



# Evaluation of BBSRC's Industrial CASE scheme

June 2013

This document represents the views and conclusions of a panel of experts.

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# Abbreviations

BBSRC:	Biotechnology and Biological Sciences Research Council
BIS:	Department for Business, Innovation and Skills
CASE:	Collaborative Awards in Science and Engineering (former definition)
DTG:	Doctoral Training Grant
DTP:	Doctoral Training Partnership
EPSRC:	Engineering and Physical Sciences Research Council
Je-S	Joint electronic Submission
iCASE:	Industrial CASE (a variant of the Industrial CASE scheme)
ICP:	Industrial CASE Partnership (a variant of the Industrial CASE scheme)
IP:	Intellectual Property
IPA:	Industrial Partnership Award
MRC:	Medical Research Council
PIPS:	Professional Internships for PhD Students
ROS:	Research Outcomes System
SDP:	Studentship Details Portal
SME:	Small and medium enterprise
YES:	Young Entrepreneurs Scheme

# Executive Summary

This document summarises the views of a specialist Review Panel convened to provide an independent evaluation of BBSRC's Industrial CASE scheme. The objectives of the evaluation were to:

- assess the quality of the training supported, with particular emphasis on the training provided by industry partners
- assess the outcomes and achievements of the postgraduate research and training
- identify the benefits from supporting postgraduate training through the Industrial CASE scheme in comparison to non-CASE
- examine the drivers which influence industry, academia and student participation in the scheme
- consider whether the current requirements for financial contributions from industry are appropriate
- comment on the balance and coverage of the Industrial CASE scheme portfolio
- comment on the range of industry partners that participate in the scheme
- comment on the scheme's application and assessment processes
- identify any examples of best practice in the provision of collaborative training with industry
- comment on ways to build on successes and ways to address any identified gaps and issues

The Panel's analysis was based on over 600 questionnaire responses which included 334 postgraduate students, 155 academic researchers, 107 industry supervisors, 9 industry coordinators of Industrial CASE Partnership awards, and 19 academic research managers. Data from BBSRC databases and previous evaluations of BBSRC training and research were also considered.

## Key conclusions

### **1. The Industrial CASE scheme supports high-quality student training**

The quality of training supported through the Industrial CASE scheme was good. Students were provided with a variety of research, broader science and generic professional skills training within academia which was generally rated highly. Industry-led training was often complementary to that of academia with strengths including the development of technical and practical skills, commercial and entrepreneurial awareness, and generic professional skills. The industry training was primarily delivered through the industry placement and, as such, was dependent on student participation in the placement. The quality of this training was more variable than that provided by academia and it was worrying that a small number of students had never met with their industry supervisor or met with them very infrequently. BBSRC should

provide clearer guidance regarding its requirements and expectations for the provision of training by industry.

## **2. The industry placement is an essential feature of the Industrial CASE scheme**

The industry placement is an important mechanism for delivering additional benefits from Industrial CASE studentships in comparison with non-CASE studentships. The opportunity for students to participate in a placement is a major strength of the scheme and a strong driver for student participation. It was clear that the placements had delivered numerous benefits to student training and student research projects, as well as to academic and industry partners. The majority of placements consisted of multiple, periodic placements and these were as effective as single, continuous placements. BBSRC should provide additional guidance about the purpose of the placement and the nature of research to be conducted while based at the industry partner, as these were not well understood. BBSRC should clarify the extent to which the placement should align with the student's research project and whether the placement is required to be research-based.

## **3. The Industrial CASE scheme's requirements for student participation in industry placements are not being met for all studentships**

A lower than expected proportion of students had participated in an industry placement and very few students had participated in placements which met the six-month minimum duration requirement. The guidance provided by BBSRC should make it much clearer that participation in industry placements is a mandatory requirement of the scheme. BBSRC should also actively monitor student participation in placements. The research community was confused about the minimum placement duration for Industrial CASE studentships, particularly as this is longer than for other CASE studentship funding. BBSRC should lower the minimum placement duration to three months, to be consistent with other BBSRC and Research Council CASE studentships. The failure to provide an industry placement was often due to changes in the industry partner's circumstances. For smaller companies or under particular circumstances, it may not be possible for the industry partner to arrange an alternative placement. However, larger companies, especially ICP 'Partners', should be required to provide an alternative.

## **4. The outputs, outcomes and achievements arising from Industrial CASE studentships are generally good**

In aggregate, the performance of the students and their associated research projects was good, despite considerable variation between studentships. Many were good or very good, and a few were excellent; others were disappointing and a few had not met the expected standard. Many students had published an original research article from their studentship, including some in prestigious, high-impact journals. However, the Panel was concerned with several aspects of the student publications data such as mean number of papers per student, first author papers and industrial co-authorship. The first destinations of Industrial CASE students were impressive, and a notably higher proportion of students pursued research-related careers in industry compared with other BBSRC-funded students. In partnership with industry, the Industrial CASE

scheme has delivered highly skilled workers: a very positive achievement. The scheme has enabled industry to influence student training and this has helped ensure that the training meets the needs of industry and the wider UK economy. A small number of Industrial CASE studentships resulted in new intellectual property or the commercialisation of research findings. However, this was not common and it is important for BBSRC to manage industry partners' expectations in this area.

## **5. The distinctiveness of Industrial CASE studentships was variable and sometimes absent**

Many of the outputs, outcomes and achievements arising from Industrial CASE studentships required the interactions with industry partners. However, many others were generic to a successful PhD and could have as easily been realised through non-CASE studentships. It was a concern that for some Industrial CASE studentships, the training experience or the associated outputs were not sufficiently different from those of non-CASE studentships. The distinctiveness of individual CASE studentships was influenced by the level of engagement of the industry partner and the strength of the academia-industry collaboration. BBSRC should place greater emphasis on ensuring that Industrial CASE studentships are distinct from non-CASE. In this context, providing academia and industry with additional guidance on the aims of the scheme would be beneficial. There is also a risk that the specific aims of the Industrial CASE scheme may get sidelined during the four-year period of a studentship. This risk could be reduced by better planning of studentships at the outset.

## **6. The interactions between students, academia and industry can create additional challenges for Industrial CASE studentships**

The majority of academia-industry partnerships supported through the Industrial CASE scheme were successful. However, a moderate proportion of academic and industry supervisors identified issues which affected the success of the interaction. A common issue reported by academic supervisors was a change in the priorities or circumstances of the industry partner. Such changes could affect the success of a studentship, for example, if an industry placement was not provided or if the industry partner was no longer able to provide resources essential to the research project. Industrial CASE studentships could usually overcome issues associated with changes in the priorities or circumstances of the industry partner, but many in effect became non-CASE studentships as a result. There is limited scope for BBSRC to address these unavoidable consequences of working with industry; the impact of industry staff changes might be reduced by requiring studentships to have an industry co-supervisor in addition to the main industry supervisor where possible. Industry partners cited issues with individual CASE students as a factor affecting the success of the academia-industry interaction (e.g. quality, performance). Greater involvement of industry partners in the student recruitment process would help to address this. It may also be helpful for academic institutions to provide training in student supervision to industry supervisors.

## **7. It is beneficial for Industrial CASE studentship research projects to be developed jointly by the student, academic supervisor and industry partner**

The most successful Industrial CASE studentships tended to be those with a genuine partnership between the student, academic supervisor and industry supervisor. BBSRC should encourage all parties involved in the Industrial CASE studentships to meet at the outset and develop a clear plan for a *joint* student research project. For Industrial CASE studentships to be successful, all parties need to 'buy in' to the aims of the scheme. A jointly developed project plan may also increase the industry partner's commitment to the studentship and reduce the risk of problems arising during the studentship.

## **8. BBSRC should monitor Industrial CASE studentships more closely**

There is currently limited monitoring associated with the Industrial CASE scheme and no end-of-award reporting. As such, BBSRC cannot routinely determine whether the requirements of the scheme are being met and cannot capture the outcomes and impacts of its investments in the scheme. This is not acceptable considering the substantial amount BBSRC invests in studentships and the scheme as a whole. BBSRC should introduce a system of reporting for Industrial CASE studentships. Academic supervisors should be required to report on the outputs, outcomes and achievements of the studentship, either through a light-touch end of award report or through the new Research Outcomes System. A minimum duration requirement for student industry placements will not be effective unless compliance is monitored and enforced. It is not possible for BBSRC to compel the provision of, or participation in, industry placements at the individual studentship level. However, where there is a repeated lack of provision or participation, BBSRC might consider imposing appropriate sanctions on the industry or academic partner.

## **9. There is scope to broaden the range of industry partners and academic researchers involved in the Industrial CASE scheme**

The Industrial CASE scheme has supported training and research from across the BBSRC remit. Nevertheless, the portfolio is very health-oriented as there is strong participation of companies in the 'health and pharmaceuticals' sector both in iCASE studentships and as ICP 'Partners'. A large number of industry partners had participated in the scheme and there was a good variety of companies represented (e.g. industry sectors, company sizes). However, for some sectors (e.g. industrial biotechnology), industry participation in the scheme was limited or predominantly through a very small number of companies. BBSRC should consider how to broaden industry participation in the scheme, although not at the expense of existing partners and it is vital that new industry partners understand the purpose of collaborative doctoral training. As expected, the Industrial CASE scheme has primarily supported academic researchers who had previous collaborations with industry: the scheme is clearly valued by this part of the research community. It can be difficult for academics who do not have a track record of working with industry to identify potential CASE partners, and BBSRC should consider how best to reduce these barriers.

## **10. The requirement for industry partners to make contributions to Industrial CASE studentships is appropriate**

In general, the requirement for industry companies to make financial contributions to Industrial CASE studentships is appropriate. Contributions demonstrate the industry partner's commitment to the studentship, industry partners often make substantial contributions above the minimum requirement and the provision of the industry placement is also a significant contribution. The Industrial CASE scheme represents good value for money for industry and industry partners can benefit substantially from their participation. It would not be appropriate to increase the level of industry contribution; this would work against efforts to broaden participation, particularly in the current economic climate. The requirement to make financial contributions is a barrier to participation in the scheme for some companies (e.g. small and medium enterprises (SMEs), particular industry sectors, companies with low profitability). This is a complex issue, but BBSRC should consider lowering the level of contributions for such companies to encourage their participation within the scheme. It should be re-emphasised that the Industrial CASE scheme is about student training and this is why the majority of the funding is provided by the public sector.

## **11. The Industrial CASE scheme's application and assessment processes are generally effective, but there is scope for improvement**

The majority of academic and industry supervisors were satisfied with the iCASE studentship application and assessment processes. It is helpful that applications can be made by academia and industry, and important that industry is involved in the assessment of iCASE applications. The success rate for iCASE studentships is very high compared with other BBSRC funding. While it is important for industry-facing schemes to have success rates which encourage industry participation, there is a risk that this could result in lower quality studentships being funded. The number of applications to the Industrial CASE scheme is expected to increase following the introduction of the new Doctoral Training Partnerships (DTP) programme, which funds fewer studentships compared with the previous Quota Doctoral Training Grant competition. The provision of individual iCASE studentships is useful and such studentship can be very successful. However, this can work against BBSRC's other objectives for studentship funding such as cohort identity, flexible use of funding, and accountability. The provision of studentship allocations through the ICP variant of the Industrial CASE scheme is very useful. It allows greater flexibility and planning among ICP 'Partners' and BBSRC can develop stronger relationships with 'Partner' companies. However, the process for selecting ICP 'Partners' should be more transparent, e.g. selecting ICP 'Partners' through open competition. iCASE and ICP are both useful variants of the Industrial CASE scheme and should be retained. Applicants' track records with past Industrial CASE studentships should be considered as part of the assessment process.

## **12. There is a need for BBSRC to provide greater clarity regarding the aims of the Industrial CASE scheme**

CASE is a strong and respected brand. However, individual researchers in academia and industry have different perceptions and some misconceptions about the purpose of CASE studentships. BBSRC's aims for the Industrial CASE scheme are not clear to the academic and industry research communities, and this lack of clarity can create

tensions between academia and industry partners. In particular, there was some confusion as to whether the primary aim of the scheme is to support excellent doctoral training or to support academia-industry collaborations which benefit UK business. These two goals are not mutually exclusive and the most successful studentships were those which were beneficial to all parties. Nevertheless, BBSRC should make clear that the priority of the scheme is student training. BBSRC should develop an Industrial CASE studentship 'user guide' for students, academia and industry partners. This should describe BBSRC's aims and priorities for the scheme, illustrate best practice and highlight the potential benefits from participation. It is also important for BBSRC's guidance to manage the expectations of students, academic supervisors and industry partners.

### **13. The introduction of Professional Internships for PhD students will create a new context for the Industrial CASE scheme**

BBSRC is introducing Professional Internships for PhD students (PIPS) as part of the new DTP programme. This will alter the training landscape in which the Industrial CASE scheme operates. BBSRC should clarify its expectations for CASE and PIPS placements to ensure, in particular, that the community understands the distinctions between CASE and PIPS placements. BBSRC should also ensure it takes a consistent approach to CASE and PIPS.

### **14. BBSRC should continue to harmonise its support for CASE studentships with other Research Councils**

BBSRC and other Research Councils support too many different CASE studentship schemes which vary considerably in their details. The proliferation of different CASE studentship schemes is not helpful to academic or industry research communities. Academia and industry recognise the CASE brand rather than individual Research Council CASE studentship schemes. BBSRC must continue to work together with other Research Councils to improve understanding of their respective studentship schemes. It is encouraging that BBSRC and MRC now manage their Industrial CASE schemes concurrently and with the same deadline, allowing for the transfer of applications between Councils.

### **15. BBSRC should continue its support for the Industrial CASE scheme**

The Industrial CASE scheme is an important part of BBSRC's training portfolio. Overall, BBSRC's investment in the scheme has been successful and the scheme is contributing to BBSRC's strategies for training and engagement with industry. Industrial CASE studentships have the potential to deliver a variety of additional benefits compared with non-CASE, including benefits to students, academia, industry and the wider UK economy. The Industrial CASE scheme is also a very useful mechanism through which researchers from academia and industry can establish new partnership links. BBSRC should continue to invest in the Industrial CASE scheme in the future. However, there is a need for BBSRC to refresh the scheme to ensure that it remains effective and distinctive from non-CASE studentships.

# 1. Introduction

## 1.1 BBSRC

1. The Biotechnology and Biological Sciences Research Council (BBSRC) is one of seven Research Councils sponsored through the Department for Business, Innovation and Skills (BIS) of the UK government. Its principal aim is to foster a world-class biological science community in the UK. The mission of the BBSRC is to fund internationally competitive research, to provide training in the biosciences, to encourage opportunities for knowledge exchange and impact, and to engage the public and other stakeholders in dialogue on issues of scientific interest.

## 1.2 Evaluation context

2. BBSRC is committed to the effective evaluation of the research and training it funds, as part of its strategy for evidence-based decision making. Evaluation plays a central role in:
  - enabling BBSRC to account to government, the public, the scientific community and other stakeholders for the funds it allocates
  - justifying BBSRC funding allocation and contributing to the evidence that all Councils are required to submit to BIS
  - informing internal funding decisions, providing evidence of progress and achievement, and facilitating the development of a strategic overview for future funding decisions
  - helping BBSRC to improve its policy and practice, through informal policy decisions and the design of new schemes, programmes and processes; and through identifying good practice, lessons learned and ways to improve processes
3. Formal evaluation of research is currently conducted at a number of levels in BBSRC:

Project:	<ul style="list-style-type: none"><li>• evaluation of end-of-award reports from grants</li></ul>
Scheme:	<ul style="list-style-type: none"><li>• evaluation of major research investments, for example, through responsive mode or research initiatives (time-limited research funding in strategically-important areas)</li><li>• evaluation of funding schemes (e.g. international Partnering Awards, Research and Technology Clubs, fellowships, studentships)</li></ul>
Institution:	<ul style="list-style-type: none"><li>• Institute Assessment conducted every five years at the BBSRC strategically-funded institutes</li></ul>

BBSRC's Evaluation Framework<sup>1</sup> outlines the Council's approach to evaluation and the methodology used.

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<sup>1</sup> [www.bbsrc.ac.uk/researchevaluation](http://www.bbsrc.ac.uk/researchevaluation)

## 1.3 BBSRC's support for bioscience skills and careers

4. Research training and skills development are vital to maintaining a healthy UK bioscience sector. BBSRC aims to provide an integrated and sustainable skills and training framework that attracts and retains talented people in bioscience research. BBSRC develops its training and development schemes to meet the needs of the changing face of biosciences and to help scientists follow their chosen career paths within academia, industry or by applying their skills to another sector.
5. BBSRC supports research and training in a number of ways, including research grants, studentships, and fellowships. Support is provided for individuals at several stages of their research careers, including doctoral students, postdoctoral researchers, early-career scientists and established academic staff. Some limited support is also provided for undergraduate and Masters level training. In the 2011-12 financial year, around £64M was invested in training awards and fellowships at universities and BBSRC strategically-funded institutes. At any one time, BBSRC supports approximately 2000 postgraduate students.

## 1.4 BBSRC and working with industry

6. As a publicly funded organisation, BBSRC has a responsibility to ensure that the research and training it supports delivers benefits to society. The commercial application of research and provision of skilled staff to industry are among the routes by which this is achieved, and it is therefore important that BBSRC engages with industry. BBSRC's investments in research and training underpin innovation in important UK industrial sectors including the agriculture, bioenergy, bioprocessing, biotechnology, chemical, food, healthcare, and pharmaceutical sectors. By enabling industry participation in research and training at an early stage, and by engaging industry in BBSRC's strategy development, BBSRC seeks to ensure that its investments meet the needs of these industries.

## 1.5 Introduction to CASE studentships

7. CASE awards (formerly Collaborative Awards in Science and Engineering) are doctoral studentships designed around a collaborative research project and giving the student a training experience within a non-academic setting. The research project undertaken by the student should be agreed between the academic department and cooperating body, and the student should be supervised by staff from both organisations. CASE students are based at universities or other eligible bodies, but must spend part of their time with the cooperating partner through an industry placement. All Research Councils support CASE studentships.
8. CASE studentships are expected to provide PhD students with a first rate, challenging research experience within the context of a mutually beneficial research collaboration between academic and partner organisations (e.g. industry and policy making bodies). The training and research supported by CASE awards provide benefits to students, academia and partner organisations:
  - **Benefits to the student:** CASE provides access to training, facilities and expertise not available in the academic setting alone. Students benefit from a diversity of experimental approaches, including those with applied / translational

dimensions. Students have an opportunity to develop a range of valuable skills and significantly enhance their future employability.

- **Benefits to the academic partner / partner organisations:** CASE studentships encourage productive engagement between partners who benefit from a motivated, high-quality PhD student undertaking cutting-edge research relevant to the organisations' priorities and objectives. CASE provides opportunities to explore novel research collaborations and strengthen current partnerships.

9. An excellent CASE studentships should incorporate:

- **High-quality project:** a challenging, feasible and realistically achievable PhD project which stimulates excellent discovery-oriented research. Through a truly collaborative approach, it provides tangible benefits to all partners
- **High-quality training environment:** through access to distinctive but complementary environments, partners provide a stimulating framework for research training in the proposed field. Joint supervision broadens the perspective on the impact of collaborative research
- **High-quality student experience:** an enriched integrated training experience allows the student to acquire novel skills and expertise. The student gains a wider understanding of, for example, applied research or policy development that will enhance their future career prospects.

10. As a measure of the interest and commitment, the non-academic partner must contribute to the training of the student and make financial contributions. At the time of the evaluation, these were:

- an annual contribution to the academic institution towards the costs of the project. The minimum rate to be paid is £1400 per annum
- all additional expenses, such as the costs of travel and accommodation, incurred by the student as a direct result of attendance at the premises of the company or organisation
- a mandatory cash payment, direct to the student, of at least £2,500 per annum as a supplement to the stipend funded by BBSRC

BBSRC has subsequently made several changes to non-academic partner financial contribution requirements in response to the evaluation.

