The Economic Impact of the Babraham Research Campus

Report to:

Babraham Research Campus Limited (BRCL) and the UKRI-Biotechnology and Biological Sciences Research Council (BBSRC).

FINAL REPORT IN CONFIDENCE

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Acknowledgements

Babraham Research Campus Limited (BRCL) and their campus partner and freeholder (UKRI- Biotechnology and Biological Sciences Research Council commissioned a research team led by Cambridge Economic Associates and comprising the Centre for Business Research, Cambridge Econometrics, Savills and Professor Lisa Hall to assess the economic impact of the Babraham Research Campus to include the Babraham Institute as a campus partner.

The new study had the objective of updating the study that was undertaken in 2019[1].

The outputs from the impact assessment will be used to inform the future development of the Campus and to demonstrate the contribution it makes to Cambridge and the British economy.

The research team Director has been Professor Peter Tyler, supported by Angela Brennan and Colin Warnock from CEA. Dr Andy Cosh, Senior Research Associate, directed the research team from the Cambridge University Centre for Business Research (CBR) working with Dr Giorgio Caselli, Research Fellow at the CBR. Shyamoli Patel, Principal Economist, directed the Cambridge Econometrics input, supported by Daniel Seymour, Project Manager. The research input from Savills was directed Ryan McKenzie, Director, Planning and Economics. The research team has also been supported by Professor Lisa Hall, Professor of Analytical Biotechnology in the Department of Chemical Engineering and Biotechnology at the University of Cambridge.

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[1] https://www.babraham.com/media/0wyjdtzl/brc-impact-report-210520-na-web.pdf

CONTENTS

Executive Summary

Objective of the study

Babraham Research Campus Limited (BRCL) and their campus partner and freeholder (UKRI-Biotechnology and Biological Sciences Research Council commissioned a research team led by Cambridge Economic Associates and comprising the Centre for Business Research, Cambridge Econometrics, Savills and Professor Lisa Hall to assess the economic impact of the Babraham Research Campus to include the Babraham Institute as a campus partner.
The new study had the objective of updating the study that was undertaken in 2019[2]. The outputs from the impact assessment will be used to inform the future development of the Campus and to demonstrate the contribution it makes to Cambridge and the British economy.
Babraham Research Campus

Key Findings

The development of the Babraham Research Campus

The Babraham Research Campus (BRC), developed and managed by the Babraham Research Campus Ltd (BRCL), is located on over 430 acres (174 Hectares) in a parkland environment, approximately 10km south-east of Cambridge. BRC was initially occupied and developed by the Agricultural Research Council in 1948, who developed the campus's first research and laboratory facilities in the 1950s. In 1993 the 'Babraham Institute' phased out agricultural research, and adopted its current biological research specialisation of epigenetics, signalling and immunology. In 1998 the Institute launched the Babraham BioIncubator and established a company (Babraham Bioscience Technologies or BBT) to manage the Incubator to support 'start-up' bioscience companies. Since then, the incubator has grown and evolved to become the Babraham Research Campus (BRC) and BBT has become BRCL. The freehold owner of the campus is the UKRI-Biotechnology and Biological Sciences Research Council (UKRI-BBSRC), who lease the campus to the Babraham Institute (BI) and Babraham Research Campus Ltd.

The BRC co-locates the Babraham Institute with bioscience businesses, at various stages of their business lifecycle, promoting links between academia and business. The BRC provides approximately 475,000 sq. ft. of research facilities, services, and commercial space, available on flexible terms for life-science startups and more established businesses seeking to scale up their operations. There are other laboratory providers on the campus who have constructed R&D buildings available to let: Kadans and Biomed Realty. The latter has also entered a joint venture with BRC on the construction and letting of a new laboratory building.

The direct, indirect and induced economic impact of the Campus

In 2022/23, the Babraham Research Campus and the companies located on the Campus spent £578.2m on their operational activities, resulting in a direct GVA impact of £199.7m in the UK. This generated further activity elsewhere in the UK economy through supply chains (indirect impacts) and household spending (induced impacts), resulting in a total GVA impact of £537.9m.

The Campus directly supported nearly 2,000 jobs on site, which, by generating activity elsewhere, supported an additional 7,400 jobs across the UK economy, resulting in a total employment impact of 9,400 jobs.

The previous study, published in February 2020, estimated that the companies located on the Campus spent £303.5m on their operational activities in 2017/18, resulting in a total GVA impact of £285.7m, which supported 4,270 FTE jobs across the UK. While it is not possible to

[2] https://www.babraham.com/media/0wyjdtzl/brc-impact-report-210520-na-web.pdf

compare the results of the two studies directly, as the assumptions and availability of data have changed since the previous analysis, it can be inferred that the economic impact of the Campus has grown considerably over the period 2017/18 to 2022/23. The more recent growth has been driven primarily by the increase in R&D spending by companies located on the Campus. Much of this increase in R&D spend reflects the increased maturity of the companies located on the campus and the move into preclinical and clinical activities.

Quantifying wider business impacts

The BRC is home to a vibrant 'cluster within the Cambridge cluster' of start-up and scale-up bioscience companies operating alongside world-leading academic research from BI. The supportive and collegiate environment provided by the BRC has benefitted Campus companies in a number of important ways, ranging from the availability of suitable premises on flexible lease terms, access to scientific equipment, expertise available at BI, proximity to other organisations making up the Cambridge cluster and underlying support services.

The 44 companies included in the 2023 survey have an average age of just under 9 years. Two-thirds of the companies have up to 10 years of age, while companies that have been in operation for more than 15 years represent 14% of the total. These figures vividly illustrate the diversity of life science ventures located on the BRC. The diversity of age profiles has also increased over time, underscoring the successful role played by the Campus in supporting all stages of life science venture.

These 44 companies employ over 1,500 staff worldwide and have raised more than £1.6bn to date. About one-third of these companies originated out of academic research [and intellectual property] conducted at the University of Cambridge, while over three-quarters have accessed BI's scientific facilities at least once over the period 2013/14-2022/23. The number of staff employed worldwide and funds raised to date are higher in the latest survey than in our 2019 survey, along with the proportion of Campus companies using the science services made available by BI.

Our comparison of the main business and science locations across the Cambridge region further highlights some of the distinctive features of companies located on the BRC, including their relatively young age and small size. BRC-based companies have achieved fast growth in employment and performed well against companies located on other research locations in recent years, confirming the major role played by the BRC as a hotspot for life science research and innovation within the Cambridge cluster.

The BRC emerges as the campus with the greatest specialisation in life sciences across the research locations assessed– 97% of the companies and close to 100% of employment. It also ranks in the top three business locations in the wider Cambridge region for total R&D spend over the last three years (£727m). Overall, R&D spend by companies on the BRC accounted for over 17% of total R&D spend by life science companies located on any of these locations. Another figure that is most revealing of the vibrancy of the BRC is the number of companies carrying out R&D – it is estimated that 5 out of 6 businesses on the Campus engaged in R&D activity over the last four years, the highest figure by far across all locations.

The comparison against 2019 figures portrays a picture of an increasingly more dynamic business base on the BRC, as exemplified by the considerably higher R&D activity of 2023 occupiers compared with the 2019 study.

These figures, which are all the more remarkable if one considers that Campus companies' R&D happened against a backdrop of unprecedented uncertainty and disruption to business associated with the Covid Pandemic, point to the BRC as a key component of the innovative milieu of the Cambridge cluster.

The scale of investment in Campus companies and Investors returns

Over the past decade, companies located on the BRC have been able to attract a considerable amount of commercial investment from a diverse pool of investors, including IP Group, BGF, LifeArc Ventures, M Ventures, Sofinnova Partners and SV Health Investors. Campus companies have raised over £1.6bn to date, up from £1.2bn in the 2019 study. This suggests a market capitalisation of the campus companies in excess of £3.1 Billion.

The survey findings show that the support structure provided by the BRC has made an important contribution to the fundraising activity of Campus companies. Four out of five respondents consider their location on the BRC as having some importance for facilitating their fundraising, with one out of four respondents feeling that their BRC location was either very important or critically important. Campus companies estimate that being located on the BRC has accelerated their fundraising by 6 months (2019 survey: 3 months) and increased the amount of funds raised to date by 20.0% (2019 survey: 10.0%).

Fundraising by Campus companies has been facilitated further by the support provided by the University of Cambridge. Over the years, a number of current and past Campus companies have been sponsored, developed or financed with the help of Cambridge Enterprise and Cambridge Innovation Capital.

Our ownership concentration analysis for the largest 16 Campus companies by market value suggests that investors' appetite for these companies has increased over time. The majority of the companies saw their ownership become more dispersed over the last five years, reflecting their ability to secure funding from an increasingly large pool of investors. Some companies were also fully acquired in recent years, again demonstrating the appetite of the market for these innovative bioscience businesses.

The comparison with other business locations in the wider Cambridge region further illustrates how dynamic (and successful) Campus companies have been in their fundraising activity. The BRC has one of the highest total amounts of funds raised by companies located on business and science locations over the last three years, with 5 out of 6 companies raising finance over the last five years. The Campus also has the largest total amount of finance raised by life science companies across all locations.

Overall, our business locations analysis points to an ever more dynamic fundraising activity by Campus companies at the last count. Whilst the average annual amount raised by each company has remained unchanged (£4.3m in both the 2023 and 2019 studies), total fundraising in the last three years has increased from £169.7m in the 2019 study to £208.3m in the current study. The number of BRC-based companies raising finance during the same period has also gone up from 34 in 2019 to 47 in 2023.

Investors painted an extremely positive perception as to what they considered to be the quality of the Babraham Research Campus and the very significant and positive impact it was making to building the capacity of the life science sector in Cambridge and the UK economy overall.

The Babraham Institute's contribution to science, knowledge and societal health

The evidence shows that the strategically focussed effort at BI "through excellence in discovery life sciences research and training………… to be an international leader for research on lifelong health and healthy ageing" provides a critical mass of talented research leaders, having overlapping but distinct research areas that can produce outstanding scientific outcome. The BI research output is generally world leading and the model is entirely fit for purpose. We should note that the Babraham Institute is strategically funded by UKRI-BBSRC in terms of both programmes and core capabilities.

This is not to say that BI are the only world leaders in the mechanism of ageing, nor that the critical mass is the only key ingredient to the BI model. Indeed, it is the unique combination of strategic focus, state of the art serviced research facilities, with their own agenda of excellence in innovative methodology development, and the BRC providing a translational culture and collaboration opportunities. This synergy provides a research drive that also looks beyond the fundamental scientific research discovery to the potential impact of the research findings in lifelong health.

Achieving and maintaining this environment has been the passion of the Leadership teams and their ability to work in concert with the researchers and support staff, so that discovery is driven from all levels. During the current review period there has been a high staff turnover with a number of new GLs establishing themselves at BI. Their areas of expertise and track record to date suggest that BI are continuing to make 'high-flying' appointments, but this will be tested in the next period when their publication and output metrics should begin to match those of the established GLs.

Furthermore, the success of the strategic vision to produce significant understanding of "Proteostasis across the life course" is a Key Performance Indicator of the BI model and its ability to drive advances in a singularly focused theme through cross Institute Strategic Programmes (ISP) collaboration, without dilution of the ISP themes. The evidence for spin-out is also encouraging with some new foundations established in the current review period having exciting potential. However, success, dissolution and general progress of these spin-out companies also provides useful lessons in translation and longevity, many of which are also being learned by the BRC companies.

There is good evidence that the BI Knowledge Exchange and Commercialisation team has provided entrepreneurial mentorship and brokered translation of research innovations from within, but it is more difficult to assess whether this can be improved and the unique environment can be further exploited to enable more early translational high risk research and development, without compromising the BI mission for fundamental innovative excellence in science. At one end, the BRC provides a wealth of experience in active translation and at the other end BI provides excellence in Discovery Science and state-of-the-art science facilities. Is the space in between also world leading in the BI/BRC model?

The impact on the Cambridgeshire innovation system

Research campuses can play a major role in this respect by providing 'neutral space' for interaction to occur and also by encouraging educational programmes, mentoring, facilitating networks, engagement and research that will develop the understanding and the personal and interpersonal skills required. Research shows that[3] success requires attention across all the systems including building the capacity of the knowledge base, the quality of the physical place and infrastructure including the provision of premises, the financing of enterprise and also entrepreneurship and the fostering of business and industry networks.

The Babraham Research Campus has provided a major role in this respect. It runs accelerator and soft-landing programmes that shape business development, and it also assists businesses to obtain funding from a wide variety of sources and obtain specialist advice and mentoring support. Venture finance from outside the Cambridge sub-region has become of increasing importance in recent years. There is co-location of a vibrant community of start-up and scale-up companies with world-leading academic research from Babraham Institute, as well as the opportunity for these companies to access a range of state-of-the-art scientific facilities provided by the Babraham Institute.

[3] *Enterprising Places; Sustaining Competitive Locations for Knowledge –Based Business*, (with Baxter, C, Moore, B, Morrison, N, McGaffin, R and Otero-Garcia M). CMI-MIT Research Series, Cambridge. 2007.

The evidence from the key stakeholders in the Cambridge innovation ecosystem supports the strong contribution that BRC is making to the development of the Cambridge life science innovation system and building the capacity of the life-science cluster. Respondents emphasised that the provision of new-start up and accelerator space was of particular importance, as was the attraction of funding and the provision of facilities and services to assist with the development of life science companies.

The Campus is helping to expand the knowledge base and the commercialisation of life science research. These findings are much in line with the findings from companies in 2019. Similar views tended to be expressed by each category of respondents questioned.

The impact on the property market

The impact of BRC on the local property market was assessed by in-depth analysis of the office and lab markets across Cambridgeshire, building bespoke clusters of research and science locations.

The BRC is a world-class bio-technology research location located south of Cambridge and co-locating start-up and scale-up enterprises with the Babraham Institute. The BRC hosts 475,000 sq. ft of state-of the art facilities, including 133,000 sq. ft of flexible lab and office space delivered in partnership with BioMed Realty.

One of the key characteristics, which differentiates the BRC from the broader market, is the provision of lab space, co-located with a public funded institute and flexible lease terms tailored to R&D start-ups (average lease term of 3.4 years compared to 7-9 years in other areas of Cambridgeshire).

BRC has made a significant contribution to the Cambridgeshire property market through its provision of specialised start-up and scale-up space being life science property investors on site with a joint venture with BRCL access to science facilities (e.g. cell sorting capabilities), and lease terms tailored to the needs of start-ups. Kadans and Biomed Reality have long-lease agreements with UKRI-BBSRC.

The BRC has created an agglomeration effect, attracting inward investment and occupier demand, that has driven a significant uplift in net absorption and structurally lower vacancy amongst research locations in the surrounding area.

Reflecting this, the lab market surrounding the BRC has outperformed a similar sub-market in Cambridgeshire (with comparable amenity, infrastructure, and location), with net absorption 4.9% higher per annum, vacancy 1.1% lower on average, and delivery of 97,500 sq. ft more new stock per annum.

Bringing the impacts together and assessing the economic additionality of the Campus

A key objective of the Research has been to assess the economic additionality to economic growth that BRC creates, including additional activity for the UK as a whole. This element of the research assessed:

- the importance of being located on the BRC to the companies located there in terms of a) accelerating scientific advances for various outcomes, b) facilitating fundraising, c) increasing the number of employees and d) providing flexible and affordable space.
- the impact of the BRC on business growth.
- the growth in value of Campus companies and the contribution of the BRC to this value
- the additional UK economic activity (GVA) associated with the Campus

- the cost to the public sector of its contribution to the Campus and bring costs and benefits together to derive a Benefit Cost Ratio.

Impact of BRC location

Table 1 summarises Campus companies' estimates of the impact that their location on the BRC has had on their business. Mean and median figures from the 2019 survey are included for comparison.

Table 1 Impact of location on the Babraham Research Campus

	Mean		**Median**			
	2019 survey	**2023 survey**	**2019 survey**	**2023 survey**		
Accelerated scientific discovery process by	5.1	8.0	3	6	months	↑
Accelerated fundraising by	5.2	6.9	3	6	months	↑
Increased fundraising to date by	11.4%	25.0%	10%	20%	%	↑
Increased number of employees by	21.6%	101.6%	10%	50%	%	↑

Number of responses: 25 (2019 survey); 26 (2023 survey)
Source: CBR.

Focusing on the median results (which is less affected by extreme values) the 26 Campus companies who responded to the additionality question, estimated that being located on the BRC had accelerated their scientific discovery process and fundraising by half a year. These companies also estimate that the amount of funds they have raised to date is 20% higher as a result of their location on the BRC, while the number of employees was increased by 50%.

The 2023 additionality figures are even more remarkable when compared against the 2019 figures. The estimated impact is twice as high as in the 2019 survey in terms of scientific discovery process and fundraising, and five times higher in terms of number of employees. Overall, the figures analysed reveal an increasing additionality impact of the Campus on its companies.

Return to investors

To examine returns to investors and market values, the research focused on the largest 16 companies on the Campus by market value (£20m or more). These 16 companies represent almost 90% of the funds raised to date by all Campus companies. Market values cannot be precisely measured and can be subject to very large changes in response to a single event such as a successful drug trial, or a new discovery by a competitor. The research made reasonable estimates of market value utilising one, or more, of three approaches: the value established at the latest funding round; the value given by Dealroom.co, or the value implied in the report and accounts of an investor in the company. Although we believe in the reasonableness of our estimates, we present them here in aggregate, anonymised.

The aggregate results suggest that the total market value of the Campus companies has risen to £3.15bn. The values range from £869m down to £0.75m. The largest 16 companies in terms of market value have 6 in the range £15m to £99m; 9 between £100m and £500m; and one valued at £869m. These values represent significant potential returns to the investors. The total market value of the largest 16 companies is £3.07bn and, by the valuation dates, the investors have put in £1.4bn in total. This gives a 2.2 times return on their investments on average. This ratio varies between 0.4 and 9.7 across the 16 companies.

The total market value of Campus companies in 2023 (£3.15bn) is somewhat lower than the total market value in 2019 (£4.07bn). This mainly reflects the different contribution to total market value made by the company with the highest valuation – £869m in 2023 (28% of total market value) and £2.6bn in 2019 (64%). It follows that the average market value of the other, smaller companies is much higher in 2023 than it was in 2019.

Of course, these returns represent the progress to date and can be subject to sudden and very large swings on the basis of drug trial results, change in partnerships, or an undermining success of a competitor.

Additionality of the BRC on the value of companies

The question of the scale of the value-added provided to the companies by their location on the BRC is even more difficult to answer. However, the research attempted to get an estimate of this figure by drawing upon the replies given to us about the benefits they derived from their location on the Campus. If we look at their responses to how much the Campus had accelerated their scientific discoveries and fundraising, the median was 6 months in each case.

Making use of the valuations of the companies in 2023 discussed above we can estimate for each company what this represents in terms of the addition of market value per year. The total across the 16 companies that dominate the current set of companies on the BRC amounts to £356m per year. If the contribution of the BRC to this figure is taken at one-half, in line with the medians above, this puts the contribution to the growth in value of these companies at £178m per year – a sizeable achievement which is close to the £191m figure from the 2019 study. It is also important to bear in mind that these figures do not include the contribution the BRC has made to the growth in value of the 'graduates' (analysed in Chapter 4), who had a total valuation of £1.04bn in 2023.

Additional UK economic activity (GVA) associated with the Campus

Additionality is the real increase in social value that would not have occurred in the absence of the intervention being evaluated, where in this case the intervention supported is the Babraham Research Campus. There are benefits to society, and thus an increase in social value, from increased scientific discovery since this will translate into improvements in health and the welfare of people in society in the United Kingdom, but also around the world. Increased quality of life and reduced mortality result. These can be valued. It is also the case that additional activity created on the Campus translates into GVA and employment.

A strict, narrow interpretation, of additionality would focus simply on whether the activity would otherwise have occurred with zero (no additionality) representing all of the activity would otherwise have occurred to 100% where all of the activity is totally additional. However, a *broader* interpretation should also include enhancements to quality of outcome and the ability of the intervention to speed things up. The evidence referred to earlier in this Section indicates that the Babraham Research Campus has been able to increase both *scale* and *speed* of delivery of the life-science product. It would be very surprising if it had not also improved *qualit*y as well, but that is inherently difficult to assess.

The study provided an assessment of the increase in GVA and employment associated with the Campus for the United Kingdom as a whole over broadly the period 2011/12-2022/23. Based on the views expressed by the businesses on the Campus, the *additional* GVA was calculated by removing deadweight (what would otherwise have occurred in the absence of the Campus). Evaluation Guidance varies on how long the GVA might be expected to persist and thus what should be the NPV. Conventional approaches that have assessed the land and property market benefits created or supported by Government intervention have adopted a ten year profile but it is obviously possible to adopt different profiles and adjust the NPV accordingly with a lower option being five years. This research adopts a ten year profile, which would seem appropriate given that the floorspace on the Campus is expected, by its very nature, to continue to longer term benefits.. HM Treasury indicates that the NPV of this should be calculated using a discount rate of 3.5%.

Before assessing the NPV it is important to calculate the overall *net* additionality to the United Kingdom as a whole and this requires allowing for how much of the activity would otherwise have not been located in the UK in the absence of the Babraham Research Campus and also possible product market displacement. The survey of Campus companies provided evidence where the companies would have probably located if the Babraham Research Campus had not existed and a figure of 15% would seem to be appropriate for companies who would otherwise have relocated outside of the United Kingdom. Product market displacement has been assumed to be of the order of 20% drawing on previous research[4].

After allowing for displacement the net additional GVA NPV at the UK level is £353.7 million at 2024/25 prices.

