question on the commercial opportunities that have emerged from FIC projects (just two respondents). These organisations agreed to a follow-up interview about their experience and the benefits from their FIC project. Case studies of these examples are presented in Appendix D. A summary of one of these cases is presented below.

Box 2 Case example of emerging commercial opportunities from a FIC project - Aurrigo

Aurrigo is a Coventry-based publicly listed company, internationally recognised as a leader in autonomous technology. It was awarded £350k in FIC funding via Innovate UK to develop and test self-driving baggage handling vehicles on site at Singapore's Changi airport. The project ("ABACAS") ran from May 2021 to May 2022, with Aurrigo working alongside the Changi Airport Group (CAG) and the Civil Aviation Authority of Singapore (CAAS).

The project was focused on the company's Auto-Dolly product, a unique and disruptive baggage transportation solution for airports that can reduce baggage and cargo loading and unloading times, improve movement efficiencies, and drastically reduce operational costs. The project funding enabled Aurrigo to put its first Auto-Dolly on the ground at Changi Airport for extensive operational testing and demonstration. During the one-year project, the team was able to move from an experimental proof of concept (TRL 3) to the demonstration of a prototype in an operational environment (TRL 7), achieving acceptance from CAAS to operate the Auto-Dolly airside for trialling purposes.

In February 2023 a multi-year agreement was also signed between Aurrigo and CAG for the continued joint development and testing of the Auto-Dolly at Changi Airport, alongside demonstrations of the technology to other airports.

Further testing has been carried out (funded commercially by CAG and CAAS), leading to an improved and more sophisticated vehicle, with new features that include the ability to load baggage on both sides, and loading at different heights. A second and final phase of testing is now underway, with a fleet of four vehicles working at the airport, with scheduling and monitoring systems in place. When this completes in March 2025, Aurrigo anticipate full deployment of live operations at the airport.

The success of this project has generated significant interest, both within Singapore and internationally. Aurrigo has established a business in Singapore, with 10 employees in two offices in Changi that deal directly with the airport, and a listing on the London Aim stock exchange to raise funds. Offices have also been established in Australia, Canada and the US, ready to take the product global. The manufacturing of the Auto-Dolly itself takes place in Coventry, where the factory can produce 400 vehicles a year (more than enough for current needs), but additional sites in Singapore and north America are also being considered.

Changi airport is already one of the largest transportation hubs in Asia and one of the world's busiest airports. By the end of the decade it will have also built its fifth terminal and is anticipated to be servicing 140 million people. This would require 800-1,000 autonomous vehicles at just this one airport. There are then another 20-30 such large hub airports globally, with hundreds of other mid-size airports – all looking to reduce costs and improve turn-around times and efficiency. With small adaptations, the Auto-Dolly would be suitable across all these sites. The potential market size for the product is therefore immense. From humble beginnings, it could easily be generating tens or hundreds of millions of pounds each year

> *"The funding and ability to collaborate with partners in Singapore has been terrific. Without this collaboration we would not have made such rapid progress and developed such good working relationships… Aurrigo are effectively getting revenue and commercial traction from the fact that CAG and CAAS had the confidence in moving, following on from that first ABACUS programme"* Aurrigo CEO

Source: Technopolis (2024) based on survey and interview with Professor David Keene, CEO, Aurrigo

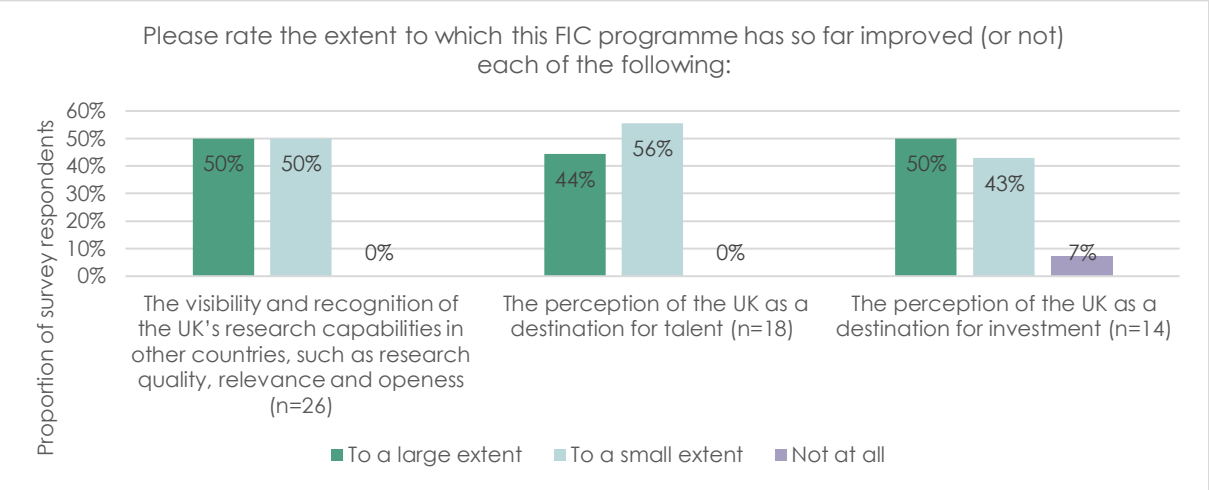
7 Impact Evaluation: Supporting wider government objectives (Obj. 2)

Finally, the second FIC objective was to support DSIT and wider government objectives, including science diplomacy.

7.1 FIC is supporting wider UK government objectives, mostly by helping to identify areas of common interest and adding value to science diplomacy efforts

Responses provided by programme leads suggest that FIC has contributed either to a large or small extent to improving the visibility and recognition of the UK's research capabilities in other countries (50% respectively), the perception of the UK as a destination for talent (44% and 56%) and the perception of the UK as destination for investment (50% and 43%).

Figure 18 Contribution to FIC to strengthening international perception of UK



Source: Survey with FIC Programme Leads. Results from the interim survey are used, as only 4-8 programme leads responding at the final stage could state a view on these three areas.

Furthermore, evidence from funder level case studies (at baseline, interim and now final report stages) has showcased that FIC is delivering on this objective by five main mechanisms:

1. Acting as a platform to systematically identify joint opportunities and capabilities, and strategic areas of collaboration (Singapore, Japan, US, Switzerland)

In the case of **Innovate UK and Enterprise Singapore**, stakeholders stated that collaborating through FIC has improved their ability to identify strategic areas of collaboration. This has allowed them to build upon prior efforts, such as the alignment in priority policy areas reflected in Singapore's (Food Security) Agenda '30 by 30' (published in May 2021) and has also informed the thinking behind the MoU signed in December 2021. There is also the intention to explore further integration of the R&I ecosystems (e.g. exploring collaboration between UK catapults and Singaporean innovation centres).

In the case of Japan, both **ESRC and JST** agreed that the collaboration has enabled a better understanding of their partner's 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 have a focus on AI research and their levels of investment in this area. As stated by one consultee from JST, they have "realised that there are no major differences between Japan and the UK; rather, they have many points in common".

In the case of the US, **UKRI and NSF** had already established lead agency opportunities between individual councils and directorates under a broad MoU on collaboration. Working jointly to deliver the FIC programmes has enabled each organisation to gain further knowledge about their partner's funding processes and organisational setup and has opened communication channels between key individuals. As one NSF stakeholder explained: "I'm more aware of UKRI's strategies, capabilities and priority research areas than I was [before FIC], just simply because I'm interacting with them more. We now have a lot of ideas where we might be able to work together in the future."

In the case of **Switzerland**, the FIC programme and partnership between **SNSF and URKI** have led to a clearer understanding of each other's strengths and capabilities in the strategic areas covered by the programme (Languages, Materials, Synthetic Biology and the Life and Physical Sciences interface, plus two cross-cutting themes: Artificial Intelligence and Big Data), particularly during the early stage of programme design. It is expected that this increased understanding will influence the next steps of collaboration.

2. Providing an opportunity to increase (or sustain) awareness of the UK as a potential partner (Canada, India, US)

According to interviews with **CIHR (Canada) and UKRI**, FIC has also improved the perceptions of the UK as a research and innovation partner due to the scale of funding UKRI has been able to commit to international projects and success of UK researchers in securing competitive funding. For example, the UK was able to secure significantly more funding to NeuroNex (a US initiative) than any other international partner involved in the programme.

In the case of **India, MOST 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 an R&I partner. The fact that FIC funding 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 a partner of choice for India.

In the case of the US, the Changing North Atlantic Ocean and its Impact on Climate programme was the first example of a programme co-designed by NERC and the Physical Oceanography Directorate of the NSF Ocean Sciences Division. The successful working relationship and trust built during its implementation formed the basis for a follow-on joint programme funded by the ISPF. This also extended the partnership to include a second NSF GEO Directorate that NERC had not previously partnered with. The NERC programme lead reported: "Without FIC, I think this would not have been impossible. […] FIC has basically led to a blossoming of our relationship with NSF Ocean Sciences. We now have the Physical Oceanography and Chemical Oceanography Directorates as partners."

3. Providing funding to fulfil or follow on from common aspirations and political commitments (Canada, China)

In the case of Canada, FIC has provided a valuable mechanism to deliver the aspirations in the MoU signed between **Canada Research Coordination Committee 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.

In the case of China, 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 via biennial meetings). This ensures that priorities and joint opportunities are systematically identified independently of any specific funding programme.

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

4. Supporting diplomatic efforts (Singapore, Japan, US)

FIC has provided **Innovate UK and Enterprise Singapore** a first opportunity to implement and fund a joint activity to support collaboration among innovators in both countries. In turn, the relationship between the UK and Singapore in the area of innovation is now one of the strongest aspects of the diplomatic relationship between the UK and Singapore, based on feedback received by Innovate UK from the British High Commission in Singapore.

In the case of Japan, and from the perspective of the SIN officer, the portfolio of FIC programmes with Japan has supported international diplomatic activities and improved the credibility and the strength of the **UK-Japan science relationships**. The FIC programme (including both the UKRI-JST Joint Call on AI and Society the UK-Japan SSH Connections grants programme), in addition to collaborations between the UK and Japan during the COVID-19 pandemic, had fostered a positive impression of the UK and helped to offset Japanese concerns surrounding the UK's exit from the European Union. Representatives from ESRC also agreed the FIC programmes supported sustained engagement and have helped to maintain momentum of the relationship between UKRI and Japan. Reflecting this, in December of 2022, the UK Science and Technology Minister announced the launch of the ISPF in Tokyo, specifically noting the importance of "deepening our collaborations with R&D powerhouses, like Japan".[14] The Minister also detailed the continued interest in supporting research collaboration with Japan and mention a "range of joint projects including AI".[15]

FIC is contributing to broader UK government goals in the US by encouraging, strengthening and deepening **UK-US scientific relationships**. Some FIC programmes align directly with UK government sector priorities in the US, e.g. Signals in the Soil and its potential contribution to net zero carbon goals, and a UK-US bilateral FIC programme focussing on offshore wind R&I[16]. In these areas, the FIC has enabled staff at UK Embassy and Consulates to deepen their engagement with relevant US funders and research communities.

5. Leveraging and adding value to other initiatives to support R&I collaboration (US, Canada)

In the **US,** FIC has served as "a useful calling card" for the SIN and has been profiled as an example of the UK's commitment to US-UK partnerships in discussions with US R&I stakeholders, including the US Department of Energy, State Department, and White House Office of Science and Technology Policy.

Evidence from case studies also suggests that 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 office, 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 this portfolio.

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[14] https://www.gov.uk/government/news/uk-science-and-technology-minister-launches-new-global-international-science-partnership-funding-in-tokyo-with-initial-119m-of-funding (accessed 1st October 2024)

[15] https://policymogul.com/key-updates/26024/science-minister-s-speech-at-keio-university-in-japan (accessed 1st October 2024)

[16] https://apply-for-innovation-funding.service.gov.uk/competition/502/overview (accessed 1st October 2024)

8 Conclusions

In conclusion, we find strong evidence that FIC is meeting its two high level objectives. For Objective 1 we find positive evidence for two themes in particular (enabling funding and developing partnerships). Progress towards deepening R&I (Theme 3) is more evident in the area of international research/publications, with more mixed results for other R&I outputs, including commercialisation (in part because only a small proportion of the portfolio was focused on support to companies). There is also evidence of FIC contributions to supporting international collaboration more widely and science diplomacy (Objective 2).

In terms of **Enabling funding (Theme 1)**, we looked at this from two perspectives: at the funder level and at the level of researchers and innovators.

At funder level, we find **FIC has successfully delivered and attracted additional resources to fund international collaboration in R&I**. In addition to UKRI's £160m investment, FIC has attracted £211m from partners in FIC programmes and £29m from partners in FIC projects.

FIC resources are relatively small (~3% of total UKRI investments in projects with participation from FIC priority countries, based on grant information in GtR). However, **its main added value has been more a matter of focus than scale**, as it is aimed at enhancing funder level relationships that are more strategic and longer lasting (see Theme 2).