11. UK based organisations can be considered as the non-academic partner if they can provide students with a relevant and distinctive research training and experience not available in an academic setting. Organisations eligible for Research Council funding cannot be non-academic partners. Where the non-academic partner is a company, it must have an established UK-based research and/or commercial production capability. In exceptional cases, organisations based overseas may be eligible, but only where they can provide the student with an opportunity to gain skills not currently available in the UK.

12. BBSRC supports CASE studentships through two distinct mechanisms:

- **dedicated funding schemes:** the Industrial CASE scheme
- **conversion of standard studentships to CASE**

## 1.6 Introduction to the Industrial CASE scheme

13. BBSRC has supported the Industrial CASE scheme since the Council's inception in 1994. The scheme provides support for postgraduate training and research which is supervised jointly by academic and industrial partners. There are two variants of the scheme:
  - **Industrial CASE (iCASE):** the standard scheme with an annual funding call; it is open to company-led or academic-led proposals. Up to 90 iCASE studentships are awarded each year.
  - **Industrial CASE Partnership (ICP):** provides Industrial CASE studentship allocations covering several years' intake to 'Partner' companies. Historically, BBSRC has invited companies to become 'Partners' based on their track record with iCASE studentships. Up to 70 ICP studentships are awarded each year<sup>2</sup>.
14. All Industrial CASE research students are based at a university (or other eligible research organisation), but must spend part of their time with the non-academic partner. At the time of the evaluation, the partner was expected to provide a placement within the company or organisation for a period of between six and eighteen months<sup>3</sup>.
15. The eligibility criteria for Industrial CASE partners are the same as for standard CASE studentships. Although the Industrial CASE partner would normally be an industry company, other organisations are eligible to participate in the scheme (e.g. levy bodies user groups).
16. At the time of the evaluation, applications for iCASE studentships were assessed by BBSRC's Training Awards Committee<sup>4</sup>. The key assessment criterion is the overall quality of training offered by the academic institution and the proposed non-academic partner. In addition, the assessment takes account of:
  - quality and suitability of the project
  - supervision
  - advanced research and generic professional skills
  - collaborative training and added value of industry contribution
  - wider importance of the project
  - Research Organisation theses submission rates

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<sup>2</sup> BBSRC currently provides ICP studentship allocations to ten companies: AstraZeneca, Bioscience KTN, Campden and Chorleywood Food Research Association, Lilly, GlaxoSmithKline, Nestle, Pfizer, Syngenta, UCB, Unilever.

<sup>3</sup> In response to the evaluation, BBSRC reduced the minimum placement length to three months.

<sup>4</sup> In future, applications will be assessed by a bespoke Panel whose membership includes 50% representation from industry

## 1.7 Evaluation methodology

17. Information for the evaluation was gathered from a number of sources:

- **Industrial CASE students:** a questionnaire was sent to 426 postgraduate students funded by the Industrial CASE scheme (i.e. all current students at the time, who had started their studentship between September 2007 and November 2010, and who had up-to-date e-mail addresses in the Je-S Studentship Details Portal (SDP)). The survey covered topics including the quality and scope of the training available, interaction with the industry partner, the industry placement, supervision and mentoring, career development, and the outputs and achievements of the studentship. 334 students completed the survey (78% response rate). Of these:
  - 11 (3%) were in the 1<sup>st</sup> year of their studentship (excludes career breaks)
  - 113 (34%) were in their 2<sup>nd</sup> year
  - 88 (26%) were in their 3<sup>rd</sup> year
  - 81 (24%) were in their 4<sup>th</sup> year
  - 3 (1%) were in their 5<sup>th</sup> year
  - 38 (11%) had completed their studentship (e.g. the thesis had been submitted or the PhD had been awarded)
- **Academic supervisors:** a questionnaire was sent to a sample of 211 current and former academic supervisors. The sample covered studentships with start dates between October 2004 and November 2009. The sample was structured to ensure representative coverage of the portfolio (e.g. research areas, studentship start years, iCASE and ICP studentships). The survey covered topics including the quality of training provided, the interaction with the industry partner, the industry placement, the achievements arising from individual studentships, and the scheme's application and administration processes. 155 academic supervisors completed the survey (73% response rate).
- **Academic research managers, administrators and other professional services staff:** a questionnaire was sent to a sample of 47 research managers, administrators and professional services staff at academic institutions. The survey covered topics including the drivers and barriers to participation in the scheme, agreeing the terms of the collaboration with industry partners, and the management of Industrial CASE studentships. 19 research managers completed the survey (40% response rate)
- **Industry supervisors:** a questionnaire was sent to a sample of 165 industry supervisors. The sample was structured to ensure representative coverage of the portfolio (e.g. companies, sectors, iCASE and ICP studentships). The survey covered topics including the interaction with academic partners, the industry placement, the drivers and barriers to participation in the scheme, and the scheme's application and administration processes. The questionnaire did not refer to a specific studentship, and respondents were asked to answer with respect to all BBSRC Industrial CASE studentships that they had supervised. 107 industry supervisors completed the survey (65% response rate). Of these:
  - 31 (29%) stated that they worked for a small or medium enterprise
  - 75 (70%) had supervised a single BBSRC Industrial CASE student since September 2006
- **Industry CASE Partnership coordinators:** a questionnaire was sent to all ten coordinators of ICP awards (i.e. the individuals within 'Partner' companies who coordinate the award). The survey covered topics including the management of the ICP award, the industry placement, drivers and barriers to participation in the

scheme, and the scheme's application and administration processes. Nine ICP coordinators completed the survey (90% response rate).

- **BBSRC data:** Data for studentships funded between September 2006 and August 2011 were obtained from the Je-S Studentship Details Portal (SDP). Data for studentships with start dates between October 2004 and June 2007 were obtained from the BBSRC grants database. For the older dataset, details of the industry partner and industry supervisor were not available.

The survey responses were received between October and November 2011. The questionnaires are at Appendix 2.

18. The evidence for the evaluation was reviewed by a panel of experts from academia and industry who are familiar with the issues relating to postgraduate training and academia-industry collaborations, and who between them have expertise across the BBSRC remit. The Review Panel membership is at Appendix 1. The Panel met in February 2012.
19. Results from previous evaluations of BBSRC's research and training portfolios are provided for information. These data provide some context within which to view the performance of the Industrial CASE scheme. However, any direct comparison must be treated with caution.
20. The majority of non-academic partners of Industrial CASE studentships are industry companies. However, for a small number of studentships, the non-academic partner is not a company (e.g. levy bodies, end-user groups). For conciseness, Industrial CASE studentships non-academic partners are referred to as 'industry partners' throughout the text.

## 2. The quality of student training

### Summary

- The overall quality of training supported through the Industrial CASE scheme was good
- The quality of training provided by industry partners was more variable than that provided by academia
- Industry training was primarily delivered through the industry placement
- Industry-led training was often complementary to that provided by academia

### Key recommendations

- BBSRC should provide improved guidance regarding its requirements and expectations for the provision of training by industry.

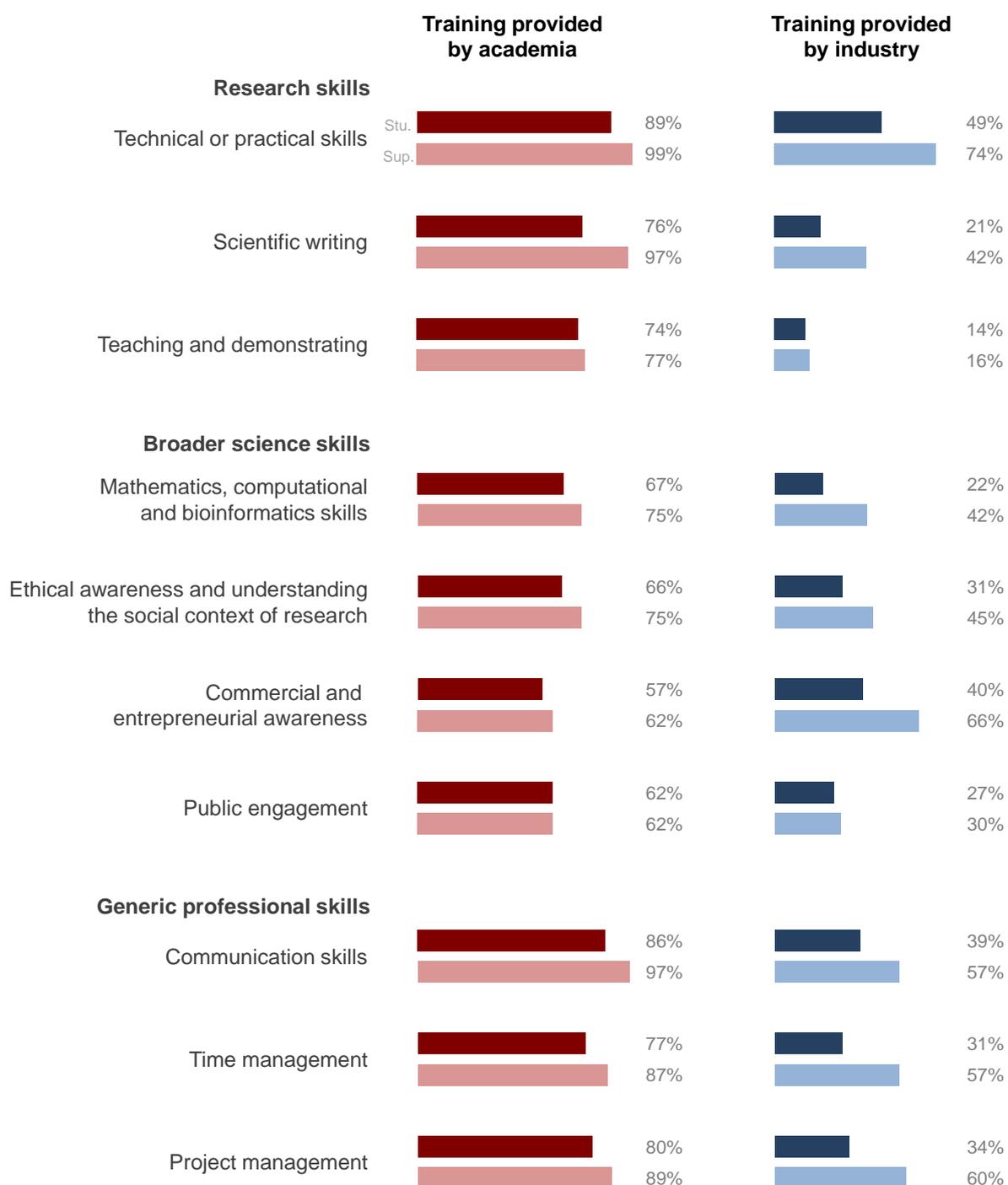
### 2.1 Overview

21. BBSRC expects doctoral students to be provided with a broad training experience which supports the development of specialist research skills, broader science skills and professional skills. For example:
  - research skills:
    - technical or practical skills
    - scientific writing
    - teaching and demonstrating
  - broader science skills, including multi-disciplinary skills which underpin modern bioscience research:
    - mathematics, computational and bioinformatics skills
    - ethical awareness and understanding the social context of research
    - commercial and entrepreneurial awareness
    - public engagement
  - generic professional skills:
    - communication skills
    - time management
    - project management
22. It was difficult for the Panel to assess the quality of the student training from the evidence provided, which was primarily students' and academic supervisors' self-assessments. The Panel noted that the Industrial CASE studentships were based at academic institutions which had good reputations for doctoral training (e.g. the institutions which had been awarded studentships through other BBSRC doctoral training competitions).
23. Overall, the quality of training supported through the Industrial CASE scheme was good. The scheme has enabled students to develop a broad variety of skills within different training environments.

## 2.2 Training and skills development provided by academia

24. Students and academic supervisors were generally satisfied with the research skills training provided by academia, noting that a broad training programme was available within the academic institution. The research skills training included informal 'hands on' training as well as formal training courses, both of which were very valuable. 'Hands on' training in technical or practical skills was identified as particularly beneficial and was most effective when delivered by an experienced researcher (e.g. a postdoctoral researcher). Broader science skills training and generic professional skills training were rated less highly than research skills training.
25. There are additional constraints associated with Industrial CASE studentship which may limit the opportunities for some types of training within academia. For example, the time spent based at the industry partner may reduce the opportunity for students to participate in teaching and demonstrating activities.
26. Several Industrial CASE students had participated in the Biotechnology Young Entrepreneurs Scheme (Biotechnology YES) during their studentship. This was very beneficial and BBSRC should encourage greater participation in Biotechnology YES within the Industrial CASE scheme.

## Proportion of students and academic supervisors who rated the quality of training as good or very good



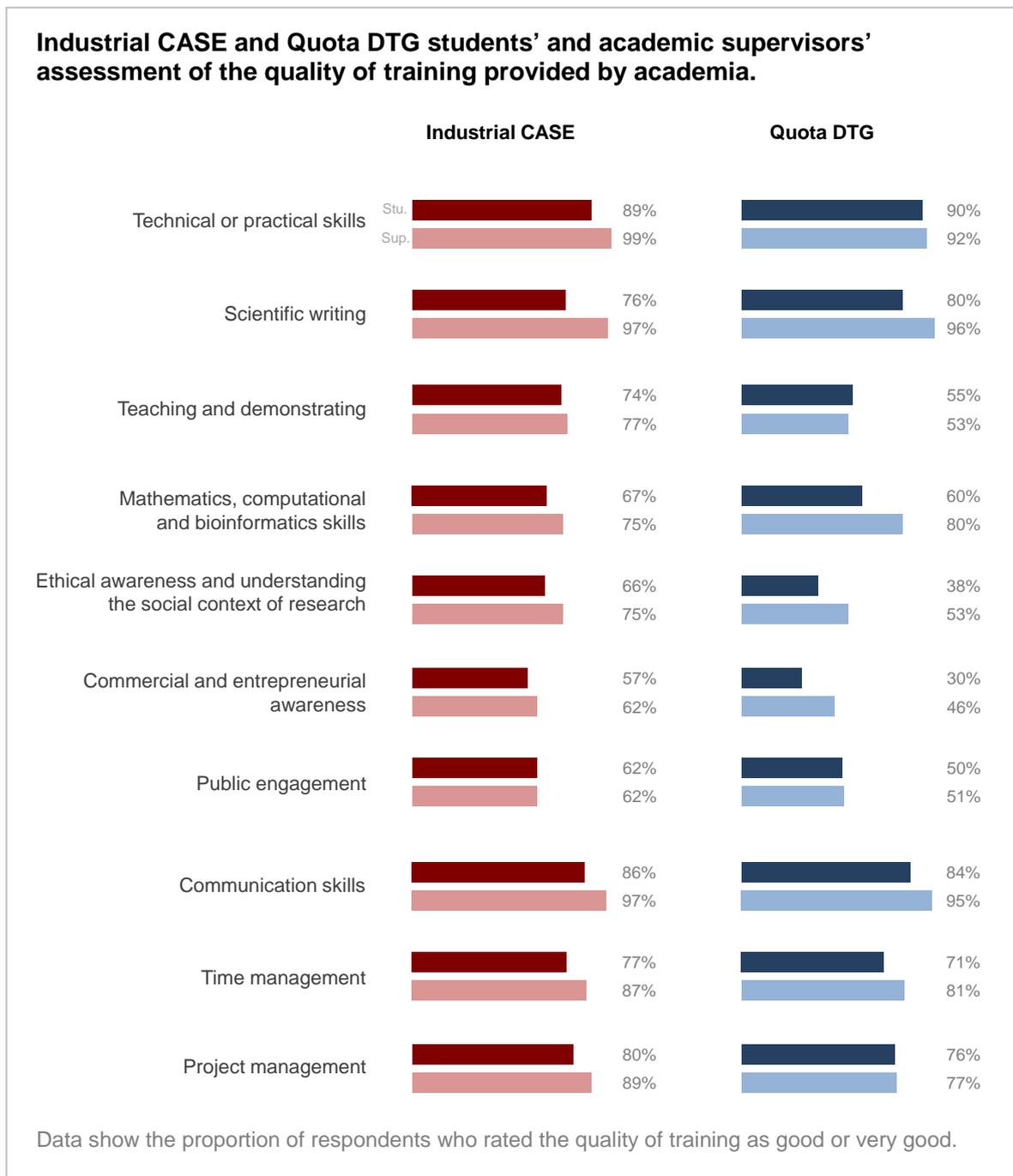
The data presented here are based on respondents' self-assessments and must therefore be treated with caution. However, the relative values between different training areas provide some indication of strengths and weaknesses. The data for training provided by industry include studentships where the student had not participated in the industry placement (see Chapter 3).

## 2.3 Training and skills development provided by industry

27. Industry partners provided training to Industrial CASE students through a number of mechanisms. The training was primarily delivered through the industry placement and, as such, was dependent on student participation in the placement (see Chapter 3). Other opportunities for training and skills development included: short site visits; internally-provided training courses; funding to attend externally-provided training courses; funding to attend national and international conferences; and other general interactions with the industry partner (e.g. meetings, progress reports and associated feedback).
28. The quality of training provided by industry partners was more variable than that provided by academia. For example, some students received a very good training experience whereas others received little or no training from the industry partner. As expected, the nature of training differed between individual companies and was influenced by a variety of factors (e.g. company size, sector, research activities). Industry-led training was often complementary to that of academia and provided opportunities which were not available in an academic setting. Its strengths included the development of technical and practical skills, commercial and entrepreneurial awareness, and generic professional skills. 'Hands on' training by experienced industry researchers was very useful and, in some cases, the expertise gained from the industry partner was essential for the success of the student research project. There were some areas where industry training provision was limited (e.g. teaching and demonstrating). This does not reflect a weakness with the Industrial CASE scheme, as such training is not expected to be provided by industry partners.
29. Some students did not recognise the industry placement and other interactions with their industry partners as training, which is a potential concern. Within academia students are made aware of the formal and informal training provision, and it may be helpful to be more explicit that activities with industry partners are a form of training. Moreover, the Panel noted that the industry training provision should be more than just exposing students to a different working environment. BBSRC should provide clearer guidance regarding its requirements and expectations for the provision of training by industry. This would benefit students, academic supervisors and industry partners.