The cost of the public sector contribution to the Campus and its development

It is not straight forward to assess the true level of overall public sector support that has underpinned the development of the Babraham Research Campus. A number of issues arise. The public sector has provided grants and loans to encourage the development of research and, in recent years, the economic development potential of the site. The land is owned by the public sector and as the landowner the public sector can accrue ground rent. It is understood that this was only at a pepper corn level until 2020. A new lease signed in December 2020 is now based on a market rent discounted to allow for the costs of the innovation activities delivered on behalf of the research council. After these allowances the rent bill is now £950K per annum. This will be reviewed in 2025 for the next five years.

On the credit side of the account the public sector has seen a very substantial increase in the value of the site compared to when it was used for agriculture and thus its return on the investment, should it ever seek to realise it. It is also the case that the increased commercial development of the site has generated increased tax revenue to HM Exchequer.

If the estimate of net economic impact of £337.7 million NPV is taken and put alongside the £89.8 million (2024/5 prices) of direct public sector support, mainly from research council grant, the Benefit Cost Ratio is around 3.9 which is impressive. However, this estimate does not value the wider medical and health benefits that are, and will continue, to benefit society. If these were included, the overall societal Benefit Cost Ratio would increase, probably

[4]https://assets.publishing.service.gov.uk/media/5a7a2cc040f0b66a2fc006f8/Research_to_improve_the_assessment_of_additionality.pdf

substantially.

The research thus confirms that considerable value can be realised by well targeted public sector investment in this extremely important sector to the future of the British economy and its citizens.

Glossary of Terms

Additionality is a real increase in social value that would not have occurred in the absence of the intervention being appraised.

Benefit Cost Ratio is used in cost benefit analysis to provide an indication of how the benefits to society of an investment relative to its costs. Both benefits and costs can be considered in different ways but the overall idea is to help with assessing value to society.

Deadweight refers to outcomes that would have occurred without the intervention. This is used to determine the difference that can be attributed to an intervention.

Displacement is the degree to which an increase in economic activity promoted by an intervention is offset by reductions in economic activity elsewhere.

Effectiveness is a measure of the extent to which a proposed intervention achieves its objectives.

Evaluation is the systematic assessment of an intervention's design, implementation and outcomes.

Gross Value Added *(*GVA*)* is the measure of the value of goods and services produced in an area, industry or sector of an economy.

Leakage describes the leakage of benefits intended for a recipient group or area into another group or area

Market failure is where, for one reason or another, the market mechanism alone cannot achieve economic efficiency.

Net Present Value (NPV) is a generic term for the sum of a stream of future values (that are already in real prices) that have been discounted (in the Green Book by the social time preference rate) to bring them to today's value.

Outcome refers to the consequences to society of a change in service or policy. For example, improved life expectancy of the population.

Output refers to the change in the level or quality of a service delivered. For example, more cardiovascular operations carried out.

Sensitivity Analysis involves exploring the sensitivity of expected outcomes of an intervention to potential changes in key input variables. It can be used to test the impact of changes in assumptions and should be clearly presented in the results of appraisal

Social Benefits are the total increase in the welfare of society from an economic action – the sum of the benefit to the agent performing the action plus the benefit accruing to society as a result of the action (external benefits).

Social Cost is the total cost to society of an economic activity – the sum of the opportunity costs of the resources used by the agent carrying out the activity, plus any additional costs imposed on society from the activity (external costs).

Social Cost Benefit Analysis quantifies in monetary terms all effects on UK social welfare. Costs to society are given a negative value and benefits to society a positive value. Costs to the public sector are counted as a social welfare cost.

1. The aims and scope of the study

Babraham Research Campus Limited (BRCL) and their campus partner and freeholder UKRI-Biotechnology and Biological Sciences Research Council commissioned a research team led by Cambridge Economic Associates and comprising the Centre for Business Research, Cambridge Econometrics, Savills and Professor Lisa Hall to assess the economic impact of the Babraham Research Campus to include the Babraham Institute as a campus partner.

Review objectives

1.1 The BRC was established by the Babraham Institute in 1998 and its aim is to 'support new bioscience companies and catalyse the commercial exploitation of biomedical research'[5]. It offers leading-edge research, incubator, accelerator capabilities and follow-up space in an attractive and accessible location and currently has around 60 start-up and scale up innovative companies located on the Campus.

Babraham Research Campus Ltd (BRCL) is a for-profit organisation with the responsibility of developing and managing the Campus on behalf of its shareholders the BBSRC and the Babraham Institute. Figure 1.1 summarises how it is structured. In addition to the provision of the commercial laboratory and office facilities on site, it exists 'to facilitate the initiation and growth of life sciences enterprises, maximising the impact of public and privately funded UK bioscience investment, to help improve economic growth, and increasing financial value for our stakeholders and supporting the discovery of therapeutics to benefit society. The Vision is for the campus to be one of the best places in the world for discovery bioscience research and innovation; a leading sustainable ecosystem within a campus environment to start, nurture, scale and grow bioscience business, providing and developing property assets, scientific capabilities and fostering a supportive communal network of entrepreneurs, commercial and academics bio scientists, and to be an influential and integral part of the Cambridge Life Science cluster.

1.2 BRCL's role extends beyond 'campus and property management, to include support of early-stage life-science companies through provision of communal laboratories, accelerator programmes such as Accelerate@Babraham, and investor and cluster conferencing activities.

1.3 There has been much interest in assessing the impact of a bioscience research campus on the economy (local and national) and society as a whole. The policy agenda is focused on the Government Life Science Industrial Strategy[6] where the emphasis is on building the capacity of local place based initiatives like Babraham to maintain and extend the United Kingdom's world-leading position in bioscience. At the sub-regional level, the activities of the Cambridgeshire and Peterborough Combined Authority and the production of the Cambridgeshire and Peterborough Independent Economic Review (CPIER) emphasise the

[5] The Babraham Research Campus-supporting the UK bioscience industry. BBSRC.
[6] https://www.gov.uk/government/publications/life-sciences-industrial-strategy

case for greater fiscal devolution and powers to unlock the delivery of major infrastructure that will assist the growth of high technology based development in the Cambridge Life Science cluster. In this context it is important that the Campus can show the contribution it is currently making to society and the economy.

Figure 1.1. Babraham Research Campus Ownership Structure

1.4 The present study was co- commissioned by BRCL and UKRI-BBSRC to assess the economic impact of Babraham Research Campus and to include the Babraham Institute as a campus partner. A key objective of the study was to update the findings of the study undertaken in 2019 and assess change over the period [in particular during and after COVID 19 and the effects of working practices.] . It is intended that the outputs from the impact assessment will be used to inform the future development of the Campus and the overall contribution it makes to the Cambridge and British economy.

The Pathways through which the Babraham Research Campus makes an impact.

1.5 The assessment of the economic impact of the Babraham Research Campus undertaken in 2019 adopted a methodology which has been repeated in the present study. [This was done in order that a comparison could be made between the two periods, and in particular to help identify any effects due to COVID 19.] This section sets-out the approach adopted as described in the earlier Report.

1.6 Figure 1.2 summarises the different pathways through which the Babraham Research Campus makes an impact, showing how funding from the private sector, charities and government enables the Campus to deliver benefits;

- that arise from the provision of strategically important infrastructure and the provision

of premises that generate economic gain and societal well-being;
- to business and the development of the local life science cluster;
- from the augmentation of the science and knowledge base;
- through the enhancement of skills, education and a number of other labour market impacts;
- to the wider society and communities

Defining the pathways

1.7 The conventional approach impact to is to recognise and quantify the activities, outputs and outcomes associated with the BRC. For each activity it is important to consider the 'theory of change', i.e. the specific ways in which the activity brings about change to the people and businesses in the local, regional and national economy. The resources committed to the Campus activities lead to outputs like the development of new buildings, facilities, jobs, training places and many other things. These outputs translate into enhanced societal welfare which can take a number of forms including improvements to health and increased income. The impact is the outcome change attributable to the BRC.

The direct, indirect and induced economic impacts of the activities of the BRC

1.8 There are direct economic impacts that arise from the operation of the Campus and the companies that are based on it: This is *direct* economic activity. This activity also provides economic opportunities in the companies that supply the Campus and its companies with goods and services: These are referred to as *indirect* effects. People who work in the companies and organisations associated with Campus spend their incomes which creates more jobs and activity in the local and sub-regional economy. These *induced* effects can be very significant, particularly as new businesses and workers move into the region to work on the Campus.

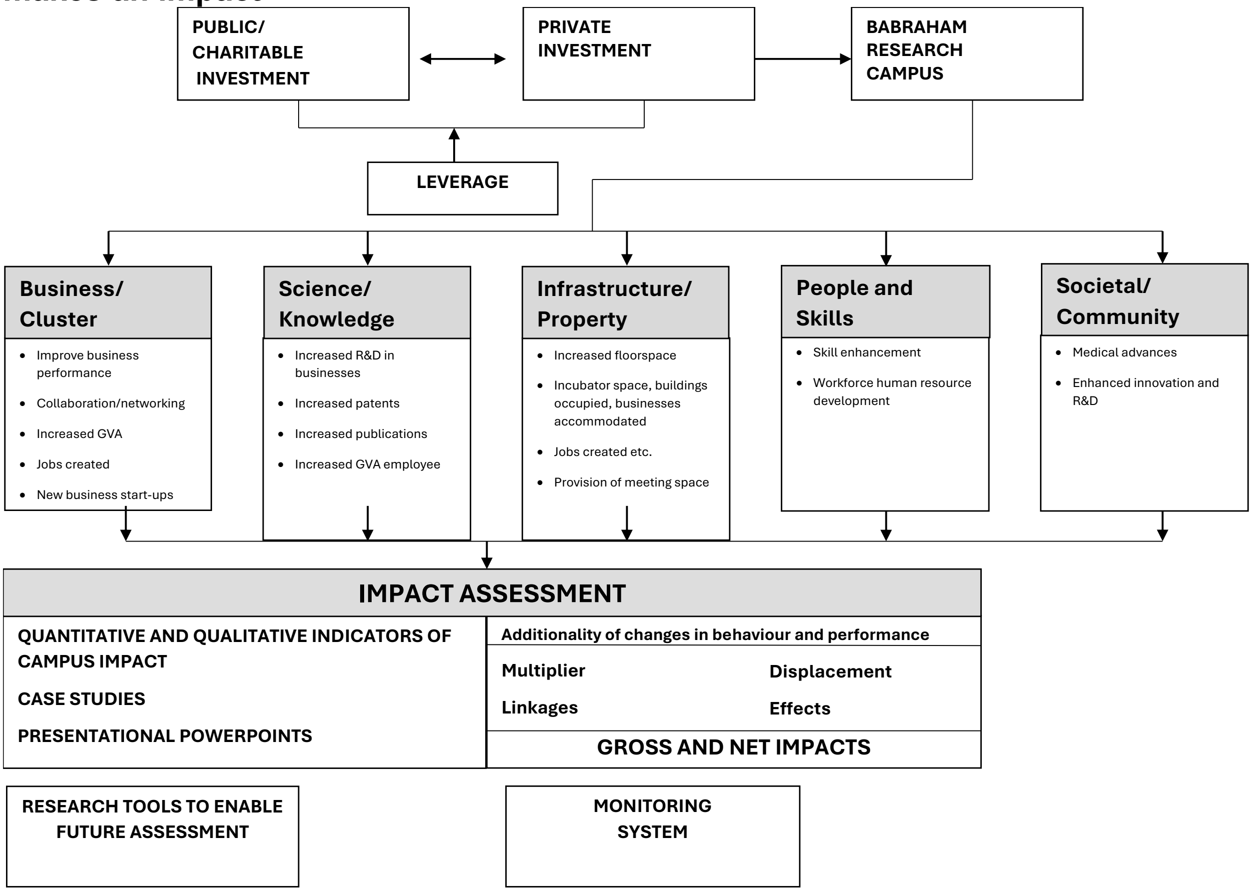
1.9 The direct, indirect and induced economic effects generate gross value added and employment in the Cambridge sub-regional economy. This is additional activity to the local economy unless it represents displaced activity that would otherwise occur elsewhere within it. The more 'unique' the relative advantages of the Campus location compared to elsewhere the higher the level of additionality. As Figure 1.2 shows, the assessment framework recognises the need to distinguish gross and net impacts and thus judgement on the additionality of the benefits created.

The impact of the Campus on the Knowledge, Science and the Life Science cluster and associated innovation system

1.10 Further impacts from the Campus arise from the *wider effects* that result from the commercial exploitation of the science and knowledge base that is possible because of the activities on the Campus that include the accommodation of new business start-ups, the use of the research facilities and the Campus acting as a place that allows networking and collaboration to occur. There are a number of possible ways in which these effects can arise.

1.11 Thus, the research can generate new ideas that may be patented. Companies will exploit the new market opportunities that arise reflected in academic and business spinouts and increased activity in existing companies. Yet other benefits can arise from the sharing of knowledge and ideas. As the Campus grows it provides benefits to existing businesses and others in surrounding knowledge based institutes. It will also create outputs that may benefit people elsewhere in the United Kingdom and indeed, the rest of the world.

Figure 1.2. The Pathways through which the Babraham Research Campus makes an impact



1.12 We can assess the impact of the Campus in strengthening interactions between the traditional three main components that make up the 'triple helix' of a regional innovation system, namely academia-industry-government. These reflect links between research staff in medical and related Departments in the University and local life-science companies, either in the form of collaboration, funding, and as an employment route for University graduates, or as vehicles for the commercialization of University-based research. Much research in University departments is funded by public bodies such as the Charities and Research Councils and in the Bioscience Impact Report[7] it was argued that it is increasingly being realised that the traditional helix should be augmented by a fourth element which is the funding and institutes provided by major charitable bodes, such as the Wellcome Trust: the reality is thus one of a 'quadruple helix'. The impact of the BRC on all of these interactions should be assessed.

1.13 The framework adopted in the research has been designed to capture the extensive and diverse range of benefits that arise from the activities of the Campus. It has recognised that the impact assessment should be compliant with HM Government Treasury Green Book[8] requirements and thus assess the *additionality* of induced activity wherever possible.

Methodology

1.14 The research methodology had to meet a number of key requirements. Public investment in the Babraham Research Campus has a long history, dating from the original acquisition of the land and its development by the Agricultural Research Council in 1948. The Babraham Institute focused on agricultural research until the early 1990s when it shift to its current research specialisation in Discovery Bioscience and Human Health, in particular epigenetics, signalling and immunology**.** The focus on Life Science research meant that the public sector interest was represented by the Biotechnology and Biological Sciences Research Council (BBSRC), from whom the Babraham Institute (BI) and Babraham Research Campus Limited (BRCL) lease the Campus.

1.15 Throughout the early part of the new century the Campus was developed and assisted through public sector support and its ownership in the public sector enabled a flexible approach to the letting of space to newly developing life science start-ups. However, the quality of the provision was substantially enhanced from 2011 with an investment by BBSRC of £58.8 million in additional infrastructure.

1.16 A key issue in assessing the benefits realised from the investment by the public sector is the extent to which it has helped to overcome market and/ or institutional failures that would otherwise prevent the provision of space of the kind required by the emerging life science sector in Cambridge. If the public investment has filled an identifiable gap in the market

[7] https://www.phpc.cam.ac.uk/pcu/files/2015/09/CambridgeBioscienceImpact.pdf
[8] https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent

provision, then the life science activity that takes place is *additional* to the Cambridge region. In certain circumstances where the innovative activity is not likely to have occurred elsewhere, it might be additional to the United Kingdom[9].

1.17 A central requirement of the research methodology was therefore that it should identify the extent of the land and property market failure as it relates to the provision of floorspace for new and early start up life science companies and thus confirm whether the rationale for public sector investment was justified.

1.18 To assess the impact of the Babraham Research Campus has required a considerable amount of evidence to be collected and analysed. Some of this has been available from established government data sources and some from the data and modelling systems that the consultants have developed over the years. This includes the Cambridge Econometrics Local Economy Data Base of the UK and regions, the Cambridge Centre for Business Research company database and cluster mapping system and data accessible by Savills from CoStar. Other data has come from BRC records, but a further substantial amount has been collected by the consultants.

1.19 The survey of companies located on the BRC was undertaken between October 2023 and March 2024. The survey instrument used a combination of open-ended and closed-ended questions to allow for greater participation in the study. To achieve a higher response rate, each questionnaire was also pre-completed with information that the research team had been able to gather from public sources. It was designed by the research team with feedback from BRCL and BBSRC and circulated to Campus companies by BRCL. A copy of the questionnaire is included in the Appendices.

1.20 The consultants also assembled a considerable body of evidence on the Campus provided by those responsible for monitoring and tracking the performance of the Campus. These included Derek Jones (Chief Executive, Babraham Research Campus Ltd (BRCL)), Ms Nicola Kinsey (Director of Business Operations, BRCL), Ms Becky Paxton (Chief Financial Officer, BRCL), Dr Kathryn Chapman (Director, Science & Entrepreneurship, BRCL), Chris Chapman (Director of Campus Capital Development, BRCL), Stuart Hay (Chief Operating Officer, BRCL), Samantha Jackson (Marketing and Business Development Manager, BRCL), Dr Jenny Hirst (Programme Manager, Entrepreneurship, BRCL), Dr Simon Cook (Director, Babraham Institute) and Dr Emily Boyce (Knowledge Exchange Manager, Babraham Institute) and the Babraham Research Campus Ltd Board.

1.21 The consultants have also undertaken a survey of Cambridge Bioscience research community, University and other relevant Knowledge Based Institutes, Venture capitalists and public and charitable funding organisations, representatives from local and central

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[9] Additionality is the real increase in social value that would not have occurred in the absence of the intervention being appraised[9].

government, relevant support industries and local community.

1.22 A key focus has been to assess the performance of the Campus over time and to compare performance using data from the local business cluster data base and local property market data.

Report Structure

1.23 This Report begins in Section two by describing the historic development of the Babraham Research Campus and then moves in Section three to provide estimates of the direct, indirect and induced economic impacts of the Campus. Section four then presents evidence on the wider business impacts and associated public and commercial investment contribution. Section five then identifies the scale of investment in Campus companies and the views of investors about the Campus as a location for high-technology investment. Section six then outlines the contribution of the Campus to the advancement of science, knowledge and societal health. Section seven reviews the impact of the Campus on the development of the Cambridgeshire innovation system. Section eight considers the impact on the Cambridgeshire property market. Section nine brings together the over total impact of the Campus and considers the question of additionality. The Annex provides supporting material.

2. The Babraham Research Campus.

History, Location and Development Context

2.1 The Babraham Research Campus (BRC), developed and managed by the Babraham Research Campus Ltd (BRCL), is located on over 430 acres (174 Hectares) in a parkland environment, approximately 10km south-east of Cambridge. BRC was initially occupied and developed by the Agricultural Research Council in 1948, who developed the campus's first research and laboratory facilities in the 1950s. In 1993 the 'Babraham Institute' phased out agricultural research, and adopted its current biological research specialisation of epigenetics, signalling and immunology. In 1998 the Institute launched the Babraham BioIncubator and established a company (Babraham Bioscience Technologies or BBT) to manage the Incubator to support 'start-up' bioscience companies. Since then, the incubator has grown and evolved to become the Babraham Research Campus (BRC) and BBT has become BRCL. The freehold owner of the campus is the UKRI-Biotechnology and Biological Sciences Research Council (UKRI-BBSRC), who lease the campus to the Babraham Institute (BI) and Babraham Research Campus Ltd.

2.2 The BRC co-locates the Babraham Institute with bioscience businesses, at various stages of their business lifecycle, promoting links between academia and business. The BRC provides approximately 475,000 sq. ft. of research facilities, services, and commercial space, available on flexible terms for life-science startups and more established businesses seeking to scale up their operations. There are other laboratory providers on the campus who have constructed R&D buildings available to let: Kadans and Biomed Realty. The latter has also entered a joint venture with BRCL on the construction and letting of a new laboratory and office building.

2.3 Table 2.1 shows the landlord/occupant breakdown.

Landlord/Occupant	**Sq. Ft**
Babraham Institute	144,729
MRC ARES[10]	32,292
Biomed Realty	99,160
Kadans	42,173
Babraham Research Campus Ltd	128,924
BRCL-BMR	35,274

[10] MRC ARES is a Medical Research Council facility.

TOTAL	482,552

Table 2.1. Landlord/tenant occupancy on Babraham Research Campus 2024.
Source: Babraham Research Campus

2.4 The focus of the campus is to support tenants who are developing technologies or products of relevance to human healthcare and the pharmaceutical sector, with a need for wet-laboratory space. Although there is no requirement to align scientific approaches to that of the Babraham Institute, nor other tenants on the campus, a scientific "coherence" is encouraged.

2.5 **Figure 2.1 Babraham Research Campus**

Source: Babraham Research Campus

2.6 The BRC has seen development of its campus since 1998. Table 2.2 below outlines the key campus development and funding milestones:

Table 2.2 – Timeline of development and funding milestones

Year	Timeline of key events and milestones
1998	The Babraham Institute refurbishes Building 405 and 406 (approximately 15,000 sq. Ft) and establishes the Babraham BioIncubator.
2001	• Babraham Bio incubator is fully occupied.
2002	• BBT[11] are granted planning permission for two further bio-incubator buildings.
2004	• The bio-incubation facilities on the campus houses 21 companies.
2005	• Development of Minerva building (approximately 20,000 sq. Ft).

[11] BBT (Babraham Bioscience Technologies) was the previous name for the Babraham Research Campus Ltd.