At researcher and innovator level, feedback from FIC participants (as well as evidence on unsuccessful proposals) suggests that **a majority of the international collaboration projects supported through FIC would not have gone ahead without the Fund**, further showcasing its importance in enabling funding to support international collaboration with priority countries.

In terms of **Developing partnerships (Theme 2)**, we also looked at two levels.

At funder level we find that **FIC has strengthened partnerships between UK and overseas funders, both within FIC programmes and beyond them**, demonstrating that successful international collaboration is built over time. Most UK programme leads report significant improvements in mutual understanding and alignment with their overseas partners, as well their abilities to identify strategic opportunities for future collaboration.

The highest added value of FIC has been among partnerships that were relatively new (e.g. with specific funders in Canada and Singapore) and where FIC has provided a substantial (funded) opportunity to collaborate (where there was little opportunity via other funding).

At the interim evaluation stage (2021), sustainability was unclear, with uncertainty around dedicated UKRI funding, and opportunities identified that could not yet be taken forward. At the final evaluation stage, the picture is more positive, with **many examples of funders having now taken concrete actions to carry forward collaborations with their FIC partners (beyond FIC)**, with new agreements in place and joint programmes under development or underway. **In many of these cases, the follow-up programmes are being supported through the new ISPF,** which was announced in 2022 and includes most FIC priority countries within its scope**.** This Fund is being led by DSIT, but delivered by a consortium of R&I bodies (including UKRI).

At researcher and innovator level we find that **UK participants in FIC projects have increased their ability to access knowledge, facilities and sources of funding overseas, while improving their skills and capabilities to work internationally.** These were all areas identified at the baseline stage as strong motivators for applying for FIC funding, which have then materialised.

UK participants reported that ~60% of their partners in FIC projects were from overseas, with the majority of these being new collaborators. Most of those surveyed reported that this experience had led to a better understanding of their partners' capabilities (94%), research agenda and priorities (96%), and ways of working (94%).

Where FIC projects have now ended, the majority (73%) of UK participants have been able to continue their relationship with their overseas partners from the FIC project through further grants or other means (nearly twice the rate of unsuccessful FIC applicants).

In terms of **Deepening R&I (Theme 3)**, FIC sought to enable UK researchers and innovators to carry out world-leading R&I within areas of strategic importance across the UKRI international portfolio, delivering new knowledge, and societal and economic impact.

In line with the assumptions stated in the ToC, we did not expect to find evidence of the achievement of R&I outputs across all projects at this stage (as not all projects have finished, and it can take time for final results to emerge). However, the evaluation has found that **most completed projects (81%) reported that they have fully achieved their objectives,** while a similar proportion of those that are ongoing report being on track to achieve theirs.

Nearly 1,000 publications in peer-reviewed journals have now emerged from FIC projects, with others still expected. **While most UK participants already co-published internationally before FIC, the Fund has clearly had a positive effect on increasing that degree of collaboration (while not replacing pre-existing levels of activity)**. For instance, prior to FIC (2014 to 2018), 38.7% of UKRI papers from (what would become) FIC researchers included at least one author affiliated to an institution in a FIC priority country. This degree of collaboration has increased over time and is 43.5% in the period 2019 to 2023, and even higher (57.0%) just in relation to FIC funding.

It is still early to observe the research impact of publications produced within FIC, but across UKRI/UK papers more generally, those with international collaborators tend to score more highly on citation metrics (a proxy of impact). Initial indications from early papers (published 2019 to 2021) suggest that this will be the case for FIC too.

FIC projects have also produced other R&I outputs, particularly new research tools and methods, creative products and research materials. However, for some projects it is still too early to have a complete view. FIC is also producing more outputs per £ million invested than other UKRI grants that include participation from at least one FIC priority country, in terms of new research databases and models, new research tools and methods, software and spin outs.

Additionally, **FIC projects report good progress (so far) along TRLs, where this is relevant** (understanding that only a minority of the projects supported by FIC are focused on developing solutions that would have a market application). Finished projects have advanced 2.5 TRLs on average since the time of application (compared with 1.3 TRLs progress for unsuccessful applicants that have continued their project idea through other means over the same period). The number of FIC projects reaching high TRLs (8-9) is small, however, and there are few examples yet of commercial exploitation. In this regard, it is important to note that only around 13% of UK and international participants in FIC programmes are businesses.

Finally, with regards to **Objective 2 (supporting wider UK Government objectives, including science diplomacy)**, evidence from funder level case studies (across the different stages of the evaluation) has showcased that FIC is delivering on this by:

- Acting as a platform to systematically identify joint opportunities and capabilities, as well as strategic areas of collaboration (e.g. Singapore, Japan, US, Switzerland).
- Providing an opportunity to increase (or sustain) awareness of the UK as a potential partner (e.g. Canada, India).
- Providing funding to fulfil or follow on from common aspirations and political commitments (e.g. Canada, China).
- Supporting diplomatic efforts (e.g. Singapore, Japan, US).
- Leveraging and adding value to other initiatives to support R&I collaboration (in particular the UK SIN) (e.g. US, Canada).

Appendices

Appendix A Glossary

AHRC	Arts and Humanities Research Council (UK)
AI	Artificial Intelligence
AMR	Anti-Microbial Resistance
ARC	Average of Relative Citations
BBSRC	Biotechnology and Biological Sciences Research Council (UK)
BEIS	Department for Business, Energy and Industrial Strategy (UK)
BIRAC	Biotechnology Industry Research Assistance Council (India)
CAAS	Civil Aviation Authority of Singapore
CAG	Changi Airport Group
CAR	Chimeric Antigen Receptor
CCROC	Climate Consequences of Rapid Ocean Changes
CDI	Citation Distribution Index
CIHR	Canadian Institutes for Health Research
CoI	Co-Investigator
DSIT	Department for Science, Innovation and Technology (UK)
EEID	Ecology and Evolution in Infectious Diseases
EPIC	Extreme Photonics Innovation Centre
EPSRC	Engineering and Physical Sciences Research Council (UK)
ESRC	Economic and Social Research Council (UK)
EU	European Union
FIC	Fund for International Collaboration
GCRF	Global Challenges Research Fund
GtR	Gateway to Research
HCP10	Highly Cited Papers (10% most cited)
ISPF	International Science Partnerships Fund
JST	Japan Science and Technology Agency
KHIDI	Korean Health Industry Development Institute
ODA	Official Development Assistance
MOST DBT	Ministry of Science and Technology – Department for Biotechnology (India)
MoU	Memorandum of Understanding
MRC	Medical Research Council (UK)
NERC	Natural Environment Research Council (UK)
NIHR	National Institute for Health Research (UK)
NNSA	National Nuclear Security Administration (US)
NSERC	Natural Sciences and Engineering Research Council (Canda)
NSF BIO	National Science Foundation – Biological Sciences Directorate (US)

NSF GEO	National Science Foundation – Geosciences Directorate (US)
NSF ENG	National Science Foundation – Engineering Directorate (US)
NSFC	National Natural Science Foundation of China
OSNAP	Subpolar North Atlantic Program
PI	Principal Investigator
R&I	Research and Innovation
RISTEX	Research Institute of Science and Technology for Society (Japan)
SIC	Science and Innovation Council (UK-India)
SIN	Science and Innovation Network (UK)
SIP	Share of International co-Publications
SNSF	Swiss National Science foundation
SSHRC	Social Science and Humanities Research Council (Canda)
STFC	Science and Technology Facilities Council (UK)
STI	Science, Technology and Innovation
ToC	Theory of Change
TRL	Technology Readiness Level
UKRI	UK Research and Innovation
USDA	US Department of Agriculture

Appendix B Key findings from the FIC process evaluation (2021)

The FIC process evaluation was undertaken in an earlier phase (2021), soon after the Fund had been established. The main findings and conclusions from this evaluation were as follows.

FIC provided an additional, dedicated Fund that addressed a gap in the UK funding system, providing the opportunity to pursue activities that would not otherwise have been progressed.

It emerged in recognition of the importance of supporting internationally collaborative R&I to expand access to ideas, talent and investment, and the desire to offer (non-ODA) funding for collaboration with key priority countries that were not explicitly covered by other UKRI Funds. While UKRI councils already collaborated with most leading developed research nations, funding was (increasingly) limited and opportunities were being missed or de-prioritised.

The main policy steer for the establishment of FIC could be found in the 2017 Industrial Strategy White Paper (setting out the need for the UK to remain connected to other leading international sources of ideas and to make strategic choices to maximise international collaborations) and the subsequent (2019) International Research and Innovation Strategy (setting out the intention to build and promote international partnerships, seek opportunities for collaboration to deliver shared objectives, and encourage international connections).

These policy commitments were then underlined emphatically in the UK R&I Roadmap published for consultation in July 2020 (which devoted several pages to keeping the UK at the forefront of global collaboration), as well as in UKRI's Delivery Plan 2019/20 (which stated its intention to support the development and delivery of new international partnerships, building on successful collaborations with global partners, generating a source of UK soft power and opening up new opportunities for export and inward investment to the UK).

The government's 2021 'Integrated Review of Security, Defence, Development and Foreign Policy: Global Britain in a competitive age' then included the priority action of building a strong and varied network of international science and technology partnerships, "putting science and technology at the heart of our alliances and partnerships worldwide".

International collaboration in R&I allows the UK to tap into expertise and research capital elsewhere, expanding the frontier of what would be possible nationally.

Increasing internationalisation of the production of research has been observed across different countries and fields of research,[17] while it has also been demonstrated that international collaboration increases the quality and academic impact[18] of research outputs (using citations as a proxy for impact). More than half of all UK publications are now internationally co-authored,[19] and analyses have identified a significant "impact premium" for such papers.[20] Among other theories, it has been suggested that this could be because international collaborations involve the best researchers in each country.[21]

A study conducted by Technopolis for DSIT[22] revealed why key actors in the innovation ecosystem seek to engage with international collaboration. In public sector research, international engagement provides a vital underpinning to research excellence, and there is a wide consensus that it improves the quality and impact of UK research. University

[17] 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.

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

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

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

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

[22] Technopolis (2018) Drivers and Barriers for Collaboration, prepared for BEIS (not published)

collaboration is largely driven by individual academic researchers who might have personal motivations, e.g. aspirations of working with the best and "making a difference".

International collaboration is also increasingly needed to address global challenges or to access unique resources or populations, e.g. conducting research on climate change, the Arctic or international measurements standards. These are especially important drivers for academics and government labs. For Public Sector Research Establishments, international engagement has a particularly strong focus on societal impacts and is often necessary in order to fulfil their role within the UK R&I system.

Research and Technology Organisations are motivated by the need to maintain their capabilities at or close to the technological frontier and access potential new markets through collaborative projects and networks. Similarly, the most common reason for companies to engage internationally is the prospect of improved competitiveness and profitability, and for many Small and Medium-sized Enterprises it is an important source of financial leverage and a natural step towards growing the business. International engagement also provides an opportunity for companies to access new markets (geographical and thematic).

FIC sat alongside other initiatives to support international collaboration.

There are different ways in which the UK and governments around the world provide support for international collaboration and most countries have an increasingly varied portfolio of relevant initiatives. In many cases though, this does not include stand-alone programmes with earmarked budgets, as 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, and funding instruments (dedicated or generic) open to applications for internationally-collaborative projects.

FIC, however, was a relatively small investment in comparison with other key UK initiatives to support international collaboration (e.g. contributions to the European Space Agency or Horizon Europe) and its achievements should be viewed in this context. FIC's relatively small size also has implications for the ability to attribute impact to the Fund, and so the evaluation has explored FIC's direct contribution, rather than just examining at a macro level and attributing changes to the Fund.

FIC complemented the existing international collaboration activities of councils by providing a dedicated Fund targeting priority countries and encouraging funder-to-funder relationships.

FIC was set up to support international collaboration, in identified priority countries, via a cross-council approach. International collaboration was already at the heart of many of the activities supported by UKRI councils and FIC complemented these other activities by supporting international institutional partnerships (in priority countries with a high R&I profile), built around common areas of interest, with joint commitment of resources.

No other UKRI Fund (except ODA Programmes) was dedicated to developing relationships at the *funder* level (i.e. between one or more UKRI councils and their counterparts abroad). This offered the opportunity to build deeper, more stable and longer-lasting relationships than might be possible through existing (bottom-up) routes amongst individual researchers and innovators. It also enhanced the ability of respective funders to steer resources (top-down) towards areas of mutual strategic importance.

The addition of FIC funding was positively received across all UKRI councils, as it offered the opportunity to fund international collaboration that would not be possible via other means, or to do so at a scale that is not usually feasible.

The experiences of programme selection suggested that advance knowledge of funding helps establish the best portfolio of programmes to support objectives.