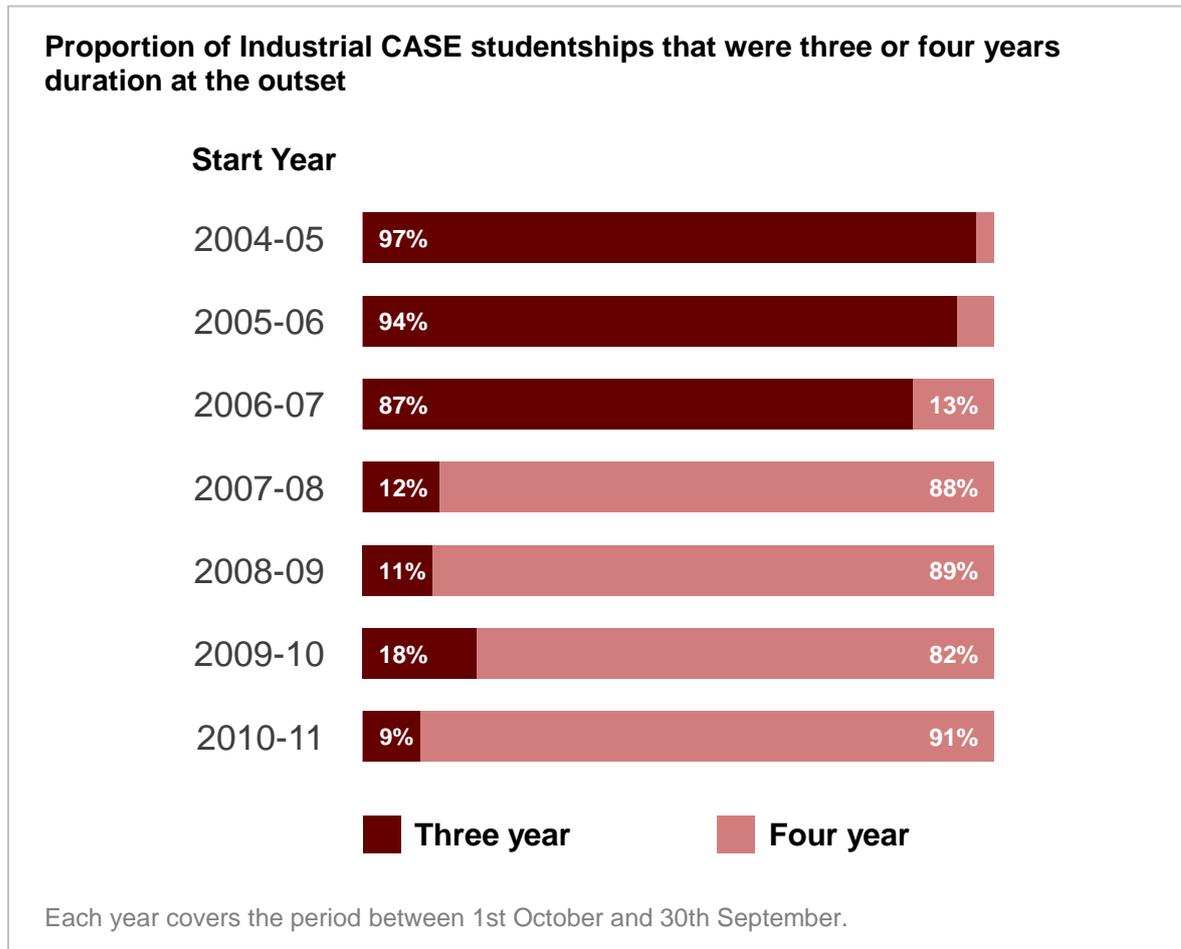
## 2.4 Comparison with Quota DTG studentships

30. Students' and academic supervisors' assessments of the quality of training were similar to those reported in the Quota Doctoral Training Grant (DTG) competition evaluation. There were some areas in which the training provided to Industrial CASE students was rated more highly, most notably 'commercial and entrepreneurial awareness' and 'ethical awareness and understanding the social context of research'. This is good and expected, given the rationale of the Industrial CASE scheme.



## 2.5 Duration of the studentship at the outset

31. BBSRC awards studentships as four-year doctoral training grants, although historically studentship awards were of three years duration. Since October 2007, the majority of studentships have been of four years duration at the outset, which is welcome. However, the shift to four-year studentships may have created additional challenges for industry partners, who are now expected to support students for a longer period.



# 3. The industry placement

## Summary

- The industry placement is an essential feature of the Industrial CASE scheme
- The industry placement delivers numerous benefits to student training, the student research project, academic supervisors and industry partners
- The Industrial CASE scheme's requirements for student participation in industry placements are not being met for all studentships

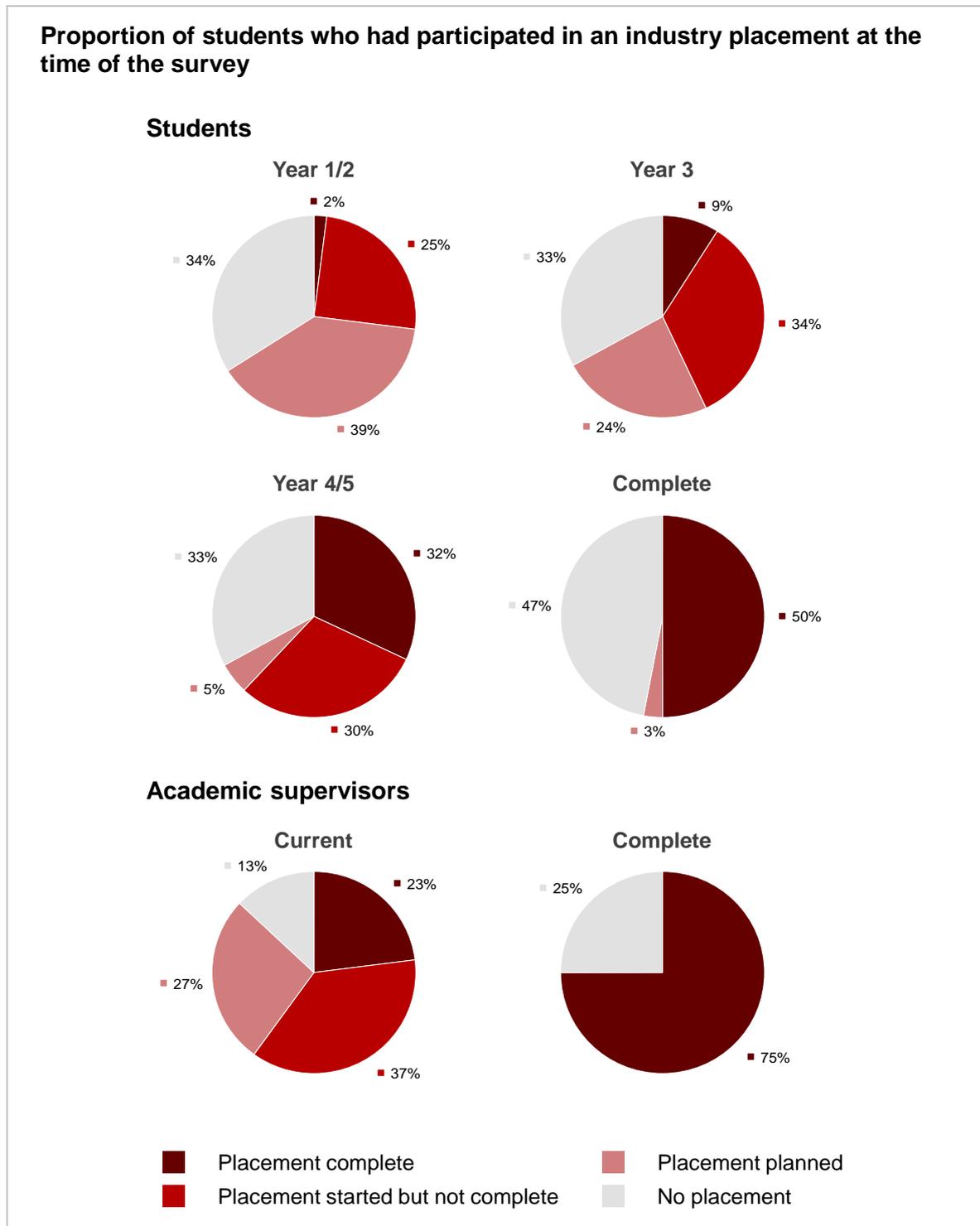
## Key recommendations

- BBSRC should develop a mechanism to monitor Industrial CASE student participation in industry placements
- BBSRC should lower the minimum placement length from six-months to three-months
- BBSRC should provide further guidance about its requirements and expectations for industry placements
- BBSRC should ensure that the distinction between CASE and PIPS placements is clear to the research community

## 3.1 Student participation in the industry placement

32. The Industrial CASE scheme requires all students to participate in an industry placement as part of their training. At the time of the evaluation, students were required to spend between six and eighteen months working for the industry partner on a collaborative training project. The placement is expected to provide a relevant training experience which is not available in an academic setting. The collaborative project is usually a continuation of the student's doctoral research project, although this is not a requirement.
33. The industry placement is an essential feature of the Industrial CASE scheme. It is an important mechanism for delivering the 'added value' from the studentships and ensuring that Industrial CASE studentships are distinctive from other BBSRC studentships. The placement is the primary mechanism for delivering the industry-led training. It is also a strong driver for student participation in the scheme (see Chapter 7).
34. The proportion of students who participated in a placement was lower than expected. At the time of the survey, 62% of Year 4/5 students reported that they had participated in a placement; 60% and 75% of current and former academic supervisors, respectively, stated that their student had participated in a placement. For current studentships, there were slight differences in the level of student participation between iCASE and ICP studentships (49% vs. 39%, all student years). For ICP studentships, student participation in the placement varied considerably between 'Partner' companies and some had a poor record of participation. Overall, the level of student participation in the industry placement was disappointing.

35. A higher proportion of Industrial CASE students participated in a placement than CASE students supported through BBSRC's Quota DTG competition<sup>5,6</sup>.



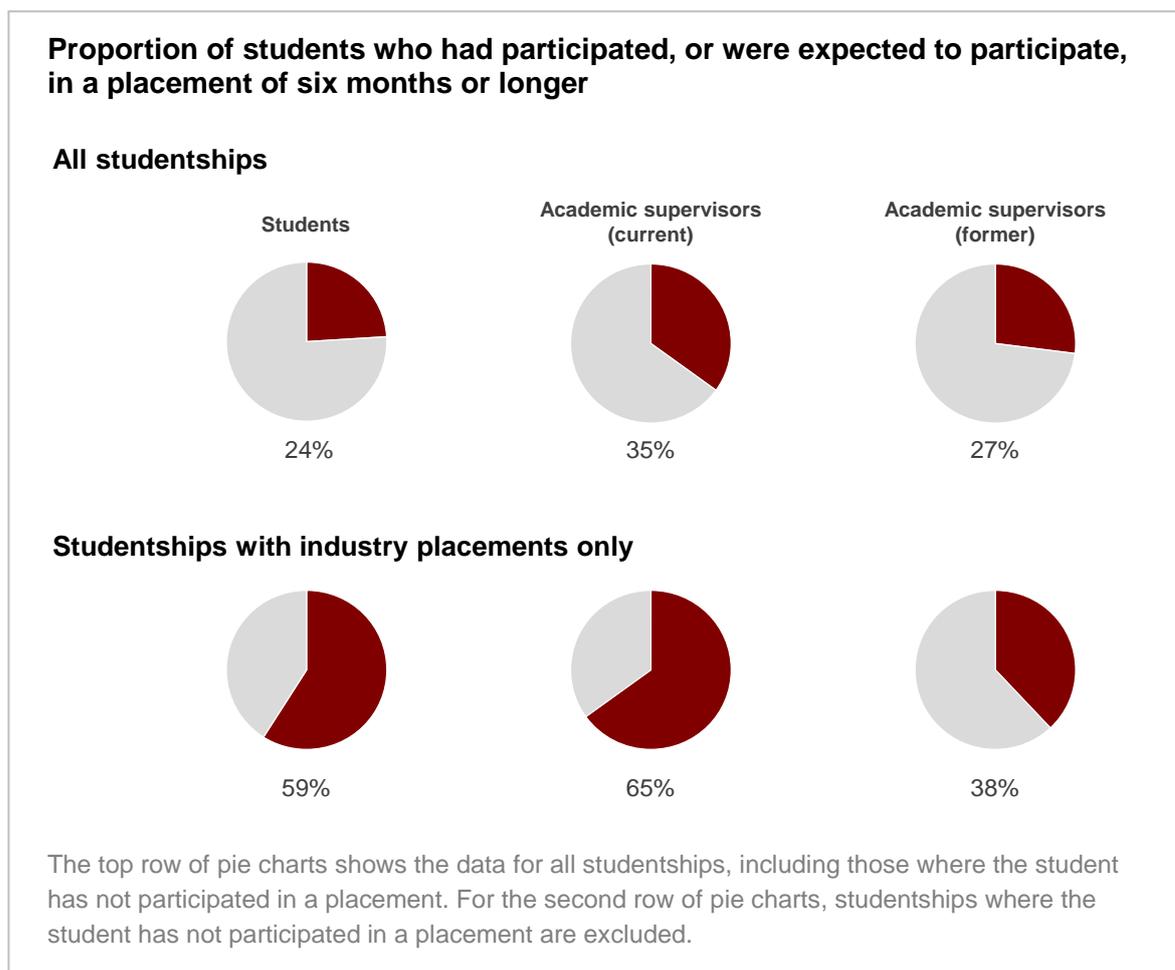
<sup>5</sup> 38% of Year 4 Quota DTG students had participated in a placement with their industry partner.

<sup>6</sup> The Quota DTG competition required that a minimum of 25% of the nominal allocation of studentships to be CASE awards. The Quota DTG competition evaluation noted that institutions found it difficult to combine the requirement for CASE studentships into their general student recruitment for Quota studentships. In response, BBSRC removed the mandatory requirement to create CASE studentships from the new DTP scheme (which replaces the Quota DTG competition). The removal of the mandatory CASE requirement was from DTPs was balanced by increased investment in the Industrial CASE scheme.

36. The reasons why Industrial CASE students did not participate in an industry placement included issues relating to the industry partner (e.g. restructuring, a change in priorities, staff changes etc.), issues relating to the student research project (e.g. insufficient project progress, the lack of suitable equipment, facilities or expertise at the industry partner site) and other issues (e.g. personal circumstances of the student or industry supervisor).
37. The failure to provide an industry placement was often due to changes in the industry partner's circumstances. For smaller companies or under particular circumstances, it may not be possible for the industry partner to arrange an alternative placement. However, larger companies, especially ICP 'Partners' should be required to provide an alternative. In recent years, several major pharmaceutical companies have closed sites in the UK, and this has affected the provision of Industrial CASE studentship placements.
38. The guidance provided by BBSRC should make it much clearer that the provision of, and participation in, industry placements are mandatory requirements of the scheme. BBSRC should also actively monitor Industrial CASE student participation in placements. Academic supervisors or institutions should be required to inform BBSRC of any significant changes to the industry partner's circumstances or participation in the studentship, especially if these are likely to affect the success of the studentship.
39. It is not possible for BBSRC to compel the provision of, or participation in, industry placements at the individual studentship level. However, where there is a repeated lack of provision or participation, BBSRC might consider imposing sanctions on the industry or academic partner as appropriate. The track record of ICP 'Partners' in providing placements should be considered as part of the ICP renewal process. The provision of placements should also be discussed at annual meetings between BBSRC and ICP 'Partners'.

## 3.2 Duration and timing of the industry placement

40. A variety of models was used to provide industry placements including: single, continuous placements; multiple, periodic placements; *ad hoc* visits; and studentships which were primarily based at the industry partner. The majority of placements consisted of multiple, periodic placements which were as effective as single, continuous placements.
41. A very low proportion of students participated in a placement which had met, or was expected to meet, the six-month minimum duration requirement. The median placement duration reported by former academic supervisors was 3.75 months with a range from 0.5 to 40 months<sup>7</sup>. A small proportion of placements lasted considerably longer than the recommended 18 month maximum.



42. Industry placements occurred throughout the course of the studentships, with no strong bias for any particular year. The majority of students and academic supervisors were satisfied with the timing of the placement during the studentship. In general, to take full advantage of the potential benefits, industry placements should not occur too early or too late during the studentships. Too early, and the student may not have the core skills or confidence to benefit fully from the placements; too late, and the students would not be able to take advantage of the skills developed during the studentship throughout the remainder of their PhD. However, it is important for BBSRC to maintain a flexible, non-

<sup>7</sup> Data exclude studentships where the student did not participate in a placement.

prescriptive approach to the timing of the placement, as this allows for the training needs of the student, the requirements of the research project, and the needs of the industry partner to be considered.

43. The research community was confused about the minimum placement duration for BBSRC's Industrial CASE studentships, particularly as the six-month minimum is longer than for other CASE studentships. BBSRC should lower the minimum placement duration to three months. This would be consistent with other BBSRC and Research Council CASE studentships<sup>8</sup> and may be a more realistic expectation for many industry partners. While longer placements can be very beneficial and should be encouraged, what the minimum requirement is should be clear. The Panel noted that a minimum duration requirement for the placement will not be effective unless compliance is monitored and enforced.

### 3.3 Nature of the industry placement

44. Academic supervisors and industry partners were not always clear on BBSRC's expectations regarding the nature of the industry placement. In particular, it was not clear whether the placement was required to be directly related to the student research project and it would be helpful for BBSRC to provide additional guidance about this.

### 3.4 Benefits of the industry placement

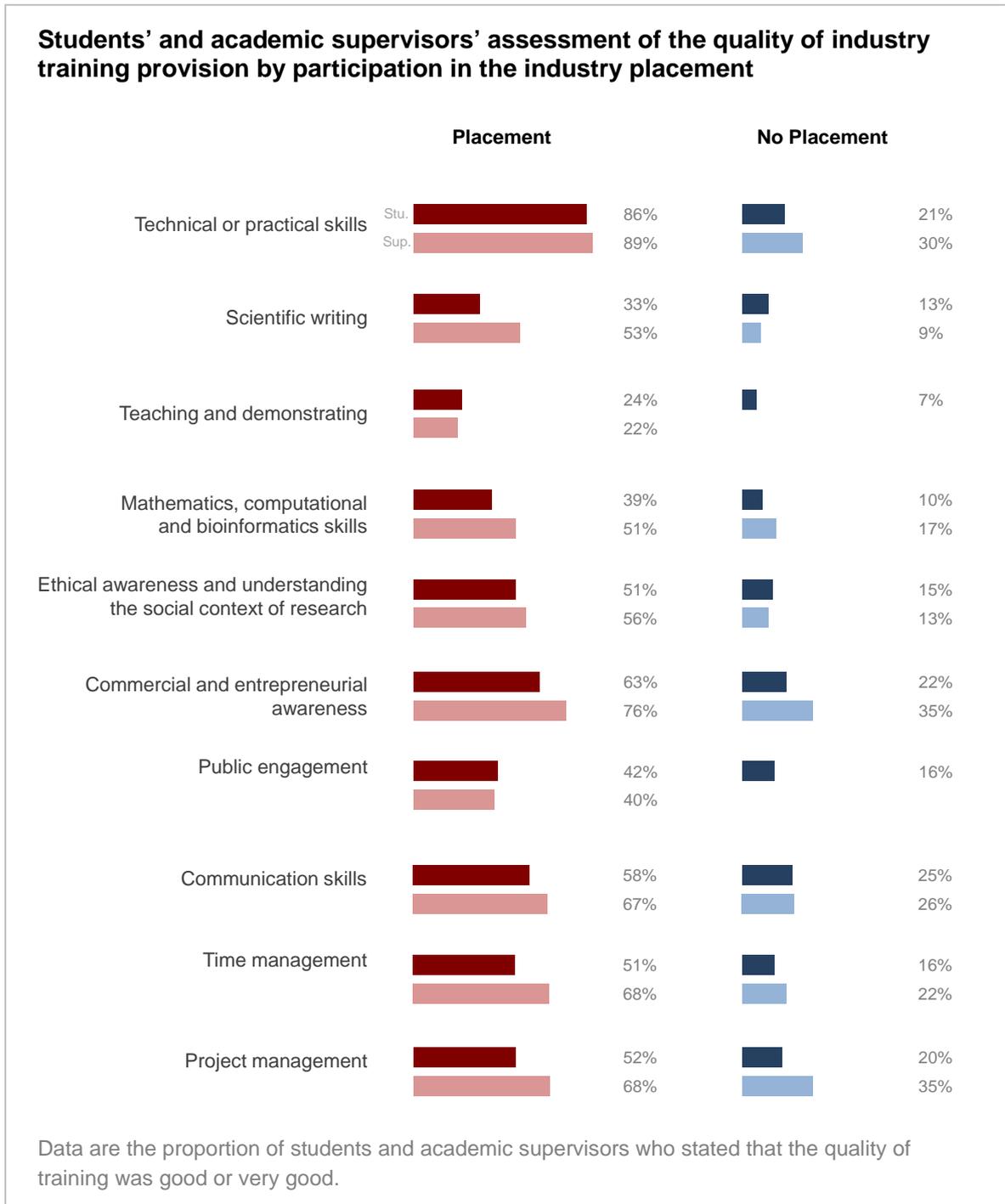
45. A very high proportion of students, academic supervisors and industry supervisors stated that the industry placement was beneficial to students' training and skills development. In most cases, it was reported that the placement led to the acquisition of skills which would not be acquired through an academic setting. A major benefit was the training in specific technical skills or methodologies, including the use of specialised equipment, and it was advantageous to receive this training from highly-skilled industry staff. A variety of broader skills were also developed during the placement including commercial awareness, communication skills, increased confidence, management skills, professionalism and team-working. Such skills were beneficial when the student returned to the academic research group.
46. Students, academic supervisors and industry supervisors were also very positive about the benefits of the placement to the student research project. The placement provided students with access to equipment, facilities and resources which were not available at the academic institution, and the research projects benefited from the industry partners' knowledge and expertise.
47. 73% of industry supervisors stated the industry placement was beneficial to their company. For example, the placement enabled the company to develop new techniques and technologies, it provided opportunities for industry staff to learn mentoring and supervisory skills, and could help with staff recruitment. The industry placement also helped to strengthen collaborations with academic partners and enabled the company to maintain close contact with academic experts and key opinion leaders. In general, industry supervisors rated the placements as more beneficial to the students and student research projects than to their company, noting that the company must allocated considerable resources to support the placements. There were few reports of

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<sup>8</sup> Industrial CASE studentships awarded by EPSRC or the MRC have a minimum placement length of three months.

research conducted during the placement which produced direct benefits to the company. Nevertheless, many industry supervisors recognised that the placements produced wider benefits to their industry sector through training the next generation of scientists.