2007	• Development of Meditrina building (approximately 20,000 sq. Ft).
2010	• Development of Maia building (approximately 8,500 sq. Ft).
2011	• BRCL receives £58.8 m for investment in the Babraham Research Campus. This funds several additional buildings, infrastructure and utilities over the period to 2020.
2012	• Development of Moneta (approximately 17,500 sq. Ft), funded by the BBSRC grant.
2013	• Change in the management of buildings 501, 530, 301 and 580 (adds approximately 30,000 sq. Ft). • Development of Jonas Webb building (approximately 14,500 sq. Ft), funded by the BBSRC grant.
2014	• Development of Bennet building (approximately 20,000 sq. ft), funded by the BBSRC grant. • Extension of the BSU • Building 580 funded by the BBSRC grant.
2015	• Development of Eddeva building (approximately 20,000 sq. ft).
2016	• Development of the Cambridge Building, a 200-capacity tiered lecture theatre, meeting rooms, restaurant and bar.
2017	• Development of Imperial College London (ICL) (approximately 49,500 sq. ft).
2018	• Biomed Realty starts construction of 108,000 sq. ft scale up research space for growing bioscience companies.
2019	• Kadans Science Partner acquired B900 (49,000 sq. ft) from Imperial College ThinkSpace.
2022	• Biomed Realty and BRCL enter a joint venture to construct a 35,000 sq. ft lettable space.
2024	• The BioMed Realty-BRCL JV building is completed and occupied.

Source: Babraham Research Campus, 2024

2.7 Some businesses that started and developed through the BRC have left the campus once they outgrew their premises. This is one source of impact the BRC has on the surrounding property market, producing companies that take-up space in nearby business locations. The BRC have advised that the primary locations for previous BRC start-ups include Granta Park, Unity Campus, Chesterford Research Park, Wellcome Genome Campus and Cambridge Science Park.

2.8 Of the companies that graduated from the campus (since the last report published in 2019) and are tracked by the BRC and still operating (excluding companies that failed, relocated out of the UK, or were acquired), there have been nine companies who have relocated – primarily for space reasons. Three relocated to nearby research locations (Granta Park , Chesterford Research Park and Wellcome Genome Campus), while three re-located to the Cambridgeshire Science Park in the Northern Research Cluster. The remaining three businesses relocated throughout the Southern Cambridgeshire submarket, Cambridge Periphery and elsewhere within the UK.

Positioning Babraham in the wider Cambridgeshire Property Market

2.9 In addition to providing a world-class biotechnology research via the Babraham Institute, the BRC provides over 475000 sq. ft of state-of the art facilities that allow bioscience enterprise to start and scale up. It offers a distinctive contribution to the market, with a mix of start-up space (including a communal laboratory capability – "LiveLabs") designed for SMEs on flexible lease terms, which vary from what a commercial landlord would offer. Providing specialised space, co-located with the Babraham Institute with access to world-class facilities (e.g. science capabilities such a cell sorting) on lease terms tailored to the needs of start-up space, has led to the creation of multiple scaled up biotechnology companies. It also provides 'grow on' space ranging from 8,000 – 50,000 sq. ft of bespoke R&D and office space. BRC have partnered with BioMed to deliver approximately 133,000 sq. ft of flexible lab and office space, providing additional space for companies looking to scale up and remain part of the Babraham Research Campus community.

2.10 The supply of this space has positive externalities, and benefits the broader commercial market by clustering start-ups, researchers and scaled up companies undertaking world-class biotechnology. This has flow-on impacts to the local commercial market, making it more appealing to biotechnology occupiers and developers/investors seeking to deliver in demand R&D stock to this market.

2.11 The Babraham Research Campus (BRC), and other research locations, play a key role in anchoring the research clusters within Cambridge and providing start-up space to businesses developing technologies or products relevant to human healthcare and the pharmaceutical sector.

2.12 The combination of start up space, with lab facilities, co-located with the Babraham Institute, creates an ecosystem that has attracted substantial development into the local market, both on the campus and within the nearby area.

2.13 The Report identified seven key sub-markets within the broader Cambridge office market were identified (Figure 2.2). These are:

- Northern Sub-Market
- Northern Cluster
- Southern Research Cluster
- Prime Central sub-market
- City Centre Periphery sub-market
- Cambourne Sub-market
- Southern Cambridgeshire sub-market.

2.14 The Southern Cambridgeshire sub market is differentiated from the remainder of the market, in that it is primarily made up of town centres, research campuses and business locations surrounding Cambridge's urban centre. Cambridge Prime Central comprises a consolidated urban centre, containing Cambridge Train Station, amenity and retail services and the majority of the area's housing stock. Prime Central constitutes the Cambridge market's premium price point, offering A grade office space at the centre of the CBD.

2.15 The City Centre Periphery immediately surrounds the Cambridge Prime Central sub-market. It contains Cambridge University Campus, Cambridge International Airport and a number of key business locations such as the Cambridge Biomedical Campus.

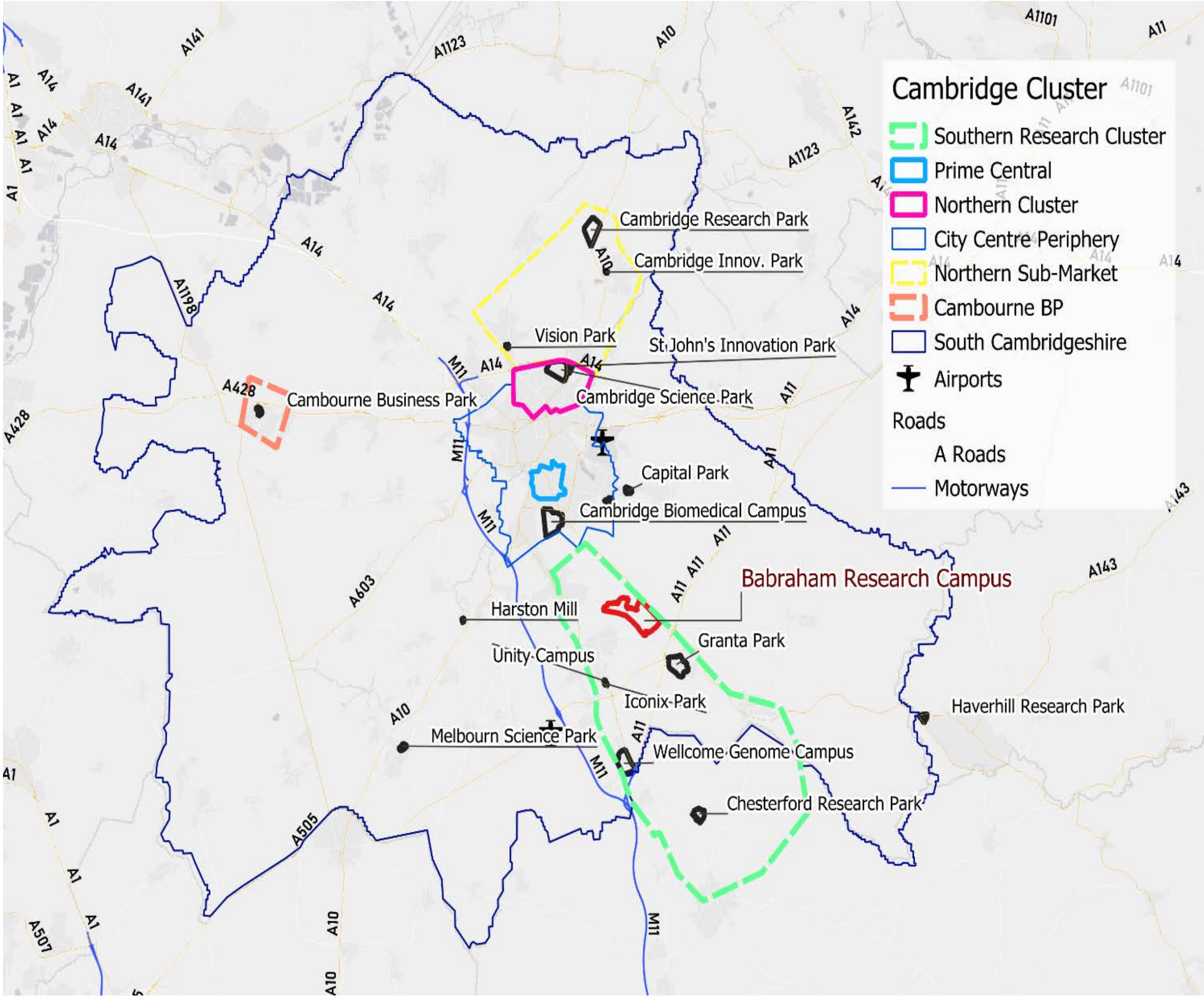
2.16 The North Cluster is immediately to the north of the City Centre Periphery, up to the A14. It includes Cambridge Science Park, St Johns Innovation Park and Cambridge Business Park.

2.17 The Northern sub-market is north of the A14 along the A10, and west to Histon. It includes Vision Park, Cambridge Research Park and Cambridge Innovation Park.

2.18 The Cambourne Business Park has recently been developed, and primarily consists of office space, though with plans to deliver laboratory space. The Northern sub-market contains a number of business locations, including Vision Park, Cambridge Innovation Park and Cambridge Research Park. While it has recently delivered and leased laboratory space, it does not contain any publicly funded research institutes or Universities, making it a useful counter-factual to compare the BRC and the Southern Research Cluster to.

2.19 While the Southern Research Cluster has ample land supply when compared to more land constrained markets such as Prime Central and City Centre Periphery, so does the Northern sub-market and Cambourne sub-markets, and the broader Southern Cambridgeshire sub-market. This indicates that the Southern Research Cluster has attracted more investment than other Cambridge markets due to demand side drivers. This is shown in Figure 2.2 below.

Figure 2.2 Cambridge Sub-market and Clusters



Source: Savills 2024.

The public sector contribution to the Campus and its development

2.20 The BRC has been in public sector ownership since 1948. The switch to its current biological research specialisation of epigenetics, signalling and lymphocyte signalling occurred in 1993 and the move to the provision of more commercially orientated premises to accommodate bioscience companies dates from 1998. The public sector primarily UKRI-BBSRC has provided grants and capital investment to BRCL to support the campus vision distinct from that provided to the Babraham Institute, of around £102.5 million (constant 2024/25 prices. Other investment has come from BRCL itself from its financial reserves and through commercial loans.

3. The Direct, Indirect and Induced Economic Impacts of the Campus

In 2022/23, the Babraham Research Campus and the companies located on the Campus spent £578.2m on their operational activities, resulting in a direct GVA impact of £199.7m in the UK. This generated further activity elsewhere in the UK economy through supply chains (indirect impacts) and household spending (induced impacts), resulting in a total GVA impact of £537.9m. The Campus directly supported nearly 2,000 jobs on site, which, by generating activity elsewhere, supported an additional 7,400 jobs across the UK economy, resulting in a total employment impact of 9,400 jobs. The previous study, published in February 2020, estimated that the companies located on the Campus spent £303.5m on their operational activities in 2017/18, resulting in a total GVA impact of £285.7m, which supported 4,270 FTE jobs across the UK. While it is not possible to compare the results of the two studies directly, as the assumptions and availability of data have changed since the previous analysis, it can be inferred that the economic impact of the Campus has grown considerably over the period 2017/18 to 2022/23. The more recent growth has been driven primarily by the increase in R&D spending by companies located on the Campus. Much of this increase in R&D spend reflects the increased maturity of the companies located on the campus and the move into preclinical and clinical activities.

Introduction

3.1 The companies on the Campus contribute to the UK economy through its operational activities. The financial expenditures of companies on the Campus create expenditure and income effects in the wider economy. The following expenditures of companies were analysed in detail in order to quantify the operational economic impacts of the Campus on the UK economy:

- Payments to other organisations for goods and services – such payments generate receipts to other UK organisations, which in turn generate a requirement for inputs further up the supply chains.
- Wages and salaries paid to staff – this represents income, some of which will be spent on goods and services in the UK, which in turn also generates further rounds of spending.

3.2 Both cases reflect the 'multiplier effect', by which an initial set of purchases generates further purchases elsewhere in the economy to support production. By focusing on expenditure, this part of the research measures the economic impact of the Campus from the 'demand-side'. It does not take account of 'supply-side' effects that might improve UK productivity and competitiveness, such as capital expenditure and investment in skills and R&D. These effects are addressed in other, more qualitative, parts of the research.

3.3 This analysis seeks to measure the gross economic impact of the Campus through its operational activities. The study does not measure the opportunity cost of what would have happened had the campus not existed in order to estimate the net impact of the Campus. These issues of additionality are discussed more qualitative in other parts of the research.

Input-output tool

3.4 An input-output (I-O) analysis approach was used to quantify the above impacts. An I-O tool was built that captures:

- Supply-chain effects: the Type I, or indirect impacts from economic activity generated by supplying companies.
- Income effects: the induced impacts from companies paying wages and salaries to workers who then spend that income in the economy, which in turn creates more jobs and activity in the local and regional economy. These induced effects can be very significant, particularly as new businesses and workers move into the region to work on the Campus. The combined indirect and induced effects make up the Type II (Keynesian multiplier) impacts.

3.5 In the context of this analysis we classify:

- The direct impact as the monetary value of spending by companies on the campus on goods and services (which are provided by suppliers).
- The indirect impact as those generated when suppliers of goods and services must themselves purchase inputs from other sectors of the economy.
- Induced impacts from people working in sectors where the direct and indirect impacts take place going on to spend their wages and salaries on consumer products and services, such as food and drink, shopping, healthcare, education and entertainment.

3.6 The I-O economic impact tool is based on the 2019 UK Input-Output table produced by the Office of National Statistics (ONS), which captures the output linkages between 105 sectors, different agents in the UK economy and the rest of the world. The tool estimates the three different types of economic impacts (direct, indirect and induced) on gross output, GVA and employment.

Direct impact

3.7 The direct impacts are based on:

- the Babraham Institute (BI) and tenant[12] companies' estimated research and development (R&D).
- expenditures made by BRC to manage the operations of the Campus. The BRC expenditures are categorised as 'non-R&D' and include expenses incurred to operate the campus, such as utilities, information services, and facilities services. Table 3.1 provides a description of the types of BRC expenditures included in this analysis.
- wages and salaries paid to staff at BRC, BI, and the tenant companies.

3.8 Data on tenant companies and BI's expenditures, specifically on R&D spending and on staff wages and salaries were provided by the Cambridge University Centre for Business

[12] Tenant companies are those with tenancy agreements to let office and laboratory space on the Campus.

Research (CBR). Data on BRC's operational expenditures, including wages and salaries, were provided by BRC.

Table 3.1: Description of BRC expenditure data

BRC expenditure category	Description
Activity-related costs	Catering services, office supplies, waste disposal, etc.
Building maintenance	Services to buildings and facilities
Business support	Administrative services and other business support activities
Insurance	Insurance fees
IT services	Fees paid for IT services
Legal and professional services	Fees paid for legal and consulting or other professional services
Rent payments	Rental of equipment
Salaries	Wages and other compensation paid to BRC staff
Utilities	Electricity, gas, heating, air conditioning, and water

3.9 All data were classified into an I-O sector (of which there are 105) and used as inputs into the I-O tool to generate estimates of the wider (indirect and induced) operational economic impacts.

Data issues

3.10 The primary source of data on tenant companies and BI was the CBR corporate database, while the data from BRC were used to capture non-R&D expenditure taking place on the Campus. The key issues we faced with the data are listed below.

3.11 BRC does not hold data on tenant company employee salaries. We therefore made estimates based on CBR's data on employment and salaries for the companies on the Campus. As some companies were missing salary data, we imputed salaries for these companies using the average salary per employee from companies with available salary data.

3.12 The R&D expenditure of all tenants on the Campus were estimated using the R&D expenditure and employment data provided by CBR. The R&D expenditures were disaggregated by I-O sector according to the Scientific research and development services sector's supply chains according to the UK I-O table (i.e. how the sector buys inputs from other sectors). The total R&D expenditure was disaggregated to sectors in the I-O table that are most likely to be affected by R&D activities (see Table 1 in Annex 1 for a list of the sectors included).

3.13 Expenditure on R&D was not available for BI, unlike the other tenant companies. To estimate BI's spending on R&D, wages and salaries were subtracted from BI's total turnover in the CBR data. Additionally, data on BI income from select companies were available for 2022/23. As the kinds of services BI provides could be classified as R&D (e.g. bioinformatics services, computing services, laboratory analysis services, etc.), BI income received from tenant companies (totalling £0.89m in 2022/23) was excluded on the grounds it would double count R&D expenditure already captured in the CBR data for tenant companies. BI spending on R&D in 2022/23 was therefore estimated to be £25.4m.

Results

3.14 The operational impact of the Campus is estimated based on the total operational expenditure of the companies associated with the Campus, including the total salaries paid to on-site employees. **Table *1*.2** below shows the scale of these expenditures in 2022/23.

Table 1:2 Campus expenditures in 2022/23

Expenditure	£m	%
Non-R&D	8.9	1.5
R&D	380.0	65.7
Employee compensation	191.2	33.1
Total	**578.2**	**100.0**

Note: Non-R&D includes expenses incurred to operate the campus, such as utilities, information services, and facilities services.
Discrepancies between the sum of the expenditure categories and the total are due to rounding.

Operational impact of the Campus

3.15 Table 3.3 presents the total gross economic impacts on the UK economy of on-campus activities in 2022/23. The companies associated with the Campus spent £578.2m on their operational activities in 2022/23, resulting in £199.7m direct GVA impact, which generated an additional £338.2m (indirect and induced) GVA impact of further activity elsewhere in the UK economy. The Campus directly supported 1,980 jobs on site, which, by generating activity elsewhere, supported an additional 7,445 jobs in the wider economy.

3.16 People working in sectors where the direct and indirect impacts took place going on to spend their wages and salaries is estimated to have created a large GVA (induced) impact (£216.2m).

Table 3.3: Total UK economic impacts in 2022/23

Impacts	GVA (£m)	Employment (FTEs)
Direct	199.7	1,977
Indirect	122.0	4,164
Induced	216.2	3,281
Total	537.9	9,422

3.17 The employment and GVA impacts can be summarised in terms of Type I and Type II multipliers. Type I multipliers capture the ratio of direct and indirect impacts to direct impacts, while Type II multipliers also include induced effects. This study finds that the operational activities of the Campus has a Type I multiplier of 1.6 and a Type II multiplier of 2.7. This means that every £1 of direct GVA associated with the Campus, generates an additional £0.60 in the rest of the economy through indirect impacts and an additional £1.70 through indirect and induced impacts.

3.18 Spending on ‘Scientific research and development services’ has been the major driver of the GVA impacts on Campus, accounting for more than 58% of the overall direct GVA impact in 2022/23. Other important drivers of GVA impacts are ‘Wholesale trade services, except of motor vehicles and motorcycles’ and ‘Education services’, which account for 8% of the total direct GVA impacts each.

3.19 In 2022/23, 18% (1,340 jobs) of the indirect and induced jobs supported by the operational activities of the Campus were in the ‘Scientific research and development services’ sector. Other sectors in which employment was estimated to be supported by the indirect and induced impacts include ‘Education services’ (accounting for more than 9% of indirect and induced employment impacts), ‘Food and beverage services’ (accounting for nearly 7%), and ‘Retail trade services, except motor vehicles and motorcycles’ (accounting for nearly 7%).

3.20 As mentioned in the introduction, the analysis estimates the gross economic impact of the Campus through its operational activities on the UK economy. Depending on the extent of the additionality of the Campus, the net impact is likely to be lower. These issues of additionality are discussed more qualitative in other parts of the research in order to better capture the net impact of the Campus.

3.21 The previous study, published in February 2020, estimated that the total GVA impact of the operational activities of the Campus in 2017/18 was £285.7m, which supported 4,270 FTE jobs across the UK. It is not possible to compare the results of the two studies directly, as the assumptions and availability of data have changed since the previous analysis. The analysis in this study benefits from a refined approach due to better data availability, therefore improving the robustness of the results. While the results of the two studies can’t be compared directly, it can be inferred that the economic impact of the Campus has grown over the period 2017/18 to 2022/23. In particular, there has been a larger increase in R&D expenditure on the Campus than in direct employment on-site, resulting in much larger indirect and induced employment impacts in 2022/23 compared to direct employment impacts. Other sections of this report explore the change in impacts of the Campus over the period since the last report was published.

4. Quantifying Wider Business Impacts

The BRC is home to a vibrant ‘cluster within the cluster’ of start-up and scale-up bioscience companies operating alongside world-leading academic research from BI. The supportive and collegiate environment provided by the BRC has benefitted Campus companies in a number of important ways, ranging from the availability of suitable premises on flexible lease terms, access to scientific equipment and expertise available at BI and proximity to other organisations making up the Cambridge cluster.

The 44 companies included in our 2023 survey have an average age of just under 9 years. Two-thirds of the companies have up to 10 years of age, while companies that have been in operation for more than 15 years represent 14% of the total. These figures vividly illustrate the diversity of life science ventures located on the BRC. The diversity of age profiles has also increased over time, underscoring the successful role played by the Campus in supporting all stages of life science venture.

These 44 companies employ over 1,500 staff worldwide and have raised more than £1.6bn to date. About one-third of these companies originated out of academic research conducted at the University of Cambridge, while over three-quarters have accessed BI’s scientific facilities. The number of staff employed worldwide and funds raised to date are higher in the latest survey than in our 2019 survey, along with the proportion of Campus companies using the science services made available by BI.

Our comparison of the main business and science locations across the Cambridge region further highlights some of the distinctive features of companies located on the BRC, including their relatively young age and small size. BRC-based companies have achieved fast growth in employment and performed well against companies on other locations in recent years, confirming the major role played by the BRC as a hotspot for life science research and innovation within the Cambridge cluster.

The BRC emerges as the campus with the greatest specialisation in life sciences across the entire set – 97% of the companies and close to 100% of employment. It also ranks in the top three business locations in the wider Cambridge region for total R&D spend over the last three years (£727m). Overall, R&D spend by companies on the BRC accounted for over 17% of total R&D spend by life science companies located on any of these locations. Another figure that is most revealing of the vibrancy of the BRC is the number of companies carrying out R&D – it is estimated that 5 out of 6 businesses on the Campus engaged in R&D activity over the last four years, the highest figure by far across all locations.