The need to deliver in-year spend in 2018/19 meant the process for allocating wave 1 FIC funding was run to tighter timescales than wave 2. This was reflected in feedback from councils, who regularly highlighted that the timetable for wave 1 was too short, with only limited opportunity to identify, discuss and prepare programme ideas. As a result, there was a tendency to propose programmes based on established funder relationships and initiatives, already well-developed ideas, and where spend could commence quickly. Whilst the short timescale was necessary, the implications of this are somewhat at odds with some of the strategic ambitions of the Fund. By comparison, wave 2 was anticipated, allowing more time to explore possibilities, plan, engage and think strategically about the best opportunities. This is reflected in the scoring data, where a greater proportion of wave 2 bids were considered above the basic threshold for funding (scored at least satisfactory all four essential criteria).

Councils reported a need for clarity (and forewarning) of the timing, scale and priorities of any potential future funding, such that they are given the best chance to explore and develop new opportunities (internally and externally), can sustain developments and achievements (and not mislead, frustrate or disappoint overseas partners), and are able to prioritise what to bid and when. This is particularly important if there is a desire to encourage and support the development of new relationships, rather than just the strengthening of existing ones.

A clearer strategic steer could help UKRI councils targeting and selecting opportunities.

The funding criteria for selecting FIC programmes (and choice of priority countries) were broadly seen by programme leads as appropriate for the objectives and intentions of FIC. However, there were calls for additional clarity and specificity in several areas that it was felt would aid programme idea and proposal development. This included the importance attached to multi-disciplinary/council activity, the DSIT/UKRI international goals and priorities that programmes should align with, the rationale for the choice of priority countries, and the likely scale of programmes that would be funded. The additionality criteria and guidance could also have been improved to focus more on complementarity and added value with respect to existing initiatives. FIC's relatively small budget contrasted with a high level of demand and lots of potential opportunities for international programmes. Additional guidance would have helped steer councils towards the most appropriate ideas to develop and propose, helping the Fund to better achieve its aims.

The scale of ambition for FIC (its objectives and scope), was considered by many of those consulted to be too great, given the scale of funding available (overall, per country and for individual partnerships), with the risk of creating a thinly dispersed and uncoordinated portfolio. Additional funding may have helped achieve better critical mass, while a more targeted and coordinated approach might have enabled the Fund to achieve more with its resources.

The Strategic Opportunities Stream was a welcome addition to a Fund that intended to capitalise on emerging opportunities, but there was a lack of transparency or awareness.

A separate mechanism – the Strategic Opportunities Stream – existed for opportunities that did not fit with the timescales of the standard FIC programme selection process, with ringfenced funding available to support such activities. There was widespread support for such an agile stream that could react quickly to emerging opportunities and challenges, support wider diplomatic activities and government priorities, or that might help address challenges associated with fixed FIC spending timetables.

Project applicants reported high levels of satisfaction with FIC programme processes.

Successful UK project applicants were mostly positive about their experiences of the application process across different FIC programmes. Two FIC-specific elements that were highlighted included specific support being provided to engage with potential overseas partners and the benefits of allowing single submissions for multi-council/country awards.

Appendix C Case studies

C.1. Introduction

A series of longitudinal case studies were developed for the FIC evaluation, each focusing on a specific international funder in a priority country. These sought to explore the three main themes for the FIC evaluation (how FIC has enhanced funding, deepened R&I and strengthened partnerships at the funder level between the UK and partner countries).

Case development followed a longitudinal design, involving data collection (desk research and interviews) at three points in time (baseline, interim and final evaluation), enabling the study to provide early evidence, as well as illustrate dynamic aspects and change over time.

Originally, five longitudinal case studies were being developed (each focusing on a specific funder in **China, the US, Canada, India and Japan**). The first iteration of each of these cases (2021) was summarised within and appended to the Baseline Evaluation Report.

For the interim evaluation (2022/23), seven case studies were developed. This included an updated view of the original five, plus a first iteration of two additional smaller cases (each focusing on a specific funder within **Singapore** and **Switzerland**). These new and updated case studies were appended to the Interim Evaluation Report. They included coverage of:

- Pre-FIC relationships between the overseas organisation and UK partners before FIC
- Programme origins, rationale and development
- Progress of programmes, including enabling factors, barriers, risks and lessons learnt
- Programme activities and early outputs and outcomes

For the final evaluation, each of the seven case studies was again revisited, to identify any further progress or achievements that had been realised since the interim stage in relation to the two main objectives of FIC. Findings from this latest update are presented in this appendix and drawn on in the main report (along with evidence obtained through previous iterations of the case studies, where relevant).

C.2. United States National Science Foundation Geosciences (NSF GEO)

C.2.1. Introduction

NSF GEO is a partner in three FIC programmes, which are led by NERC with participation from other councils.

The **Changing North Atlantic Ocean and its Impact on Climate** (FIC2-02) programme enabled NERC to continue a (pre-FIC) collaboration with NSF GEO using existing infrastructure, the Overturning in the Subpolar North Atlantic Program (OSNAP) observing system. NERC's original investment in OSNAP covered four years of data collection; FIC provided funding for data capture and analysis for a full ten years, and supported two research projects integrating OSNAP data with data from other sources to maximise research insights.

The programme was initially extended due to delays caused by the COVID-19 pandemic. It later received a second extension from UKRI to take advantage of a research cruise scheduled for 2024 and to enhance data collection and analysis. The two funded projects completed in the first half of 2024. Implementation of the FIC programme is proceeding smoothly and will conclude at the end of 2024.

The **Delivering Healthy Soils: Signals in the Soil** (FIC-26) programme enabled NERC to partner with NSF and the USDA for the 2019 call for proposals of an existing NSF annual grant programme. This emerging field of research is highly multi-disciplinary, integrating 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. FIC provided funding for ten joint projects.

The COVID-19 pandemic led to substantial delays and most projects were extended, including an additional £320,000 from the FIC budget for costed extensions. Supported with FIC funding, the NSF, USDA and NERC also organised three programme workshops, bringing together the highly multi-disciplinary 'Signals in the Soil community'. The third (and final) workshop took place in Washington DC at the end of June 2024. By early 2025, all projects will have concluded.[23]

Climate, Environment and Health (FIC-23) is a multi-national programme delivered through the Belmont Forum, aiming 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. FIC funding was key as UKRI had not delivered a call with the Belmont Forum in several years.[24] Four projects that include UK research groups are still open and will conclude by the end of 2024. A second Climate, Environment and Health call was announced in January 2023, with the UK National Institute for Health Research (NIHR) providing funding for ODA-eligible research partnerships.[25]

This case study update focuses on the first two FIC programmes listed above (Changing North Atlantic Ocean and its Impact on Climate and Delivering Healthy Soils: Signals in the Soil).

C.2.2. Objective 1: Enabling international collaboration

Theme 1: Enabling funding

The Changing North Atlantic Ocean and its Impact on Climate programme has enabled the upkeep of the OSNAP observing system (beyond its initial four year funding period), which would not have been possible without collaborating internationally. In 2023, the partnership developed through the FIC programme formed the basis for a second joint programme, Climate consequences of rapid ocean changes (CCROC), funded by the ISPF and NSF under the lead agency agreement. The close working relationship and strategic discussions established during implementation of the FIC programme, ensured that NERC and NSF were ready to submit a proposal when the ISPF call was announced. The proposal was approved for fast-track funding, with £625,000 from ISPF for the UK component and US$625,000 from the NSF for the US component of projects.[26, 27]

Insights from the OSNAP data collection and research enabled by the FIC programme have contributed to evidence demonstrating the key role of the North Atlantic Ocean in climate variability (see Theme 2 below). Looking ahead, there are indications that the NSF and NERC may provide longer-term funding to sustain ongoing measurements and research, based on this improved understanding and new evidence.

The Signals in the Soil programme brought together otherwise relatively siloed research communities, e.g. soil sciences and engineering, on both sides of the Atlantic. These projects

[23] https://gotw.nerc.ac.uk/list_them.asp?them=Signals+in+the+Soil (accessed 1st October 2024)

[24] Technopolis Evaluation of the Fund for International Collaboration. Baseline and Interim Process Evaluation – Technical Report (2021)

[25] https://belmontforum.org/wp-content/uploads/2024/01/240115-CRA-CEH2-2023-Doc-02-UKRI_NERC_Annex_final.pdf (accessed 1st October 2024)

[26] https://www.ukri.org/opportunity/climate-consequences-of-rapid-ocean-changes/ (accessed 1st October 2024)

[27] https://www.ukri.org/wp-content/uploads/2022/09/NERC-150823-DeliveryPlanOverviewProgress2022To2023.pdf (accessed 1st October 2024)

would not have come together without the thematic focus of the programme, e.g. through the response mode funding.

The US is a major technology player in engineering biology and environmental applications, an area the UK has been less active in. As one stakeholder commented: "FIC was an opportunity to do some great collaborative research and real cutting-edge science that would not have been done in the UK otherwise. […] The collaborations with the US groups pushed our scientists, they had to step up and learn." By bringing together UK and US skills, the programme helped to move the UK research community into this emerging research space.

Theme 2: Deepening R&I

With the recent or imminent conclusion of the majority of projects, research outputs and outcomes are starting to emerge.

The Changing North Atlantic Ocean and its Impact on Climate programme enabled the collection of a decade of ocean current data through an array of sensors (OSNAP) stretching from Scotland to Greenland and Labrador. The extended timeframe, enabled by FIC funding, allowed the collection of crucial data, demonstrating the significance of variations in ocean circulation along the North Atlantic's Eastern boundary as a key factor influencing climate variability in the Northern Hemisphere.[28,29,30]

The scientific value of the array can now be deepened with a decade of observations available. For example, the ISPF-funded follow-on programme CCROC will take advantage of combining OSNAP and other observation data to enhance our understanding of changes in ocean circulation and improve projections of future climate change throughout the North Atlantic region. The OSNAP data will also form the basis for CCROC research aiming to design a simpler, less costly observing system that can be deployed in the future.

Signals in the Soil projects have achieved a range of research outputs to date, including over 120 publications, 6 tools and 5 databases. Many of these were presented at the final workshop, held in 2024.

Theme 3: Developing partnerships

The Changing North Atlantic Ocean and its Impact on Climate programme was the first example of a programme co-designed by NERC and the Physical Oceanography Directorate of the NSF Ocean Sciences Division. The successful working relationship and trust built during its implementation formed the basis for a follow-on joint programme, CCROC, funded by the ISPF, which extended the partnership to include a second NSF GEO Directorate that NERC had not previously partnered with: "Without FIC, I think this would not have been impossible. […] FIC has basically led to a blossoming of our relationship with NSF Ocean Sciences. We now have the Physical Oceanography and Chemical Oceanography Directorates as partners." The new partnership also demonstrates that these NSF GEO Directorates now have confidence in NERC's commissioning process, as "getting the programme up and running was really straight-forward this time".

As summarised by the NERC programme lead: "Overall, I find it hard to think of how the outcome could have been better, really. It feels to me like we've reached a point in the road where hopefully this way of joint working will become normalised. It's a huge change. To give

[28] https://www.nature.com/articles/s41467-023-40323-9#Sec8 (accessed 1st October 2024)

[29] https://www.nature.com/articles/s43247-023-00848-9 (accessed 1st October 2024)

[30] https://royalsocietypublishing.org/doi/10.1098/rsta.2022.0191 (accessed 1st October 2024)

you an idea, I spent probably a decade talking with NSF staff about partnering in principle - and in the last five years, suddenly we are just doing it. And now we're doing it again."

The Signals in the Soil programme, through its multi-disciplinarity, provided a focal point for the lead agencies, NERC and NSF Directorate of Engineering (NSF ENG), to work with NSF directorates (including NSF GEO), the USDA, and other UKRI councils. The main driver for interactions between these funders were the three programme workshops. In addition to enabling researchers to showcase their work to each other, development of the workshops also provided a structure for funders to remain in regular contact. The final workshop included the wider community of US researchers funded through the annual Signals in the Soil calls, giving UK researchers the opportunity to strengthen links with the world-leading US community. These benefits highlight the importance of UKRI funding for this type of activity, as the NSF cannot provide financial support.

The implementation of the FIC programme has allowed NERC to build close relationships with key individuals in NSF ENG and at the USDA, which will facilitate discussions on future partnerships, including with other NSF directorates such as NSF Biological Sciences (NSF BIO) and NSF GEO. As one stakeholder explained: "We now have an 'in', through the engagement through FIC, that we didn't have before."