48. Overall, the Industrial CASE studentship placements had delivered numerous benefits to student training and student research projects, as well as to academic and industry partners.



## 3.5 Professional Internships for PhD Students

49. In 2011, BBSRC launched its Doctoral Training Partnership (DTP) programme and within it, the Professional Internships for PhD Students (PIPS) scheme. Students supported through DTPs are required to take part in a three month PIPS placement as part of their training. PIPS provide students with the opportunity to gain non-academic work experience, to understand the broader context of their research and explore the range of opportunities available to them after they graduate.
50. The introduction of PIPS will alter the training landscape in which the Industrial CASE scheme operates. BBSRC should provide greater clarification about its expectations for CASE and PIPS placements and, in particular, ensure that the community understands the distinctions between the two types of placement. BBSRC should also ensure that there is a consistency of approach between CASE and PIPS.
51. PIPS and CASE will be running alongside each other within academic institutions and this may create new tensions. There is a risk that Industrial CASE students could be provided with a narrower training experience than DTP students (e.g. if the CASE student does not participate in a placement).

# 4. Supervision and the interaction with the industry partner

## Summary

- The frequency of meetings between students and their academic and industry supervisors was generally appropriate
- The majority of academia-industry partnerships supported through the Industrial CASE scheme were successful
- Interactions between students, academia and industry can create additional challenges for Industrial CASE studentships
- There is limited scope for BBSRC to address the issues affecting the success of the academia-industry interactions as these are often an unavoidable consequence of working with industry

## Key recommendations

- The impact of industry staff changes might be reduced by requiring studentships to have an industry co-supervisor in addition to the main industry supervisor, where possible
- Increased involvement of the industry partners in the student recruitment process would help mitigate some of the issues which may arise during the studentship

## 4.1 Students' interactions with their academic supervisor

52. As part of the evaluation, data were collected on the frequency of students' informal and formal interactions<sup>9</sup> with their academic supervisors. While based at the academic institution, 81% of students had formal contact with their academic supervisor at least once a month; 75% of students had informal contact with their academic supervisor at least one a week. As expected, the frequency of contact with academic supervisors was reduced during the industry placement, but the majority of students (66%) still had some contact with their academic supervisor at least once every two weeks. The Panel noted that these data are not necessarily an indicator of the effectiveness of the student-supervisor relationship and that individual students will have different preferences regarding the frequency of interaction. Nevertheless, it was encouraging that students were meeting their academic supervisors regularly and that most were satisfied with the frequency of contact. Many students noted that the relationship with their academic supervisor was good and that they could arrange additional meetings with them as required. However, students who were based primarily with their industry partner commented that they would have benefitted from more frequent contact with their academic supervisor.

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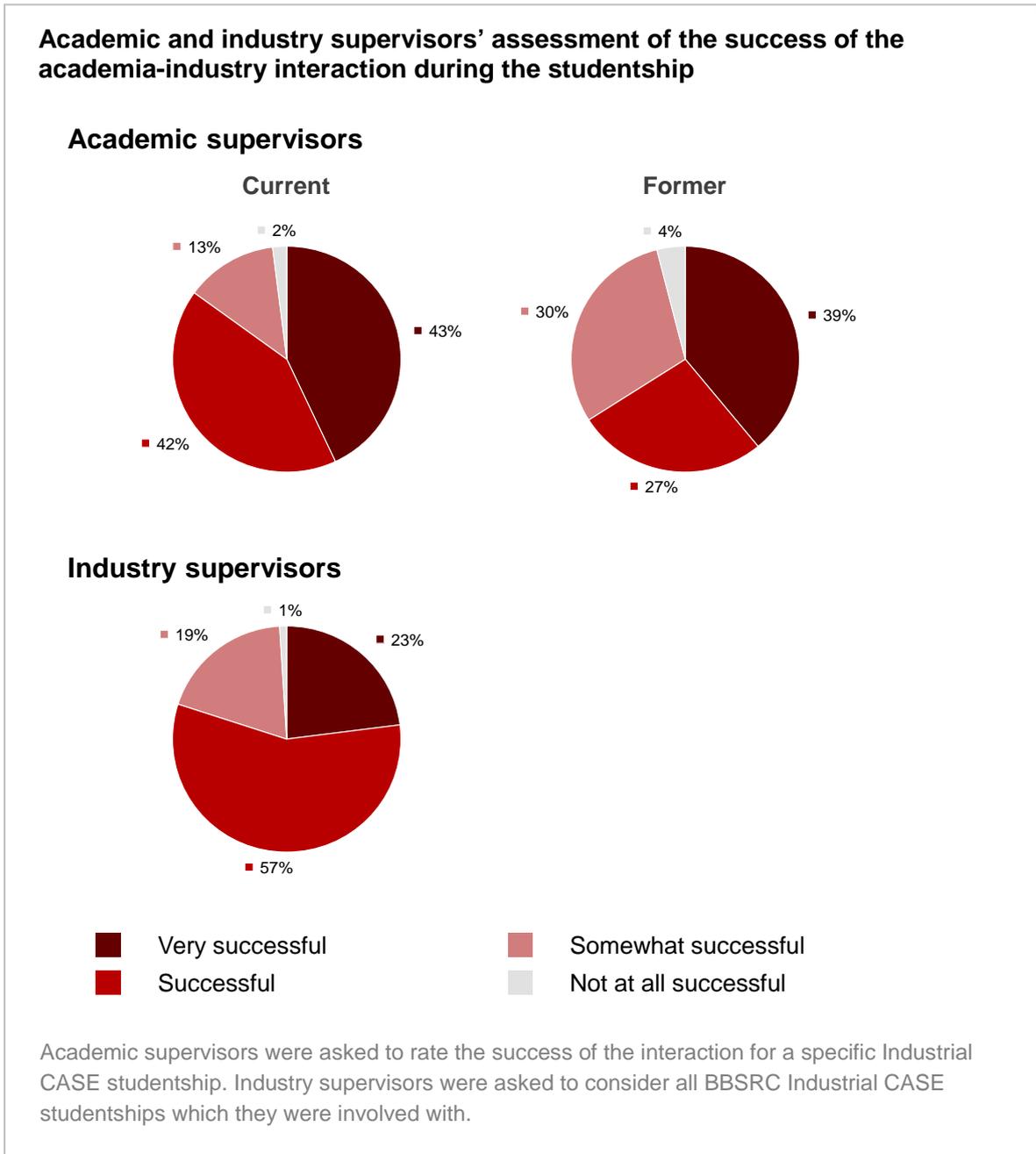
<sup>9</sup> For example, formal interactions might include updates, progress meeting or review meetings; informal interactions might include pop-ins, chats over coffee or e-mails.

## 4.2 Students' interactions with their industry supervisor

53. The frequency of meetings between students and industry supervisors was generally appropriate. For example, 57% of students had some contact with their industry supervisor at least once every two to three months while they were based at the academic institution; 70% of students had some contact with their industry supervisor at least once a week during the industry placement. However, it was worrying that a small proportion of students had never met their industry supervisor or met them very infrequently.
54. The frequency of contact between students and industry supervisors was higher for students who had participated in an industry placement. While based at the academic institution, 77% of students who had participated in a placement had some contact with their industry supervisor at least once every two to three months, compared with 42% of students who had not.
55. Students' comments about the frequency of interaction with their industry supervisor were mixed. Some supervisors were reported as being very helpful and supportive; others were difficult to contact or demonstrated a lack of interest in the studentship. As with the provision of placements, company restructuring and associated staff changes affected the frequency of interaction. Geographical distance could also limit opportunities for face-to-face interaction
56. Students identified a number of benefits from having an industry supervisor in addition to an academic supervisor. These included increased advice and support, access to complementary scientific expertise, another perspective on the research, another perspective on future career options, assistance with obtaining future employment, and networking opportunities. However, there were also some potential disadvantages including delays in decision making, or conflicting views or priorities of the two supervisors. In general, the issues identified were not specific to Industrial CASE studentships and might be expected of any studentship which involved two supervisors.

### 4.3 Success of the interactions between academia and industry

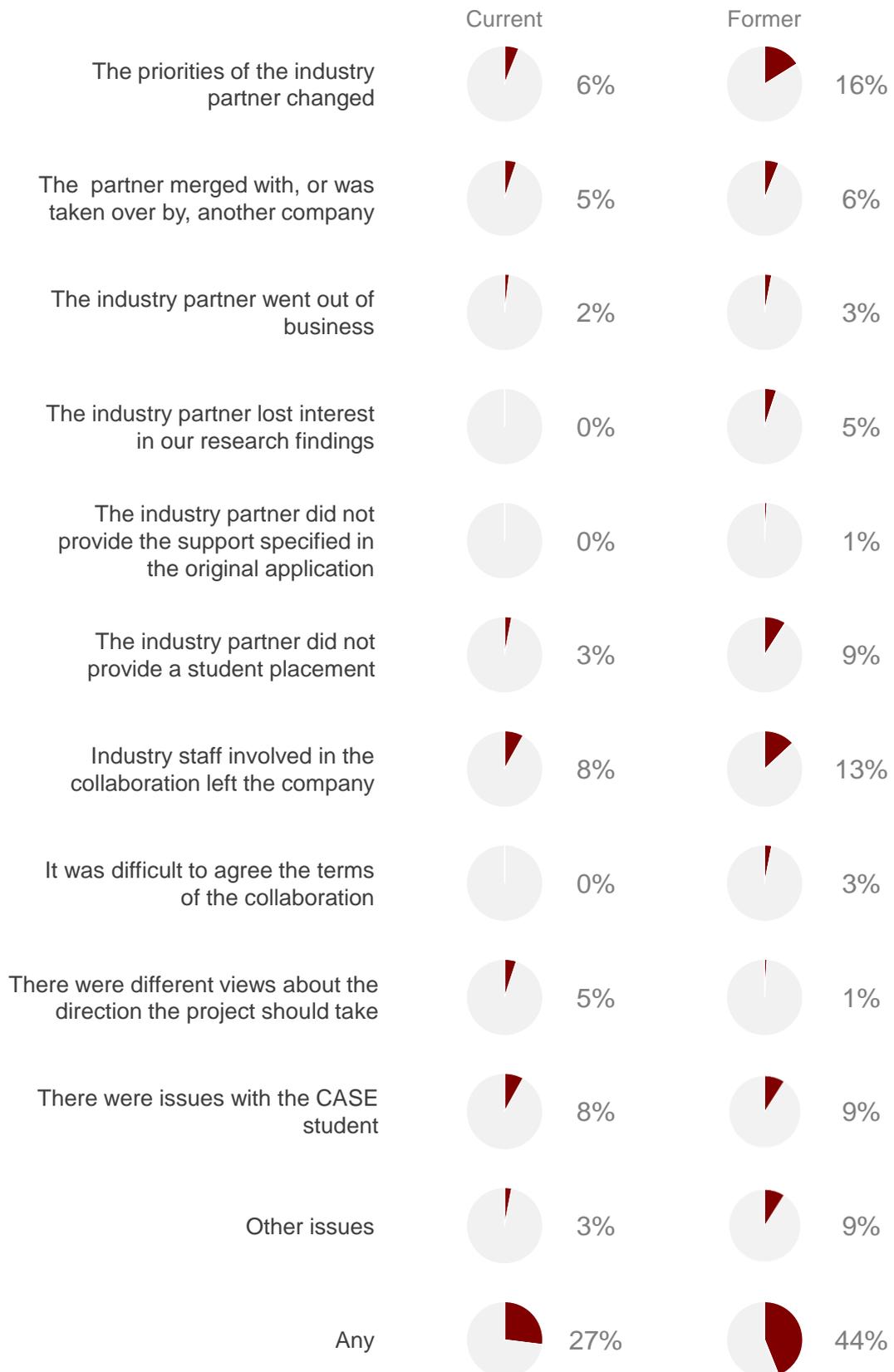
57. Academic and industry supervisors were positive about the success of the academia-industry interaction during the studentship. It was very encouraging that 80% of industry supervisors stated that the interaction with the academic partner was successful or very successful.



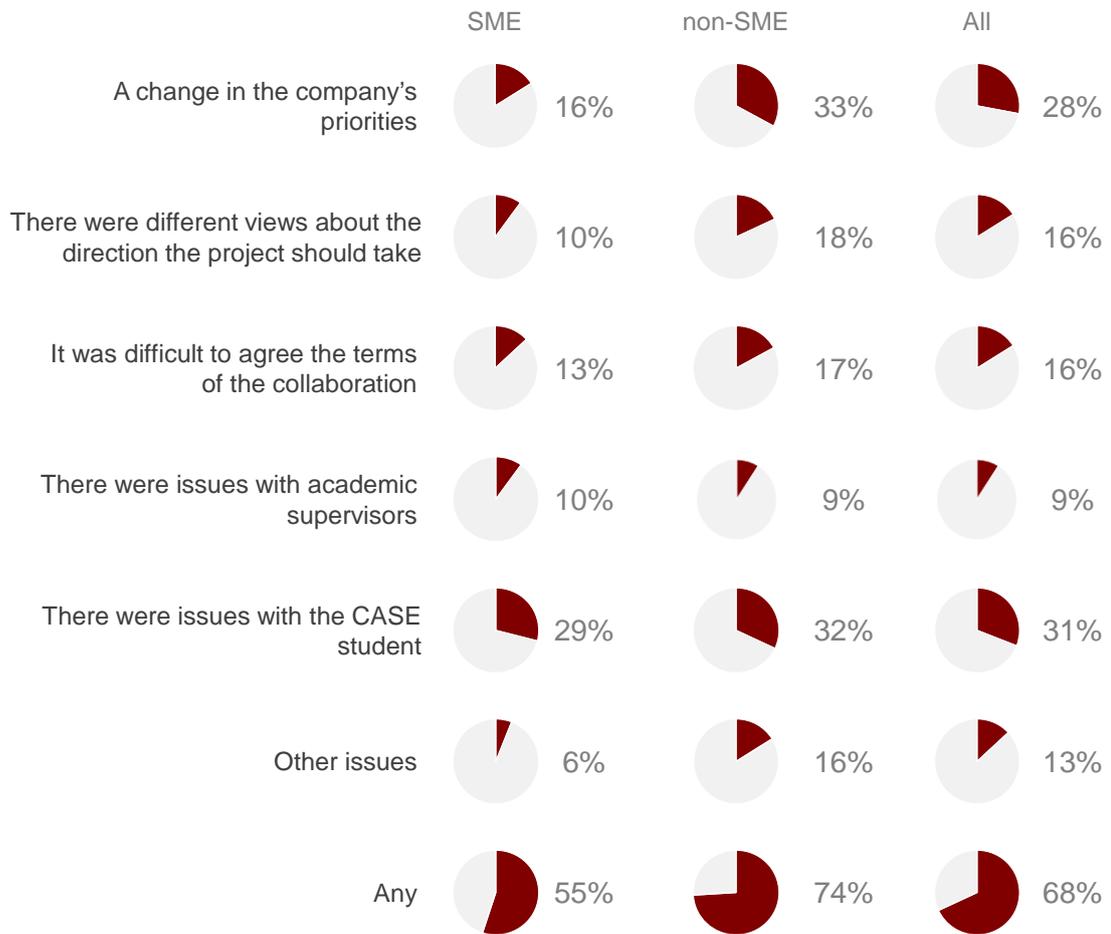
## 4.4 Issues affecting the success of the academia-industry interactions

58. The majority of academia-industry partnerships supported through the Industrial CASE scheme were successful. However, the interactions between students, academia and industry can create additional challenges for Industrial CASE studentships and a moderate proportion of academic and industry supervisors identified issues which affected the success of the interaction.
59. A common issue reported by academic supervisors was a change in the priorities or circumstances of the industry partner. Such changes could affect the success of a studentship, for example, if an industry placement was not provided or if the industry partner was no longer able to provide resources which were essential to the research project. In particular, the recent restructuring of large companies within the UK pharmaceutical sector has had a negative impact on some Industrial CASE students. Industrial CASE studentships could usually overcome issues associated with changes in the priorities or circumstances of the industry partner, but many in effect became non-CASE studentships as a result. There is limited scope for BBSRC to address these unavoidable consequences of working with industry. The impact of industry staff changes might be reduced by requiring studentships to have an industry co-supervisor in addition to the main industry supervisor where possible.
60. Industry partners cited issues with individual CASE students as a factor which affected the success of the academia-industry interaction (e.g. quality, performance). Greater involvement of industry partners in the student recruitment process would help to address this. It may be helpful for academic institutions to provide training in student supervision to industry supervisors.
61. In general, the issues reported by iCASE and ICP academic supervisors were similar. However, a slightly higher proportion of iCASE supervisors reported that the industry partner had been taken over by another company or had gone out of business. A slightly higher proportion of ICP supervisors reported that the studentship was affected by a change in the priorities of the industry partner or that staff involved in the collaboration left the company.

**Proportion of academic supervisors who identified issues which affected the success of the interaction with the industry partner**



**Proportion of industry supervisors who identified issues which affected the success of the interaction with the academic partner(s)**



# 5. Outputs, outcomes and achievements

## Summary

- The overall standard of Industrial CASE studentships and the associated student research projects was good
- The outputs, outcomes and achievements arising from Industrial CASE studentships were generally good
- There is scope to improve the publication outputs arising from Industrial CASE studentships
- The first destinations of Industrial CASE students were impressive, with a notable proportion of students pursuing a career in industry
- In partnership with industry, the Industrial CASE scheme has delivered highly skilled workers, a very positive achievement
- The extent to which the outputs, outcomes and achievements arising from the Industrial CASE studentships were dependent on the industry partner was variable
- The most successful Industrial CASE studentships tended to be those with a genuine partnership between the student, academic supervisor and industry supervisor

## Key recommendations

- BBSRC should place greater emphasis on ensuring that Industrial CASE studentships are distinct in comparison to non-CASE
- BBSRC should encourage all parties involved in the Industrial CASE studentship to meet at the outset and develop a plan for a *joint* student research project.
- BBSRC should introduce a system of reporting to capture the outputs, outcomes and impacts of Industrial CASE studentships.