The comparison against 2019 figures portrays a picture of an increasingly more dynamic business base on the BRC, as exemplified by the considerably higher R&D activity of 2023 occupiers compared with the 2019 study. These figures, which are all the more remarkable if one considers that Campus companies’ R&D happened against a backdrop of unprecedented uncertainty and disruption to business, point to the BRC as a key component of the innovative milieu of the Cambridge cluster.

Introduction

4.1 The last four years saw profound changes to the business environment, with the COVID-19 pandemic, the Ukraine war and more recently the UK’s slower economic growth causing severe disruption to supply chains and a marked decline in business confidence. This chapter assesses the impact that companies located on the BRC make on local, national and international ecosystems in a post-COVID world. It aims to provide an up-to-date picture of the wider business impacts of the BRC and compares this with the picture from the 2019 impact study.

4.2 This element of the work addresses the following main objectives:

- To identify the benefits that Campus companies derive from their location on the BRC, including the benefits from collaborations with other organisations.
- To classify and compare Campus companies according to their life science sector.
- To compare Campus companies with those located on other business and science locations in the wider Cambridge region.
- To assess the growth of Campus companies over time.
- To establish growth plans and ambitions of Campus companies.
- To determine the key achievements of Campus companies to date, including the contribution to the personal and professional development of their staff.
- To identify the factors that might make Campus companies move off the BRC and the areas where their activity might be relocated.

Methodology

4.3 To quantify the wider business impacts of the BRC, we used a combination of primary and secondary data analyses. A first source of data was a bespoke survey of companies located on the BRC. The survey built on the very successful survey of Campus companies that was carried out as part of the 2019 study, when a 74% response rate was achieved. The purpose of the latest survey was to find out what Campus companies have achieved so far, what they hope to achieve in the future, and the importance of their collaborations and of their location on the BRC. The questionnaire was designed by the research team with feedback from BRCL and included a mixture of open-ended and closed-ended questions. We sought to keep the survey questions as similar as possible to those used for the 2019 survey to ensure comparability. A comparison of the latest results against the 2019 results is presented in this report whenever relevant.

4.4 The survey was administered to Campus companies with the support of BRCL between October 2023 and January 2024.[13] To achieve a higher response rate, each copy of the survey was pre-filled with information that we were able to retrieve from public sources, including annual accounts. Companies were asked to amend or enhance pre-completed sections and fill in those sections that we could not complete. A copy of the questionnaire can be found in Appendix B.

4.5 The sample for the survey includes a total of 44 companies that were located on site as at September 2023.[14] When considered alongside the 2019 sample, the 44 companies are split as follows: (a) 15 companies were on the Campus in 2019 and responded to the 2019 survey; (b) 8 companies were on the Campus in 2019 but did not respond to the 2019 survey; and (c) 21 companies are new to the Campus. An additional 22 companies left the Campus after the 2019 survey and are analysed separately in the next section.

4.6 Table 4.1 provides an overview of the Campus companies selected for the study. A total of 35 companies returned the questionnaire, which gives a response rate of 80%. This figure

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[13] We are grateful to BRCL, and to its Chief Executive Derek Jones in particular, for their assistance with accessing Campus companies.

[14] BRCL returned a completed copy of the questionnaire, but their responses were not used in the analysis to ensure comparability with the 2019 survey (when BRCL, formerly BBT, was not included).

is significantly higher than the response rate achieved by previous Annual Tenant Surveys conducted by BRCL (approximately one-third) and even higher than the response rate of our 2019 survey.

Table 4.1 Overview of Campus companies selected for the study

Variable	Value	
	2019 survey	**2023 survey**
Number of companies selected, of which:	46	44
(a) Tenants	36	35
(b) Virtuals	9	3
(c) Communal lab users	1	6
Campus companies by sector:		
(a) Core biopharmaceutical	59.1%	61.9%
(b) Biopharmaceutical service and supply	29.5%	28.6%
(c) Core medical technology	11.4%	9.5%
Average age of the business (years)	5.8	8.7
Total employment worldwide	1,010	1,504
Funding raised to date (£,000) [as reported by survey participants]	1,249,654	1,603,897
University of Cambridge spin-outs	34.8%	27.3%
Campus companies using BI science services	60.9%	79.5%
Number of companies that returned questionnaire	34	35
Response rate	73.9%	79.5%

Source: CBR.

4.7 The largest group of survey respondents is represented by companies that are renting premises on the Campus (tenants). The remainder is made up of companies with either no physical presence (virtuals) or permanent location (communal lab users) on site. Two out of three companies operate in the core biopharmaceutical sector, which includes all businesses involved in developing and/or producing their own pharmaceutical products (Office for Life Sciences, 2024, *Bioscience and health technology sector statistics*).

4.8 The 44 companies covered by our survey have an average age of just below 9 years, employ over 1,500 staff worldwide and have raised more than £1.6bn to date. About one-third of these companies originated out of academic research conducted at the University of Cambridge, while over three-quarters of them have accessed the scientific facilities provided by BI (and coordinated by BIE).[15]

4.9 The sample used for our latest survey is broadly similar to the 2019 sample in terms of company type, sectoral composition and share of University of Cambridge spinouts. The higher average age of the business partly reflects the older age of the 23 companies that were

[15] The 79.5% figure for 'Campus companies using BI science services' includes companies that used any of BI's scientific facilities at least one year over the period 2013/14-2022/23.

already on the Campus in 2019 (e.g. RxCelerate, who recently moved to larger premises on site to support their growth) and partly the addition of mature companies such as Inivata and PlaqueTec in recent years. The number of staff employed worldwide and funds raised to date are also higher in the latest survey, along with the proportion of Campus companies using the science services made available by BI. These figures offer some initial evidence that the BRC is home to an increasingly more dynamic business base, as will be explored in more detail in the remainder of this chapter.

4.10 Responses from the survey of Campus companies were complemented with secondary data from the CBR corporate database, a longitudinal database covering the population of businesses across the Cambridgeshire and Peterborough region over a 13-year period. The database has detailed information at both the geographical and sectoral level for over 100,000 companies (alive and not alive) in the region. CBR data was used to carry out a detailed comparison of Campus companies against those located on other business and science locations in the wider Cambridge region. Additional data was supplied to us by BRCL and BI and used to augment the survey data.

Companies who left the BRC

4.11 We examined the set of companies that were located on the BRC at the time of our 2019 study but are no longer on the Campus. These 22 companies can be classified into five main groups: (1) companies with a virtual presence on the BRC; (2) companies that were acquired; (3) companies that died or are in the process of dying; (4) companies that moved away from Cambridge; and (5) companies that relocated elsewhere within Cambridge.

4.12 A first group includes four companies that are no longer operating on the Campus but have maintained a virtual address there. Immunobiology and Rapid Biosensor are two examples. Collectively, companies within this group employed 7 people in 2022-23.

4.13 Another four life science ventures were acquired by other bioscience companies in recent years. Two of these ventures, Morphogen-IX and Z Factor, were acquired by clinical-stage pharmaceutical company Centessa Pharmaceuticals. The other two ventures, Methuselah Health and Total Scientific, were acquired by BRC-based RxCelerate. After the acquisition, RxCelerate launched the quantitative proteomics platform developed by Methuselah Health for analysis of proteome stability as ProQuant™ in 2022.

4.14 A third set consists of five companies that have been dissolved or put into liquidation. These companies generally had to close down due to a shortage of funds to sustain business operations. A case in point is PredictImmune, which is currently in liquidation after failing to secure further financing to meet its working capital needs. PredictImmune, the largest among these five companies, employed 11 staff in 2018-19 and was valued at £50m in 2019.

4.15 Two companies have left the BRC to take up premises outside the Cambridge region. Atelerix, which spun out of Newcastle University and developed an innovative solution for storing and transporting cells and tissues at room temperature, has moved its headquarters from the BRC to Newcastle in 2021, while NeoPhore, which was founded in 2017 to create novel small molecule immuno-oncology therapeutics, is now based in Altrincham. Atelerix and NeoPhore employed a total of 19 people in 2022-23. NeoPhore was valued at £80m in 2023.

4.16 The fifth and final group comprises seven BRC 'graduates' that relocated elsewhere within the Cambridge region, in most cases with the aim of accommodating further growth. The aggregate size of this group of companies is significant – over 380 employees in 2022-23 and a total market value of £1.04bn in 2023. Bicycle Therapeutics contributes the largest share, with just under 200 employees and a valuation over £700m. All of these companies relocated their operations to another business park in the region. Three of them, Ablatus Therapeutics, Cypralis and Diagnodus, moved to the St John's Innovation Centre; two of them, Bicycle Therapeutics and Sphere Fluidics, opened new laboratory facilities on Granta Park; Novogene relocated its Cambridge Sequencing Centre to Cambridge Science Park in 2019; and PhoreMost expanded into a new facility at Unity Campus in 2022.

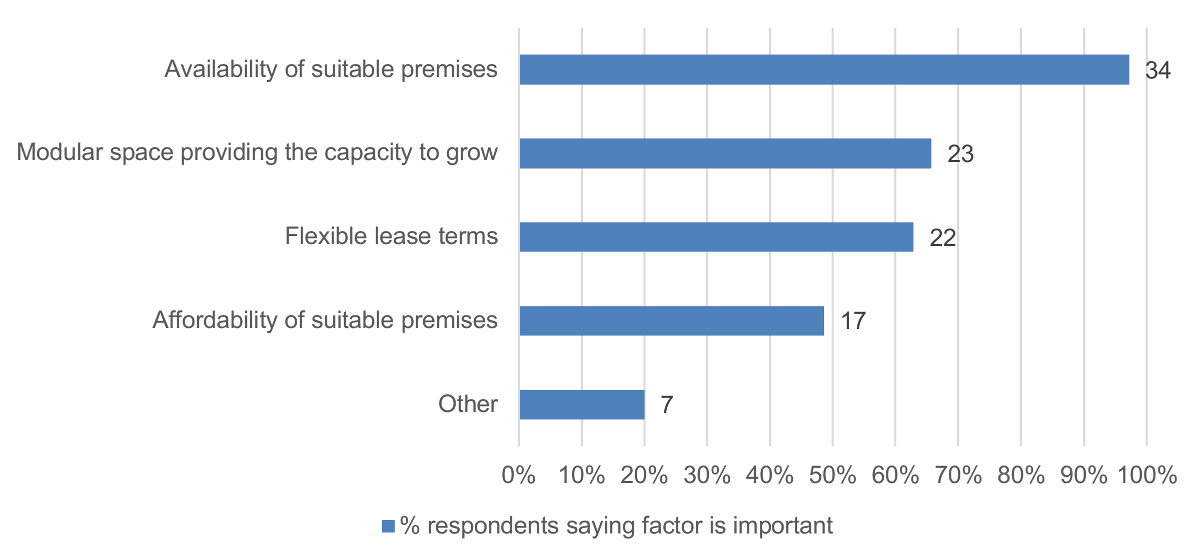
4.17 The findings of our 2019 study revealed that the support structure provided by the BRC had made a major contribution to these 'graduates'. Our analysis indicated that being located on the BRC had brought additional value to these companies by increasing both the speed and scale of their activity through the provision of flexible and affordable space. The contribution of the Campus to these businesses forms an important part of the economic impact of the BRC alongside the contribution to its current occupiers. The latter will be the focus of the remainder of this chapter.

Benefits of location

4.18 The BRC is home to a vibrant 'cluster within the Cambridge cluster' of start-up and scale-up bioscience companies operating alongside world-leading academic research from BI. The Campus is located within a parkland estate situated right at the heart of the Cambridge cluster and caters to a segment of life science ventures, i.e. early-stage bioscience businesses, which are often regarded as less attractive as tenants due to their relatively high-risk profile. It is important to establish how these and other aspects of its location may help companies fulfil their ambitions.

4.19 Campus companies were asked to indicate the benefits of their location on the BRC, distinguishing between property related, facilities related and other benefits. Figure 4.1 presents the list of property-related benefits in descending order of importance, together with the total number of respondents that identified a given benefit as important. The total number of responses to the relevant question in the survey is given below each figure.

Figure 4.1 Benefits of company's location on the Babraham Research Campus: property related



Number of responses: 35
Source: CBR.

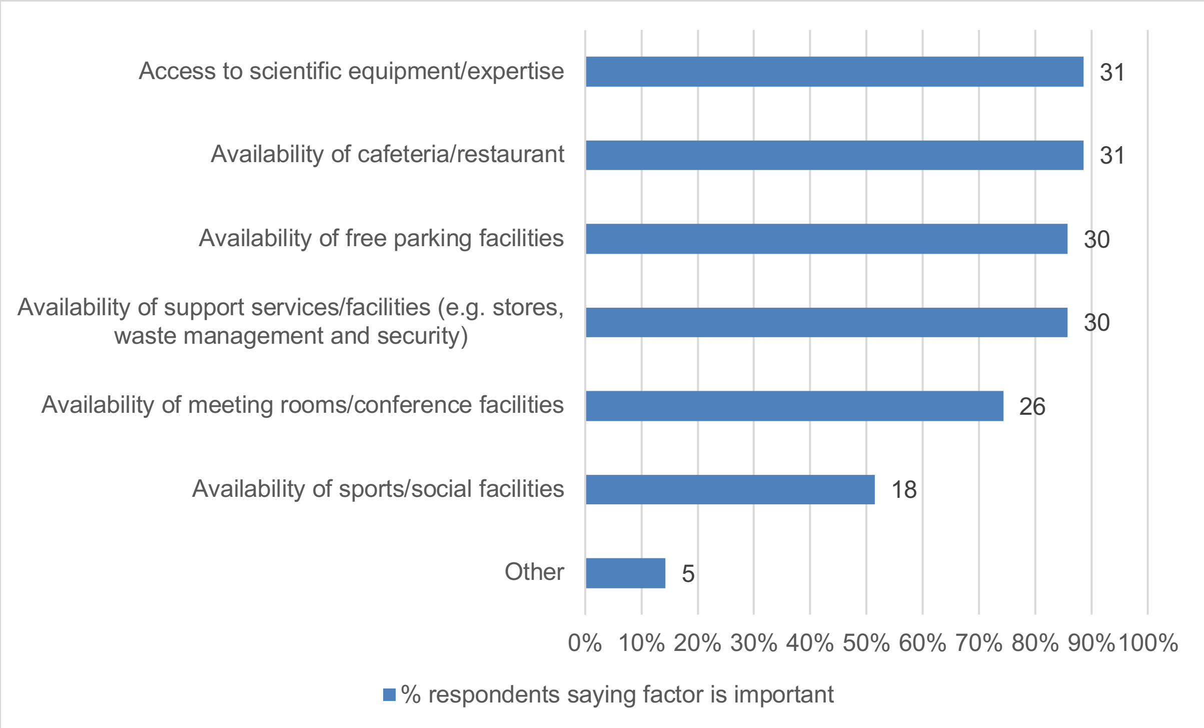
4.20 Virtually all respondents (97.1%) regard the availability of suitable premises as an important benefit of being located on the BRC. These include the co-working LiveLabs space, which provides fully serviced and equipped labs for molecular biology and cell culture work designed for early-stage bioscience businesses. The availability of modular space to grow is cited as the second most important benefit (65.7%), followed closely by the flexibility of lease terms (62.9%). The opportunity to access flexible lease terms, which differentiates the BRC from many other locations in the wider Cambridge region and beyond, allows companies to focus on their research without putting excessive pressure on the speed of development. The affordability of suitable premises is viewed as an important factor by a smaller, albeit still very significant, share of respondents (48.6%).

4.21 These results suggest that Campus companies give more weight to the suitability rather than the affordability of premises and may be prepared to pay a higher rent to be situated on the BRC. For example, one of the survey respondents stated that "Locating […][16] on site […][17] justifies the premium over renting office space on a non-science park location". The support provided by BRCL was cited by a couple of other respondents as an important benefit of their location on site, as "The campus team understands the needs of young life sciences companies".

4.22 Figure 4.2 shows the facilities-related benefits associated with Campus companies' location on the BRC.

[16] Name omitted due to confidentiality
[17] Name omitted due to confidentiality

Figure 4.2 Benefits of company's location on the Babraham Research Campus: facilities related

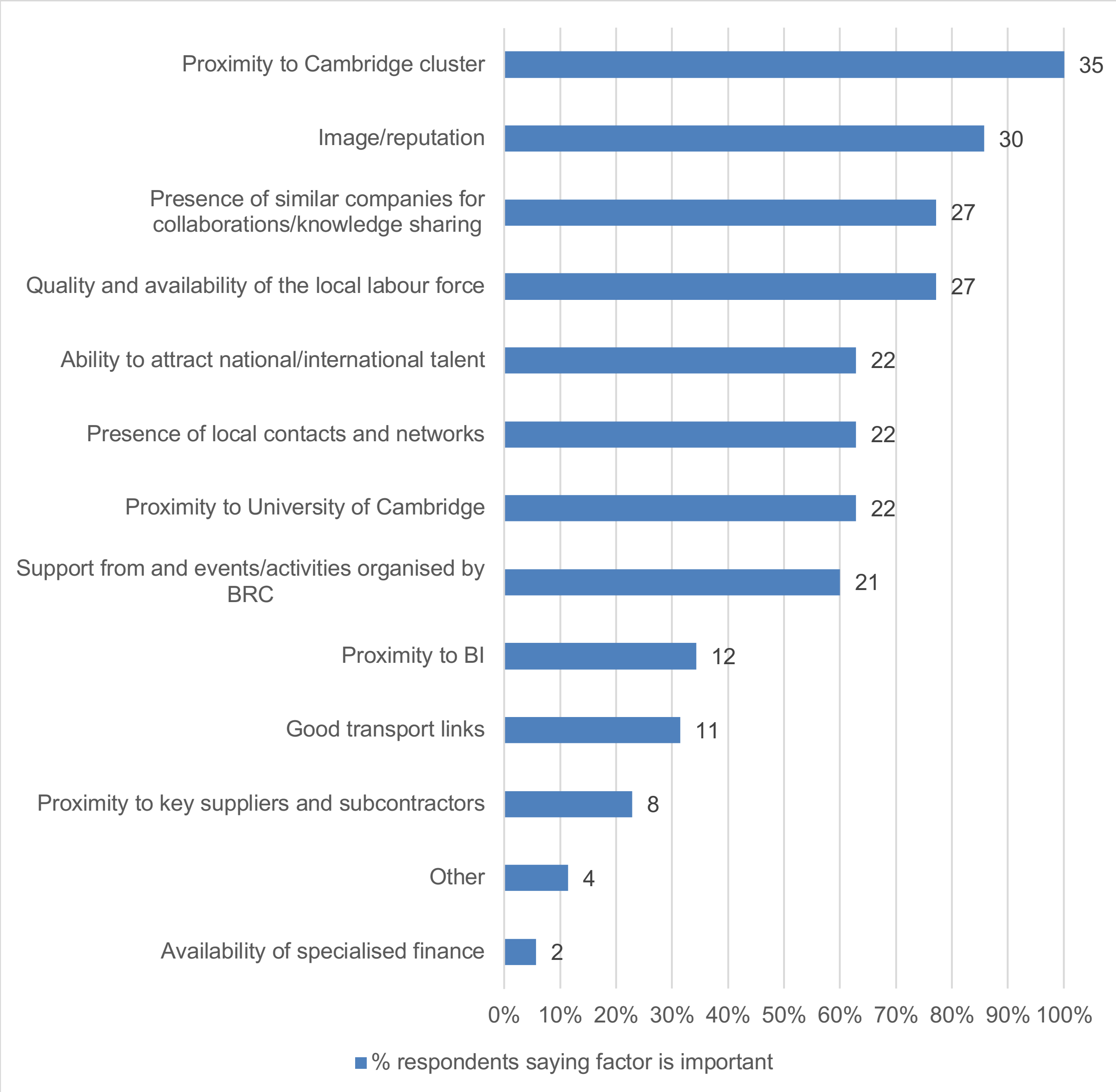


Number of responses: 34
Source: CBR.

4.23 Access to scientific equipment and expertise, including those available at BI, features as the most important facilities-related benefit of being located on the BRC (88.6%). Equally important is the availability of cafeteria/restaurant, which is seen by companies as a key space for bringing people together. The Cambridge building, which was designed with the intent of enabling collaboration and facilitating connection, is cited by several respondents as an ideal place to meet like-minded people. The results also underscore the benefits that companies obtain from the availability of free parking facilities (85.7%), support services such as stores, waste management and security (85.7%), meeting rooms and conference facilities (74.3%), and sports and other social facilities (51.4%). Some survey respondents also highlighted the positive effects of the Campus' attractive grounds on staff wellbeing, while another respondent was pleased to see the Campus install more charging points for electric vehicles.

4.24 Company's location on the BRC also has a range of other benefits, as summarised in Figure 4.3.

Figure 4.3 Benefits of company's location on the Babraham Research Campus: other benefits



Number of responses: 35
Source: CBR.

4.25 All respondents consider the proximity to the Cambridge cluster as an important benefit of their location on the BRC. Alongside image-related benefits (85.7%), being located at the heart of Europe's largest life science cluster benefits Campus companies by facilitating interactions with similar companies (77.1%) and the University of Cambridge (62.9%), enabling access to local labour force (77.1%) as well as national and international talent (62.9%), and expanding their local contacts and networks (62.9%). Other factors that rank highly are the support services offered by BRCL, including events and other activities organised on the Campus, and the opportunity to be co-located with BI. Approximately one out of three respondents regard good transport links as an important benefit. However, some companies stated that transport links should be improved, for example by providing a better public bus service from Cambridge or introducing a shuttle bus service from/to the BRC. The impact of these various contributions of the BRC to Campus companies is examined in more detail in Chapter 3, which also provides a comparison with the findings from our 2019 survey.