C.2.3. Objective 2: Supporting DSIT and wider objectives including science diplomacy

The FIC is contributing to broader UK goals in the US by strengthening and deepening UK-US scientific relationships. Some FIC programmes align directly with UK government sector priorities in the US. For example, the Signals in the Soil programme served to scope out an emerging multi-disciplinary research area, working with world-leading experts in the US. This has informed UK policy and helped to embed soils into the new cross-council theme 'Building a green future' under the 'Land use for net zero' programme, supporting the government's adaptation programme to tackle climate impact.[31]

Working jointly to deliver the FIC programmes has enabled NERC and the NSF (and USDA) to gain further knowledge about their partner's funding processes and organisational setup, and has opened communication channels between key individuals. This can now facilitate future interaction and research partnerships, and enable staff at UK Embassy and Consulates to further deepen their engagement with relevant US funders and research communities. For example, the UKRI North America Office and SIN Team in the US were involved in organising the final meeting of the *Signals in the Soil* programme, providing them with the opportunity to develop or strengthen relationships with key US stakeholders.

C.3. Swiss National Science Foundation (SNSF)

C.3.1. Introduction

The FIC-funded **Partnering Awards Programme** (FIC-STR-03) was a joint initiative between UKRI and the SNSF. The call supported closer collaboration in R&I between the two countries by supporting researcher mobility, particularly for early career researchers, fostering knowledge sharing between researchers and technical specialists, strengthening existing collaborations, enabling new research collaborations, and facilitating access to research facilities in the two countries.

[31] https://www.gov.uk/government/news/government-sets-out-adaptation-programme-to-tackle-climate-impact (accessed 1st October 2024)

The programme consisted of two parallel and coordinated calls run independently by UKRI and SNSF, with BBSRC delivering the funding. There was a strategic focus on languages, materials, synthetic biology, life and physical science interfaces, and two cross-cutting themes on Artificial Intelligence and Big Data. A total pot of £2m was available for the calls. A lack of applications, however, meant that UKRI and SNSF only allocated 39.4% of the funding to 30 projects (21 projects from the UK and nine projects from Switzerland).

The Partnering Awards provided up to £25,000 to successful applicants and 100% of the project costs to support collaborative research activities between the UK and Switzerland, including travel expenses, visits and access to facilities and organising workshops and networking events.

C.3.2. Objective 1: Enabling international collaboration

FIC strengthened international collaboration between UKRI and SNSF by providing dedicated funding to researchers seeking to undertake exploratory visits and workshops in the two countries. The programme was viewed as a proof-of-concept for collaboration between the two countries, mainly as there was uncertainty about access to Horizon Europe funding for both countries at the time of the programme's design and launch. The UK and Switzerland have been common collaborative R&I partners through multilateral funding and policy forums such as Science Europe and the EU Framework programmes,[32] but FIC represented the first time that they had run bilateral calls together.

UKRI and SNSF interviewees agreed that the programme would have been more effective overall if they had made a joint call rather than independent, parallel calls. This process would have decreased the administrative burden for applicants and administrators and may have increased the visibility of these projects. Despite these challenges, interviewees agreed that significant positive outcomes for international collaboration emerged due to FIC funding. For example, interviewees cited improved access to each other's scientific infrastructure and networking that have provided the foundation to identify future strategic opportunities for collaboration. Interviewees shared that discussions to collaborate in the future are ongoing but are currently complicated by the upcoming UK Government Spending Review and the recent announcement of the UK's association to Horizon Europe (in place as of January 2024).

New funding calls have been announced since the FIC-funded programmes ended. For example, Innovate UK and Innosuisse, the Swiss Innovation Agency, collaborated on two rounds of funding calls to support UK businesses to collaborate with Swiss counterparts. Interviewees shared that the call was heavily oversubscribed and pointed to an opportunity for future collaborative calls and a desire from both UK and Swiss researchers and innovators. However, as these are from agencies that were not involved in FIC-funded programmes, interviewees were unsure as to the extent to which FIC contributed to these funding calls.

C.3.3. Objective 2: Supporting DSIT and wider objectives including science diplomacy

The size, scope, and types of activities funded through this FIC programme meant there were limited opportunities to align R&I policy and strategies between the two countries more broadly.

However, in February 2022, following the launch of the Partnering Awards, UKRI and SNSF issued a joint statement of intent for bilateral cooperation, which was then formalised with an MoU. This aimed to enable partnerships and foster alliances between researchers in the UK and

[32] For instance, in Horizon 2020, the UK is the third most important partner for Swiss researchers, while Switzerland is ranked eighth as collaborative partner for the UK. Source: https://www.gov.uk/government/publications/uk-science-and-innovation-network-country-snapshot-switzerland (accessed 1st October 2024)

Switzerland, demonstrating UKRI's and SNSF's commitment to collaboration. Later that year, the UK and Switzerland also signed a MoU that outlined intentions to collaborate more deeply, focusing on 'deep science' and 'deep tech'. Additionally, the MoU highlighted the intention to collaborate on 'commercialisation through innovation, and policy in science and innovation'. Since then Innovate UK and Innosuisse have collaborated on two rounds of funding calls to support business collaboration (as introduced above).

C.4. Department of Biotechnology (DBT), Ministry of Science and Technology (MOST), India

C.4.1. Introduction

MOST DBT was set up in 1986 to promote the adoption of biotechnology. DBT was involved in two FIC programmes, in partnership with a range of UKRI councils:

The **Tackling Anti-Microbial Resistance (AMR) in the Environment** programme (FIC-25) aimed to inform the development of strategies to limit environmental contamination by waste from antimicrobial manufacturing, in partnership with NERC and ESRC. In addition to the implementation of individual projects, activities to coordinate across the five different projects have been undertaken from the start. UK researchers involved in the programme proactively organised a meeting in late 2020 to discuss common interests and further meetings then took place in April 2021 and July 2022. To facilitate interaction between projects and with the funders, NERC has funded a "Programme Coordination Team".

The funded projects experienced delays for several reasons. Project starts were delayed by the COVID-19 pandemic, and the Indian components of the programmes were able to start somewhat later than their UK counterparts. Subsequently, the disbursement of funds by DBT to Indian project partners was delayed which ultimately means that not all project milestones will be met during the time available. The projects are now in their final stages and will close between September 2024 and January 2025.

The **UK-India COVID-19 Partnership Initiative** (FIC-STR-02) supported comparative research of South Asian populations in the UK and India. It aimed 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 was funded under the Strategic Opportunities Stream of FIC, with MRC and ESRC as partners.

Whilst funding for UK researchers was released, Indian partners were met with a range of challenges including a serious wave of COVID-19 infections in India, delays in funding coming through and agreement of the overall portfolio. The four projects were able to start in late 2021, and all but one has now successfully completed.

In addition, the **Global Incubator Programme** (FIC2-20), which was implemented as a series of separate bilateral calls between Innovate UK and partners in Canada, Singapore and the United States, was also originally planning to launch a bilateral call with India. However, the intention is now to take this forward outside of FIC. FIC funding was used to pilot the Global Incubator Programme with three countries (and has enabled discussions to take place with India) and it will now be mainstreamed through the core Innovate UK global budget. From the three incubator programmes that originally launched, Innovate UK are now working towards 12 programmes. In 2023, Innovate UK launched a new part of the Global Incubator Programme

with new Indian partner, Urban Systems, delivered in partnership with Innovate UK EDGE.[33] This programme is not funded by FIC and is not carried out in partnership with DBT.

C.4.2. Objective 1: Enabling international collaboration

Theme 1: Enabling funding

There is considerable demand in India for collaboration with the UK, thus FIC funding helped to unlock new opportunities. Since GCRF and the Newton Bhabha Fund, UK-India collaboration has evolved and is no longer based on ODA funding.[34] In this context, FIC provided a forward-looking alternative. It has 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 through previously available mechanisms and so FIC has opened new opportunities for this bilateral relationship. In both programmes described above, the Fund played an important role in enabling co-funded activities with equal funding from Indian partners. Both programme leads confirmed that these programmes would not have been possible without FIC funding.

For the time being, the two programmes have not unlocked further funding at the programme level. The ISPF has funded a new BBSRC-led programme on farmed animal diseases and health, including AMR,[35] but this is not considered a follow-up on the Tackling AMR in the Environment programme.

Even so, several individual AMR projects do report attracting further funding. These are often small amounts, such as internal university funds for 'pump priming' but there are also some examples of larger grants, such as follow-on funding from the BBSRC to support impact from the research findings.[36]

Theme 2: Deepening R&I

At the funder level, DBT remains a key partner for UKRI in India, and the FIC has enabled this relationship to be maintained through a period where there is limited new non-ODA funding for international collaboration becoming available. The partnership with the DBT's innovation arm, the Biotechnology Industry Research Assistance Council (BIRAC) regarding the Global Incubator Programme did not lead to the implementation of a joint programme on this occasion, but the ongoing dialogue has helped Innovate UK better understand opportunities for joint initiatives in India.

At the level of the scientific community, FIC has helped consolidate a closely interconnected community. The Tackling AMR in the Environment programme, builds on a previous portfolio of AMR-related programmes under the Newton Fund and GCRF[37], and as a consequence,

[33] Global Incubator Programme: India (Hyderabad) - Urban Systems - Innovate UK Business Connect (ktn-uk.org) (accessed 1st October 2024)

[34] UKRI "Applying for official development assistance (ODA) funding": https://www.ukri.org/apply-for-funding/how-to-apply/applying-for-official-development-assistance-oda-funding/ (accessed 7th November 2024)

[35] https://www.ukri.org/opportunity/india-uk-partnership-to-address-farmed-animal-diseases-and-health/ (accessed 1st October 2024)

[36] Gateway to Research, August 2024

[37] "Interim Impact Evaluation – Appendix", pp. 28-38, available at: https://www.ukri.org/publications/fund-for-international-collaboration-fic-interim-impact-evaluation-jul-2023/ (accessed 20th August 2024)

researchers were able to use existing connections to find partners and develop bids for the call with less need for the dedicated partner building activities. The 'Programme Hub' has further implemented a number of joint workshops, most recently the 'AMR-India Stakeholders Workshop' in Mumbai, India in December 2023.[38]

Theme 3: Developing partnerships

The period immediately prior to FIC saw a significant increase in R&I collaboration and co-publications between UK and Indian researchers. The two FIC funded programmes built on the this and further contributed to consolidation.

The Tackling AMR in the Environment programme complemented the existing portfolio of funding initiative related to AMR, covering an area that had not previously been funded. The projects are still ongoing, but they have produced significant scientific outputs, including between 4 and 10 publications each.[39] In addition to a number of engagement activities, several projects have also contributed to policy developments, including participation in workshops to inform the Scottish "AMR National Action Plan (2024 to 2029)" (AMSPARE)[40] and input to the World Health Organisation's "Guidance on waste and wastewater management in pharmaceutical manufacturing with emphasis on antibiotic production" (AMRflows).[41]

Projects funded by the UK-India COVID-19 Partnership Initiative have reported fewer publications[42] but given the nature of the programme as a response to a global pandemic, the projects instead produced findings that were immediately relevant to national health authorities – e.g. on the ethnic disparities in Long COVID-19 diagnosis[43] – and produced new datasets which could be shared internationally.

C.4.3. Objective 2: Supporting DSIT and wider objectives including science diplomacy

The collaboration with the DBT has supported the UK's wider collaboration with India. The priority accorded to collaboration with India is illustrated by the "2030 Roadmap for India-UK future relations" which was published in the context of the UK-India virtual summit in May 2021.[44] The text outlines plans for collaboration across a number of policy areas, including research and innovation (e.g., para. 4.9-4.11), climate, and health. Relevant to the FIC programmes featured here, specific commitments include initiatives on AMR, COVID-19 and pandemic preparedness.

In general, stakeholders see India as a future science and innovation 'powerhouse' and view it as ready to offer leading expertise in a range of areas, and often at a much greater scale than most other countries. As a non-ODA programme, FIC has contributed to building a more equitable partnership in science and innovation between India and the UK. Compared to previous funding instruments, FIC sought broadly equal contributions from both sides and includes collaboration in a broader spectrum of areas, including business innovation.

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[38] Programme Hub – India-UK Tackling AMR in the Environment from Antimicrobial Manufacturing Waste (AMR-India) (indiaukamrenvironment.org) (accessed 1st October 2024)

[39] As reported in Gateway to research, August 2024

[40] https://gtr.ukri.org/projects?ref=NE%2FT012986%2F1 (accessed 1st October 2024)

[41] https://gtr.ukri.org/projects?ref=NE%2FT013222%2F1 (accessed 1st October 2024)

[42] As registered in Gateway to research, August 2024.