## 5.1 Standard of the studentships

63. In aggregate, the performance of the students and their associated research projects was good, despite considerable variation between studentships. Many were good or very good, and a few were excellent; others were disappointing and a few had not met the expected standard. The outputs, outcomes and achievements arising from the Industrial CASE studentships were generally good<sup>10</sup>, but there was concern that for some studentships these were not sufficiently distinct from non-CASE studentships.

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<sup>10</sup> There is no end-of-award reporting associated with individual BBSRC studentships. As such, data on the Industrial CASE studentship outputs, outcomes and achievements were captured through the evaluation surveys.

## 5.2 Students submitting PhD theses within four years

64. There were no specific data on the proportion of Industrial CASE students who submitted their thesis within four year of the start of their PhD. However, over 80% of all BBSRC-funded doctoral students submit their thesis within four years which is very good. The Panel noted that it would also be helpful for BBSRC to collect data on the proportion of students that were subsequently awarded a PhD after submitting their thesis.

<b>PhD theses submission rates</b>			
Year degree started	Proportion of students submitting by the end of their:		
	4 <sup>th</sup> year	5 <sup>th</sup> year	6 <sup>th</sup> year
2002-03	<b>79%</b>	<b>92%</b>	<b>95%</b>
2003-04	<b>80%</b>	<b>90%</b>	<b>94%</b>
2004-05	<b>80%</b>	<b>94%</b>	<b>94%</b>
2005-06	<b>83%</b>	<b>91%</b>	
2006-07	<b>83%</b>		

Data are for all BBSRC-supported doctoral students, not only those funded by the Industrial CASE scheme.

## 5.3 Publications

65. Many students had published an original research article from their studentship<sup>11</sup> including in high-impact journals or prestigious journals in specific scientific fields. However, the Panel was concerned with several aspects of the student publications data including mean number of publications per student, proportion of students who had a first author paper, and the level of industrial co-authorship. There are additional constraints on Industrial CASE studentships which may delay publication of students' research, such as the need to protect intellectual property (IP). Nevertheless, there should be a very strong expectation that all students should publish the research conducted during their studentship; a good quality publication is needed to obtain subsequent employment in academia or industry.
66. In total, students reported that 153 publications had arisen from their studentships to date including: 110 original research articles, 26 review articles (including book chapters) and 7 other publications (e.g. articles in the popular press). The mean number of original research articles published by Year 4/5 students was 0.6 (median = 0, range = 0 to 4); for completed students it was 0.9 (median = 0.5, range = 0 to 4).

<sup>11</sup> The data on publication outputs were provided by the students as part of the evaluation survey. The data should be interpreted carefully as the studentships were still active or only recently completed. Further publication outputs are expected to arise in the future as, for example, some students may not publish their work until after the thesis has been submitted.

67. 33% of the original research articles had an industrial co-author; 28% had a CASE partner as an industrial co-author. Of the students who had published a paper, 42% had published at least one paper with an industry co-author and 36% had published with their CASE partner.
68. 31% of the original research articles had an international co-author. Of the students who had published a paper, 28% had published at least one paper with an international co-author. The interactional co-authors were based in a variety of countries including: Australia, Austria, Belgium, Canada, China, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Japan, the Netherlands, New Zealand, Norway, Pakistan, South Africa, Spain, Sweden, Switzerland, Taiwan and the USA.

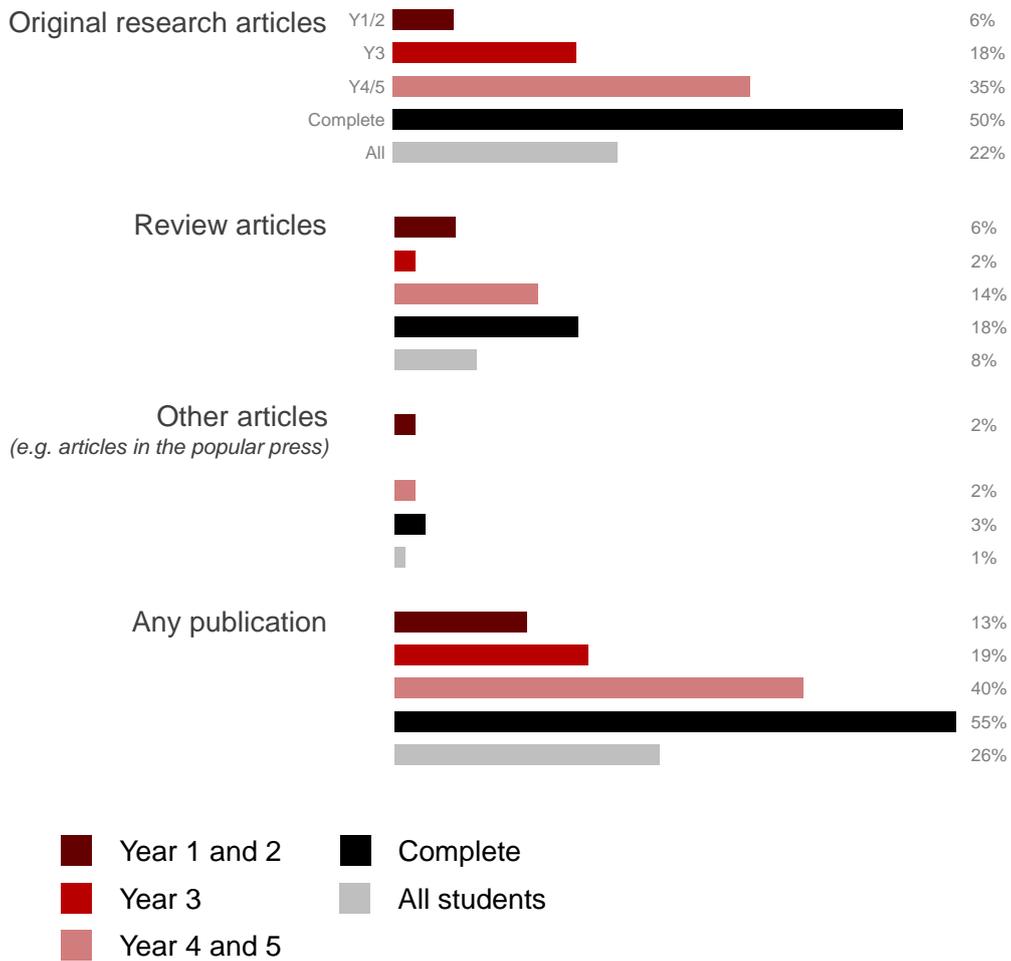
### **Examples of publications arising from Industrial CASE studentships**

An Industrial CASE student at the University of Cambridge collaborated with *Organon* (now *Merck Sharp and Dohme*) to investigate the role of nerve fibre ion channels in eliciting a sensation of pain. He discovered that the HCN2 ion channel plays a central role in inflammatory and neuropathic pain, and published a first-author paper in the prestigious, multi-disciplinary journal *Science*. The findings have subsequently contributed to a major drug discovery initiative to develop blockers for the HCN2 ion channel.

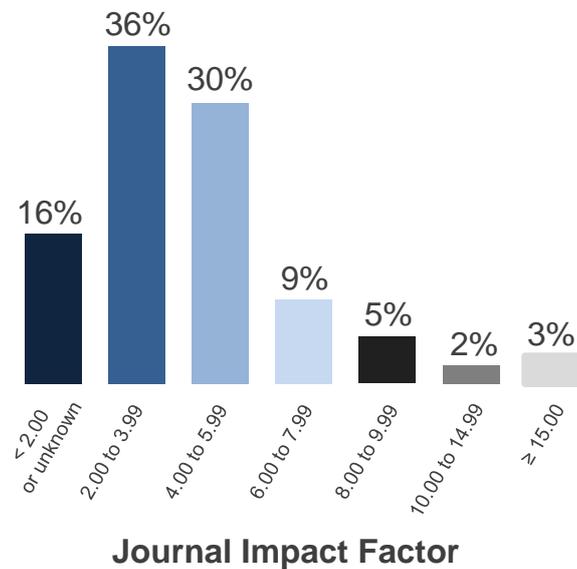
An Industrial CASE student at the University of Manchester collaborated with *GlaxoSmithKline* to investigate an array of positive and negative modulators of glutamate receptor signalling. She published five original research articles from her PhD, including papers in *British Journal of Pharmacology*, *Molecular Pharmacology* and *PLoS ONE*. Three of the papers were first-author publications and two were co-authored with the industry partner.

A student at St George's University of London conducted research into the role of a family of potassium channels in the contraction of smooth muscle cells. As part of his research project, he compared the effects of different Kv7 channel activators in regulating coronary blood flow and demonstrated that reduced channel activity could cause high blood pressure. He published a first-author paper in the prestigious journal *Circulation*, which was co-authored with the industry partner *NeuroSearch*.

**Proportion of students who authored or co-authored an original research article, review article or other publication during their PhD**



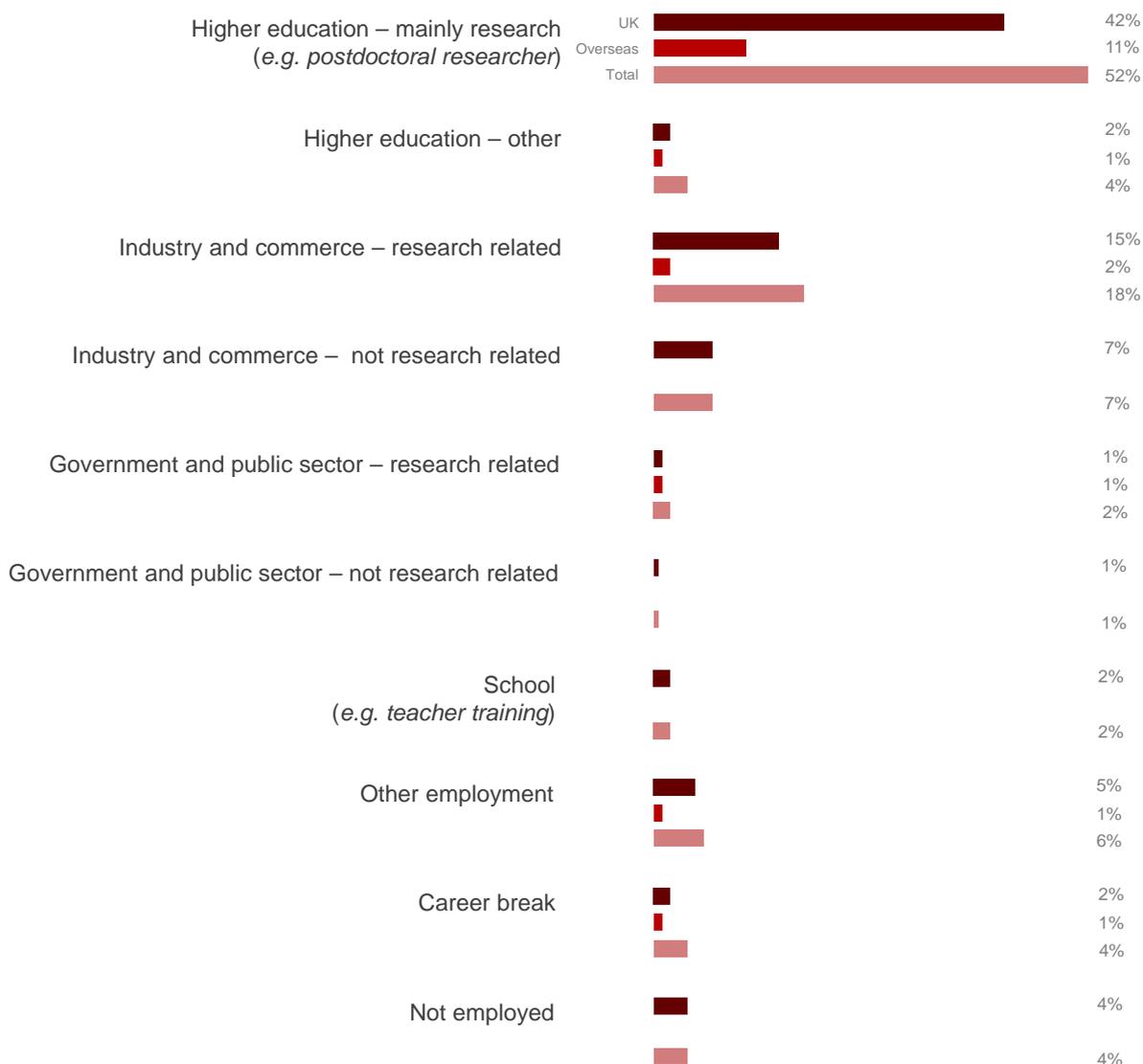
**Distribution of original research articles by journal impact factor**



## 5.4 Career development

69. The first destinations data of Industrial CASE students were impressive. Former academic supervisors reported that 56% of students were employed within the higher education sector as their first destination (e.g. postdoctoral research) and that 25% were employed within industry and commerce. 82% of students were employed within the UK.
70. A notably higher proportion of Industrial CASE students pursued research-related careers in industry compared with other BBSRC-funded students, and several students were employed by their industry partner after their PhD. The interaction with industry partners and the participation in industry placements encouraged many students to pursue a career in industry. Conversely, a small number of students were discouraged from working with industry by participation in the Industrial CASE scheme. Both these outcomes are positive; they indicate that the scheme has helped students to identify which type of career is most suitable for them.
71. In partnership with industry, the Industrial CASE scheme has delivered highly skilled workers and this is a very positive achievement. The scheme has enabled industry to influence student training and this has helped to ensure that the training meets the needs of industry and the wider UK economy.

## First destinations of Industrial CASE students

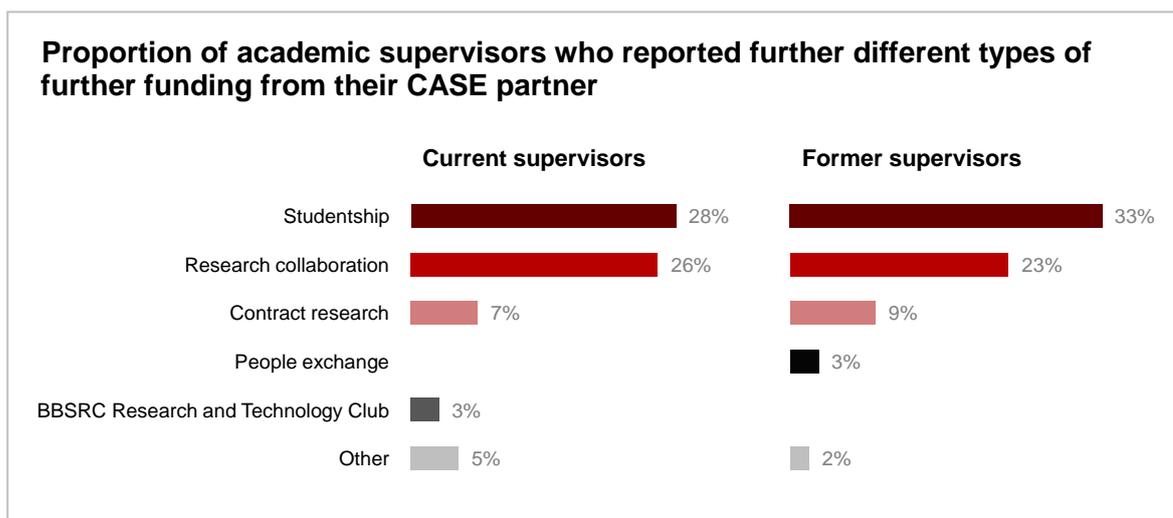


The data were reported by former academic supervisors. Supervisors were asked not to consider any brief period of time (e.g. up to six months) the student spent in the host laboratory after submitting their thesis.

The Higher Education Statistics Agency (HESA) provides BBSRC with data on the first destinations of BBSRC-funded postgraduate students. The data are from a sample of all BBSRC studentships and it is not possible to identify Industrial CASE students within the data. The 2009-10 HESA data were: Higher education – mainly research, 38%; Higher education – academic, 3%; Higher education – other, 3%; Industry and commerce – research related, 4%; Industry and commerce – not research related – 12%; Government and public sector – research related, 2%; Government and public sector – not research related, 5%; R & D – sector unknown, 11%; School, 2%; Other employment, 2%; Further study, 4%; Not employed, 11%; Self-employed, voluntary and unpaid work, 1%; Not known or not reported, 3%.

## 5.5 Further collaborations

72. The Industrial CASE scheme has fostered longer-term collaborations between academia and industry, and this is a very positive outcome. For example, 36% and 41% of current and former academic supervisors, respectively, reported that they had obtained further funding from their CASE partner. The Panel noted that the evaluation data on further funding are a relatively narrow measure of success. For example, an Industrial CASE studentship may help to maintain the academia-industry partnership links, but may not necessarily lead to further funding from the industry partner.



## 5.6 Other outcomes and achievements

73. Students, academic supervisors and industry supervisors reported a wide variety of outcomes and achievements arising from the studentships and the associated student research projects. These included benefits to students, academia, industry, the UK economy and the wider public good. A small number of Industrial CASE studentships resulted in new F or the commercialisation of research findings. However, this was not common and it is important for BBSRC to manage industry partners' expectations in this area.

## Types of notable achievements reported by students, academic supervisors and industry supervisors

### Students and academic supervisors

#### Training and skills development

Development of technical skills

Development of broader skills

Interdisciplinary training

Good career development outcomes

#### Student research project

Novel scientific discoveries

Development of new methodologies and technologies

High-quality publications

Research findings with potential economic and societal impacts

Pump-priming new research directions

Underpinning future grant applications

#### Knowledge exchange and commercialisation

Knowledge exchange with industry, end-users, and academics

Exploitation or implementation of the research by industry partners

New intellectual property

Understanding the broader context of the research

#### Participation in the scientific community

Attending and presenting work at scientific conferences and workshops

Collaborating with other academics (UK and international)

Participation in scientific networks

#### Public engagement activities

#### Prizes and awards

#### Stronger academia-industry partnerships

### Industry supervisors

#### Staff recruitment opportunities

Recruitment of high performing students

Directing student training to meet the needs of the company or industry sector

#### Industry staff training

Opportunities to gain management, planning and supervisory experience

#### Access to research

Access to research which falls outside the main focus of the company

Access to research which would not be supported internally

Access to methodologies and technologies not available inside the company

Opportunities to explore new research directions

Opportunities to influence academic research

#### Exploitation and commercialisation

New intellectual property

Development of new products and processes

New applications for existing company products and technology

Data for company literature and presentations

#### Improving the profile of the company

#### Stronger academia-industry partnerships

## Examples of notable achievements from Industrial CASE studentships

As part of her PhD, an Industrial CASE student at Cardiff University worked with *Unilever* to conduct research on endogenous pulmonary protection systems in the lung. The student and academic supervisor won the *2007 National Centre for the Replacement, Refinement and Reduction of Animals in Research (NC3Rs) Parliamentary Event Replacement Prize* for their work on 3D cell cultures of lung to find a possible alternative to animal testing. Her research also contributed to winning the *2007 Cardiff University Science & Technology Innovation Award* for novel research between academia and business, in collaboration with the industry partner.

A student at the University of Glasgow investigated the interactions between the cAMP signalling system and that of the androgen receptor, whose action is required for normal prostate development and function. In collaboration with the industry partner *Philips*, his research contributed to the development of four patents relating to cancer diagnostics. The student subsequently obtained a postdoctoral position at the prestigious Salk Institute for Biological Studies in the USA.