4.26 The results presented in Figure 4.3 point to increased opportunities for collaboration as a major benefit of being located on the BRC. To explore this further, we asked Campus companies to reflect on the benefits they have received from collaborations with other organisations and to give an estimate of the number of such collaborations. The results are summarised in Table 4.2. It is estimated that the 32 companies who responded to this survey question have engaged in more than 1,200 collaborations to date. The highest number of collaborations is with other companies outside the Cambridge area, illustrating the beneficial impacts of Campus companies at the local, national and international level.

Table 4.2 Benefits Campus companies have received from and number of collaborations with other organisations

Organisation	Benefits	No. of collaborations
Babraham Research Campus Ltd	- Renting of office/lab premises - Access to site facilities (e.g. communal lab space, meeting rooms, canteen) - Support services (e.g. security, stores, waste management) - Participation in conferences, seminars and workshops (e.g. Babraham Investor Conference) - Access to Accelerate@Babraham programme - Facilitation of interactions with Campus companies - Support with managing growth on site	10+
The Babraham Institute and Babraham Institute Enterprise Ltd	- Access to scientific facilities - Access to specialised expertise, including training and consultancy services - Research/science collaborations (e.g. joint research grants) - Participation in commercial alliances - Informal research discussions - Funding and/or supervision for PhD studentships - IP access - Advisory board membership	40+
Other companies on the Babraham Research Campus	- Research/science collaborations - Purchase or sale of products/services, including contract research support - Access to technology - Informal discussions with potential licensing and collaborator companies - Access to specialised expertise - Access to training and seminars - Access to memberships (e.g. One Nucleus) - Collaboration on Green Impact scheme	90+
University of Cambridge	- Research/science collaborations - Access to specialised expertise - Access to lab space and specialised equipment (e.g. University's animal unit) - Access to technology - Support with student projects - Access to spinout opportunities - Business development through participation in University-led programmes (e.g. CJBS EnterpriseTECH) - Opportunities for social interactions and networking	70+
Other academic organisations in the Cambridge area	- Research/science collaborations - Access to specialised expertise - Running of clinical trials - Access to project-related services - Support with linking into Cambridge clinical community	10+

Organisation	Benefits	No. of collaborations
Other companies in the Cambridge area	- Research/science collaborations - Contract research services - Access to specialised expertise, including e.g. commercial legal advice, tax and HR - Access to specialised equipment and materials (e.g. antibodies) - Access to or licensing of technology - Availability of support services (e.g. logistics, taxi, hospitality)	170+
Other academic organisations outside the Cambridge area	- Research/science collaborations - Access to specialised expertise - Access to specialised equipment and materials (e.g. reagents) - Access to technology - Access to spinout opportunities - Running of clinical trials - Access to project-related services	110+
Other companies outside the Cambridge area	- Research/science collaborations - Contract research services - Strategic partnerships with pharma companies - Access to specialised expertise, including e.g. commercial legal advice, software development and recruitment - Access to specialised equipment and materials - Access to technology - Access to investors	690+

Number of responses: 32
Source: CBR.

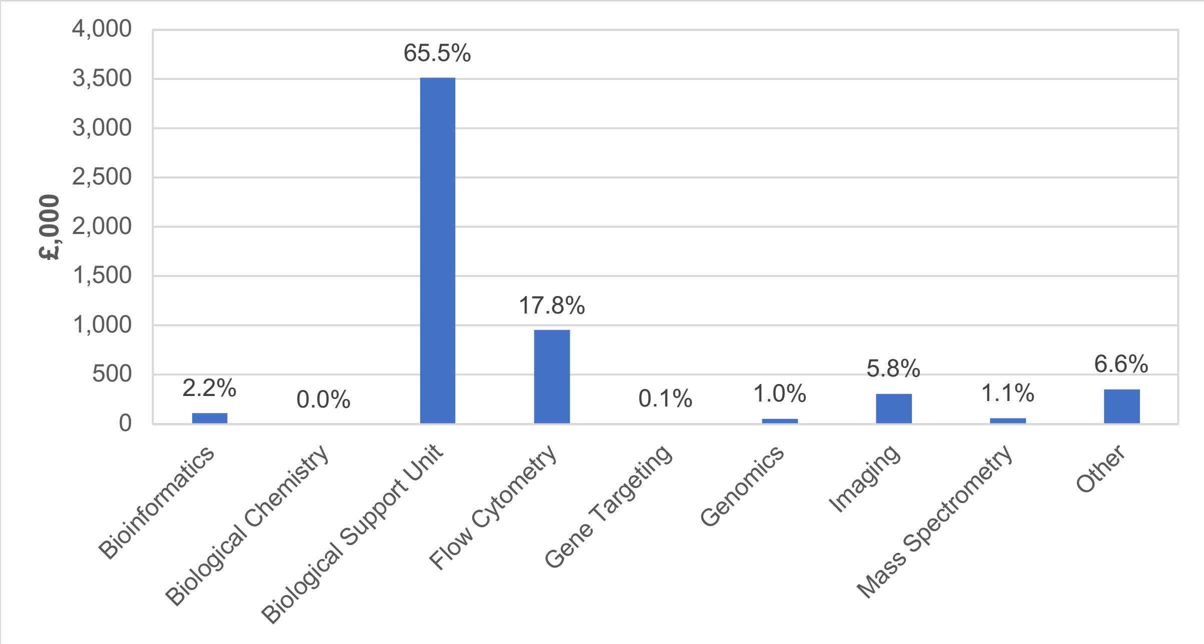
4.27 A key finding that emerges from our survey relates to the benefits Campus companies receive from collaborating with BI and accessing its scientific equipment and expertise. Access to these facilities includes expert scientific advice and training (e.g. Flow Cytometry-related training), support with experimental design and data analysis. BI maintains eight cutting-edge, expensive scientific facilities that are available to Campus companies for a fee on an ad hoc basis.

4.28 BI's scientific facilities involve substantial capital investment and running costs. For example, the Biological Support Unit (mouse vivarium) underwent a substantial refit in 2020, - funded by UKRI-BBSRC - which amounted to a total investment of about £2.8m.[18] This facility also requires considerable running costs in the form of estate charges, staff salaries and energy consumption (£5.44m in 2023/24). Since 2021, new capital expenditure across the other four largest scientific facilities (Flow Cytometry, Imaging, Mass Spectrometry and Genomics) was £8.8m, with Flow Cytometry and Imaging (all primarily UKRI-BBSRC funded) alone contributing just under £7m.

Figure 4.4 reports total expenditure of Campus companies for BI's science services over the last ten years (2013/14 to 2022/23) broken down by scientific facility.[19]

[18] We would like to thank Dr Danielle Hoyle, Head of Research Operations at the Babraham Institute, for supplying these figures.
[19] The 'other' category mainly includes income from consultancy services and training provided to Campus companies.

Figure 4.4 Usage of Babraham Institute's science services by Campus companies: total expenditure by scientific facility 2013/14-2022/23

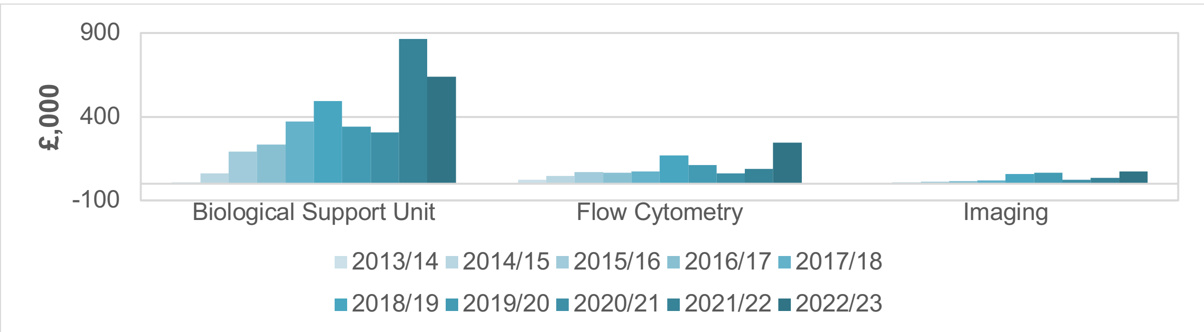


Source: CBR's calculations based on data from Babraham Institute Enterprise Ltd.

4.29 Over the period 2013/14-2022/23, a total of £5.4m was spent by Campus companies to use the scientific facilities provided by BI. With over £3.5m, the Biological Support Unit accounted for two-thirds of Campus companies' expenditure in BI's science services. The Flow Cytometry and Imaging facilities follow with £1m and £0.3m expenditure, respectively. These facilities, combined with a range of other key services offered by BI such as stores and H&S consultancy, help Campus companies further develop their science while supporting their growth.

4.30 Figure 4.5 examines how Campus companies' expenditure for the three most widely used scientific facilities (Biological Support Unit, Flow Cytometry and Imaging) has changed over time.

Figure 4.5 Usage of Babraham Institute's science services by Campus companies: annual expenditure 2013/14-2022/23 for selected scientific facilities



Source: CBR's calculations based on data from Babraham Institute Enterprise Ltd.

4.31 BIE expenditure data reveals that usage of the Biological Support Unit, Flow

Cytometry and Imaging facilities by Campus companies has gone up over time, suggesting that companies located on the BRC have taken increasingly more advantage of the specialised equipment and expertise available at BI. Campus companies' expenditure for these scientific facilities decreased during the pandemic but bounced back strongly post COVID lockdowns, with the most recent year witnessing the highest total expenditure in Flow Cytometry and Imaging. Overall, these figures capture well the interactions between bioscience companies on the Campus and scientists at BI as a distinctive feature of the BRC.

4.32 The availability of these key BI facilities both allows start-up companies to be formed without very significant initial costs and reinforces their choice of the BRC as a location.

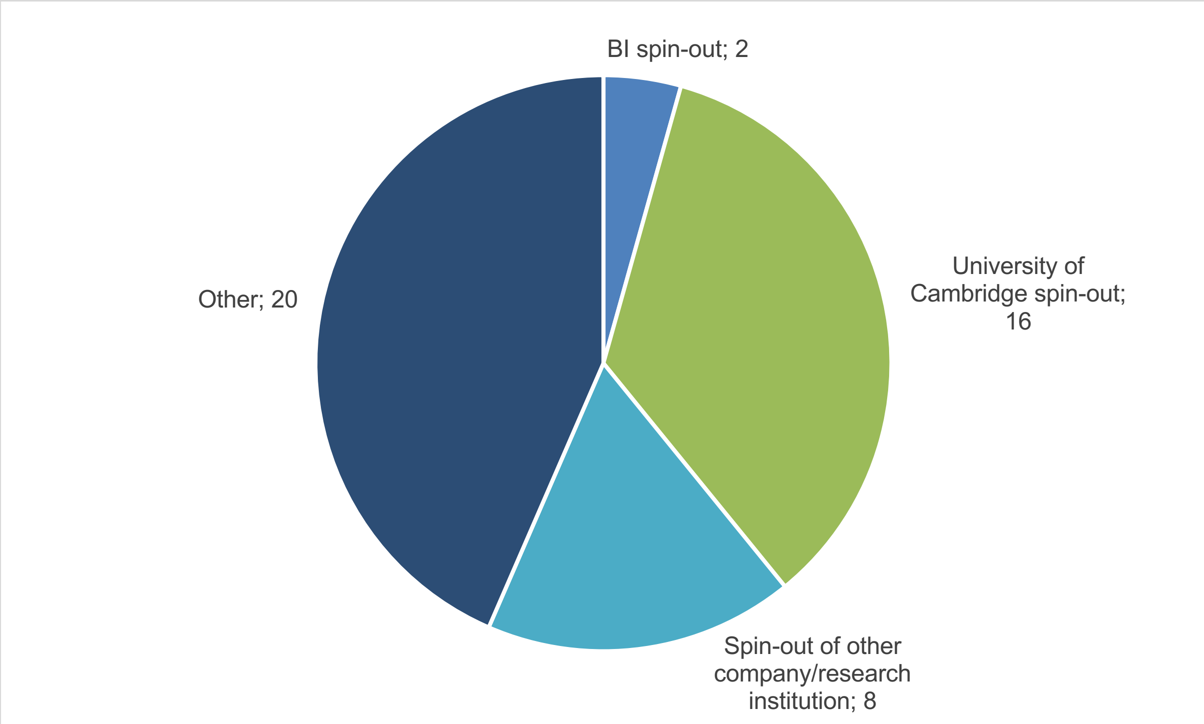
Growth performance and ambitions

4.33 The analysis presented so far points to the support structure provided by the BRC as a key factor enabling Campus companies to advance their core scientific programme or technology. The Campus has created the conditions for a number of these companies to grow organically, while attracting other bioscience companies to the site. Although many similarities exist among companies located on the Campus, there are several differences within the vibrant community of start-up and scale-up companies on site that should be adequately captured.

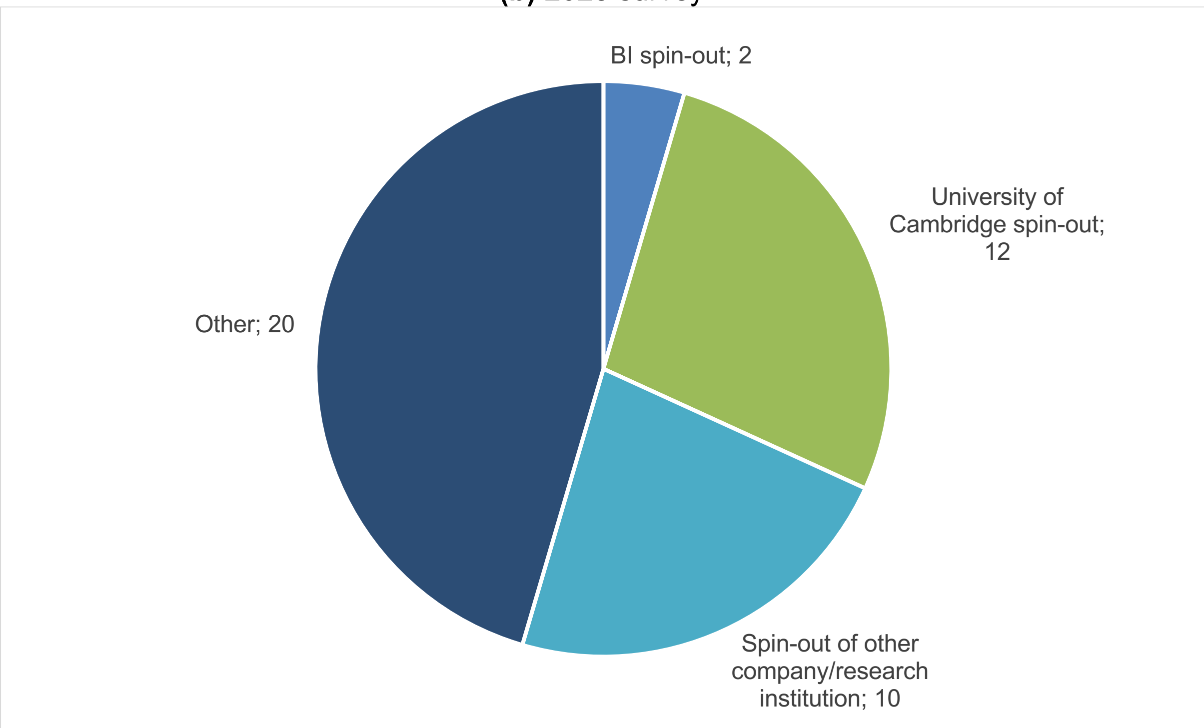
4.34 This section profiles the 44 companies included in our survey based on their origin, age and whether they set up on the BRC or moved to the site thereafter. Figure 4.6 provides a breakdown of Campus companies according to the origin of the business, including a comparison with the equivalent figures from the 2019 survey.

Figure 4.6 Origin of the business

(a) 2019 survey



(b) 2023 survey



Source: CBR.

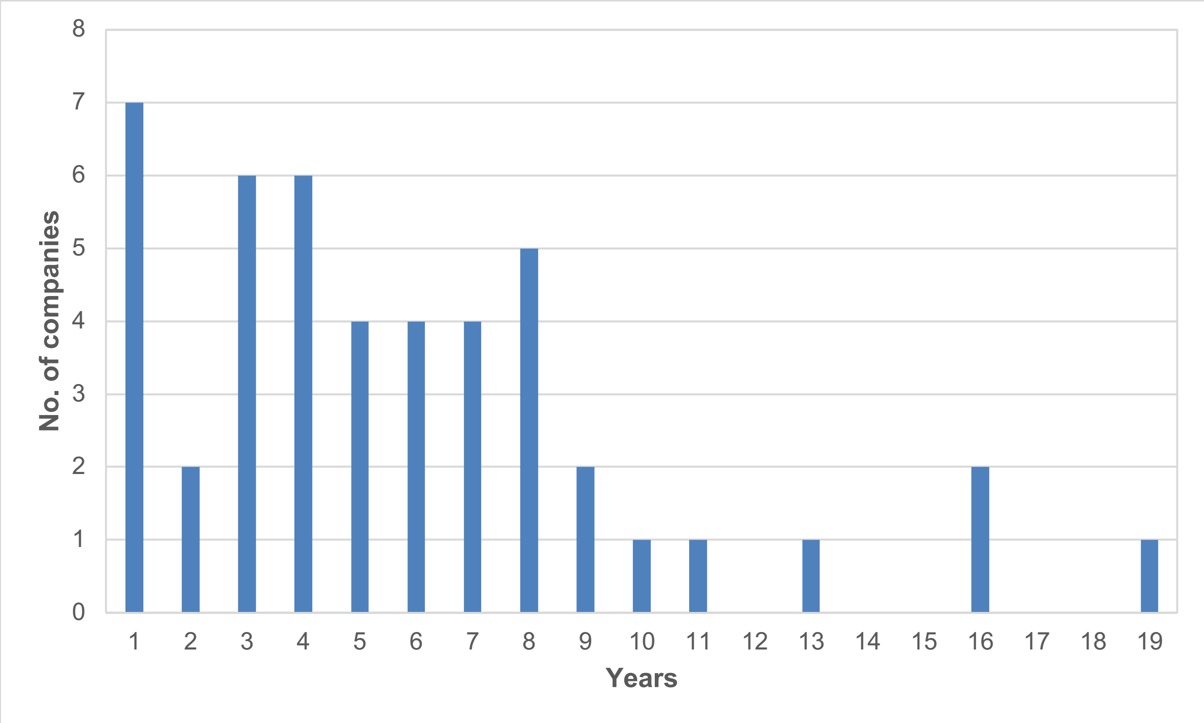
4.35 Figure 4.6 shows that a significant number of companies located on the BRC spun out of BI, the University of Cambridge or another institute/organisation. Two of the Campus companies were created to progress scientific research from BI, while about one out of three companies are based on science or technology originating from the University of Cambridge.

An additional ten companies are spinouts of other companies or research institutions, including best-in-class organisations such as PA Consulting, UCL and Wellcome Sanger Institute. The remainder 45% of Campus companies had no direct link with science or technology generated in other companies or research institutions when they were first set up. These figures are largely in line with the 2019 picture.

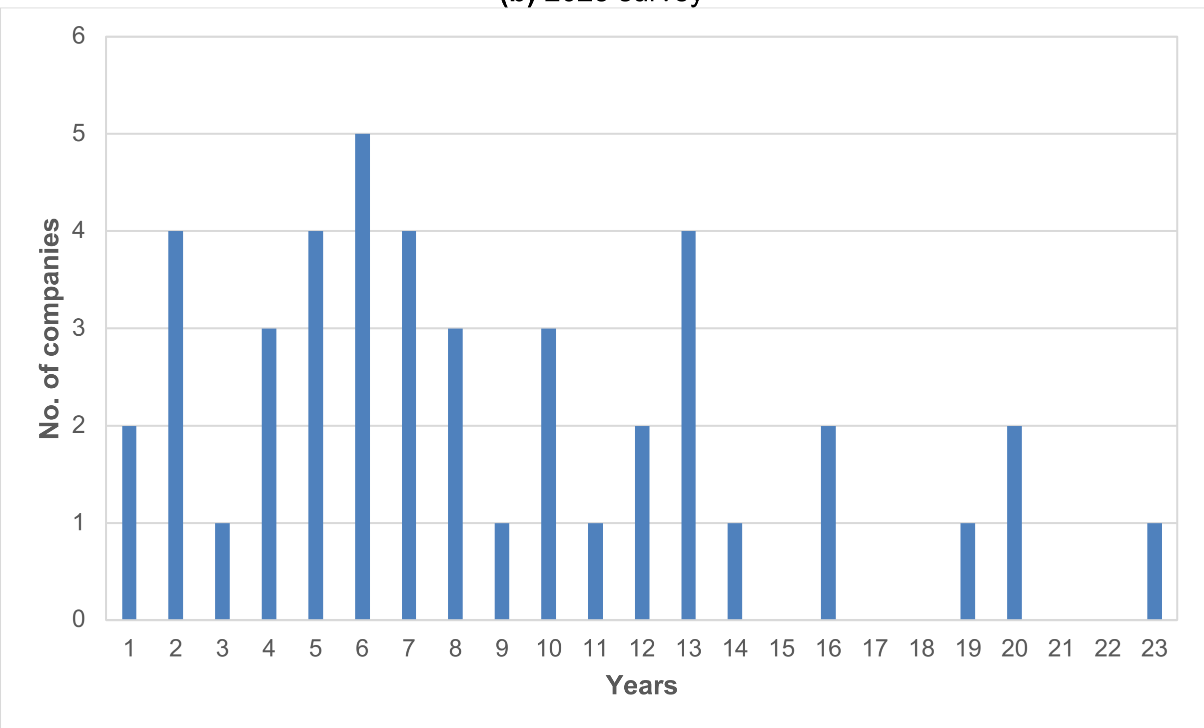
4.36 Figure 4.7 provides a count of Campus companies by age of the business, calculated as the number of years since incorporation.

Figure 4.7 Age of the business (years)

(a) 2019 survey



(b) 2023 survey



Source: CBR.