[43] https://gtr.ukri.org/projects?ref=MR%2FV040235%2F1#/tabOverview (accessed 1st October 2024)

[44] https://www.gov.uk/government/publications/india-uk-virtual-summit-may-2021-roadmap-2030-for-a-comprehensive-strategic-partnership/2030-roadmap-for-india-uk-future-relations#i-connecting-our-countries-and-people (accessed 1st October 2024)

C.5. Canadian Institutes of Health Research

C.5.1. Introduction

The Canadian Institutes of Health Research (CIHR) is the federal funding agency for health research in Canada. It is comprised of 13 "virtual" Institutes, each of which is dedicated to a specific area and supports researchers to pursue common goals through interdisciplinary research and the facilitation of connections with health professionals and policymakers. It is one of three federal agencies funding research in Canada, alongside the Social Science and Humanities Research Council (SSHRC) and the Natural Sciences and Engineering Research Council (NSERC), and accounts for around 40% of the overall tri-agency funding allocation.[45]

CIHR was a partner in three FIC programmes, all of which have now been successfully implemented. Two of the funded programmes concluded by the beginning of 2024:

- The ***UK-Canada Collaboration on Artificial Intelligence: Building competitive, resilient economies and societies*** (FIC2-07) supports collaborative research projects to generate new insights into the implications of AI technologies for societies. It is a collaboration between four UKRI Councils (AHRC, MRC, EPSRC and led by ESRC) and the Canadian Councils (CIHR, NSERC and led by SSHRC).
- The ***UK-USA Neuroscience collaboration through Medical Research Council (MRC) participation in the NSF NeuroNex programme*** (FIC-17). A National Science Foundation (NSF, in the US) led initiative (to which CIHR is a member) to support the development of four large interdisciplinary collaborative networks of international partners that are working to advance research in the neurosciences and provide insights into the brain.

The final programme, the UK-Canada Diabetes Partnership, still has one project active which is expected to end in March 2025:

- The ***UK-Canada Diabetes Partnership Initiative*** *(FIC 2-11)* is a bilateral partnership between CIHR and MRC to support collaborative research to address key knowledge gaps pertaining to diabetes.

C.5.2. Objective 1: Enabling international collaboration

Theme 1: Enabling funding

Prior to FIC, CIHR itself had a very international outlook and was engaged in over 40 international initiatives supported by bilateral and multilateral agreements with countries and international programmes across the globe. CIHR had 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. However, despite these previous interactions, UKRI interviewees noted that the focus within the UK on Official Development Assistance (ODA) funding had left little room for collaboration with Canadian partners outside of core grant funding.

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

- The **NeuroNex Programme** was a pre-existing initiative led by the National Science Foundation in the US. The second phase of the programme provided an opportunity for

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

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. With FIC funding, UK researchers were involved in three of the networks, including two with Canada.

- The **UK-Canada Collaboration on Artificial Intelligence** programme arose from ongoing dialogue between ESRC, AHRC and SSHRC, but the first interdisciplinary joint call across multiple UKRI councils (AHRC, EPSRC and MRC, led by ESRC) and all three Canadian grant agencies (CIHR and NSERC, led by SSHRC) was funded through FIC.
- The **UK-Canada Diabetes Partnership Initiative** emerged from discussions between CIHR and MRC during the 'CIHR-INMD Workshop: 100 Years of Insulin: What's Next?' in October 2018, which highlighted the strong alignment in research priorities in the area of diabetes and the interest in pursuing bilateral collaboration opportunities. FIC provided the opportunity to establish a new bi-lateral partnership between CIHR and MRC to support collaborative research.

Most of these programmes have now come to an end and there have not been many subsequent funding programmes that directly follow-on from the three FIC programmes with CIHR. Nevertheless, they have contributed to facilitating the launch of programmes in other areas. For example, there is evidence that ISPF-funded activities with Canada were easier to set-up because of the strong relationships that had been built through FIC activities, including those developed through CIHR initiatives.

One example highlighted by interviewees related to the UK's involvement in the Canada-led International Joint Initiative for Research in Climate Change and Adaptation and Mitigation. The UK's involvement in the programme is supported by £3 million in funding from the ISPF to support research to help the most vulnerable people globally to deal with the impact of climate change. Though not directly linked to the relationship between MRC and CIHR, from a UKRI perspective, this joint initiative represented a continuation of the relationship built through the UK-Canada Collaboration on Artificial Intelligence. The programme is administered by SSHRC[46] and funded through the New Frontiers in Research Fund,[47] whilst ESRC is coordinating UKRI involvement. The UK call was launched in January 2023 and 16 projects were awarded, each of which will run for 3 years from March 2024.

In addition, as part of the UK-Canada Diabetes Partnership, the MRC and CIHR are in discussion about a Knowledge Exchange Event to be held in Toronto in 2025. This will involve the UK PIs from the initiative and their Canadian counterparts, as an opportunity to present their findings as part of the 2025 Diabetes Canada Conference. [48]

Numerous FIC projects have also secured further funding to support ongoing research, largely from UK sources. This includes funding from UKRI (namely MRC, EPSRC and Innovate UK), as well as charities such as Wellcome Trust, Wellcome Leap, Diabetes UK, and Kidney Research UK. For example, amongst projects supported through the FIC UK-Canada Diabetes Partnership Initiative:

- Following the 'Precision medicine in diabetes' project, the University of Dundee secured £2.8m in funding from the Chief Scientists Office to launch the iDiabetes project which is

[46] The Canada Research Coordination Committee (CRCC) was established in 2017 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.

[47] https://www.sshrc-crsh.gc.ca/funding-financement/nfrf-fnfr/international/2023/international-2023-prelaunch-eng.aspx (Accessed March 7th 2023)

[48] Diabetes Canada Conference, 2025 https://www.diabetes.ca/get-involved/conferences-(1)/professional-conference

developing a new clinical platform to enhance testing and analysis of personal data of patients with diabetes to enhance personalisation of their treatment and care.[49]

- The 'Bridging the gap to translation by understanding and preventing diabetic vascular complications using human organoids' PI secured a $3.7m Wellcome Leap grant in 2021 to launch the project Engineering functional human kidneys and urinary tracts.[50] A member of the UK project team was also awarded a £4k grant in 2023 under the UK-Canada regenerative medicine exchange programme to support their travel to Canada to further build on the project collaboration.

Theme 2: Deepening R&I

Overall, the FIC was 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 improved the perceptions of the UK as a science and innovation partner due to the scale of funding UKRI 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.

The FIC programmes have enabled UK and Canadian researchers to access each other's world-leading expertise and facilities, thus accelerating progress with research. Research outputs and outcomes are starting to emerge from the recently closed projects. For example, so far, the Diabetes partnership has supported the development of 20 publications across four projects, and the NeuroNex programme has supported 28 publications across three projects.

Theme 3: Developing partnerships

Prior to the FIC programme CIHR had established strong relationships with MRC reflecting the alignment of their respective research areas, however, as noted above, there was little funding to support joint activities.

The UK-Canada Diabetes Partnership Initiative, the UK-Canada Collaboration on AI and MRC's participation in the NSF NeuroNex programme have all strengthened the existing relationships between MRC and CIHR. In enabling the formation of new relationships between MRC and CIHR's different institutes, and through increased understanding of each other's priorities and processes, this has generated interest in and laid the groundwork for future collaborations. CIHR noted (through consultation for the final evaluation) being more aware of the UK as a potential partner and that there was an increased likelihood they would look to the UK for future international collaborations.

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.

Both MRC and CIHR hope to continue their strong collaboration in future, with both councils noting the strength of the relationship and the alignment in priorities, however the timing and scope of the Funds available to MRC and other UKRI councils for international collaboration has meant these conversations have not yet been pursued. To better support the development

[49] https://gtr.ukri.org/projects?ref=MR%2FT032014%2F1 (accessed 4th December 2024)

[50] https://gtr.ukri.org/projects?ref=MR%2FT032251%2F1#/tabOverview (accessed 23rd August 2024)

of collaborative activities, CIHR noted they would benefit from a longer-term plan / commitment and regularity of funding to reflect the annual cycles of their Institutes' budgets.

C.5.3. Objective 2: Supporting BEIS and wider objectives including science diplomacy

FIC 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* addressed and aligned 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.

The strategic challenges addressed within the FIC funded programmes align and address mutual intergovernmental priorities, and FIC made the UK a more attractive partner for Canada. Reflecting this continued and strengthened relationship, the UK and Canada signed an updated MoU on Science, Technology and Innovation in January 2024. The FIC has therefore contributed to broader UK Government goals in Canada by strengthening and deepening UK-Canada scientific relationships.

C.6. Enterprise Singapore

C.6.1. Introduction

Enterprise Singapore partnered with Innovate UK to deliver two programmes, the Global Incubator Programme (FIC2-20) and the Eureka GlobalStars Programme (FIC-08).

The **Global Incubator Programme** supported UK firms to explore commercial opportunities and enter overseas markets through local incubators and business accelerators. Both the UK and Singapore ran their version of this programme. In Singapore, partners at IoT Tribe and Rainmaker ran the Global Innovation Alliance. The UK's Singaporean partner GROW delivered the UK's Global Incubator Programme.

The second programme, the **Eureka GlobalStars Programme**, was built on the existing Eureka network. The network was established as a means for partner countries to collaborate on R&I projects to explore new markets with non-Eureka member countries. The UK (as an associate member of Eureka) invited Singapore to participate. It launched a call funded through FIC in 2019 and a second call in 2020 due to unexpectedly high demand. FIC funding supported 11 UK-Singapore initiatives through these two calls under the Eureka GlobalStars Programme.

C.6.2. Objective 1: Enabling international collaboration

FIC funding enabled the two countries to better understand the interest of UK and Singaporean firms in accessing complementary resources, expertise and market access. All interviewees agreed that collaborations between the UK and Singapore have become increasingly strategic since the FIC-funded programmes.

Theme 1: Enabling funding

Innovate UK and Enterprise Singapore have continued to strengthen their collaborative partnership. In 2022, the two organisations signed a new bilateral agreement to continue developing existing programmes with a more strategic focus. Several R&I funding calls have then been launched, supported through Innovate UK's core budget. While one interviewee noted that Innovate UK have a larger core budget than most councils (and therefore more flexibility to draw from that funding to support programmes), they suggested that this development pointed to the importance of UK and Singaporean science collaboration. The use of core funding is also expected to be more sustainable than the three-year funding

provided by FIC. Interviewees noted that the increased sustainability has led to more trust between the two countries and an increased recognition of the UK (through Innovate UK) as a trusted and consistent partner for collaboration.

FIC funding also provided leverage for Singapore to now formally join the Eureka network, enabling it to collaborate more consistently with the UK and other countries in the future.

Theme 2: Deepening R&I

Both programmes supported by FIC have enabled UK firms to better understand better the dynamics of the Singaporean market and to discover and build partnerships with local firms. As of June 2024, Innovate UK and Enterprise Singapore are supporting the fourth cohort of businesses, pointing to the sustainability of benefits arising from FIC funding.

At the interim evaluation stage, Innovate UK and Enterprise Singapore were preparing to launch an R&D funding call with a Net Zero focus, as part of the subsequent funding agreement detailed above. This funding call went ahead successfully between August and December 2023.[51] Innovate UK then launched the latest series of R&D calls in June of this year, focused on advanced manufacturing and materials, agrifood tech, mobility and transport, cybersecurity and health and life sciences.[52]

International collaboration has supported new and existing areas of strategic importance for UKRI. While FIC-supported programmes have directly supported business innovation activities, new calls from Innovate UK and Enterprise Singapore have encouraged UK organisations (including research organisations and academics) to apply for funding to collaborate with Singaporean firms. This suggests that one of the key outputs of FIC funding has been to deepen R&I collaboration between the two countries and to increase the types of stakeholders supported by such funding.

Theme 3: Developing partnerships

According to Innovate UK and Enterprise Singapore, FIC has contributed to building a stronger and closer relationship between the two funders. A strengthened relationship has made it easier to plan new projects together and envisage routes for improving their joint programmes.

The Singaporean partner who helped to deliver the Global Incubator Programme, GROW, is partly owned by an Australian company. Through the initial collaboration with FIC, Innovate UK has now expanded the scope of the Global Incubator Programme to Australia with an agri-tech focus. One interviewee cited the value of FIC funding to experiment with new models of supporting businesses, which has allowed the model to be expanded to other countries, including Australia.

C.6.3. Objective 2: Supporting DSIT and wider objectives including science diplomacy

FIC has also influenced diplomatic relationships. According to Innovate UK, the British High Commission in Singapore views the relationship between Innovate UK and Enterprise Singapore as a cornerstone of their diplomatic relationship.

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[51] UK-Singapore Collaborative R&D Call, Sustainability and Net Zero, https://apply-for-innovation-funding.service.gov.uk/competition/1675/overview/f891890f-8f16-4e59-bd91-846522347f25 (accessed 1st October 2024)

[52] UK-Singapore Collaborative R&D 2024, https://apply-for-innovation-funding.service.gov.uk/competition/1916/overview/7e6fa736-20ec-43bc-add0-58dc6f1817e6 (accessed 1st October 2024)

Interviewees also highlighted that FIC funding had improved diplomatic relations between the two countries more broadly. In September 2023, the Prime Ministers of the UK and Singapore signed a new UK-Singapore Strategic Partnership, setting the direction for relationships for the medium term. Innovate UK and Enterprise Singapore anticipate this partnership will accelerate investment in infrastructure, technology and clean energy.