A student at Sheffield Hallam University worked with *Syngenta* to develop new methodologies for examining the uptake of agrochemicals in plants by mass spectrometric imaging. During his placement, the student installed software onto the industry partner's equipment, enabling it to be used in an imaging mode. He then trained *Syngenta's* staff in the methodologies he had developed during the PhD. The findings were published in two first-author papers, both of which included co-authors from the industry partner.

A student at the University of Manchester conducted research into neuronal-glia interactions in the central nervous system as part of her doctoral training. She was involved in and organised numerous public engagement activities and events during her PhD: she won the 'I'm a scientist... get me out of here!' competition, became a public engagement mentor for her faculty, and supported the widening participation team at the university. In 2011, she won the Society of Biology's *Science Communication Award* (new researcher category).

As part of his research project, a student at the University of Stirling collaborated with *Marine Harvest* to characterise the maturation of Atlantic salmon and develop associated diagnostic tools. The protocols he developed were implemented within the industry, including a refined light protocol to suppress maturation and fish-quality assessment tools for processing plants. The student was also involved in training the industry partner's staff and was employed within the salmon farming industry after completing his PhD.

A student at the University of Edinburgh collaborated with *Biosciences KTN* to conduct research into the genome wide evaluation of UK beef cattle and sheep populations. He contributed to a report for Defra's Farm Animal Genetic Resources Committee on the breed composition of the UK cattle population, which has been used to inform policy of the conservation of cattle genetic resources. The student also won an essay competition at the UK Cattle Breeders Club and was invited to give a presentation at their annual conference.

A student at the University of Sheffield conducted research on the effects of the Varroa mite and associated viral diseases on honeybees in partnership with the *West Norfolk Beekeepers Association*. Her research produced new evidence on how honeybees discriminate workers doing different tasks, how contact pheromones have changed through evolutionary time in this group of insects, and how Varroa gains its chemical mimicry to stay undetected in the hive. She won awards from the American Beekeeping Federation and the International Society of Chemical Ecology to talk at their international meetings, and contributed to increased knowledge exchange between beekeepers and scientists through regular invited talks at beekeepers association meetings.

A student at the Institute of Food Research worked with *Campden BRI* to study the effects of pre-chilling on gene expression during the first stages of Salmonella growth. He subsequently worked for the *North Sea Marine Cluster* (an academic-commercial partnership) where he wrote a detailed report on Marine Protected Areas. His latest project is to review the economic impact of offshore wind farms on the East of England and the UK, which involves examining policy documents and local economies. The Industrial CASE studentship enabled the student to develop analytical and writing skills, which are very useful in his chosen career.

A student at the University of Oxford worked with their industry partner *Oxitec* to develop improved techniques for the mass-rearing of mosquitoes for field applications. During Summer 2010, he was heavily involved in the world's first release of genetically engineered mosquitoes in the Cayman Islands. Approximately 3.3 million male mosquitoes which had been engineered to carry a dominant-lethal transgene were released and a subsequent suppression of the target population was observed. The results were published in the prestigious journal *Nature Biotechnology*.

A student at the University of Aberdeen collaborated with *Pfizer Animal Health* to study novel chemotherapeutic targets in ticks and published the first transcriptome analysis of brown dog tick brain. During the studentship, the industry partner introduced the student and academic supervisor to a world-leader in a science area where the student's project unexpectedly developed. Furthermore, through the industry partner's relationship with that researcher, the student was able to visit their lab for fifteen months to conduct specialised work that was not possible at her host institution.

An Industrial CASE student at the University of Reading worked with the *Game & Wildlife Conservation Trust (GWCT)* to study agri-environmental management and its impact on the productivity of farmland birds. His project built on existing long-term data collected by the *GWCT* and generated important evidence that the CASE partner is now able to use to demonstrate on-farm management and to train farmers. At the end of his PhD, the student was recruited into a full-time research position at the *GWCT*.

An Industrial CASE collaboration with *AstraZeneca* enabled a student at the University of Surrey to receive training in biochemical toxicology and this contributed to his subsequently obtaining a lectureship position at the University of Westminster. The results from his research project were published in a paper in *PLoS ONE* which was co-authored with the industry partner. They also provided the foundation for a recently awarded BBSRC grant and contributed to the establishment of a new interaction between the university and another industry partner.

## 5.7 Distinctiveness of Industrial CASE studentships

74. Many of the outputs, outcomes and achievements arising from Industrial CASE studentships required the interactions with industry partners. Industry contributed to the studentships' achievements in a number of different ways, including: the provision of additional training opportunities; access to data, equipment, expertise, facilities, materials, resources, technologies and tools; knowledge exchange; and additional funding to attend scientific conferences. However, many of the outputs, outcomes and achievements arising from Industrial CASE studentships were generic to a successful PhD and could have easily have been realised through non-CASE studentships. The Panel was concerned that for some Industrial CASE studentships the training experience or the associated outputs were not sufficiently different from those of non-CASE studentships.
75. The distinctiveness of individual Industrial CASE studentships compared with non-CASE was influenced by the level of engagement of the industry partner and the strength of the academia-industry collaboration. BBSRC should place greater emphasis on ensuring that Industrial CASE studentships are distinct from non-CASE. In this context, providing academia and industry with additional guidance on the aims of the scheme would be beneficial. There is also a risk that the specific aims of the Industrial CASE scheme may get side-lined during the four-year period of a studentship. This risk could be reduced by better planning of studentships at the outset.
76. The most successful Industrial CASE studentships tended to be those with a genuine partnership between the student, academic supervisor and industry supervisor. BBSRC should encourage all parties involved in the Industrial CASE studentships to meet at the outset and develop a plan for a *joint* student research project. For Industrial CASE studentship to be successful, all parties need to 'buy in' to the aims of the scheme. A jointly developed project plan may also increase the industry partners commitment to the studentship and reduce the risk of problems arising during the studentship.

## 5.8 Reporting and monitoring

77. There is currently limited monitoring and no end-of-award reporting associated with Industrial CASE studentships. As such, BBSRC cannot routinely determine whether the requirements of the scheme are being met and cannot capture the outcomes and impacts of its investments in the scheme. Moreover, this information is needed to provide assurance that the scheme is delivering distinctive outcomes compared to non-CASE studentships. The Panel noted that the survey responses provided by academic supervisors were often very short and lacking in detail. This was disappointing and made it difficult to assess the performance of individual studentships.
78. Limited monitoring and reporting are not acceptable considering the substantial amount BBSRC invests in individual studentships and the scheme as a whole. BBSRC should introduce a system of reporting for Industrial CASE studentships. Academic supervisors should be required to report on the outputs, outcomes and achievements of the studentship, either through a light-touch end of award report or through the new Research Outcomes System<sup>12</sup>. At minimum, the reporting should cover: whether the

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<sup>12</sup> The Research Outcomes System (ROS) is a cross-Council, web-based system, through which grantholders are required to report on the outputs, outcomes and impacts of their awards. It was launched to all BBSRC grantholders in November 2011. Currently, ROS is focused on capturing data for research grants; studentship data are not captured.

thesis was submitted; whether the PhD was awarded; the student's publications; other outcomes and achievements; and whether the industry placement was completed. Companies with an ICP allocation should also report on their studentships and this information should feed into the renewal procedure for ICP awards.

# 6. Balance and coverage of the portfolio

## Summary

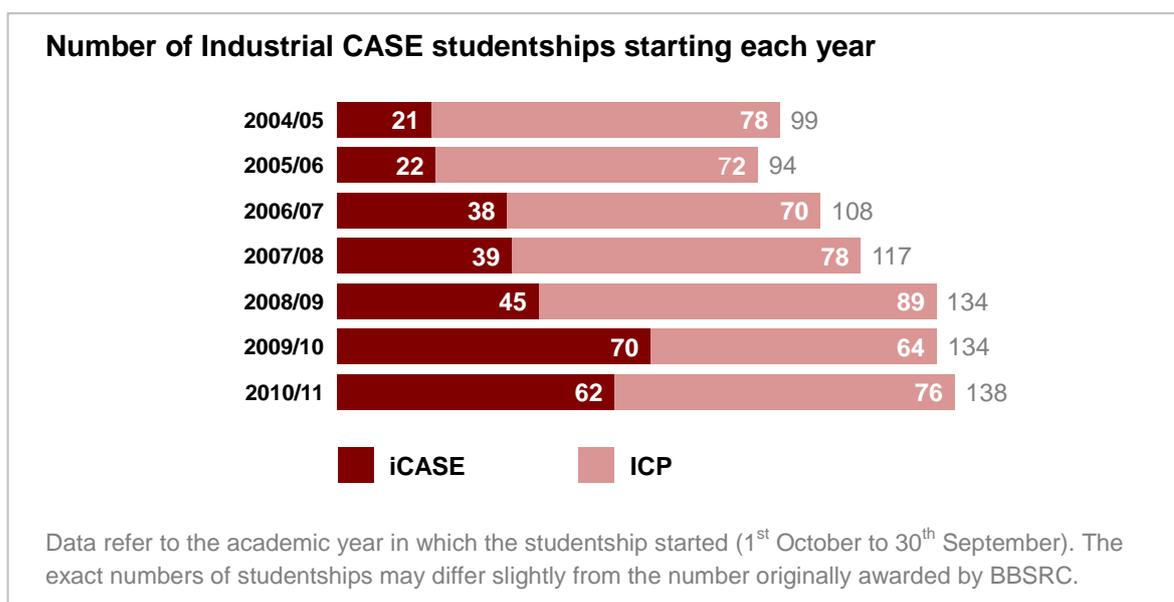
- The Industrial CASE scheme has supported training and research from across the BBSRC remit
- The portfolio is very health oriented, reflecting the strong participation of companies in the 'health and pharmaceuticals' sector in iCASE and ICP studentships
- There is scope to broaden the range of industry partners who participate in the Industrial CASE scheme

## Key recommendations

- BBSRC should consider supporting new ICP 'Partners' from outside the 'health and pharmaceuticals' sector; this may require BBSRC to modify the criteria for obtaining ICP 'Partner' status
- The Industrial CASE scheme should aim to encourage the best researchers in academia to work with the best researchers in industry

## 6.1 Overview of Industrial CASE scheme funding

79. Since 2008/09, BBSRC has supported approximately 130 new Industrial CASE studentships each year. In 2011/12, the estimated spend for the scheme including commitment from previous years was £17M (£9.5M for iCASE studentships, £7.5M for ICP studentships). The number of iCASE studentships has increased over the evaluation period, whereas the number of ICP studentship has remained relatively constant.



## 6.2 Funding by research area

80. The Industrial CASE scheme has supported training and research from across the BBSRC remit, and the overall balance and coverage is appropriate given BBSRC's other investments in doctoral training. The portfolio is very health-oriented, which reflects the strong participation of companies in the 'health and pharmaceuticals' sector in the scheme, both in iCASE studentships and as ICP 'Partners'. However, this is balanced by the other BBSRC investments. For example, following the introduction of Doctoral Training Partnerships, BBSRC reduced its support for non-CASE studentships in the health area. A higher proportion of Industrial CASE studentships were aligned to BBSRC's strategic research priorities compared with the wider studentship portfolio<sup>13</sup>.
81. A few studentships appeared to be in the remit of the Medical Research Council (MRC) rather than BBSRC based on studentship titles, abstracts and publication outputs. While it is important that students are able to follow their own research interests and explore the most promising research directions, out-of-remit studentships are a potential concern. In this context, the harmonisation of BBSRC's Industrial CASE scheme application processes and deadlines with those of MRC is welcome, as it enables the transfer of applications between Councils.

## 6.3 Funding by institution

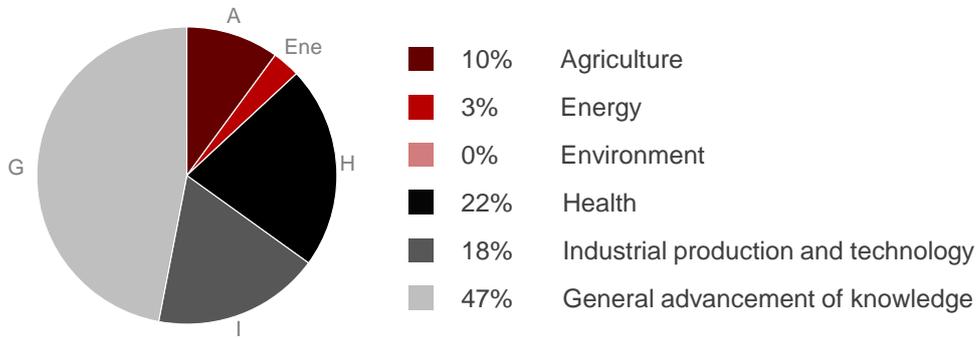
82. In total, 73 different academic institutions had hosted Industrial CASE studentships. The institutions with the largest number of Industrial CASE studentships were: Imperial College London (59 studentships), University of Manchester (50), University of Nottingham (45), Newcastle University (36), University of Cambridge (36), University of Oxford (36), University of Liverpool (33), University College London (28), King's College London (27), and University of Edinburgh (25).

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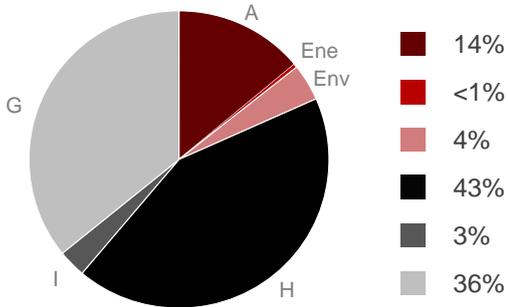
<sup>13</sup> BBSRC's Strategic Plan describes the research priorities and enabling themes which will drive the Council's investments over a five year period. The 2010-15 Strategic Plan defines three major strategic research priorities for BBSRC: food security; bioenergy and industrial biotechnology; and basic bioscience underpinning health.

**Classification of Industrial CASE studentships by Office of National Statistics NABS codes**

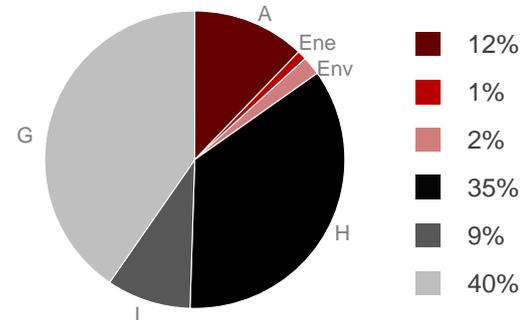
**iCASE studentships**



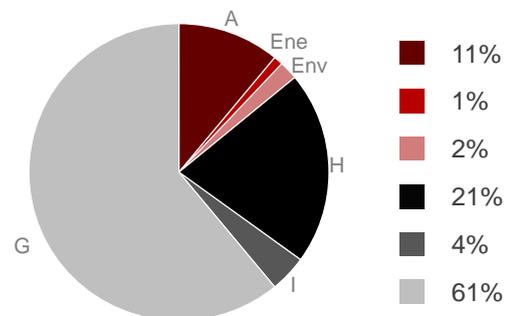
**ICP studentships**



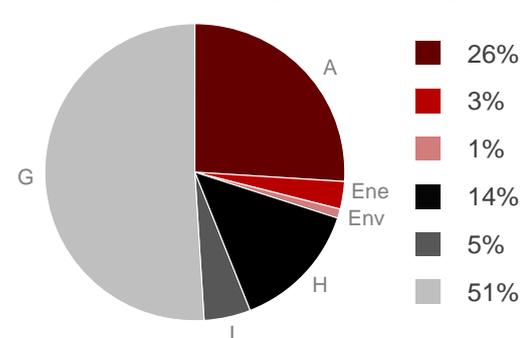
**All Industrial CASE studentships**



**All BBSRC studentships**

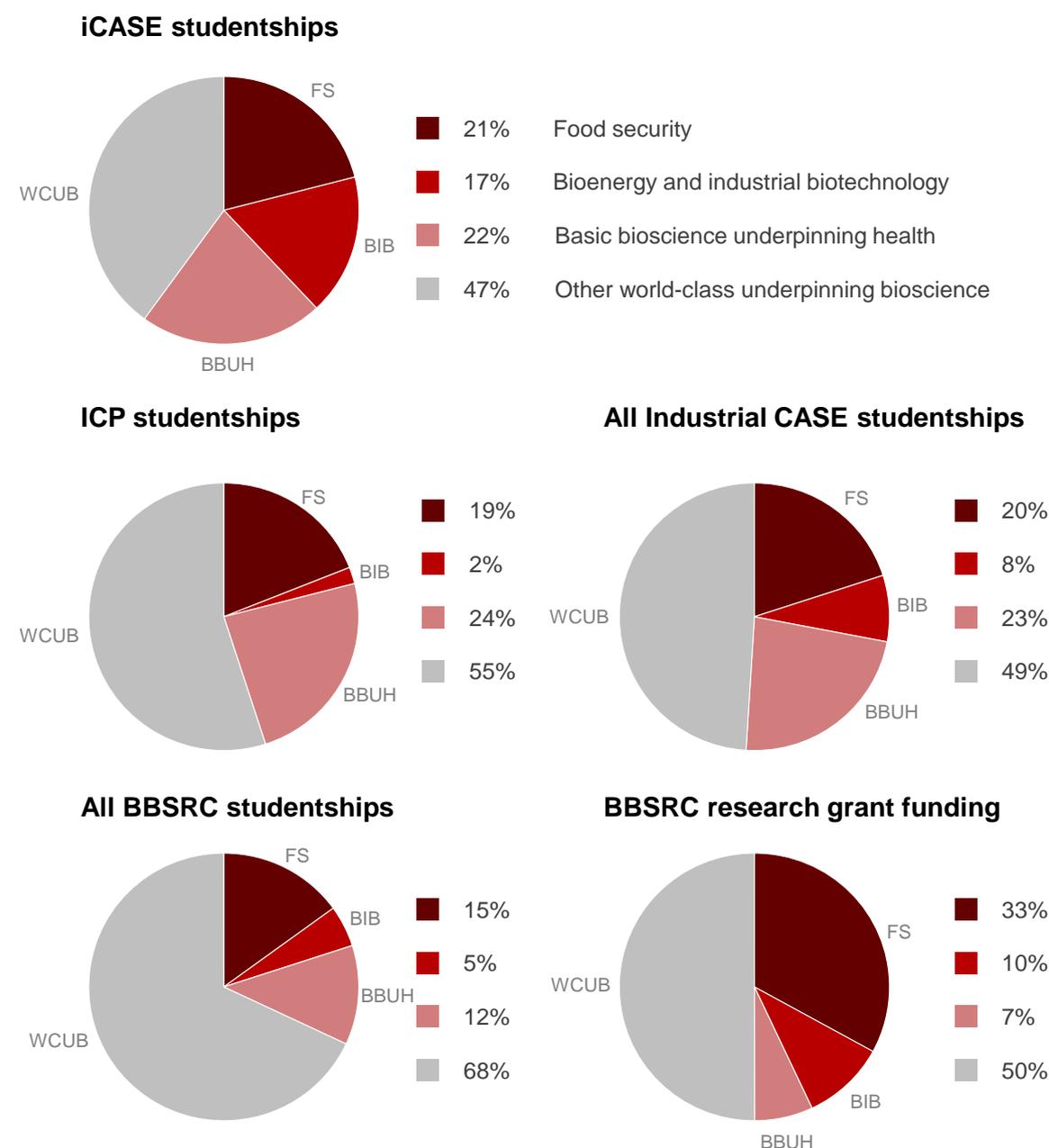


**BBSRC research grant funding**



Data are for 2363 studentships live in 2009/10 (start dates between Sep 2005 and Mar 2010). Some studentships live during this period are excluded (e.g. those with student rotations where the final studentship project is unknown). The data include 149 iCASE and 220 ICP studentships. Data are based on the number of studentships. The BBSRC research grant funding data are the proportion of research grant and Institute Strategic Programme Grant (ISPG) spend in 2009/10. NABS: Nomenclature for the Analysis of Scientific Programmes and Budgets.