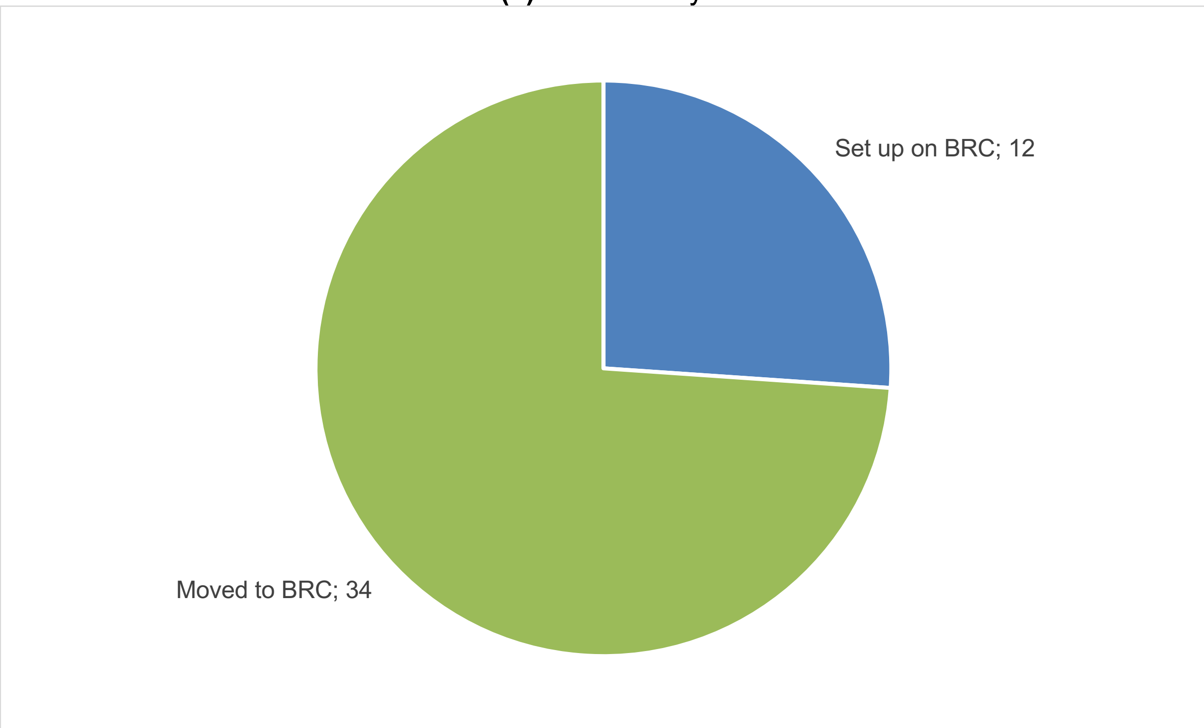
4.37 The 44 companies included in our 2023 survey have an average age of just under 9 years. Two-thirds of the companies have up to 10 years of age, most of which are within five years of incorporation. Companies that have been in operation for more than 15 years represent 14% of the total and include established life science ventures such as Abzena, BenevolentAI and Crescendo Biologics who have been able to grow on the Campus.[20] These figures vividly illustrate the diversity of life science ventures located on the BRC, which is home to younger businesses operating alongside more mature and established businesses. Importantly, the results presented in Figure 4.7 show that the diversity of age profiles has increased over time. Over 90% of the companies included in our 2019 survey had been trading for 10 years or less compared with an equivalent figure of 68% from the 2023 survey, underscoring the successful role played by the Campus in supporting all stages of life science venture.

4.38 Figure 4.8 groups Campus companies based on whether they were set up directly on the BRC or moved to the site after they were first established.

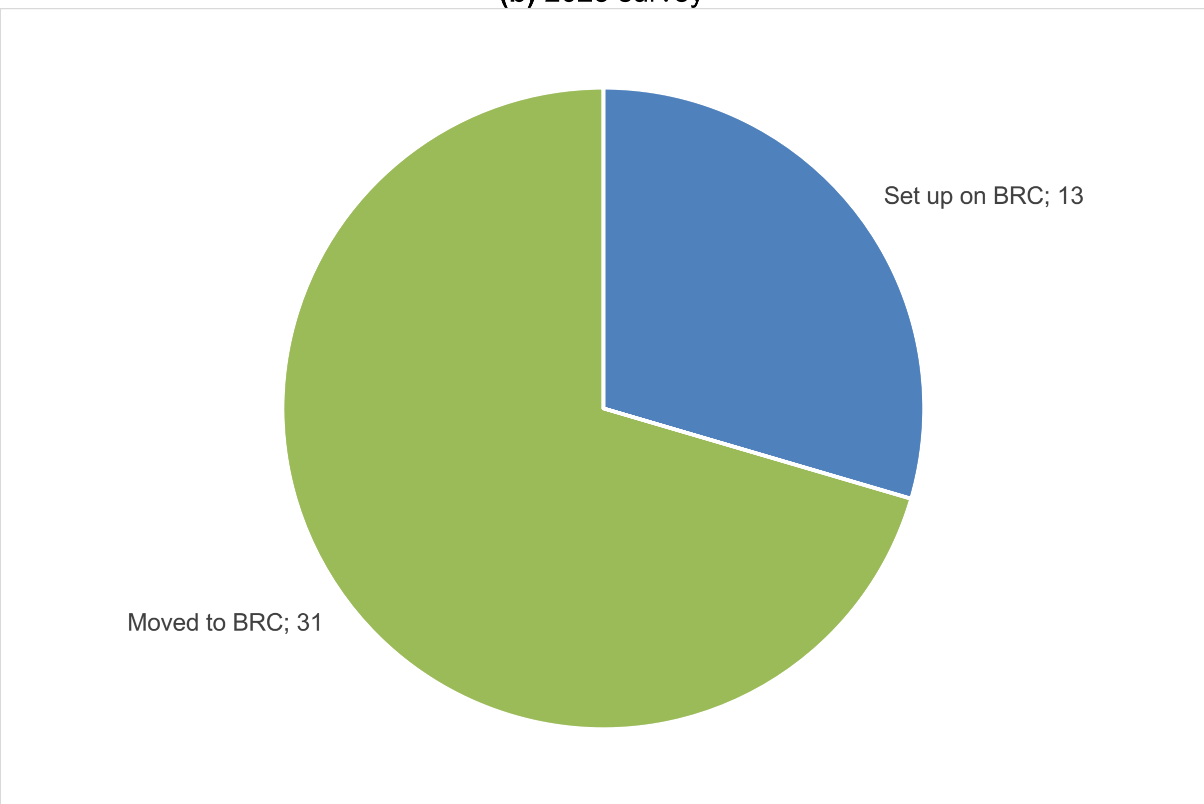
[20] Among the BRC-based companies that have been in operation for more than 15 years is also One Nucleus, who was first established as Eastern Region Biotechnology Initiative (ERBI) in 1997 and subsequently merged with the London Biotechnology Network (LBN) in 2010.

Figure 4.8 Set up on/moved to the Babraham Research Campus

(a) 2019 survey



(b) 2023 survey



Source: CBR.

4.39 The supportive environment provided by the Campus facilitated the creation of 13 out of the 44 companies covered by our survey. The overwhelming majority of the companies moved to the BRC at some point after incorporation, some shortly after being formed and others after a longer period. The survey responses suggest that companies who moved to the BRC may have been attracted by the availability of suitable premises on flexible lease terms and the various other benefits the Campus offers to its occupiers.

4.40 To establish the extent to which Campus companies' activities on the BRC are central to their operations, we asked survey participants to give us the location of their employment. Table 4.3 presents a summary of their responses.[21]

Table 4.3 Location of Campus companies' employment

	2019 survey	2023 survey
On Babraham Research Campus	86.8%	80.7%
Not on Babraham Research Campus but within 20 miles of centre of Cambridge	2.5%	7.4%
Not within 20 miles of Cambridge but within the United Kingdom	5.2%	9.9%
Outside the United Kingdom	5.5%	2.0%

Number of responses: 45 (2019 survey); 42 (2023 survey)
Source: CBR.

4.41 The BRC emerges by far as the primary location for these companies. Over 80% of staff (87% in the 2019 survey) are located on the Campus, indicating that employment of these companies is concentrated in one main location. The remaining share of employment tends to be located elsewhere in the Cambridge area or across the UK, whilst only 2% of employment is based overseas (mostly in North America) – a figure that is somewhat lower than the 5.5% figure from the 2019 survey.

4.42 Companies located on the BRC were also asked about the nature of their employment. Just under 90% of Campus companies' employees are in jobs that require a science qualification, indicating that most of the jobs created by these fast-growing bioscience companies are knowledge intensive, high value added.

Campus companies and their sectors

4.43 A distinguishing feature of companies located on the BRC is their strong focus on life sciences, as will become apparent in the next section. Life sciences encompass a variety of businesses, from R&D focused biotechs to contract research organisations to businesses producing medical technology products. This section delves deeper into the sectoral composition of companies located on the BRC by providing a comparison of selected key

[21] The employment data used to produce the figures in Table 4.3 differs from the employment data used for the business and science locations comparison, as the former is based on survey returns rather than audited accounts and covers a slightly more up-to-date period. Two companies were excluded from the analysis presented in Table 1.3 because we lacked information to allow for a breakdown of employment by location.

characteristics across life science sectors.

4.44 This comparison differs from the analysis presented in the 2019 impact study because, in agreement with BRCL, it was decided to use the sectoral classification put forward by the Office for Life Sciences, which distinguishes between four main life science sectors (Office for Life Sciences, 2024, *Bioscience and health technology sector statistics*):[22]

- *Core biopharmaceutical.* It comprises businesses, from R&D focused biotechs to Big Pharma, involved in developing and/or producing their own pharmaceutical products.
- *Biopharmaceutical service and supply.* It includes businesses, for example contract research and manufacturing organisations (CRMOs), that provide goods and services to core biopharmaceutical businesses.
- *Core medical technology.* It covers companies whose primary business is to develop and produce medical technology products, ranging from single-use consumables to complex hospital equipment.
- *Medical technology service and supply chain.* It includes businesses, for example CRMOs, that provide services to core medical technology businesses.

Comparison of company characteristics by sector

4.45 Each of the 44 Campus companies included in our survey was assigned an Office for Life Sciences sectors.[23] However, two companies had to be excluded because no information was provided on their employment on the BRC, while another two companies were dropped as they do not operate in any of the four life science sectors. A comparison was then made across sectors based on the following company characteristics: tenant type; employment on the BRC; funds raised to date; R&D spend over the last four years; company age; and origin of the business. The results of this comparison are presented in Table 4.4a (totals) and Table 4.4b (averages).

[22] These sectors are further disaggregated into more than 40 segments that describe the individual product or service groups within a sector. However, this further disaggregation was deemed too granular for our analysis, which therefore uses the four sectors defined above.

[23] We are grateful to Dr Kathryn Chapman, Director of Science and Entrepreneurship at BRCL, for her assistance with classifying Campus companies into life science sectors.

Table 4.4a Comparison of company characteristics by sector: totals

Sector	N	Tenant type	Tot empl on BRC	Funds raised to date £,000	R&D spend last 4 years £,000	No. large (empl >= 10)	No. old (age > 5 years)	Origin
Core biopharmaceutical	26	Tenant = 22 Virtual = 2 Communal lab user = 2	847	1,173,959	734,682	16	16	BI spin-out = 1 UoC spin-out = 7 Spin-out of other org = 8 Other = 10
Biopharmaceutical service and supply	10	Tenant = 9 Virtual = 0 Communal lab user = 1	293	118,301	28,151	6	9	BI spin-out = 1 UoC spin-out = 3 Spin-out of other org = 0 Other = 6
Core medical technology	4	Tenant = 1 Virtual = 1 Communal lab user = 2	6	42,657	2,788	0	2	BI spin-out = 0 UoC spin-out = 0 Spin-out of other org = 2 Other = 2
		Tenant = 32	1,133	1,302,918	759,791	22	23	
		Virtual = 3	2	30,336	5,430	0	3	
		Communal lab user = 5	11	1,664	400	0	1	
All	40		1,146	1,334,918	765,621	22	27	

Table 4.4b Comparison of company characteristics by sector: averages

Sector	N	Tenant type	Average empl on BRC	Average funds raised to date £,000	Average R&D spend last 4 years £,000	% large (empl >= 10)	% old (age > 5 years)	Average age (years)	Origin
Core biopharmaceutical	26	Tenant = 84.6% Virtual = 7.7% Communal lab user = 7.7%	33	45,152	28,257	61.5%	61.5%	7.9	BI spin-out = 3.8% UoC spin-out = 26.9% Spin-out of other org = 30.8% Other = 38.5%
Biopharmaceutical service and supply	10	Tenant = 90.0% Virtual = 0.0% Communal lab user = 10.0%	29	11,830	2,815	60.0%	90.0%	10.9	BI spin-out = 10.0% UoC spin-out = 30.0% Spin-out of other org = 0.0% Other = 60.0%
Core medical technology	4	Tenant = 25.0% Virtual = 25.0% Communal lab user = 50.0%	2	10,664	697	0.0%	50.0%	6.3	BI spin-out = 0.0% UoC spin-out = 0.0% Spin-out of other org = 50.0% Other = 50.0%
		Tenant = 80.0%	35	40,716	23,743	68.8%	71.9%	9.6	
		Virtual = 7.5%	1	10,112	1,810	0.0%	100.0%	6.3	
		CL user = 12.5%	2	333	80	0.0%	20.0%	2.6	
All	40		29	33,373	19,141	55.0%	67.5%	8.5	

Source: CBR.

4.46 Companies operating in the core biopharmaceutical sector represent the largest group of Campus companies, accounting for 65% of the total number of companies and 74% of staff employed on the BRC. These companies, most of which are renting premises on the Campus, also contribute the largest share of funds raised to date (£1.2bn) and R&D spend over the last four years (£735m). On average, each company in the core biopharmaceutical sector has raised over £45m funds and spent more than £28m in R&D, well above the average across all companies (£33m and £19m, respectively). A considerable number of core biopharmaceutical companies have at least 10 employees and have been in operation for more than 5 years. One of these companies spun out of BI, seven are based on science or technology originating from the University of Cambridge and eight are spinouts of another organisation.

4.47 The second largest group of Campus companies includes those operating in the biopharmaceutical service and supply sector, which represent one-fourth of both the total number of companies and employment on the BRC. Despite being less numerous than the core biopharmaceutical group, biopharmaceutical service and supply companies contribute a significant amount of fundraising (£118m) and R&D expenditure (£28m). However, the average funds raised and R&D spent by these companies (£12m and £3m, respectively) is lower compared with core biopharmaceutical companies. Companies in the biopharmaceutical service and supply sector have the highest average age among all groups (11 years against an average of 9 years across all companies).

4.48 Core medical technology is the smallest group of Campus companies, with just one tenant, one virtual and two communal lab users. Not surprisingly, this group accounts for the lowest share of employment on the BRC. On average, core medical technology companies have raised just under £11m funds and spent £0.7m in R&D. These companies are smaller and younger than the other two groups and do not include any BI or University of Cambridge spinouts.

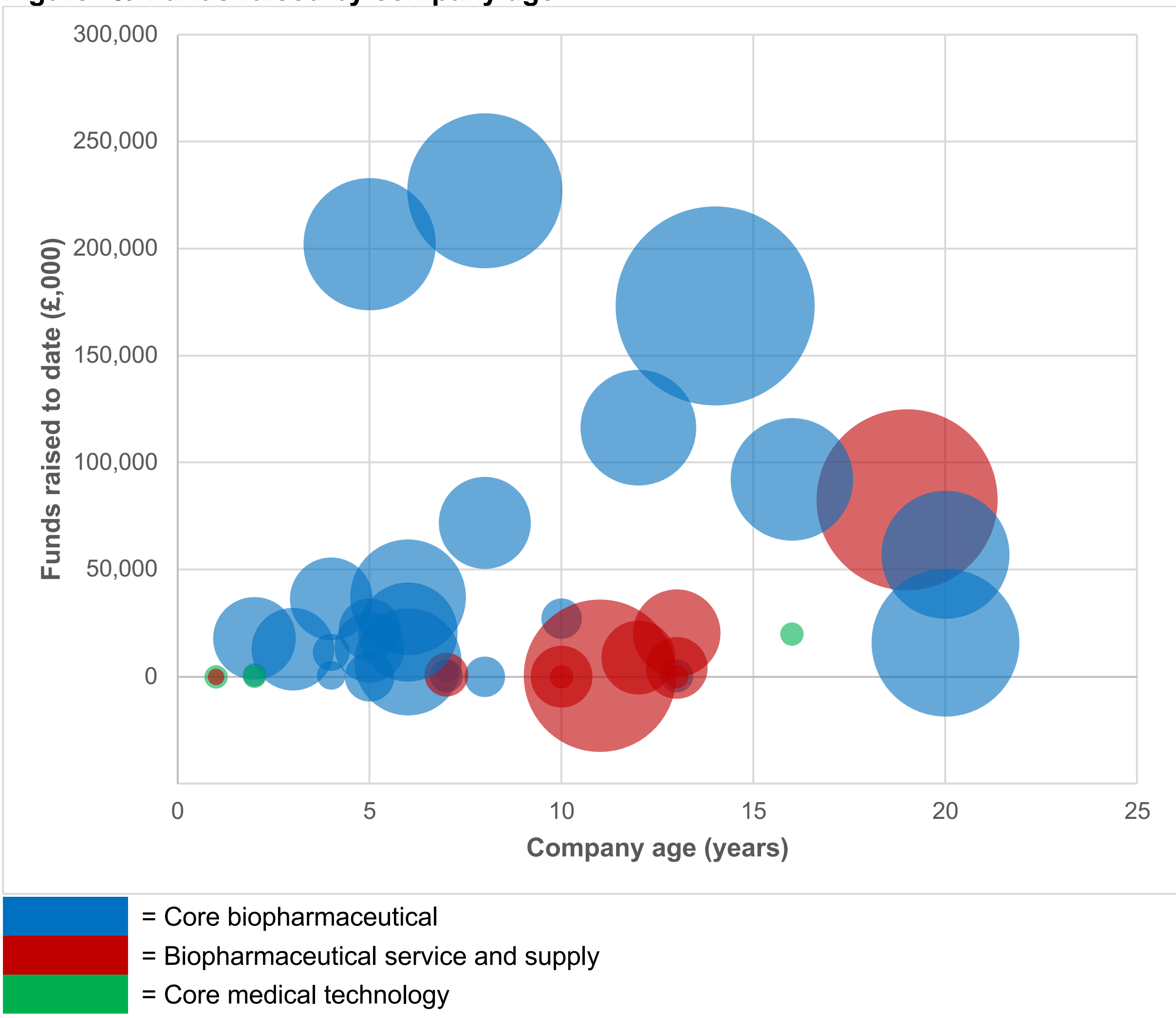
4.49 None of the Campus companies was classified into the medical technology service and supply chain sector.

Funds raised and R&D spend by company age

4.50 The results reported in Tables 4.4a and 4.4b above highlight some important differences between Campus companies operating in different life science sectors. Our analysis shows a considerable variation in company age, funds raised and R&D spend across sectors, calling for some further exploration of the relationship between company age and these two key variables. This section examines whether (and how) this relationship changes depending on the life science sector.

4.51 Figure 4.9 depicts Campus companies' funds raised to date by age of the business. Each bubble represents a company, which is given a different colour depending on its life science sector.

Figure 4.9 Funds raised by company age

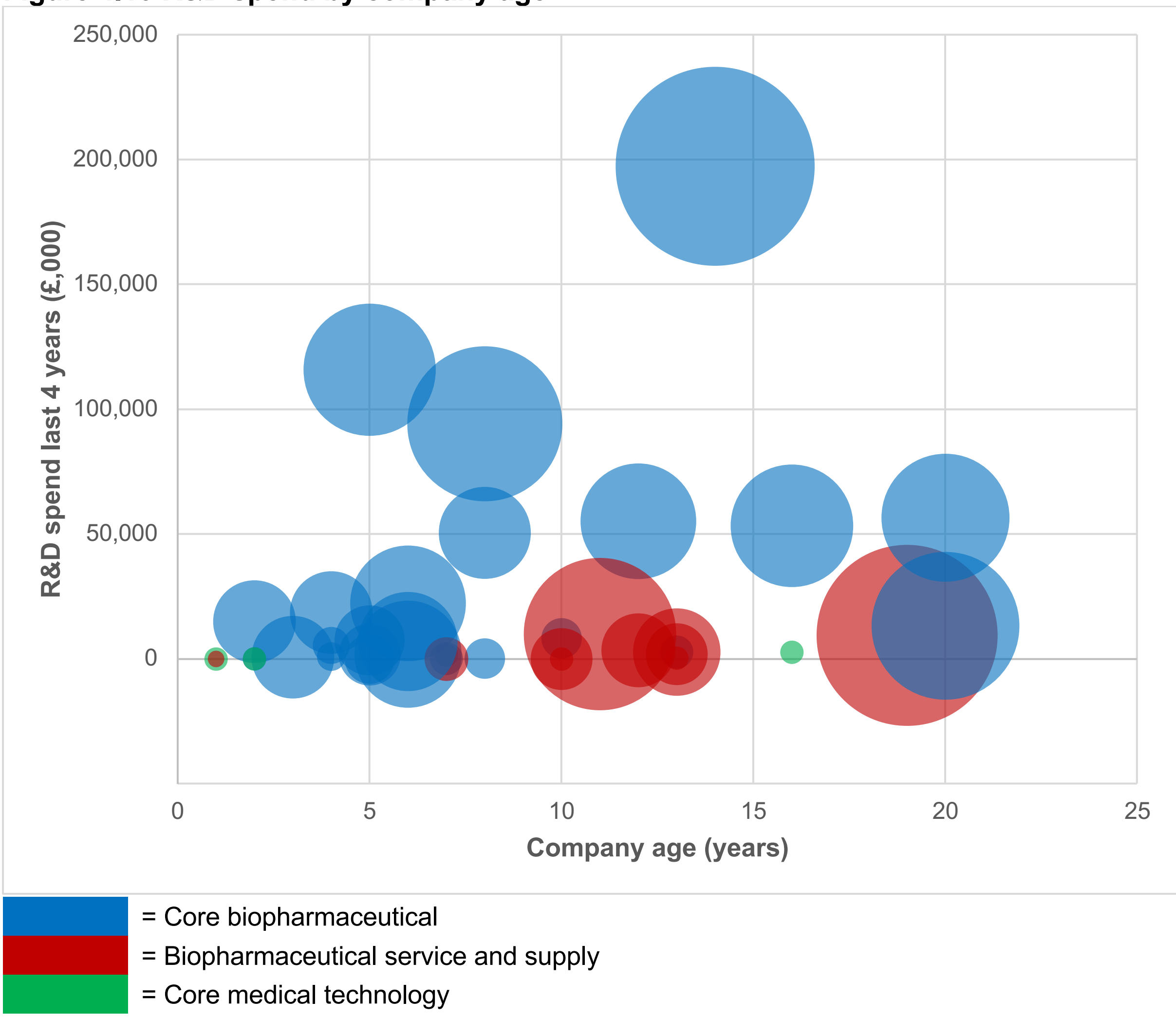


Note: The size of each bubble is proportionate to the number of employees on the BRC in the most recent year on a continuous scale.
Source: CBR.