C.7. Japan Science and Technology Agency (JST)

C.7.1. Introduction

The JST is a network-based research institute, and one of seven national R&I agencies that are overseen by the Ministry of Education, Culture, Sports, Science and Technology and the Council for Science, Technology and Innovation in Japan. 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 of 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 was led in the UK by ESRC, with the support of AHRC. The programme funded collaborative research on the societal impacts of Artificial Intelligence (AI) technologies. It was awarded £2.08m from wave 2 of FIC[53], with around £1.2m[54] in match-funding secured from JST. The programme launched a single call (April-October 2019), with six projects selected that ran from January 2020 to December 2021. It was the first joint call between ESRC and JST-RISTEX, and indeed the first ever international joint call run by JST-RISTEX. 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).

C.7.2. Objective 1: Enabling international collaboration

Theme 1: Enabling funding

For the time being, the FIC programme itself has not unlocked further funding. Whilst both JST-RISTEX and ESRC expressed interest to implement further joint programmes, funding has not been found to support this and there are currently no concrete plans for future working.

Several individual projects funded through the programme do however report attracting further funding. These are often small amounts, such as internal university funds for 'pump priming' but there are also examples of larger grants, such as follow on funding for Southampton University to lead the EPSRC funded project, AI UK: Creating an International Ecosystem for Responsible AI Research and Innovation[55].

ESRC has, however, continued to collaborate with the Japanese Society for the Promotion of Science, along with AHRC, on a set of 10 projects to explore the challenges and impacts of the COVID-19 pandemic.[56] Launched in 2021, the programme looked to explore the effects of

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

54 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

55 https://gtr.ukri.org/projects?ref=ES%2FT00696X%2F1 (accessed 1st October 2024)

56 https://www.ukri.org/news/uk-japanese-collaboration-to-address-covid-19-challenges/ (accessed 1st October 2024)

the pandemic on labour markets, mental health, public trust in institutions and sustainability of culture. Though not a direct result of the collaboration with JST-RISTEX, this programme further affirmed the UK's interest in delivering collaborative research with Japan.

Theme 2: Deepening R&I

From the perspective of JST-RISTEX and ESRC, the outputs and outcomes of the programme could not have been possible without the collaboration, as the FIC programme offered the researchers valuable chances to meet and build relationships. Though the programme did support improved relationships between Japanese and UK researchers, the extent of this is limited by the relatively small scale of the programme.

Theme 3: Developing partnerships

Though there is a history of collaboration between the UK and Japan prior to the FIC programme, the relationship between UK and Japanese research partners in the social sciences and humanities (i.e., with ESRC and AHRC) has emerged more recently. ESRC had not been able to launch a partnership with Japan due to funding constraints, and instead prioritised funding activities and strategies on collaborations with EU partners and ODA-eligible countries through the Newton Fund, notably China, India, Brazil and South Africa.

This relationship has increased in recent years, initially though the first wave of FIC via ESRC-AHRC UK-Japan Social Science and Humanities Connection grants (FIC-18), and then through the UKRI-JST Joint Call on Artificial Intelligence and Society programme (FIC2-09). The collaboration between ESRC, AHRC and the Japanese Society for the Promotion of Science launched in 2021, exploring the challenges and impacts of the COVID-19 pandemic[57] has then added to this positive foundation for future collaboration.

Whilst both JST-RISTEX and ESRC expressed interest to implement further joint programmes, available funding has not been found. As JST-RISTEX's funding cycles are fairly regular and consistent, they require commitment from International partners at specific points in time to support collaborations, which ESRC have not been able to provide. For ESRC, the relationship with Japan is unable to be supported through their core budgets at this time. ESRC have therefore focussed their international activities on relationships with countries that follow similar funding cycles, or that face similar levels of uncertainty in their funding cycles. As a result, there are no concrete plans for closer working in future.

C.7.3. Objective 2: Supporting DSIT and wider objectives including science diplomacy

Both ESRC and JST-RISTEX agreed 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 have a focus on AI research and their levels of investment in this area.

From the projects themselves, there are numerous examples of outputs that are making a positive contribution to various objectives within the UK's National AI Strategy. In particular, projects have made a positive contribution to positioning the UK as a global leader in ethical and responsible AI. For example, project participants have since formed an Working Group at the Institute of Electrical and Electronic Engineers to develop an ethical technical standard for

[57] https://www.ukri.org/news/uk-japanese-collaboration-to-address-covid-19-challenges/ (accessed 1st October 2024)

general purpose AI, emulated empathy and "partners"[58], advised UNESCO on the roll out of its Recommendation on the Ethics of AI and led the drafting of the Council of Europe's AI assurance framework for a legal framework on AI[59].

C.8. National Natural Science Foundation of China (NSFC)

C.8.1. Introduction

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. Since a reorganisation in 2018, the Foundation has 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". [60] This includes piloting a greater emphasis on transdisciplinary and application-driven basic research within certain programs, to test application and review procedures.

NSFC is a partner in 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 an interdisciplinary academic research programme delivered by the ESRC in partnership with the NSFC. In parallel with the academic strand of the programme described in this case study, a separate innovation programme is implemented by Innovate UK.

Five projects were selected for funding[61] and started in October 2020. The implementation of these projects has also been affected by the COVID-19 pandemic, for example hindering the 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. The projects were completed in 2024.

In addition, NSFC was a partner in the multilateral **Next generation transdisciplinary international research collaborations in Ecology and Evolution of Infectious Diseases (EEID) programme** (FIC2-15). The programme built on an existing US multi-agency programme led by the NSF, EEID,[62], and the bilateral UK-US call with the same title under FIC wave 1 (FIC-14). Under the terms of the latter three calls, proposals were required to include researchers from the UK and the US and could optionally include researchers from Israel and China as well.

Under the EEID programme, FIC co-funded one project that involved partners from China as well as from the USA. The project, "Predictive phylogenetics for evolutionary and transmission dynamics of newly emerging avian influenza viruses", is led in the UK by researchers from the University of Edinburgh working with the Institute of Microbiology Chinese Academy of Sciences among others. The project was launched in March 2021 and is scheduled to be completed in March 2025.

C.8.2. Objective 1: Enabling international collaboration

Theme 1: Enabling funding

[58] https://gtr.ukri.org/projects?ref=ES%2FT00696X%2F1 (accessed 1st October 2024)

[59] https://gtr.ukri.org/projects?ref=ES%2FT007354%2F1 (accessed 1st October 2024)

[60] "National Natural Science Fund Guide to Programs 2019", NSFC

[61] New UKRI-China projects tackle the challenges of ageing societies – UKRI (accessed 1st October 2024)

[62] https://beta.nsf.gov/funding/opportunities/ecology-evolution-infectious-diseases-eeid (accessed 1st October 2024)

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 cooperation. It has also specifically enabled the opportunity to fund interdisciplinary collaborative research and to test and learn from new application and review procedures. Through the inclusion of China in the EEID programme, FIC also enabled opportunities for expanding collaboration with China through an established scheme.

For the UK-China Healthy Ageing Flagship Challenge programme, there is no immediate follow-on funding scheme specifically for the collaboration with the NSFC. One project has reported a follow-on grant from the Wellcome Trust in the UK to investigate Air pollution and dementia,[63] and there are options for researchers to apply for responsive mode funding from UKRI for further collaboration. [64]

Under the new China UK Flagship Challenge, UKRI is also collaborating with the Chinese Ministry of Science and Technology[65] in the area of "One Health research for epidemic preparedness and AMR." Thematically, this is closely related to the Next generation transdisciplinary international research collaborations in EEID programme, supported through FIC – although it involves different funders.

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 UK Government's Industrial Strategy from 2017, while the 2019 Delivery Plan for ESRC (programme lead) identified 'Changing populations', including healthy ageing, as one of six priority areas to address.

The five projects funded under the Healthy Ageing academic programme have each reported producing 9 or 10 publications, several have produced new datasets and attended international seminars and conferences. By way of illustration, several projects have produced new evidence and datasets, and key findings from the projects include estimating the cost of dementia in China and improving understanding of population segments, which will enable tailoring sexual health services for older people in the UK. Findings have also been discussed with UK government organisations, including the Office for National Statistics (on projection methods) and the Scottish government (on general practitioner services).[66]

Other UK-China collaborative programmes by FIC have led to deepening engagement in the Innovation space with the National Innovation Centre for Ageing in a key role. The interdisciplinary projects carried out as part of the academic programme is expected also to feed into future innovation activities as these activities develop.[67]

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[63] Air pollution and dementia: cardiovascular pathways, population impact and potential for prevention - Grants Awarded | Wellcome (accessed 1st October 2024)

[64] Interview insight

[65] https://www.ukri.org/opportunity/china-uk-one-health-research-for-epidemic-preparedness-and-amr/ (accessed 1st October 2024)

[66] Gateway for Research (see above)

[67] Interview insight

Theme 3: Developing partnerships

At the funder level, UKRI has 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 not 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. Beyond the FIC programme, UKRI and NSFC held a joint workshop on interdisciplinary research in May 2022.[68] Overall, the FIC programme was seen by those consulted to reinforce the existing partnership and has led the way in how to design and implement cross-disciplinary collaboration in health research. In parallel, programmes with other Chinese partners have led to new partnerships with actors in health innovation and arts and technology.

Towards the end of FIC-funded programmes, during 2023 and 2024, there has been greater consideration of opportunities for future UK-China bilateral research collaboration. With the introduction of International Science Partnerships Fund (ISPF), future UK-China collaboration is expected to focus on how UK-China collaboration can contribute to strategic challenges and innovation.

C.8.3. Objective 2: Supporting DSIT and wider objectives including science diplomacy

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 role of the UKRI China office was also noted in the Interim Impact Evaluation [69] as being particularly instrumental in ensuring clear communication with NSFC. After the new Flagship Challenge Programme had been announced, UKRI's China office followed-up to ensure commitment from the partners, and negotiated the specific terms of the programme on their behalf.

Following the 10th China-UK Joint Commission on Science, Technology and Innovation Cooperation in 2021, the theme 'One Health' was identified as a new UK-China Flagship Challenge. With funding from the ISPF, UKRI is now funding projects addressing epidemic preparedness and AMR.

The FIC-funded partnership with between UKRI and NSFC has further developed the relationship and enhanced the ability of researchers and funding organisations to organise in response to such new policy initiatives to ensure they contribute to wider government objectives.

[68] https://www.nsfc.gov.cn/english/site_1/news/A1/2022/05-26/269.html (accessed 1st October 2024)

[69] "Interim Impact Evaluation – Appendix", p. 70, available at: https://www.ukri.org/publications/fund-for-international-collaboration-fic-interim-impact-evaluation-jul-2023/ (accessed 20th August 2024)

Appendix D Business participant case study

This appendix presents case studies of two businesses that are realising commercial success as a result of their FIC participation.

D.1. Aurrigo

The following case study has been developed based on survey responses and follow-up interviews with a representative from Aurrigo (a FIC grant holder) at the interim and final evaluation stages, plus additional desk research undertaken by the study team.

D.1.1. Summary

Aurrigo is a Coventry-based publicly listed company, internationally recognised as a leader in autonomous technology. The company was awarded £350k in FIC funding through Innovate UK to develop and test self-driving baggage handling vehicles. This collaborative R&D project ("ABACAS") ran from May 2021 to May 2022, with Aurrigo working alongside the Changi Airport Group (CAG, which operates Singapore international airport), and the Civil Aviation Authority of Singapore (CAAS). The project resulted in Auto-Dolly, a unique and disruptive baggage transportation solution for airports that can reduce baggage and cargo loading and unloading times, improve movement efficiencies, and drastically reduce operational costs.

D.1.2. Background

Current baggage handling systems typically start in a hall full of sorting equipment, with checked bags brought together onto a conveyor system where tags are scanned and manually packed by baggage handlers into Unit Load Device (ULD) containers. These are then pushed onto trailers, called dollies, that are driven in trains of four by a diesel or an electric tug.

However, air passenger numbers (globally) are expected to double in the next 18 years and so airports face the challenge of using existing buildings and infrastructure more efficiently to handle this dramatic increase in people and baggage. Airports are also struggling to rebuild their workforces after the pandemic, with many staff (including baggage handlers) having since moved into other sectors. Furthermore, these staff work in difficult conditions from a health and safety perspective, with baggage handlers competing for space with a range of other airside activities and working in extreme conditions of light, temperature and noise.

The ABACAS project sought to overcome these challenges by developing technology to turn every trailer into an autonomous dolly (Auto-Dolly). This would then enable many more ULDs to be moved within the same space, and more efficiently, as each could move uniquely. For instance, eight autonomous dollies with their own ULDs could be accommodated in the same space as a tug and four traditional trailers, leading immediately to doubling of capacity.