## Classification of Industrial CASE studentships by BBSRC strategic research priority area

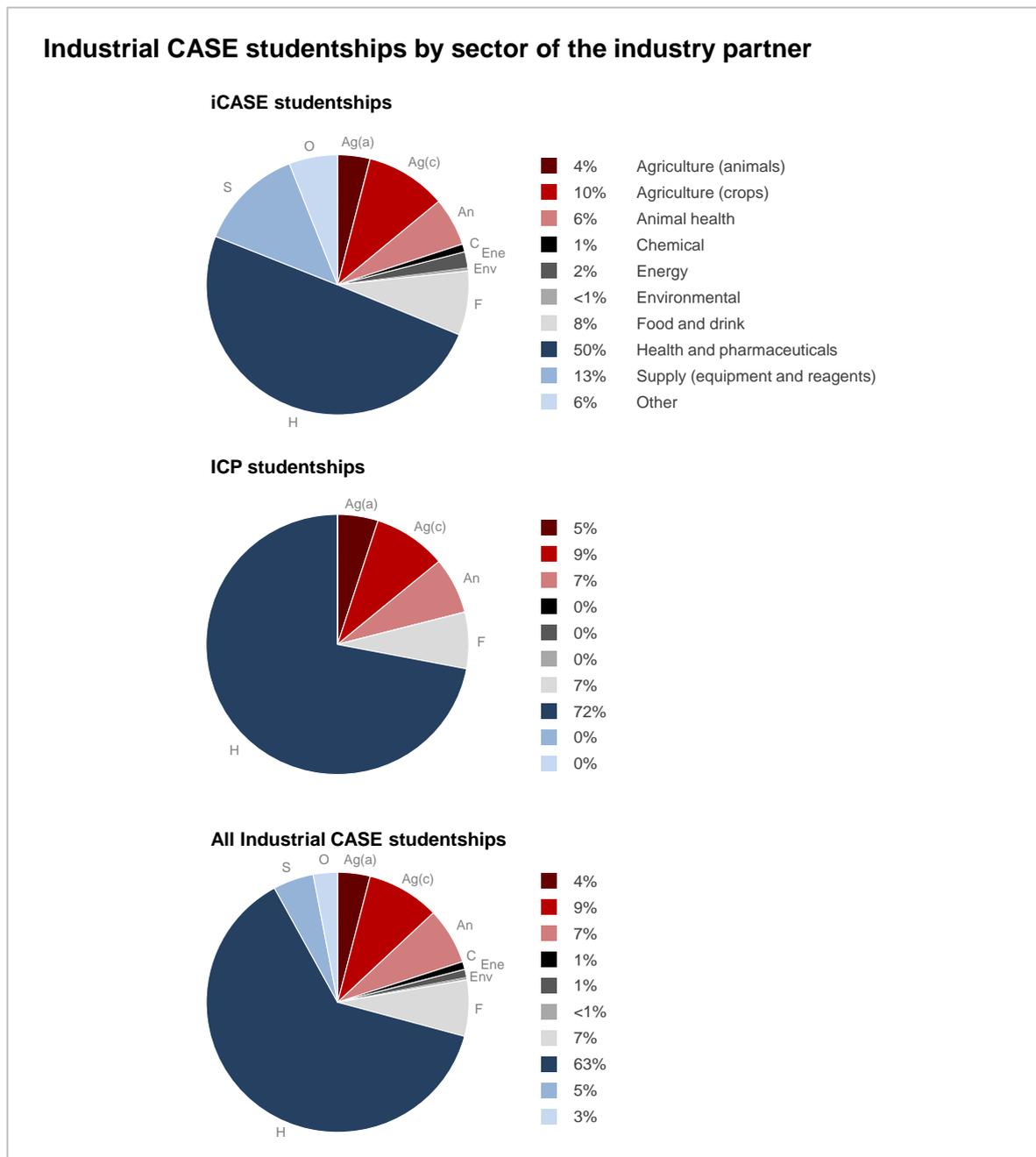


Data are for 2414 studentships live in 2009/10 (start dates between Sep 2005 and Mar 2010). Some studentships live during this period are excluded (e.g. those with student rotations where the final studentship project is unknown). The data include 149 iCASE and 222 ICP studentships. The data do not include studentships funded through BBSRC's Doctoral Training Partnerships; a higher proportion of DTP studentships are expected to be aligned with BBSRC's strategic research priorities compared with the previous Quota DTG scheme. The BBSRC research grant funding data are the proportion of research grant and Institute Strategic Programme Grant (ISPG) spend in 2009/10.

FS: Food Security; BIB: Bioenergy and Industrial Biotechnology; BBUH: Basic bioscience underpinning health; WCUB; other world-class underpinning bioscience.

## 6.4 Industry partners that participated in the Industrial CASE scheme

83. In total, at least 143 individual industry partners had participated in the Industrial CASE scheme since 2006<sup>14</sup>. A variety of industry sectors were represented, although the majority of Industrial CASE partnerships were with companies in the 'health and pharmaceuticals' sector. For some sectors (e.g. industrial biotechnology), industry participation in the scheme was limited or predominantly through a very small number of companies.



<sup>14</sup> The data are for 518 studentships in the Je-S SDP with start dates between Sep 2006 and Aug 2011, where the name of the industry partner was known. The data exclude a small number of studentships (17) funded during this period where the name of the industry partner had not been entered into the Je-S SDP by the host institution. Data prior to 2006 were not available.

Word cloud showing Industrial CASE studentship industry partners



Word cloud showing the 143 individual industry partners who had participated in the Industrial CASE scheme since 2006. The font size reflects the number of studentships each partner participated in.

84. Of the 143 individual industry partners that participated in the Industrial CASE scheme, 65 (45%) were small and medium enterprises (SMEs)<sup>15</sup>. Of the 518 Industrial CASE studentships where data on the industry partner were available, 84 (16%) had an SME industry partner.
85. There is scope for BBSRC to broaden the range of industry partners who participate in the Industrial CASE scheme, particularly within certain sectors. The most straightforward approach would be for BBSRC to support new ICP 'Partners' from outside the 'health and pharmaceuticals' sector and BBSRC should consider modifying the criteria for ICP 'Partner' status to assist with this. BBSRC should also work with other organisations, such as the Knowledge Transfer Networks, to broaden participation in the scheme. Efforts to increase the variety of industry companies participating in the scheme should not be at the expense of existing partners. The restructuring of large pharmaceutical companies and the closure of associated UK sites may offer an opportunity for timely rebalancing of the portfolio. The recent changes to the eligibility criteria for non-academic partners are a positive development which may also help to widen participation.
86. There are risks, however, with encouraging wider industry participation in the Industrial CASE scheme. It is vital that new industry partners understand the purpose of collaborative doctoral training. Different companies or industry sectors are likely to have different cultures or drivers for participation in academia-industry collaborations and Industrial CASE studentships will not be appropriate for all companies or sectors. Additional guidance from BBSRC on the aims of the scheme would help companies decide whether it is appropriate for them. BBSRC's Industrial Biotechnology and Bioenergy Strategy Advisory Panel may also have useful insights into which companies might be suitable partners for Industrial CASE studentships for these sectors.
87. A higher number of individual industry partners had participated in the Industrial CASE scheme than in BBSRC's Industrial Partnership Award (IPA) scheme<sup>16</sup>. There was limited overlap between IPA and CASE studentship partners.
88. A small number of iCASE studentships were with university spin-out companies which appeared to be based at the academic institution and where the industry supervisor was an academic. This is a potential concern as such partnerships may not provide a distinctive training experience for the student compared with a non-CASE studentship. BBSRC should clarify whether it is appropriate for the industry supervisor to be an academic.

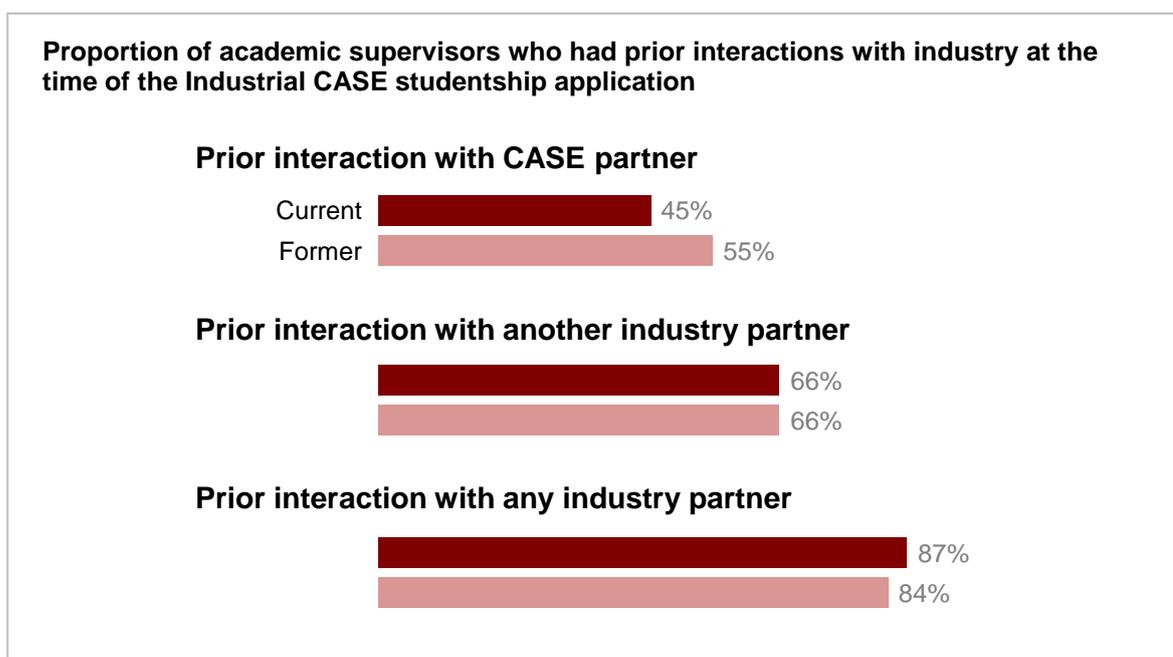
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<sup>15</sup> The European Commission defines an SME as follows: Enterprises qualify as SMEs if they fulfil maximum ceilings for staff headcount (< 250 staff) and either a turnover ceiling ( $\leq$  €50M) or a balance sheet ceiling ( $\leq$  €43M). For this evaluation, a best attempt was made to categorise industry partners according to this definition using information in the public domain and in survey responses.

<sup>16</sup> The IPA scheme is BBSRC's principal mechanism for supporting collaborative research with industry within its responsive mode funding mechanism.

## 6.5 Prior interactions with industry

89. The Industrial CASE scheme has primarily supported academic researchers who have previous collaborations with industry. This is to be expected and demonstrates that the scheme is valued by this part of the research community. The high proportion of academic supervisors who had prior interactions with their CASE partner also reflects the importance of personal relationships in establishing and maintaining academia-industry partnerships.
90. BBSRC should consider how it might encourage wider academic participation in the Industrial CASE scheme. It can be very difficult for academics who do not have a track record of working with industry to identify potential CASE partners. While it is not realistic to expect BBSRC to broker partnerships between industry and academia, there are a number of activities which BBSRC could consider to assist this process (e.g. conferences or 'dating events', a database of potential partners, providing contact details for ICP 'Partners'). KTNs can also have a useful role in facilitating the first contacts between academia and industry. Within the Industrial CASE scheme, BBSRC should aim to encourage the best researchers in academia to work with the best researchers in industry.



91. 42% of students had previous interactions with the bioscience industry at the time when they were applying for studentships, including interactions during their undergraduate or Masters degrees, internships, placements and previous employment. 28% had participated in a placement or internship within the bioscience industry.

## 6.6 The Industrial CASE scheme as a mechanism for establishing new collaborations

92. The Industrial CASE scheme is a very useful mechanism for establishing new collaborations between academia and industry. 79% of industry supervisors stated that they use studentships as a mechanism for establishing the first formal collaboration with a new academic partner. Other reported mechanisms included: research collaboration such as a joint research grant (74%); contract research (48%); BBSRC Research and Technology Club (18%); people exchange (8%).
93. 44% and 40% of current and former academic supervisors, respectively, stated that the CASE student collaboration had been initiated by the academic partner. As expected, there were differences in who initiated the collaboration for iCASE and ICP studentships. For iCASE studentships, the collaboration was more likely to be initiated by the academic partners. For ICP studentships, the collaboration was more likely to be initiated by the industry partner.

# 7. Drivers and barriers to participation in the scheme

## Summary

- The drivers and barriers which influence participation in the Industrial CASE scheme are diverse
- The industry placement is a major driver for student participation in the Industrial CASE scheme
- The requirement for industry partners to make contributions to Industrial CASE studentships is appropriate; however, it can be a barrier for some companies (e.g. SMEs, particular industry sectors, companies with low profitability)
- It can be challenging for academia and industry partners to agree the terms of the collaboration
- It is not clear to the academic and industry research communities whether the primary aim of the scheme is to support excellent doctoral training or to support academia-industry collaborations which benefit UK business

## Key recommendations

- BBSRC should consider lowering the level of financial contributions for SMEs to encourage participation in the scheme
- BBSRC should continue to encourage academia and industry to use model collaboration agreements
- BBSRC should develop an Industrial CASE 'user guide' for students, academia and industry, describing BBSRC's aims, priorities and expectations for the scheme
- BBSRC should make clear that the priority of the Industrial CASE scheme is student training

## 7.1 Overview

94. A variety of drivers and barriers which influenced participation in the Industrial CASE scheme were identified by students, academic supervisors, academic research managers and administrators, industry supervisors and ICP coordinators. As it was not feasible to consider all of these in detail, this report covers some key areas. As expected, individual respondents had different rationales for participating in the scheme. For example, industry supervisors' views could differ depending on the size or sector of the company. In general, respondents were positive about the benefits which could be realised through participation in the Industrial CASE scheme.

## Examples of drivers for participation in the Industrial CASE scheme

### **Students:**

- additional support and advice during the studentships
- additional resources for the research project and other activities
- increased stipend
- additional training opportunities
- the opportunity to interact with industry
- the industry placement
- additional networking opportunities
- benefits to future employment
- the nature of the student research project (e.g. opportunity to work on 'real world' problems)

### **Academic supervisors:**

- access to studentship funding
- access to high-quality students
- additional resources for the research project and other activities
- additional opportunities for training and skills development
- a useful mechanism for establishing and developing partnerships with industry
- the nature of the research
- additional opportunities to deliver impact from the research
- a straightforward application process

### **Academic research managers and administrators:**

- strengthening the institution's interactions with industry
- attracting additional income for the institution
- addressing the institutions strategies and meeting targets
- BBSRC's reputation as a sponsor
- feedback from former students regarding the benefits of CASE studentships

### **Industry supervisors and ICP coordinators:**

- a useful mechanism for establishing and developing partnerships with academia
- access to academic expertise and resources
- access to academic research
- the duration of the studentship (allows a relatively long-term project to be conducted)
- potential for staff recruitment
- training and skills development for industry staff

## Examples of barriers to participation in the Industrial CASE scheme

### Students:

- the tension of having two supervisors
- the expectations of the industry partner
- the industry partner may impose restrictions on the student
- the industry placement
- nature of the student project
- the industry partner's influence on the direction of the research
- future employment
- insufficient information provided to the student at the outset

### Academic supervisors:

- identifying suitable industry partners
- agreeing the terms of the collaboration
- student supervision and training (e.g. assessing the suitability of industry partners)
- the expectations of the industry partner
- the industry placement
- nature of the research project
- the industry partner may impose restrictions on the student
- general risks associated with interactions with industry partners
- perceptions and misconceptions about industry
- issues with the application and assessment processes

### Academic research managers and administrators:

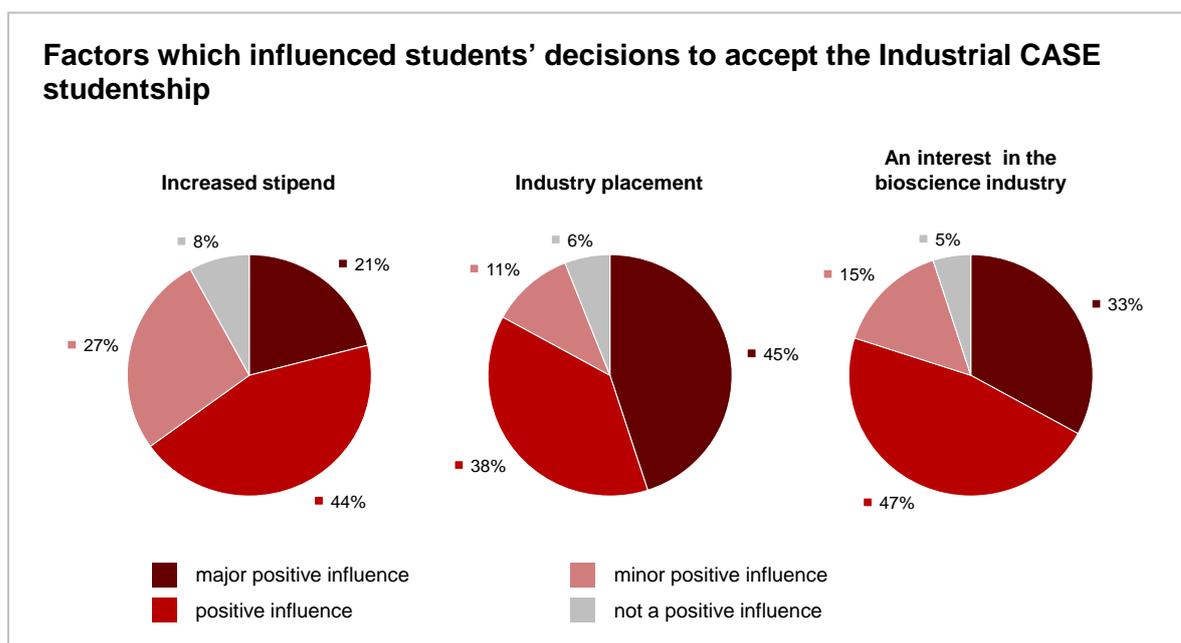
- agreeing the terms of the collaboration
- difficulties with securing the financial contributions from industry partner
- ensuring the stability of the industry partner
- the understanding of the CASE concept among industry and students

### Industry supervisors and ICP coordinators:

- the quality of students
- the challenge of supervising a student
- agreeing the terms of the collaboration
- the requirement for financial contributions
- the industry placement
- the duration of the studentship
- the nature of the research
- the level of control over the direction of the research
- the expectations of academic partners
- issues with the application and assessment processes
- internal company factors
- perceptions and misconceptions about academia
- the existence of other available opportunities for collaborations

## 7.2 Students' decision to apply for an Industrial CASE studentship

95. A student's decision to apply for or accept a particular studentship is influenced by many different factors including research area, academic supervisor, prestige of the institution, prestige of the funder, geographical location and other studentship offers. Several factors are distinct to Industrial CASE studentships, such as the studentship's increase stipend compared to other non-CASE Research Council studentships, the industry placement and an interest in the bioscience industry. All three of these factors were a positive influence on students' decisions to accept the Industrial CASE studentships. The industry placement was the most influential, followed by an interest in the bioscience industry and the studentship's increased stipend. This underlines the importance of ensuring that the requirement to provide an industry placement is met.