4.52 Figure 4.9 generally provides support for a positive relationship between company age and funds raised. As one might expect, Campus companies that have been in operation for a longer period tend to have raised a higher amount of funds than younger companies. Funds raised by core biopharmaceutical companies appear to show an inverted U-shaped relationship with company age, suggesting that total fundraising may reach its peak when companies approach 15 years of age. Data for the other two groups points to a somewhat weaker relationship, possibly reflecting the nature of their business.

4.53 Figure 4.10 provides an equivalent analysis, this time looking at R&D spend by Campus companies over the last four years.

Figure 4.10 R&D spend by company age



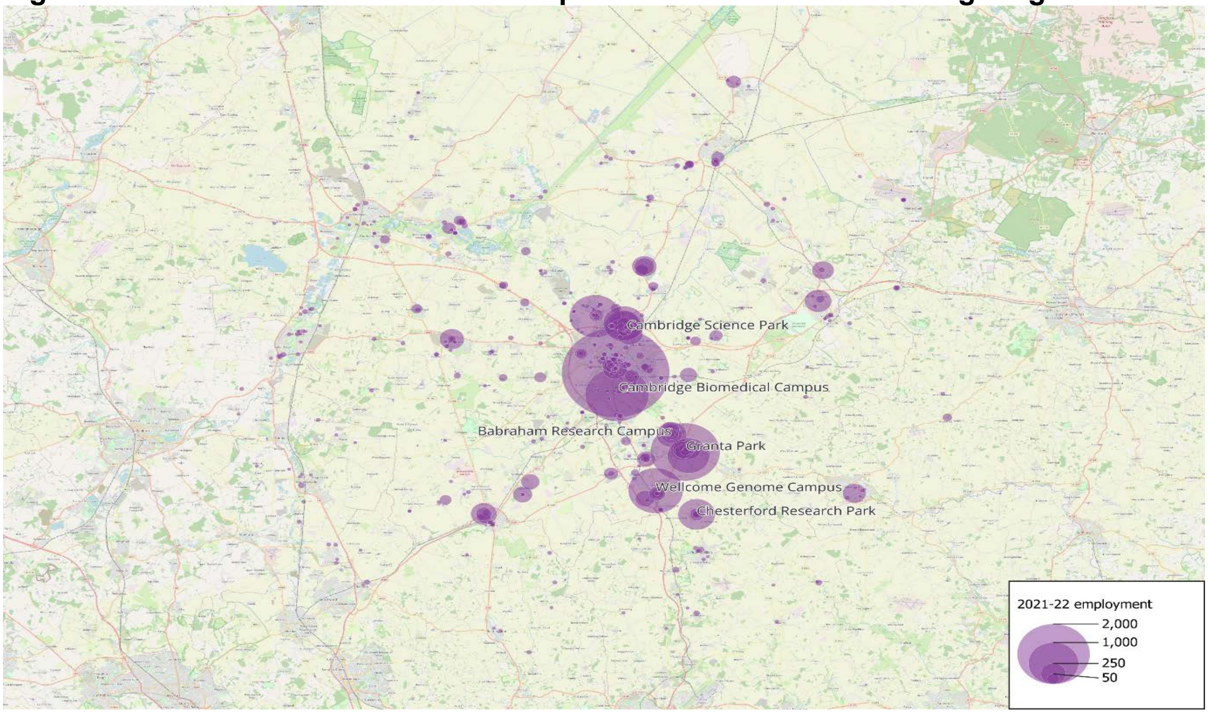
Note: The size of each bubble is proportionate to the number of employees on the BRC in the most recent year on a continuous scale.
Source: CBR.

4.54 The picture based on R&D expenditure largely mirrors the results for fundraising. Although company age is generally associated with higher R&D spend, it would appear that R&D activity of core biopharmaceutical companies increases with the age of the business until 10-15 years of age and stabilises thereafter. Figure 4.10 reveals that companies operating in the core biopharmaceutical sector aged 5 to 14 were the most R&D active over the last four years. The chart also offers a visual confirmation of the results summarised in Tables 4.4a and 4.4b – companies operating in the biopharmaceutical service and supply and core medical technology sectors have had a lower level of R&D (and fundraising) activity compared with core biopharmaceutical companies.

Comparison of BRC with other business and science locations

4.55 The sectoral analysis of companies located on the BRC vividly illustrates the significance of the R&D and fundraising activity that is taking place on the Campus. To put this analysis into context, this section examines how the BRC compares against other business and science locations in the wider Cambridge region. Figure 4.11 maps the location of Cambridge-based companies operating in the life science sector, pointing to strong employment concentrations on the BRC as well as other business and science locations in the region.

Figure 4.11 Location of life science companies based in the Cambridge region



Note: Each bubble identifies a company. The size of each bubble is proportionate to the number of employees in 2021-22 on a continuous scale. The Cambridge region is defined as a 20-mile radius of Great St Mary's. Additional maps are available on the Centre for Business Research website (https://www.jbs.cam.ac.uk/centres/business-research-cbr/research/research-projects/project-the-cambridge-corporate-database-regional-growth/).
Source: CBR. © Andy Cosh & Giorgio Caselli

4.56 As explained in the methodology section, this element of the work draws on unique company-level data available to the research team as part of the CBR corporate database, not on the survey responses. It includes both Babraham Research Campus Limited and the Babraham Institute, along with some businesses that are not currently active on the BRC.

4.57 Table 4.5 provides a comparison of companies located on the main business and science locations in the region according to company age, employment size and growth.[24] The locations included at the top of the list show a strong focus on life sciences and may hence be regarded as more similar to the BRC in terms of the nature of the companies located on them. The second group of locations have a mixture of knowledge intensive (KI) sectors, while the third group includes locations with a concentration of non-KI sectors.

[24] Unweighted employment growth is calculated as the simple average of the individual growth rates of all the companies on a given park, whereas weighted employment growth weighs each company's growth rate by the total number of people it employs.

Table 4.5 Comparison of companies on business and science locations: age, employment size and growth

BUSINESS & SCIENCE LOCATIONS	2023 Number of companies	Average age yrs	Average number of employees	Total Employment Latest Year	Employment growth over the last year % pa		Employment growth over the last three years % pa	
					Weighted	Unweighted	Weighted	Unweighted
Babraham Research Campus	65	8.9	31.0	2,012	13%	24%	10%	21%
Cambridge Research Park	66	9.6	27.5	1,817	4%	9%	5%	4%
Cambridge Science Park	198	11.3	43.5	8,620	15%	14%	11%	12%
Chesterford Research Park	22	12.4	58.8	1,294	3%	26%	20%	26%
Granta Park	20	19.3	257.8	5,156	17%	20%	10%	16%
Iconix Park	7	17.9	53.0	371	1%	0%	4%	2%
O2h Scitech Park	6	6.2	4.0	24	26%	49%	19%	10%
Wellcome Genome Campus	7	12.0	197.4	1,382	1%	18%	5%	5%
Cambourne Business Park	53	11.0	38.2	2,026	4%	6%	2%	2%
Cambridge Business Park	87	8.6	18.4	1,604	4%	-2%	4%	-1%
Harston Mill	6	19.5	113.8	683	7%	14%	2%	5%
Melbourn Science Park	6	19.0	99.2	595	7%	7%	9%	4%
St John's Innovation Centre / Park	246	12.2	10.4	2,555	13%	7%	10%	4%
Cambridge Commercial Park	15	17.1	28.1	421	17%	17%	23%	12%
Colmworth Business Park	93	13.7	9.5	888	7%	3%	2%	4%
Lancaster Way Business Park	81	17.4	33.6	2,723	5%	5%	3%	2%
South Cambridge Business Park	127	12.8	5.8	732	3%	7%	0%	1%
Vision Park	240	11.6	7.5	1,805	7%	7%	5%	3%
Total	1,345		25.8	34,708				

Source: CBR.

4.58 On average, the 65 companies on the BRC are younger than those located on many other locations in the wider Cambridge region. The average age of Campus companies (8.9 years) is significantly lower than other life science-focused locations such as Granta Park (19.3) and Chesterford Research Park (12.4). Even the Wellcome Genome Campus, which is similar to the BRC in its co-location of a world-leading academic institution (the Sanger Institute) with a number of innovative genomics and biodata companies, has an older business base (12.0).

4.59 Another distinguishing feature of the BRC is the small size of its companies relative to other life science locations. A company on the BRC employs on average 31 people worldwide, compared with 258 for Granta Park, 197 for the Wellcome Genome Campus and 59 for Chesterford Research Park. Nevertheless, companies based on the BRC employ more than 2,000 employees globally, a very significant figure if one considers that most of these employees are physically located on the Campus (Table 4.3). Companies on the BRC tend to be larger than those located on another park with a long history of providing support to young and entrepreneurial businesses, the St John's Innovation Centre (10 employees). However, the latter is home to a considerably high number of companies, many of which only have a virtual presence on site.

4.60 Companies located on life science-focused locations have achieved fast growth over the last three years, showing a superior performance compared with companies located on any of the other park types. BRC-based companies are no exception, with their employment growing by 13% in the latest year and by 10% pa over the last three years despite the challenges associated with COVID and the UK's cost-of-living crisis. *These figures provide further evidence on the dynamic, fast-growing business community operating on the Campus.*

4.61 Table 4.6 presents a detailed analysis of R&D activity of Campus companies against those based on other business and science locations. R&D expenditure data was taken directly from the companies' audited accounts whenever available. If not provided in the accounts, R&D spend was estimated using R&D expenditure data for adjacent years, or the proportion of R&D staff reported in the accounts, or the R&D tax credits shown that year. For companies without significant turnover, we obtained estimates of their R&D activity based on annual changes in their share premium account, ordinary shares and shareholders' funds.

4.62 The BRC ranks in the top three life-sciences business locations in the wider Cambridge region for total R&D spend over the last three years (£727m), together with Granta Park (£2.5bn) and Cambridge Science Park (£1bn). However, the latter locations have more mature and larger companies (e.g. Illumina on Granta Park), as shown in Table 4.5 above. The relatively small size of companies located on the BRC is reflected in a lower average annual spend on R&D compared with the average for all locations (£5m and £14.1m, respectively).

4.63 A figure that is perhaps most revealing of the vibrancy of the BRC is the number of companies carrying out R&D. It is estimated that 48 out of the approximately 60 businesses on the Campus engaged in R&D activity over the last four years, the highest figure by far across all locations.

4.64 These important differences in R&D activity may not only be reflective of differences in company age and size, but also in the sectoral make-up of these locations. For this reason, Table 4.7 compares the sectoral distribution of companies on the BRC against those located on other business and science locations in the region. This analysis considers four main sectors: Life Science; Information and Communications Technology (ICT); Other KI sectors (i.e. High-Tech Manufacturing and Knowledge Intensive Services); and Non-KI sectors (e.g. Property and Finance).

4.65 The BRC emerges as the campus with the greatest specialisation in life sciences across the research locations assessed – 97% of the companies and close to 100% of employment. These figures differentiate the BRC from other key locations within the Cambridge ecosystem such as Cambridge Science Park and St John's Innovation Centre, which have a sectorally more diversified business base. The Wellcome Genome Campus, Granta Park and Chesterford Research Park are similar to the BRC in their sectoral distribution but have a somewhat lower concentration of life science companies.

4.66 The differences in the sectoral distribution of Campus companies alongside those located on other business and science locations become even more apparent when examined in terms of R&D spend over the last three years. This analysis is presented in Table 4.8.

Table 4.6 Comparison of companies on business and science locations: R&D activity

BUSINESS & SCIENCE LOCATIONS	Latest Year		Total over last 3 years		Over last 4 years	
	Number of companies carrying out R&D	Total R&D spend £,000	Number of companies carrying out R&D	Total R&D spend £,000	Number of companies carrying out R&D	Average annual spend of those doing R&D £,000
Babraham Research Campus	43	355,866	48	726,935	48	4,950
Cambridge Research Park	6	19,182	6	55,265	6	2,869
Cambridge Science Park	26	379,893	29	1,031,754	29	12,674
Chesterford Research Park	8	49,228	8	123,940	9	4,042
Granta Park	12	967,647	12	2,534,858	12	63,239
Iconix Park	3	20,275	3	58,852	3	6,924
O2h Scitech Park	0	0	0	0	0	0
Wellcome Genome Campus	3	10,420	4	26,302	4	2,146
Cambourne Business Park	8	36,707	9	122,396	9	4,518
Cambridge Business Park	3	9,567	4	635,104	4	55,477
Harston Mill	4	39,347	4	85,051	4	92,885
Melbourn Science Park	2	12,095	2	31,634	2	5,053
St John's Innovation Centre / Park	8	76,339	8	195,081	9	6,801
Cambridge Commercial Park	0	0	0	0	0	0
Colmworth Business Park	1	345	1	1,301	2	289
Lancaster Way Business Park	5	4,508	5	13,457	5	885
South Cambridge Business Park	0	0	0	0	0	0
Vision Park	9	50,153	9	121,896	9	3,940
Total	**141**	**2,031,571**	**152**	**5,763,825**	**155**	**14,147**

Source: CBR.

Table 4.7 Sectoral distribution of companies on business and science locations: number of companies and employment (latest year)

LATEST YEAR	Life Science		ICT		Other KI		Non-KI		Life Science		ICT		Other KI		Non-KI	
BUSINESS & SCIENCE LOCATIONS	**No of cos**	**%**	**No of cos**	**%**	**No of cos**	**%**	**No of cos**	**%**	**Total empl**	**%**	**Total empl**	**%**	**Total empl**	**%**	**Total empl**	**%**
Babraham Research Campus	63	97%	0	0%	1	2%	1	2%	2,002	100%	0	0%	9	0%	1	0%
Cambridge Research Park	4	6%	13	20%	9	14%	40	61%	487	27%	259	14%	897	49%	174	10%
Cambridge Science Park	31	16%	34	17%	27	14%	106	54%	2,877	33%	3,362	39%	1,846	21%	535	6%
Chesterford Research Park	16	73%	1	5%	2	9%	3	14%	1,091	84%	1	0%	39	3%	163	13%
Granta Park	15	75%	0	0%	2	10%	3	15%	4,278	83%	0	0%	857	17%	21	0%
Iconix Park	4	57%	2	29%	1	14%	0	0%	210	57%	133	36%	28	8%	0	0%
O2h Scitech Park	3	50%	1	17%	0	0%	2	33%	6	25%	8	33%	0	0%	10	42%
Wellcome Genome Campus	6	86%	1	14%	0	0%	0	0%	1,381	100%	1	0%	0	0%	0	0%
Cambourne Business Park	3	6%	17	32%	3	6%	30	57%	271	13%	664	33%	756	37%	335	17%
Cambridge Business Park	3	3%	8	9%	1	1%	75	86%	5	0%	627	39%	757	47%	215	13%
Harston Mill	1	17%	3	50%	2	33%	0	0%	11	2%	207	30%	465	68%	0	0%
Melbourn Science Park	2	33%	1	17%	1	17%	2	33%	161	27%	5	1%	413	69%	16	3%
St John's Innovation Centre / Park	30	12%	74	30%	32	13%	110	45%	241	9%	1,443	56%	265	10%	606	24%
Cambridge Commercial Park	1	7%	2	13%	3	20%	9	60%	3	1%	59	14%	88	21%	271	64%
Colmworth Business Park	1	1%	8	9%	6	6%	78	84%	1	0%	253	28%	78	9%	556	63%
Lancaster Way Business Park	5	6%	7	9%	6	7%	63	78%	56	2%	111	4%	1,097	40%	1,459	54%
South Cambridge Business Park	0	0%	11	9%	10	8%	106	83%	0	0%	44	6%	110	15%	578	79%
Vision Park	11	5%	34	14%	17	7%	178	74%	480	27%	358	20%	160	9%	807	45%
Total	**199**	**15%**	**217**	**16%**	**123**	**9%**	**806**	**60%**	**13,561**	**39%**	**7,535**	**22%**	**7,865**	**23%**	**5,747**	**17%**

Source: CBR.

Table 4.8 Sectoral distribution of companies on business and science locations: R&D (over last three years).

TOTAL OVER LAST THREE YEARS	Life Science		ICT		Other KI		Non-KI	
BUSINESS & SCIENCE LOCATIONS	R&D spend £,000	%	R&D spend £,000	%	R&D spend £,000	%	R&D spend £,000	%
Babraham Research Campus	726,186	100%	0	0%	749	0%	0	0%
Cambridge Research Park	26,433	48%	0	0%	28,832	52%	0	0%
Cambridge Science Park	595,449	58%	300,819	29%	135,285	13%	200	0%
Chesterford Research Park	122,628	99%	0	0%	1,312	1%	0	0%
Granta Park	2,489,409	98%	0	0%	45,449	2%	0	0%
Iconix Park	58,423	99%	428	1%	0	0%	0	0%
O2h Scitech Park	0	0%	0	0%	0	0%	0	0%
Wellcome Genome Campus	26,302	100%	0	0%	0	0%	0	0%
Cambourne Business Park	0	0%	113,391	93%	743	1%	8,262	7%
Cambridge Business Park	0	0%	23,383	4%	611,721	96%	0	0%
Harston Mill	5,526	6%	41,000	48%	38,525	45%	0	0%
Melbourn Science Park	11,922	38%	0	0%	19,712	62%	0	0%
St John's Innovation Centre / Park	3,010	2%	192,071	98%	0	0%	0	0%
Cambridge Commercial Park	0	0%	0	0%	0	0%	0	0%
Colmworth Business Park	0	0%	1,301	100%	0	0%	0	0%
Lancaster Way Business Park	0	0%	0	0%	4,663	35%	8,794	65%
South Cambridge Business Park	0	0%	0	0%	0	0%	0	0%
Vision Park	104,491	86%	8,211	7%	9,195	8%	0	0%
Total	**4,169,778**	**72%**	**680,605**	**12%**	**896,186**	**16%**	**17,256**	**0%**

Source: CBR.

4.67 The sectoral split of R&D expenditure over the last three years reveals that virtually all of the R&D activity on the BRC is carried out by companies operating in the life science sector. Once again, these figures make the BRC more similar to locations such as the Wellcome Genome Campus, Chesterford Research Park and Granta Park. By contrast, R&D expenditure data differentiates the BRC from locations such as Cambridge Science Park and St John's Innovation Centre, where a substantial proportion of R&D is carried out by companies operating in other KI sectors.

4.68 Table 4.8 also shows that the BRC has had one of the highest total R&D spend in life sciences over the last three years across all locations, second only to Granta Park (where Illumina has contributed a sizeable share of R&D expenditure). Overall, R&D spend by companies on the BRC accounted for over 17% of total R&D spend by life science companies located on any of these locations.

4.69 The results of our business locations comparison highlight *some of the distinguish features of companies located on the BRC, including their relatively young age and small size, fast employment growth and dynamic R&D activity.* Table 4.9 examines whether these features have changed over time by providing a comparison with the equivalent figures from the 2019 study. The arrows in the final column indicate whether a given indicator has increased (green arrow), decreased (red arrow) or remained unchanged (amber arrow).