Before the ABACAS project, Aurrigo had already been working with CAG and CAAS on the idea of autonomous dollies, but just remotely through simulation work. They had been in negotiations about doing testing on the ground, but these discussions had been delayed due to the pandemic. That was until the opportunity of FIC funding was identified. This, according to Aurrigo CEO Professor David Keene, changed the dynamic of the relationship and unlocked the next steps in the project. Despite the sums involved being relatively small (a grant of £350k from Innovate UK, compared with a CAG operating profit of over £550m), the UK government investment catalysed the partners to sign up to the project, with CAG and CAAS also both investing £150k each (in-kind).

D.1.3. Interim Evaluation Findings

The project funding enabled Aurrigo to put its first Auto-Dolly on the ground at Changi Airport, for what was to become an extensive and challenging round of operational testing. Initially in an unused carpark on the edge of the airport, the vehicle was put through 385 different tests set by the CAAS to demonstrate its performance and abilities in a range of different situations (e.g. reacting to a bag being thrown in front of it). Passing all of these tests, Aurrigo was then able to take the Auto-Dolly airside, where the tests were repeated in the airport environment.

As such, with FIC funding, the project achieved acceptance from the CAAS team to operate airside and completed live runs that greatly advanced understanding and allowed further development and improvements to the product. During the one-year project ABACAS was able to move from an experimental proof of concept (TRL 3) to the demonstration of a prototype in an operational environment (TRL 7).

Aurrigo has now established a business in Singapore, with 8 employees and an office in Changi that deal directly with the airport, and a listing on the London AIM stock exchange to raise funds for the next stage. Offices have also been established in Australia, Canada and the US – all reportedly inundated with interest. The manufacturing of the Auto-Dolly is done in Coventry, where the factory can produce approximately 400 vehicles a year (more than enough for current needs), but additional manufacturing sites in Singapore and North America are also being considered.

D.1.4. Final Evaluation Findings

Since the project ended, further testing has been carried out as follow-ons to the ABACAS work funded by FIC. Funded by CAG and CAAS, additional testing has resulted in an improved and more sophisticated vehicle. Both the Mark 2 and Mark 3 vehicles have gone through more challenging testing that has resulted in new features added to the vehicles. These new features include the ability to load baggage onto both sides of the vehicle, 360 degrees tank turn capabilities, and lowering and raising the deck height, enabling baggage handling at different height platforms around the airport.

This additional round of testing also demonstrated the ability of the Auto-Dolly to work in different weather conditions and in close quarters with aircraft on stand. The next phase of testing, Phase 2B, which began in May this year (2024) will test a fleet of four new vehicles. The focus of this work is on Auto Dolly's communication through Aurrigo's platform, enabling a fleet of vehicles to be scheduled and monitored.

This phase, funded through a commercial contract, will run until March of next year (2025). By the end of testing, Aurrigo anticipates that the fleet of vehicles will pass testing, which should allow the full fleet to run live at the airport. Aurrigo are now also working with a third-party contractor to audit their cyber resilient systems (able to protect itself from, detect, respond to and recover from cyber-attacks) in anticipation of the end of testing.

The aviation sector is viewed by some as relatively risk-averse when it comes to introducing new technology. As such, the interviewee shared that follow-on projects would not have happened without original FIC funding. Grant funding was viewed by both Aurrigo, CAG and CAAS as a catalyst to experiment with new technology in a low-risk environment. Once the technology was proven to be viable, there is now continued appetite from CAG and CAAS to continue funding this project independently.

> *"Aurrigo are effectively getting revenue and commercial traction from the fact that CAG and CAAS had the confidence in moving following on from that first ABACUS programme" – Aurrigo CEO, Professor David Keene*

For a relatively modest grant budget, the project has leveraged additional monies through commercial contracts with CAG and other benefits. The success of this project has generated significant PR, both within Singapore and internationally. This has served as reputational boost for both Aurrigo and CAG. Aurrigo shared that the success of the project has led them to consider expanding operations to other airports in countries around the world.

Changi airport is already one of the largest transportation hubs in Asia and one of the world's busiest airports by international passenger and cargo traffic (e.g. over 68 million passengers in 2019). There are many other airports globally looking to reduce costs and improve turn-around times of aircraft. Minor, bespoke changes to the Mark 3 would enable Aurrigo provide the Auto-Dolly to address the needs of all of these airports.

D.2. Plasticell Limited

The following case study has been developed based on a survey response and follow-up interview with a representative from Plasticell (a FIC grant holder) at the final evaluation stage, plus additional desk research undertaken by the study team.

D.2.1. Summary

Plasticell Limited is a publicly listed company based in Stevenage, in the UK. The company was awarded £140,000 in FIC funding via Innovate UK (through the EUREKA GlobalStars grant) to develop biotechnology that could be useful for developing new cancer therapies and treatments (Plasticell's total project costs were £196,703). This collaborative R&D project ran from summer 2021 to spring 2024, with Plasticell working alongside Singaporean biotechnology company LambdaGen. It has led to the discovery of 8 proprietary cell manufacturing and differentiation protocols. The combination of the two technologies from Plasticell and LambdaGen paves for creating an affordable, effective and safe therapy for the treatment of cancer.

D.2.2. Background

Treatments for cancer depend on the type and the stage of cancer. Some patients may require only a single treatment, but most require a combination of treatments, such as surgery in tandem with chemotherapy or radiation therapy. Some cases may also require targeted therapy, hormone therapy or immunotherapy.

Immunotherapy is a treatment that uses the patient's own immune system to recognise and attack cancer cells. There are several different types of immunotherapies at various research and development stages including:

- Monoclonal antibodies[70], which are immune system proteins that are synthesised in a lab. These proteins are designed to bind to specific targets on cancer cells, effectively marking these foreign cells for the immune system to target more efficiently.

[70] Monoclonal antibody drugs for cancer: How they work, MayoClinic https://www.mayoclinic.org/diseases-conditions/cancer/in-depth/monoclonal-antibody/art-20047808#:~:text=Monoclonal%20antibodies%20are%20laboratory%2Dproduced,wanted%2C%20such%20as%20cancer%20cells. (accessed 1st October 2024)

- Checkpoint inhibitors[71], which are drugs that block immune checkpoints. These checkpoints are a part of a healthy immune system and keep immune responses from being too strong. By inhibiting or blocking these checkpoints, the drugs allow the patient's immune system to respond more strongly to cancer cells.
- Vaccines, which work by boosting the patient's immune system response to cancer cells.
- CAR T-cell therapy[72], a treatment in which the patient's T cells (a type of cell in the immune system) are modified to attack cancer cells. The gene for a receptor (a chimeric antigen receptor (CAR)) that binds to a specific protein on the patient's cancer cells is added to T cells. Large numbers of these modified CAR T-cells are then grown and harvested in the lab and re-introduced to the patient.

Currently these treatments, also known as autologous therapies, use the patient's own cells for the immunotherapies. The cells are harvested from the patient, modified in lab accordingly, and then re-introduced back to the patient.

One of the biggest limitations of autologous CAR T-cell therapies is patient accessibility: only 20% of patients for which CAR T-cell therapy is recommended have access to the treatment.[73] The main barrier to access for patients is the cost of the process, in part due to the expensive manufacturing processes. One report estimated the cost of CAR T-cell therapy for a single patient to be $373,000.[74] Additionally, CAR T-cell therapy may cause severe side effects, including cytotoxicity and graft vs. host disease (an immune response which triggers attacks the patients' own body).

To overcome CAR T-cell limitations, researchers have turned to allogeneic therapies. Cells used in allogeneic immunotherapy treatments do not come from the patient but instead from healthy donors, ensuring a healthy supply of cells. These therapies rely on cells from a master 'bank' which have been pre-tested and modified. This approach allows treatments to be produced in larger quantities at a central location, potentially reducing costs through economies of scale and making these increasingly effective therapies available to more cancer patients.

To mitigate against the known side effects of CAR T-cell therapy, research has turned to an alternative immune cell type and therapy; natural killer (NK)-based cell therapies. In comparison to CAR T-cell therapy, CAR-NK cell therapy has a lower chance of negative immune side effects. Additionally, CAR-NK cells have more efficient anti-cancer activity and better suitable for off-the-shelf or mass production[75].

D.2.3. Final Evaluation Findings

Plasticell, in collaboration with LambdaGen, have sought to advance the ease of manufacturing and availability of allogenic CAR-NK therapies by developing a broadly

[71] Checkpoint Inhibitors, Cancer Research UK, https://www.cancerresearchuk.org/about-cancer/treatment/immunotherapy/types/checkpoint-inhibitors (accessed 1st October 2024)

[72] CAR T-cell therapy, Cancer Research UK, https://www.cancerresearchuk.org/about-cancer/treatment/immunotherapy/types/CAR-T-cell-therapy (accessed 1st October 2024)

[73] CAR T-Cells Therapies: Opportunities and Challenges, College of American Pathologists, https://www.cap.org/member-resources/articles/car-t-cells-therapies-opportunities-and-challenges#:~:text=However%2C%20one%20of%20the%20most,have%20access%20to%20the%20treatment. (accessed 1st October 2024)

[74] Cost-effectiveness of chimeric antigen receptor T-cell therapy in adults with relapsed or refractory follicular lymphoma, Potnis, K.C., Mengyang, D., Isufi. I., Gowda, L., Seropian, S.E., Foss, F.M., Forman, H.P., Huntington, S.F., Blood Adv. 2023 Mar 14; 7(5): 801–810.

[75] Zhong, Y., Liu, J. Emerging roles of CAR-NK cell therapies in tumor immunotherapy: current status and future directions. Cell Death Discov. 10, 318 (2024). https://doi.org/10.1038/s41420-024-02077-1

applicable allogenic immunotherapy platform. They intend to do this by synthesizing a stock of NK cells from induced pluripotent stem cells (IPSC, cells with the potential to differentiate into many different cell types). This would enable mass production of a new immunotherapy treatment with better anti-cancer activity.

Before the FIC-funded project, Plasticell had already been working in the field of stem cell technologies and advanced therapies. Over the past decade, Plasticell has developed a new combinatorial screening technology that enables researchers to develop new and improved cell culture protocols (protocols through which to grow, modify and differentiate cells). The technology is capable of testing thousands of combinations of cell culture variables to identify optimised laboratory protocols for a given cell biology process.

LambdaGen, on the other hand, has commercialised a proprietary genome engineering technology called LIGIT ((Lambda-Integrase Genome Insertion Tool). This technology allows insertion of large DNA fragments into specific location in human genome. Prior collaborations between the two organisations had been limited to an advisory capacity due to limited funding. As such, FIC-funding was the first time that the two organisations had formally collaborated.

With FIC funding, the project has moved from an experimental proof of concept (TRL3) to technology that is demonstrated in a lab setting (TRL 4). LamdaGen were able to successfully develop a method for inserting large fragments of DNA into iPS cells aiming to improve anti-cancer properties of differentiated NK cells. Plasticell carried out the CombiCult screening experimental procedures on two cell lines that has led to the discovery of 8 proprietary GMP[76] compliant protocols.

> *"Not all the expertise required to bring our products to market is in the UK. International collaboration gives [Plasticell] access to the best expertise abroad that we need to achieve our goals."- Plasticell Research Director, Marina Tarunina*

Since the project ended, Plasticell has continued to develop the technology with other new collaborators. While the collaboration with LambdaGen was very valuable for the purpose of this project, the two organisations are no longer formally collaborating on the technology. There may, however, be scope for the two to collaborate in the future.

Plasticell have successfully applied for grant funding through Innovate UK's Biomedical Catalyst Fund, building on the knowledge and scaling-up the technology developed under the FIC-funded project. Alongside partners at the Cell and Gene Therapy Catapult and Imperial College London, the (ongoing) project seeks to develop GMP-ready large-scale manufacturing of the iPSC-derived natural killer cells. Additionally, some initial animal studies focusing on distribution of these cells will begin and one work package will focus on identifying timelines to market this technology.

Plasticell had also successfully applied for funding in a bilateral UK-Canadian grant call to collaborate with a Canadian biotech company that will provide access to gold-standard GMP grade custom-engineered iPSC lines for development of clinical grade medicinal products.

[76] Good Manufacturing Practices (GMP) is part of quality assurance that ensures that medicinal products are produced to controlled quality standards, World Health Organisation, https://www.who.int/teams/health-product-policy-and-standards/standards-and-specifications/gmp#:~:text=Good%20Manufacturing%20Practices%20(GMP%2C%20also,required%20by%20the%20product%20specification (accessed 1st October 2024)

However, this project is currently paused as the partner organisation undergoes a reorganisation process, thus other funding sources might be exploited.

The immunotherapy sector is currently dominated by CAR-T therapies, with over 750 active CAR-T therapies in development (as of 2022) across the globe, representing over a 50% increase from 2019. Of those therapies, 375 are in the clinical phases and 378 in the preclinical stage. In comparison, there are currently only three published clinical trials on the use of CAR-NK therapy, making the technology developments highly new and innovative. Moreover, the global cancer immunotherapy market size was valued at approximately $156.8 billion in 2023 and is expected to reach a value of around $313.3 billion by 2033. The potential market size for such technology is therefore immense.