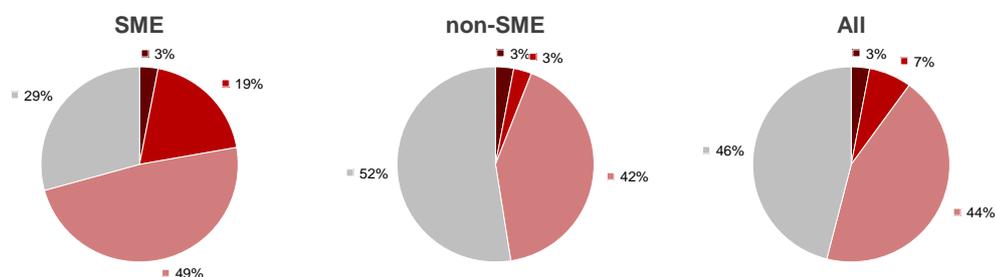
96. It is important that students are able to make an informed decision about whether to apply for or accept a CASE or non-CASE studentship. 61% of students were aware of the differences between CASE and non-CASE studentships at the time they were applying for studentships, and 64% were aware of which of the available studentships were CASE or non-CASE. Overall, 56% of students were aware of both of the above. This is a concern as all students need to be aware of what they are committing themselves to at the outset, including the benefits and constraints of CASE studentships.

## 7.3 Financial contributions from the industry partner

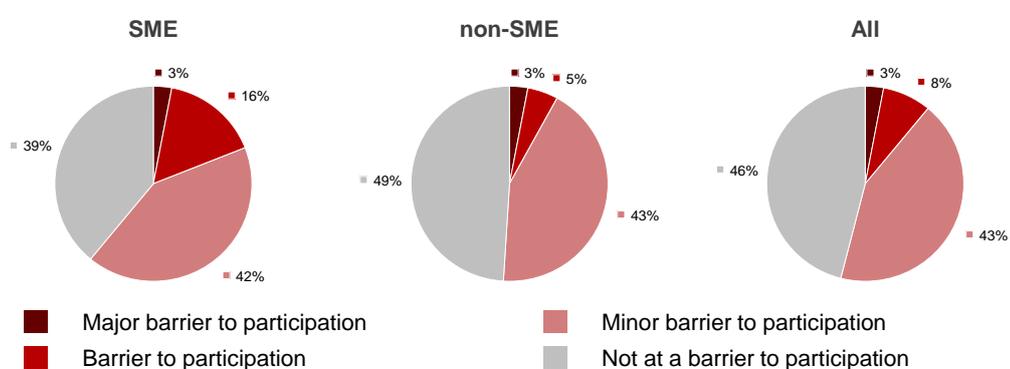
97. At the time of the evaluation, the Industrial CASE scheme required industry partners to make the following minimum level of financial contribution to the cost of the studentship:
- £2500 per annum contribution to the student stipend
  - £1400 per annum contribution to the studentship project costs
  - all additional expenses incurred by the student as a direct result of attendance at the premises of the company (e.g. travel and accommodation)
98. In general, the requirement for industry companies to make financial contributions to Industrial CASE studentships is appropriate and these contributions demonstrate the industry partner's commitment to the studentship. Moreover, industry partners often make substantial contributions over the minimum requirement (either in cash or 'in-kind') and the provision of the industry placement is also a significant contribution. 'In-kind' contributions from industry are very valuable and BBSRC should examine whether they could be considered as part of the application assessment process.
99. There was only limited evidence that industry contributions to the increased student stipend had helped attract the best students to Industrial CASE studentships, and this was not the main driver for student participation in the scheme: students indicated that the opportunity to participate in an industry placement and an interest in the bioscience industry were both more influential drivers (see section 7.2). Industry contributions to studentship project costs were appreciated by academic partners, but most respondents noted that the minimum contribution was too small to make a notable difference to the quality of research projects.
100. The Industrial CASE scheme represents good value for money for industry and industry partners can realise many benefits from their participation. The minimum industry contribution now represents a smaller proportion of BBSRC's investment in each studentship than in the past; the minimum contribution has remained the same for many years, whereas BBSRC's contribution has increased through both higher student stipends and the increased Research Training Support Grant. It would not be appropriate to increase the level of industry contribution as this would work against efforts to broaden participation, particularly in the current economic climate. BBSRC should re-emphasise that the Industrial CASE scheme is about student training and that this is why the majority of the funding is provided by the public sector.
101. The requirement for industry to make financial contributions to Industrial CASE studentships is a barrier to participation in the scheme for some companies (e.g. SMEs, particular industry sectors, companies with low profitability). This is a complex issue, but BBSRC should consider lowering the level of contributions for such companies to encourage their participation in the scheme. The Panel noted that the MRC's Industrial CASE scheme covers the costs of the financial contributions for SMEs. It is not ideal for different Research Councils to have different approaches to financial contributions and further harmonisation in this area should be encouraged.

## Industry supervisors' assessments of whether the financial contribution requirements are a barrier to participation in the Industrial CASE scheme

### Contributions to student stipend



### Contributions to studentship project costs



## 7.4 Provision of the industry placement

102. In general, the requirement to provide an industry placement was not a barrier to industry partners' participation in the Industrial CASE scheme, and for many it was a very positive feature. The most commonly identified aspect of the industry placement which could be a barrier to participation was insufficient industry staff time. Among SME partners, the meeting of additional expenses incurred by the student could also be a concern. The placement's six-month duration requirement was identified as a potential barrier by some industry partners and lowering this to three months may help to encourage wider participation in the scheme.

## 7.5 Agreeing the terms of the collaboration

103. Experiences with agreeing the terms of the collaboration were varied and dependent on the approach of individual organisations. The process could be relatively straightforward or contentious, and there was agreement among respondents from academia and industry that it would be beneficial if the process could be made simpler and smoother. Issues which often required further discussion included: industry partners' understanding of the purpose of collaborative training awards, the balance of public and private sector funding, the payment schedule, ownership of IP, disclosure of research findings and provisions for withdrawal from the studentship.

104. There could be particular tensions around the ownership of IP arising from the studentship, as well as any background IP owned by the academic institution or by the industry partner. The Panel noted that, in general, relatively little IP comes out of studentships and that it would be better for industry to use mechanisms other than studentships to support academia-industry collaborations which were trying to develop IP.
105. BBSRC should continue to encourage academia and industry to use model collaboration agreements (e.g. the Russell Group Studentship Agreement). Links to model agreements should be included in any guidance provided by BBSRC.

## 7.6 The research community's perceptions of the Industrial CASE scheme

106. CASE is a strong and respected brand. However, individual researchers in academia and industry have different perceptions and some misconceptions about the purpose of CASE studentships. BBSRC's aims for the Industrial CASE scheme are not clear to the academic and industry research communities, and the lack of clarity over the primary aim of the scheme can create tensions between academia and industry partners. In particular, there was some confusion as to whether the primary aim of the scheme is to support excellent doctoral training or to support academia-industry collaborations which benefit UK business. These two goals are not mutually exclusive and the most successful studentships were those which were beneficial to all parties. Nevertheless, BBSRC should make clear that the priority of the scheme is high quality student training.
107. BBSRC should develop an Industrial CASE studentship 'user guide' which is directed at students, academia and industry partners. The guide should describe BBSRC's aims, priorities and expectations for the scheme. It is important for BBSRC to distinguish between the mandatory elements of the Industrial CASE scheme and other guidelines and advice. It would also be helpful for BBSRC to develop case studies of successful Industrial CASE studentships. These should highlight the specific achievements of the Industrial CASE scheme in comparison with non-CASE, illustrate existing best practice, and demonstrate the types of benefits which can arise from participation in the scheme. CASE studies should also be used to manage the expectations of students, academia and industry.

# 8. Application and administration processes

## Summary

- The Industrial CASE scheme's application and assessment processes are good, but there is scope for improvement
- The success rate for iCASE applications is very high compared to other BBSRC funding
- The provision of iCASE studentships as individual awards can work against BBSRC's other objectives for studentship funding
- BBSRC's processes for selecting ICP 'Partners' and determining their studentship allocations are not transparent
- It is good that BBSRC is working together with other Research Councils to harmonise CASE scheme processes
- The iCASE and ICP variants of the Industrial CASE scheme are both effective mechanisms for supporting collaborative training with industry

## Key recommendations

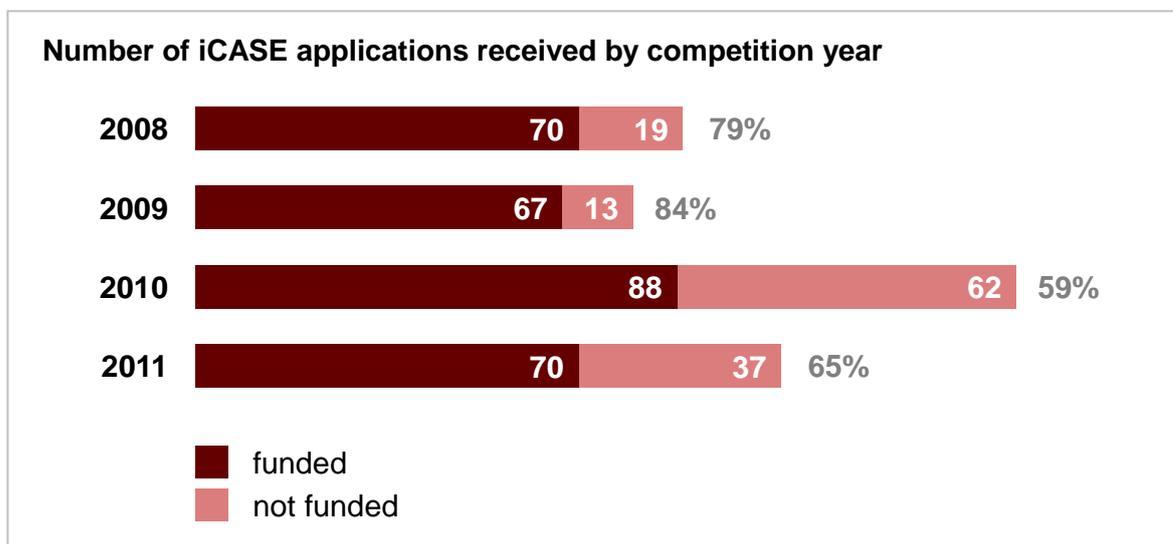
- BBSRC should provide details of the current ICP 'Partners' on its website
- BBSRC should consider selecting ICP 'Partners' through open competition
- Applicants' records with past Industrial CASE studentships should be considered as part of the assessment process

## 8.1 iCASE studentships

108. The two variants of the Industrial CASE scheme each have their own application and assessment processes. For iCASE studentships, this is an annual competition which is open to company-led or academic-led applications. The application process is managed by BBSRC and, at the time of the evaluation, applications were assessed by the Training Awards Committee (TAC) which included representatives from academia and industry.

109. The majority of academic and industry supervisors were satisfied with the iCASE studentship application and assessment processes. It is positive that applications can be made by academia and industry, and important that industry is involved in the assessment of iCASE applications. However, it is not helpful that BBSRC's guidance for iCASE studentships has two different descriptions for 'academic-led' and 'company-led' applications. This suggests that there are different expectations for these two types of Industrial CASE studentships and works against providing a clear vision of the aims of the scheme. In recent years, there have been delays to the formal announcement of awards, which was also a concern.

110. The success rate for iCASE studentship applications is very high compared with other BBSRC funding. While it is important for industry-facing schemes to have success rates which encourage industry participation, there is a risk that this could result in lower quality studentships being funded. The number of applications to the Industrial CASE scheme is expected to increase following the introduction of the new DTP programme, which funds fewer studentships and a smaller number of institutions compared with the previous Quota DTG competition.



111. The provision of iCASE studentships as individual awards can work against BBSRC's other objectives for studentship funding. For example, compared with a block award, there are fewer opportunities to develop student cohort identity, enable flexible use of funding, and ensure institutions are accountable for the use of the funding. Nevertheless, it is good that BBSRC supports doctoral training through the iCASE mechanism. iCASE studentships can be very successful and some of the most exciting Industrial CASE studentships are 'one-off' collaborations supported through iCASE.

112. BBSRC may wish to consider whether Industrial CASE studentships could be awarded as part of an institutional BBSRC cohort. In this context, BBSRC could also consider whether academic institutions should meet a training quality threshold to be eligible for Industrial CASE studentship funding (for example, as evidenced by holding a DTP).

## 8.2 ICP studentships

113. For the ICP variant of the Industrial CASE scheme, BBSRC provides 'Partner' organisations with an allocation of ICP studentships which the 'Partner' awards using their own application and assessment processes. This may involve an internal competition within the company or an open call focused on a specific subject area (e.g. for Biosciences KTN).
114. Academic supervisors of ICP studentships were generally positive about the application processes used by ICP 'Partners' and, in particular, the Biosciences KTN application process was praised for its light-touch and timely approach. However, other academic supervisors were concerned that some of these processes were not open or transparent. There was a perception among some academic researchers that ICP 'Partners' tended to collaborate with preferred academic researchers and institutions and it was therefore difficult for other academics to access ICP studentships. Academic researchers also noted that it could be difficult to determine which companies are ICP 'Partners' or how to contact them if they had a proposal for a studentship. It would be useful for BBSRC to provide details of the current ICP 'Partners' on its website.
115. It is not clear to the research community how BBSRC selects ICP 'Partners' and determines their studentship allocations. Historically, BBSRC has invited companies to apply to become 'Partners' based on their iCASE studentship record, with the Bioscience for Industry Strategy Panel approving the 'Partner' and their studentship allocation. However, there is no formal mechanism by which organisations can apply to become ICP 'Partners'. In addition, it is not clear how BBSRC determines whether to renew a company's status as an ICP 'Partner' at the end of each allocation period. Overall, the process for selecting ICP 'Partners' is not transparent and BBSRC should consider selecting ICP 'Partners' through open competition.
116. The provision of studentship allocations through the ICP variant of the Industrial CASE scheme is very useful. For example, the allocation of studentships covering several years' intake allows for greater flexibility and planning among ICP 'Partners' and BBSRC can develop stronger relationships with 'Partner' companies. They can also increase the chance of a collaboration being established, as the company can approach a potential academic partner with funding already available. However, there is a risk that ICP studentships could work against the idea of a joint studentship. For example, student projects may be industry-led rather than developed through discussions between the student, academic supervisor and industry partner.

## 8.3 General

117. The Panel identified some issues with aspects of the Industrial CASE scheme's application and assessment processes which are common to both iCASE and ICP studentships. For example, at the time of the evaluation, BBSRC's vision for CASE studentships stated that an excellent CASE studentship should incorporate a high-quality research project which stimulates hypothesis-driven research. This definition excludes projects which focus on technology development and BBSRC should consider changing the statement so that such projects are eligible<sup>17</sup>. It would also be helpful for applicants' track records with previous Industrial CASE studentships to be considered as part of the assessment process, although it is recognised that this will be easier for ICP studentships than iCASE studentships.
118. Overall, there are clear benefits to BBSRC supporting iCASE and ICP studentships, and both these variants of the Industrial CASE scheme should be retained. The two types of studentship have distinctive roles and are effective mechanisms for supporting collaborative training with industry.

## 8.4 Harmonisation with other Research Councils

119. BBSRC and other Research Councils support too many different CASE studentship schemes which vary considerably in their features (e.g. duration of studentship, duration of industry placement, financial contributions from industry, student stipend, remit, application processes, application forms, application deadlines). The proliferation of different CASE studentship schemes is not helpful to academic or industry research communities. Academia and industry recognise the CASE brand rather than individual Research Council CASE studentship schemes.
120. It is good that BBSRC has been working together with other Research Councils to improve understanding of their respective studentship schemes and harmonise processes where appropriate. It is encouraging that BBSRC and MRC now manage their Industrial CASE schemes concurrently and with the same deadline, which allows for the transfer of applications between Councils.

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<sup>17</sup> BBSRC has subsequently amended this statement to refer to 'discovery-oriented' research.

# 9. Conclusions and future perspectives

## Summary

- The Industrial CASE scheme is an important part of BBSRC's training portfolio
- Industrial CASE studentships have the potential to deliver a wide variety of additional benefits compared with non-CASE studentships
- The Industrial CASE scheme is contributing to BBSRC's strategies for training and engagement with industry
- BBSRC should maintain its support for the Industrial CASE scheme
- There is a need for BBSRC to refresh the scheme to ensure that it remains effective and distinctive in comparison with non-CASE studentships

121. The Industrial CASE scheme is a successful mechanism for supporting high-quality doctoral training in partnership with industry and is an important part of BBSRC's training portfolio. Industrial CASE studentships have the potential to deliver a wide variety of additional benefits compared with non-CASE studentships, including benefits to students, academia, industry and the wider UK economy. For example, the scheme has enabled students to develop skills which could not be acquired in an academic setting, realise excellent career development outcomes, and develop a deeper awareness of the wider context of their research. More broadly, the scheme has helped establish new collaborations between academia and industry, leverage expertise and financial support from user communities, and provide industry with access to academic research. However, there are several areas where the objectives of Industrial CASE scheme are not being met and there is a need for BBSRC to refresh the scheme to ensure it remains effective.

122. It is essential that the Industrial CASE scheme provides a distinctive training experience in comparison with non-CASE studentships. However, for some Industrial CASE studentships the training experience or associated outputs are not sufficiently different from those of non-CASE studentships. In this context, it is important that BBSRC ensures that the Industrial CASE scheme's requirement for an industry placement is met for all studentships. The industry placement is the primary mechanism for delivering the industry-led training, a strong driver for student participation in the scheme, and ensures that the CASE studentships are distinctive compared with non-CASE. Looking forward, it is important that BBSRC develops mechanisms to monitor student participation in industry placements and capture the outcomes and achievements of individual studentships.

123. BBSRC's objectives for the Industrial CASE scheme are not sufficiently clear to the academic and industry research communities. In particular, it is not clear whether the primary purpose of the scheme is to support excellent doctoral training or to support academia-industry collaborations which benefit UK business. While these two goals are not mutually exclusive, BBSRC should make it clear that the priority of the scheme is student training. It is likely that the lack of clarity over the primary aim of the scheme has contributed to tensions between academia and industry partners, and to inconsistent training experiences for students.

124. BBSRC should develop additional guidance for the Industrial CASE scheme which clarifies the scheme's objectives, illustrates best practice and demonstrates the potential benefits from participation. Although Industrial CASE studentships offer a variety of benefits, the interactions between students, academia and industry partners can also create additional challenges and it is important to manage the expectations of all participants. It is particularly important that students are aware of the benefits and constraints of CASE studentships at the outset. The most successful Industrial CASE studentships tended to be those where there was a genuine partnership between the student, academic supervisor and industry supervisor, and where there was 'buy-in' from all parties to the aims of the scheme. BBSRC should encourage all individuals involved in an Industrial CASE studentship to meet at the outset and develop a plan for a joint student project.
125. A good variety of academic researchers and industry partners have participated in the Industrial CASE scheme. However, there is scope to broaden participation in the scheme further. There are barriers which may limit the participation of academia and industry, and BBSRC should consider how these could be addressed. For example, the requirement to make financial contributions can be a barrier to participation for SMEs, particular industry sectors and companies with low profitability, whereas the difficulties with identifying suitable industry partners could be a barrier to participation for academic researchers.
126. BBSRC supports two variants of the Industrial CASE scheme, iCASE and ICP. These two types of studentships are both effective mechanisms for supporting collaborative training with industry, have distinctive roles, and should be retained. There are opportunities to improve the associated application and assessment processes and, in particular, the process for selecting ICP 'Partners' should be made more open and transparent.
127. Overall, BBSRC's investment in the Industrial CASE scheme has been successful and the scheme is contributing to BBSRC's strategies for training and engagement with industry. In collaboration with industry, the Industrial CASE scheme is delivering highly-skilled workers to the UK economy. BBSRC should continue to invest in the Industrial CASE scheme in the future, but should also refresh the scheme to ensure that it remains effective and distinctive from non-CASE studentships.