Appendix E Bibliometric analysis

E.1. Overview

For this project, Science-Metrix used the Scopus bibliometric database, produced by Elsevier. Scopus provides comprehensive coverage of the scholarly literature (although there are caveats to this, discussed in the following sections) 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 used for this project has complete coverage of articles published up until 2020.

E.2. UKRI/FIC supported publications

Articles supported by UKRI funds were retrieved from the GtR portal 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%). Although this additional step only responded to around 7% of the final list of UKRI supported papers, this is an important step to assess the completeness of the list provided by GtR.

At this point in time there were 2,240 publications recorded in Researchfish and associated to FIC (considerably higher than the 195 publications found at the baseline stage, or the 822 publications found at the interim stage). 1,443 of the 2,240 publications were found in Scopus. The other 797 could not be found for many reasons (a non-indexed document type, journal not indexed in Scopus, lack of information, etc.). Most of the outputs not indexed in Scopus refer to document types with lower coverage in Scopus, such as: Books, conference proceedings abstracts, working papers, etc. Note that across the arts, humanities, and social sciences (AHSS), researchers tend to produce a greater diversity of research output types compared to other disciplines (where journal based outputs such as articles, conference proceedings, reviews are the primary method of publication). Many of these wider outputs types are not readily indexed in databases.

From the 1,443 articles matched to Scopus, 1,116 were kept for the analysis. The 327 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) (highlighting the fact that researchers may over represent their publication records associated to specific grants in Researchfish). Publications after 2023 were also excluded (as the analysis was undertaken mid-way through 2024. From the maintained 1,116 articles, 990 were published by at least one author affiliated with a UK institution and 847 with a FIC researcher (i.e. a researcher that is named against a FIC grant in GtR).

E.3. Comparator groups

UKRI. A sub-set of UK scientific outputs based on their UKRI support (beyond FIC).

Partner countries. International co-publications with FIC priority countries were included.

Control groups. The control groups consist of Germany, Italy and France. These are considered similar in size and scientific importance to the UK (e.g. they represent the top four EU countries for gross domestic expenditure on R&D, 2018[77]), but do not have programmes similar to FIC.

E.4. Breakdown by FIC programmes

The number of FIC-supported publications does not allow for computation of bibliometric indicators by programme (at least for many of the programmes), and so programme-level findings are not presented. However, it is important to note that only 231 (out of 571) FIC projects have any publications in Scopus, and some parts of the Fund currently account for a large proportion of the published outputs (e.g. 224 publications relate to projects supported through the RE&S through AI Canada call 2019, 196 to the UK-Japan SSH Connections Call, and 111 to the Signals in the Soil October 2019 call). The results reported are therefore influenced by outputs from specific programmes and projects.

E.5. Weighting of indicators to reflect the distribution of FIC publications across subfields

All indicators of share of international co-publication in the country-level analysis were weighted to reflect the distribution of FIC publications across scientific subfields (according to Science-Metrix classification). Otherwise, comparisons with the various groups could have provided an unfair reference against which to compare FIC. FIC is not expected to produce publications in all fields of research, and its production may not be distributed the same way as, for example, national production in the United Kingdom, Germany, France or Italy. The weighted indicator was then computed to account for differences in practice of international collaboration across different fields of science.

E.6. Research impact

All bibliometric indicators of impact used in the report are based on citations. An important assumption underlying such analyses is that citations are a good proxy for contributions to scientific knowledge. While it is true that citations are generally used to communicate the positive influence of one piece of research on another, citations are also sometimes used for other reasons. For example, one article may be contradicting another; the author would in that case use a citation to highlight the article being contradicted. Additionally, an article may cite many others, with some material constituting general background information and other material constituting the principal foundation on which the new piece of knowledge is built. These varying citation behaviours are all treated equally in analyses of scientific impact, which are blind to the differences between them. Scientific impact assessed on the basis of citations would therefore be better interpreted as contributions to and visibility within scientific discourse; it would not, for example, highlight a paper that is of good quality but that fails to get much visibility or recognition within the research community. In light of these considerations, the interpretation of scientific impact analyses should proceed with due caution.

[77] https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm

Relative citation scores

Counting citations can be used as a proxy for measuring contributions to subsequent knowledge generation; however, because citation practices vary between the disciplines and subdisciplines of science, simple counting would create unwanted biases in the results. To correct for these potential distortions, individual publications are evaluated relative to the average citation rate for publications in the same subfield (using the Science-Metrix classification) and published the same year. This is known as the relative citation (RC) rate.

Average of Relative Citations (ARC)

The ARC is the average of the relative citation scores of all the articles published by a given entity. The ARC is normalised to 1, meaning that an ARC above 1 indicates that the entity's articles have higher-than-average impact, an ARC below 1 means that the entity's articles have lower-than-average impact, and an ARC near 1 means that the publications have near-average impact. Because RC scores are known to be skewed in their distribution—with a small number of papers receiving a large share of the total citations—the ARC offers a useful snapshot of overall performance but can hide important underlying nuance. For this reason, Science-Metrix complements the ARC with the highly cited papers measure described below.

Highly Cited Papers (HCP)

HCP are publications that have received RC scores among the highest in their respective field. This indicator is frequently used to examine research excellence, measuring how many high-impact articles are produced by a given research entity, relative to their expected contribution to world-leading research. For the present study, contributions to the top 10% of publications are measured (HCP10). The HCP measure is normalised to 1, meaning that an entity with an HCP over 1 contributes more than its expected number of highly cited papers, an entity with an HCP below 1 contributes fewer than its expected number of highly cited papers, and an entity with an HCP near 1 contributes close to its expected number of highly cited papers

The citation distribution index (CDI)

Science-Metrix divides all publications in a given research area into 10 groups of equal size, or deciles, based on their RC scores. The 1st decile contains the 10% of publications with the lowest RC scores; the 10th decile contains the 10% of publications with the highest RC scores. For a given research entity, it is expected that the RC scores of its publications will follow the global distribution, with an equal number of publications falling in each of the deciles. The CDI for a given entity compares that entity's scientific impact to the global level by showing how its performance compares to the world level in each of the deciles.

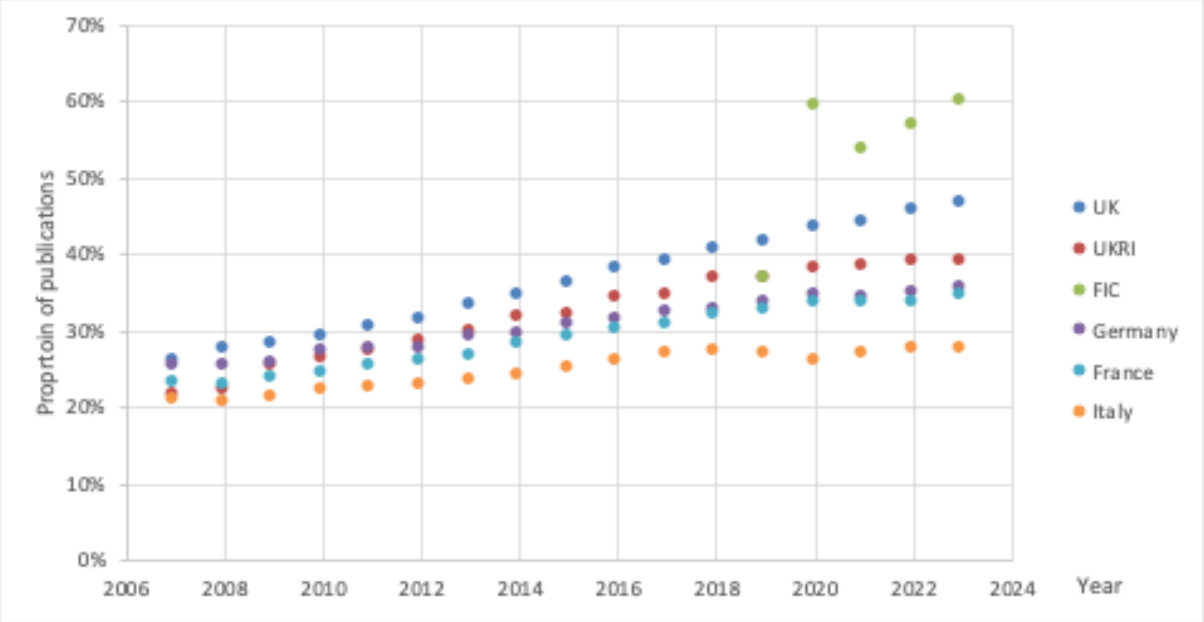
For each decile, the performance of a given research organisation is compared to the global average, and this ratio is then multiplied by the weight corresponding to that decile (negative weight for deciles 1 through 5, positive for 6 through 10). Once a score has been produced in this fashion for each decile, they are summed to calculate the CDI for the research organisation. Thus, having a higher-than-expected number of publications in the 1st decile (i.e., the lowest-impact decile) will reduce the CDI more than having a higher-than-expected number of publications in the 2nd decile. The CDI ranges from -50 (worst-case scenario) to 50 (best-case scenario), with 0 representing parity with the world level. Compared to mean-based normalised citation metrics, the use of CDI makes it possible to provide reliable citation metrics even when dealing with few publications (from 10 to a couple of hundred).

E.7. Additional Results

The main results from the analysis are presented in the Main report. This subsection contains additional information and tables to further support the results presented there.

Bibliometric data shows the UK overall has increased its level of collaboration (on papers) with FIC priority countries over time (Figure 19). Note also that collaboration with FIC priority countries is higher for the UK in comparison with Germany, France, and Italy (and growing faster).

Figure 19 Proportion of papers published in year that include at least one author affiliated to an institution in a FIC priority country



Source: Technopolis and Science Metrix, based on data from GtR, Researchfish, and Scopus (2024)

As explained in the Main Report, there is the expectation that this degree of international collaboration will contribute positively to delivering citations (used as a measure of impact).

It is early to measure this effect for FIC, but bibliometric data for UK and UKRI (for earlier periods) suggests that this is the case. Note that this analysis is for context (i.e. it does not provide information on the performance of FIC).

Table 17 is based on the ARC of papers. The analysis shows that the ARC of papers conducted with international collaborators tends to be higher than the overall average (1.7 versus 1.3 for UK papers), and that this effect is even higher among papers that include at least one author affiliated to an institution in a FIC priority country (1.9). Moreover, the ARC is higher for UKRI papers (2.0 and 2.2 versus 1.8), suggesting that UKRI's assessment processes are able to identify and fund research of potential high impact from the outset.

At present, only papers published in 2021 or earlier have an ARC score, and so only some of the earlier outputs from FIC can be analysed. However, these already show an ARC of 1.9 for the 2019-21 period, across all three measures (not shown in the table).

Table 17 Average of relative citation (ARCw) (2014 to 2018)

	ARC (1)	ARC (2) (for papers that include at least one international collaborator)	ARC (3) (for papers that include at least one international collaborator from a FIC priority country)
Country/funding sources			
UK papers	1.3	1.7	1.9
UKRI papers	1.8	2.0	2.2
Comparator countries			
Germany	1.1	1.5	1.7
France	0.9	1.4	1.6
Italy	1.1	1.4	1.6

Source: Technopolis and Science Metrix [Table III], based on data from GtR, Researchfish, and Scopus (2024). The ARC is calculated for groups/entities with a minimum of 30 papers that have a relative citation (RC) score. Only papers published in 2021 or earlier have an RC score.

The pattern shown in Table 17 also holds when looking at two other metrics: CDI and HCP10 (see Table 18 and Table 19). Again, only papers published in 2021 or earlier have a CDI or HCP score, and so only some of the earlier outputs from FIC can be analysed. However, these already show CDI of 17.1 and an HCP10 of 2.3 (for 2019-21), both similar to the results for UKRI papers in the earlier period (2014-18).

Table 18 Citation distribution index (CDI) (2014 – 2018)

Country/funding sources	CDI (1)	CDI (2) (for papers that include at least one international collaborator)	CDI (3) (or papers that include at least one international collaborator from a FIC priority countries
UK papers	7.1	15.0	16.9
UKRI papers	17.4	20.8	21.9
Germany	1.7	12.7	15.1
France	-1.3	10.2	13.7
Italy	4.4	12.9	15.3

Source: Technopolis and Science Metrix [Table IV] based on data from GtR, Researchfish, and Scopus (2024)

Table 19 Proportion of papers among the top 10% most highly cited papers (HCP10) (2014 – 2018)

Country/funding sources	HPC10 (1)	HPC (2) (for papers that include at least one international collaborator)	HPC10 (3) (or papers that include at least one international collaborator from a FIC priority countries
UK papers	1.4	1.9	2.2
UKRI papers	2.1	2.4	2.6
Germany	1.1	1.6	1.9
France	0.9	1.4	1.8
Italy	1.1	1.6	1.8

Source: Technopolis and Science Metrix [Table V] based on data from GtR, Researchfish, and Scopus (2023)

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