Table 4.9 Babraham Research Campus: comparison with 2019 study

BABRAHAM RESEARCH CAMPUS	**2019 study**	**2023 study**	
Age, employment size and growth			
Number of companies	52	65	↑
Average age in years	6.6	8.9	↑
Average number of employees	31.6	31.0	↔
Total Employment Latest Year	1,643	2,012	↑
Employment growth over the last year % pa			
Weighted	9%	13%	↑
Unweighted	25%	24%	↔
Employment growth over the last three years % pa			
Weighted	14%	10%	
Unweighted	22%	21%	↔
R&D activity			
Number of companies carrying out R&D in latest year	41	43	↔
Total R&D spend in latest year £,000	131,759	355,866	↑
Number of companies carrying out R&D in last three years	41	48	↑
Total R&D spend in last three years £,000	312,509	726,935	↑
Ave annual spend of those doing R&D over last four (3 for 2019) years £,000	3,512	4,950	↑

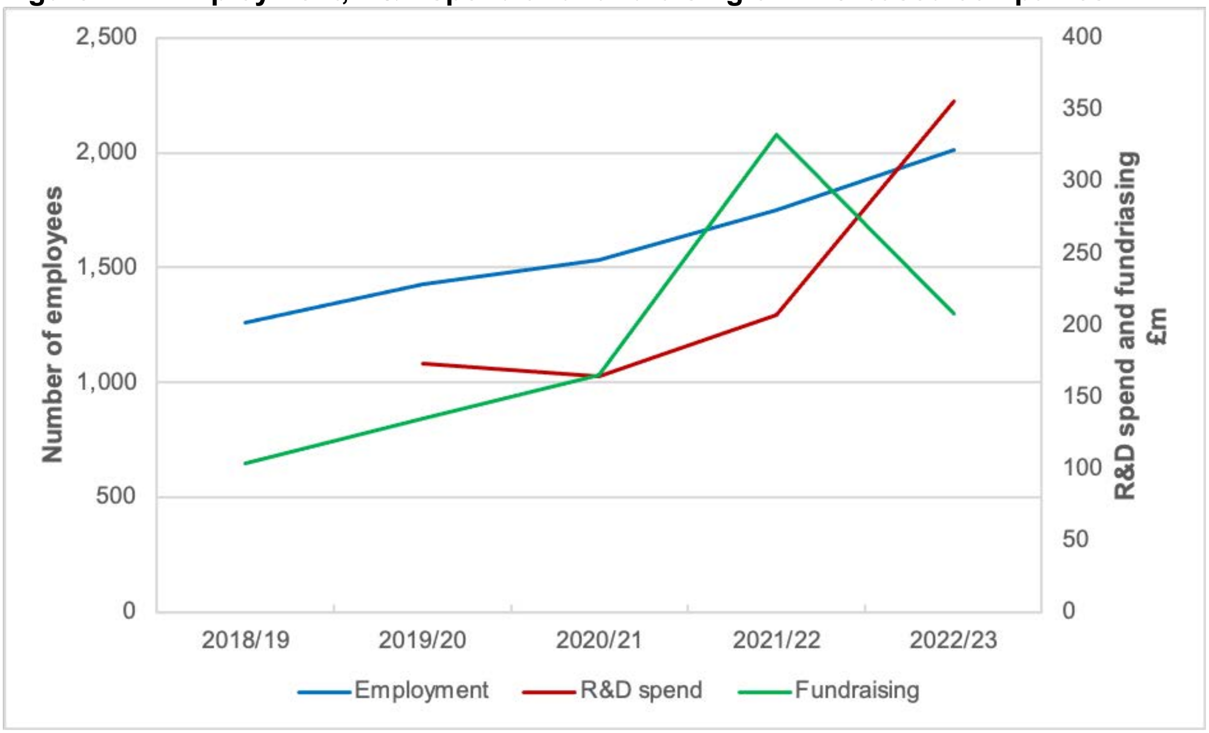
Fundraising			
Number of companies raising finance in latest year	27	27	↔
Total Funding raised in latest year £,000	169,718	208,335	↑
Number of companies raising finance in last three years	34	47	↑
Total Funding raised in last three years £,000	429,313	705,918	↑
Average annual amount raised in last five (3 for 2019) years £,000	4,286	4,313	↔

Source: CBR.

4.70 In a nutshell, the comparison presented in Table 4.9 portrays a picture of a growing and increasingly more dynamic business base on the BRC, as exemplified by the considerably higher R&D activity of 2023 occupiers compared with the 2019 study. *These figures are all the more remarkable if one considers that Campus companies' R&D and fundraising efforts happened against a backdrop of unprecedented uncertainty and disruption to business.* An analysis of fundraising by companies on business and science locations is presented in Section 2.3.

4.71 The comparison between 2019 and 2023 figures reported in Table 4.9 above begs the question of how companies based on the BRC have fared through the pandemic. Figure 4.12 examines Campus companies' activity, in terms of employment, R&D spend and fundraising, over the period 2018/19-2022/23 (data on R&D spend is available since 2019/20).

Figure 4.12 Employment, R&D spend and fundraising of BRC-based companies



Note: The number of employees is shown on the primary (left) axis, while R&D spend and fundraising (£m) are reported on the secondary (right) axis.
Source: CBR.

4.72 In line with the results that the CBR has been reporting for the broader life science sector in Cambridge over recent years, companies located on the BRC were little affected by the pandemic. Their employment continued to grow at pace, showing only a marginal slowdown when COVID hit in 2020-21. R&D expenditure by Campus companies did decline at the height of the pandemic (-5.2% in 2020/21), possibly reflecting the challenges of accessing services provided by contract research organisations and other key suppliers during the lockdown period. However, R&D activity on the BRC has been very strong since. In turn, fundraising growth increased at fast rates until 2021-22 before falling in the latest year, which saw a significant decrease in global VC investments. Since Campus companies tend to finance their R&D activity by raising new funds, it is possible that this fall in fundraising will have implications for future R&D spend.

4.73 Table 4.10 offers another comparison with the business locations analysis that was conducted for our 2019 study, this time considering the sectoral distribution of companies located on these locations.

Table 4.10 Sectoral analysis of business and science locations: comparison with 2019 study

SECTORAL ANALYSIS	Babraham Research Campus		All eight life sciences locations		All eighteen business locations	
	2019 study	2023 study	2019 study	2023 study	2019 study	2023 study
Number of companies						
Life Sciences	50	63	117	142	147	199
% of total	96%	97%	57%	36%	20%	15%
ICT	0	0	33	52	141	217
% of total	0%	0%	16%	13%	20%	16%
Other KI	0	1	26	42	81	123
%	0%	2%	13%	11%	11%	9%
Non-KI	2	1	30	155	352	806
%	4%	2%	15%	40%	49%	60%
Employment						
Life Sciences	1,480	2,002	11,907	12,332	12,165	13,561
% of total	90%	100%	42%	60%	23%	39%
ICT	0	0	2,102	3,764	10,287	7,535
% of total	0%	0%	7%	18%	20%	22%
Other KI	0	9	5,133	3,676	9,301	7,865
%	0%	0%	18%	18%	18%	23%
Non-KI	163	1	9,002	904	20,541	5,747
%	10%	0%	32%	4%	39%	17%
R&D spend Last three years £,000						
Life Sciences	312,509	726,186	2,098,439	4,044,830	2,112,842	4,169,778
% of total	100%	100%	86%	89%	52%	72%
ICT	0	0	49,207	301,248	540,924	680,605
% of total	0%	0%	2%	7%	13%	12%
Other KI	0	749	270,626	211,628	1,410,995	896,186
%	0%	0%	11%	5%	35%	16%
Non-KI	0	0	20,384	200	20,550	17,256
%	0%	0%	1%	0%	1%	0%
Funds raised Last three years £,000						
Life Sciences	429,313	692,973	852,304	2,269,221	890,020	2,401,201
% of total	100%	98%	67%	74%	56%	63%
ICT	0	0	117,162	229,089	312,465	492,300
% of total	0%	0%	9%	7%	20%	13%
Other KI	0	12,945	241,536	302,913	285,014	510,697
%	0%	2%	19%	10%	18%	13%
Non-KI	0	0	61,319	262,835	88,689	400,368
%	0%	0%	5%	9%	6%	11%

Source: CBR.

4.74 The figures summarised in Table 4.10 confirm the major role played by the BRC as a hotspot for life science research and innovation within the Cambridge cluster. Despite the relatively small size and young age of its companies, the BRC contributes a significant share of life science employment, R&D and fundraising across all locations.

4.75 An important characteristic that distinguishes the BRC from other life science locations is the higher ratio of R&D spend to funds raised over the last three years. This finding suggests that the BRC is home to younger life science ventures that tend to finance their R&D activity by raising new funds, whilst many of the other life science locations host more mature companies that are generally self-funded from revenue.

4.76 Our analysis also shows that the contribution of companies operating in the life science sector to total activity on the business locations increased over time, particularly in terms of employment and R&D (this trend is less noticeable for the BRC given its already high specialisation in life sciences). Overall, these figures point to the BRC as a key component of the innovative milieu of the Cambridge cluster.

Growth objectives

4.77 Our comparison of the main business and science locations across the Cambridge region found that companies located on the BRC have achieved fast growth in employment and performed well against companies on other locations in recent years. To understand the prospects for future growth, we asked Campus companies to share their growth objectives in two and five years' time in terms of number of employees and floor space occupied. Their responses are analysed in Table 4.11.[25]

Table 4.11 Growth objectives of Campus companies

	In 2 years' time				In 5 years' time			
	2019 survey		2023 survey		2019 survey		2023 survey	
	%	% pa	%	% pa	%	% pa	%	% pa
Number of employees	47.5%	21.5%	25.1%	11.9%	149.4%	20.1%	133.7%	18.5%
Floor space occupied (sq. ft)	63.7%	28.0%	46.7%	21.1%	155.6%	20.6%	165.3%	21.5%

Number of responses: 33 (2019 survey); 32 (2023 survey)
Source: CBR.

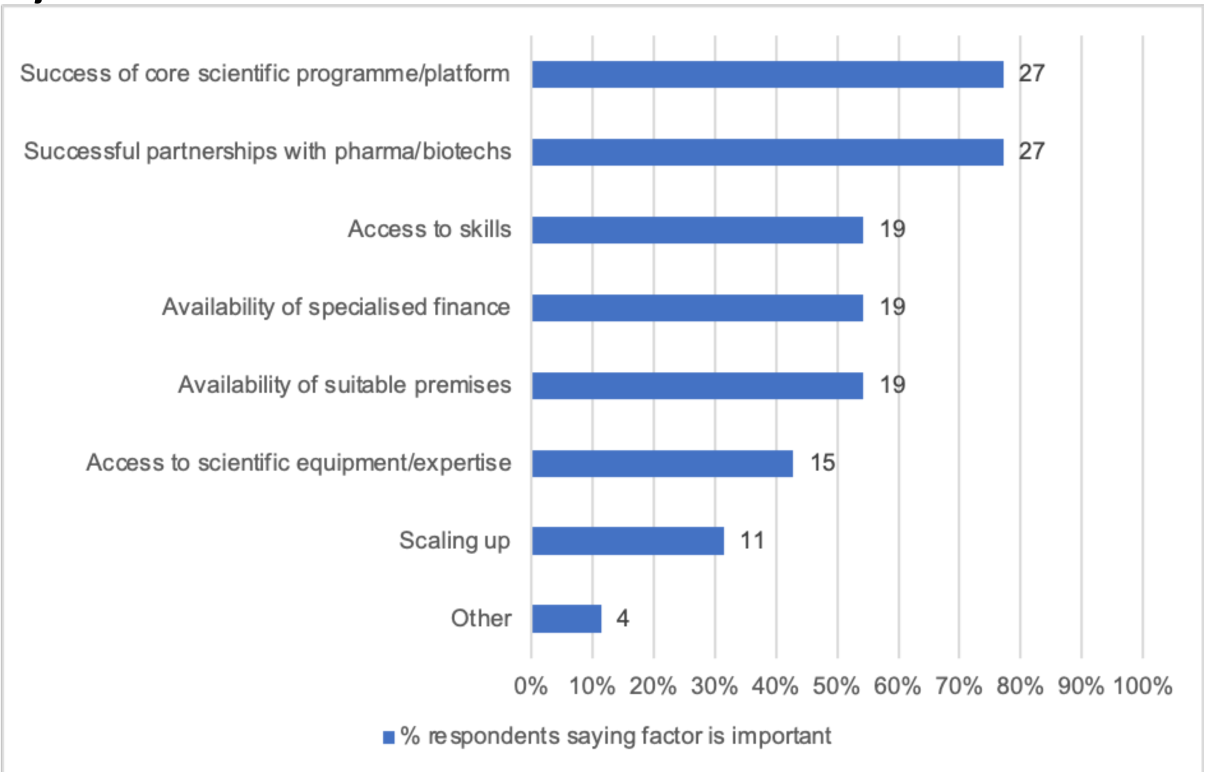
4.78 Campus companies remain quite bullish about their growth prospects. The survey respondents aim to grow their number of employees by 18.5% pa and their floor space by 21.5% pa during the next five years, in line with growth rates reported in the 2019 survey and with those that typically characterise scale-up companies. If these growth rates will be realised, these companies will have to seek larger premises either on the BRC or elsewhere to accommodate their expansion. Respondents are slightly more cautious over the two years' horizon (particularly when their latest responses are compared against the 2019 responses),

[25] We would like to thank Nicola Kinsey, Director of Business Operations at BRCL, for supplying us with data on floor space occupied by these companies.

perhaps reflecting the ongoing geopolitical instability and challenging macroeconomic environment.

4.79 Campus companies were also asked to reflect on the important challenges they may be facing in attaining their growth objectives. Figure 4.13 lists the most significant challenges in descending order of importance.

Figure 4.13 Factors influencing Campus companies' ability to attain their growth objectives



Number of responses: 35
Source: CBR.

4.80 Science-related factors emerge as the most important challenges affecting Campus companies' ability to achieve their growth objectives. Over 77% of the survey respondents regard the success of their core scientific programme or platform and establishment of successful partnerships with pharma or other biotechs as key enablers of their future growth. Access to both skills and specialised finance and availability of suitable premises are viewed as important factors by more than half of the respondents, while 42.9% of the respondents believe that their ability to attain their growth objectives hinges on access to scientific equipment and expertise.

Impacts of BRC on the local skill base

4.81 The supportive and collegiate environment provided by the BRC has benefitted Campus companies in a number of important ways, ranging from the availability of suitable premises on flexible lease terms, access to state-of-the art scientific facilities in a cost-effective manner and proximity to other organisations making up the Cambridge cluster. We also asked

Campus companies to summarise the contribution that being located on the BRC makes to the personal and professional development of their staff.

4.82 Many of the 31 Campus companies who responded to this question highlighted the opportunity for their staff to be part of a wider business and scientific community that is at the forefront of ground-breaking life science discoveries. In the words of a respondent*, "there is a fantastic sense of community and shared purpose here".* The BRC is viewed as *"a community of best practice for our scientists",* where staff can collaborate or interact with industry professionals and academics from cutting-edge bioscience companies at different stages of the business lifecycle. "Rubbing shoulders professionally and personally" with this diverse pool of life science ventures is seen by respondents as an important factor benefitting staff's understanding of the sector.

4.83 Equally important for the personal and professional development of Campus companies' staff is the opportunity to collaborate or interact with researchers based at BI. Many of the survey respondents emphasised the benefits associated with the provision of shared scientific facilities and expertise, which "broadens out the range of technologies the team have access to" and extends "their repertoire of technical skills". Campus companies value the opportunity to attend events and other activities organised by BI, particularly training sessions on how to use its scientific facilities. The co-location with a world-leading research institute helps Campus companies' staff further develop their scientific skills and knowledge while expanding their scientific networking.

4.84 Access to scientific and business networking plays a major role in staff development. Some respondents mentioned the benefits their staff derive from joining the various Campus networking forums and mentorship initiatives. A key example is the Campus Mentorship Scheme, which matches early-career staff with a range of experienced mentors across all organisations located on the BRC to enhance innovation, technology and career development. Other respondents cited the important benefits associated with the connectivity to events for professional development taking place elsewhere in the wider Cambridge ecosystem.

4.85 Our analysis of the survey responses points to the broader support structure provided by the BRC as a key enabler of the personal and professional development of Campus companies' staff. One of the most frequent themes emerging from the survey relates to the benefits arising from events organised by BRCL or third-party organisations, including conferences, seminars, workshops and symposia. These events, which are either business or scientific orientated, benefit the professional development of Campus companies' staff and are viewed as *"a great asset to the site"*. Similarly, companies located on the BRC have access to training sessions (e.g. first aid, pressurised gas and spill responders) that are very beneficial for staff's technical skills. Companies that graduated from Accelerate@Babraham, the pre-seed company support programme offered by the BRC, also stressed the benefits for professional development gained by the company founders during their time at Babraham. The benefits of the Accelerate@Babraham programme for its alumni are analysed in more detail in a separate report.

4.86 Another theme that featured strongly in the survey responses relates to the benefits of the Campus and its facilities ("the campus feel") for staff wellbeing. The shared social facilities available on the BRC, including the gym, tennis court, café and restaurant, are deemed "very good for team morale". Staff wellbeing also benefits from access to the pleasant Campus grounds and rural environment, which offer "plentiful open space for recuperation and enjoyment" and give staff the opportunity to go on a "countryside walk to think and clear the head". The social and health-related benefits of the BRC for Campus companies' staff are summarised well by one of the respondents*: "the environment, social activity and generally interactive nature of the campus is of great significance to individuals' sense of wellbeing and development".*

4.87 The contribution the BRC makes to the local skill base is not limited to the personal and professional development of Campus companies' staff. Companies located on the BRC are also actively engaging with local education to attract young people into bioscience.

4.88 A number of Campus companies host school students aged 16-18 on site to observe the work that is taking place in their lab and office spaces, with plenty of time to question staff on their experiences of college, university studies and industry work. Many of these are through the Institutes Schools Day and Public Engagement (PE activities). Apprenticeships are also offered to school leavers, who benefit from the opportunity to work in a highly innovative, disruptive field.

4.89 Companies on the BRC also engage proactively with universities and other research institutions to attract some of the best talent. Campus companies offer opportunities to both undergraduate and postgraduate students in the form of internships, industry placements and CASE PhD studentships, including the BRCL/BI administered BBSRC CTP[24] studentships' Higher education students benefit from advanced training courses and access to state-of-the art facilities, as well as from working alongside some of the best scientists and researchers in the field.

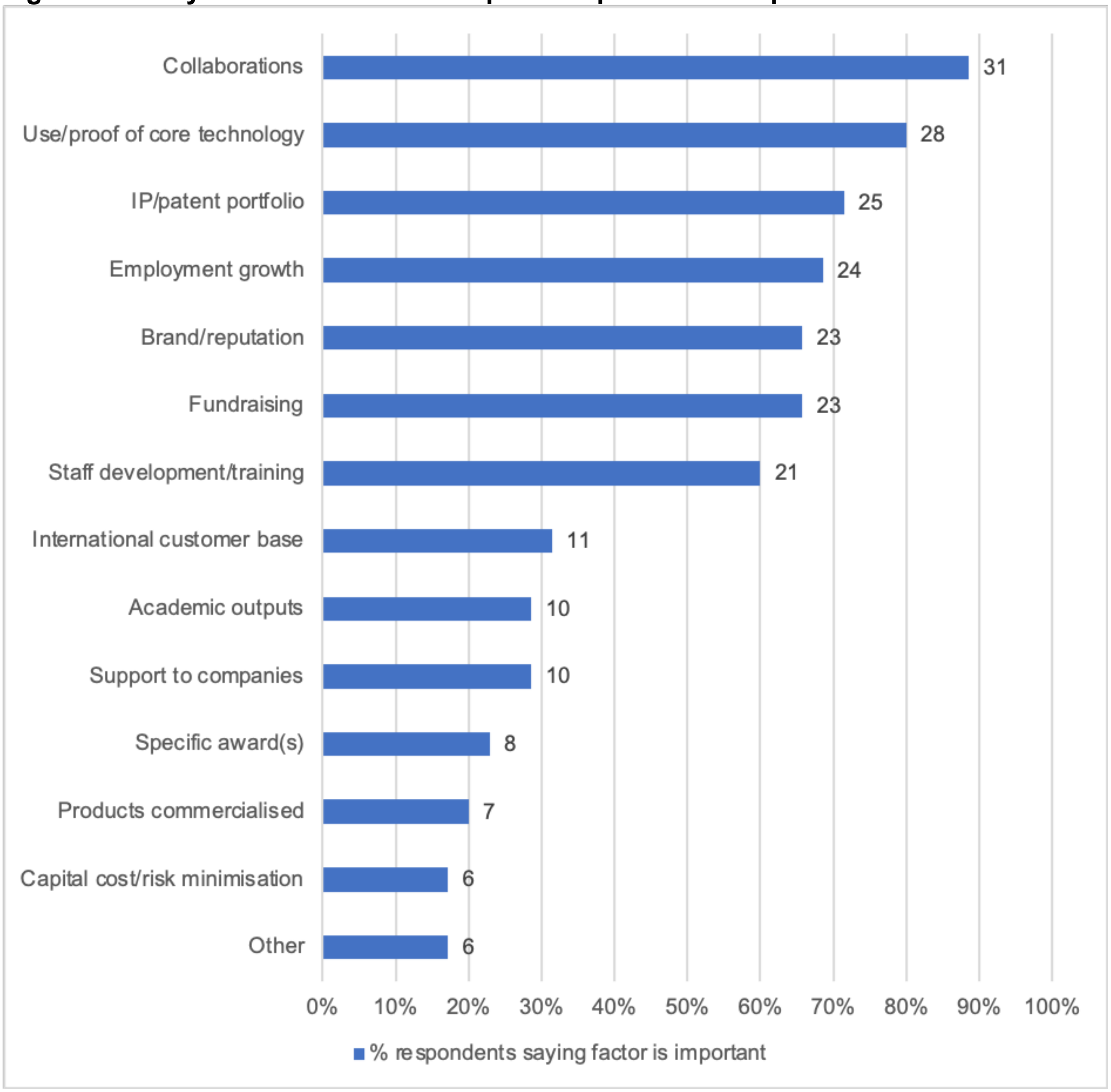
4.90 This engagement with local education supports schools, universities and other research institutions in the wider Cambridge region, while encouraging students and early career researchers to consider employment in the life science industry or other R&D-intensive sectors. Campus companies may also provide direct employment by recruiting some of these students. The start-up and scale-up biotech community may benefit as a result, together with the R&D activity in the Cambridge cluster and beyond. An example of such activity is the BRCL support of the Lucy Cavendish College Life Sciences Community[26].

4.91 To illustrate the main ways in which Campus companies have made an impact at the local, national and international level, we asked survey participants to identify the key

[26] https://www.lucy.cam.ac.uk/give-lucy/life-sciences-community

achievements of their business to the present time. Figure 4.14 lists their key achievements in descending order of importance.

Figure 4.14 Key achievements of Campus companies to the present time



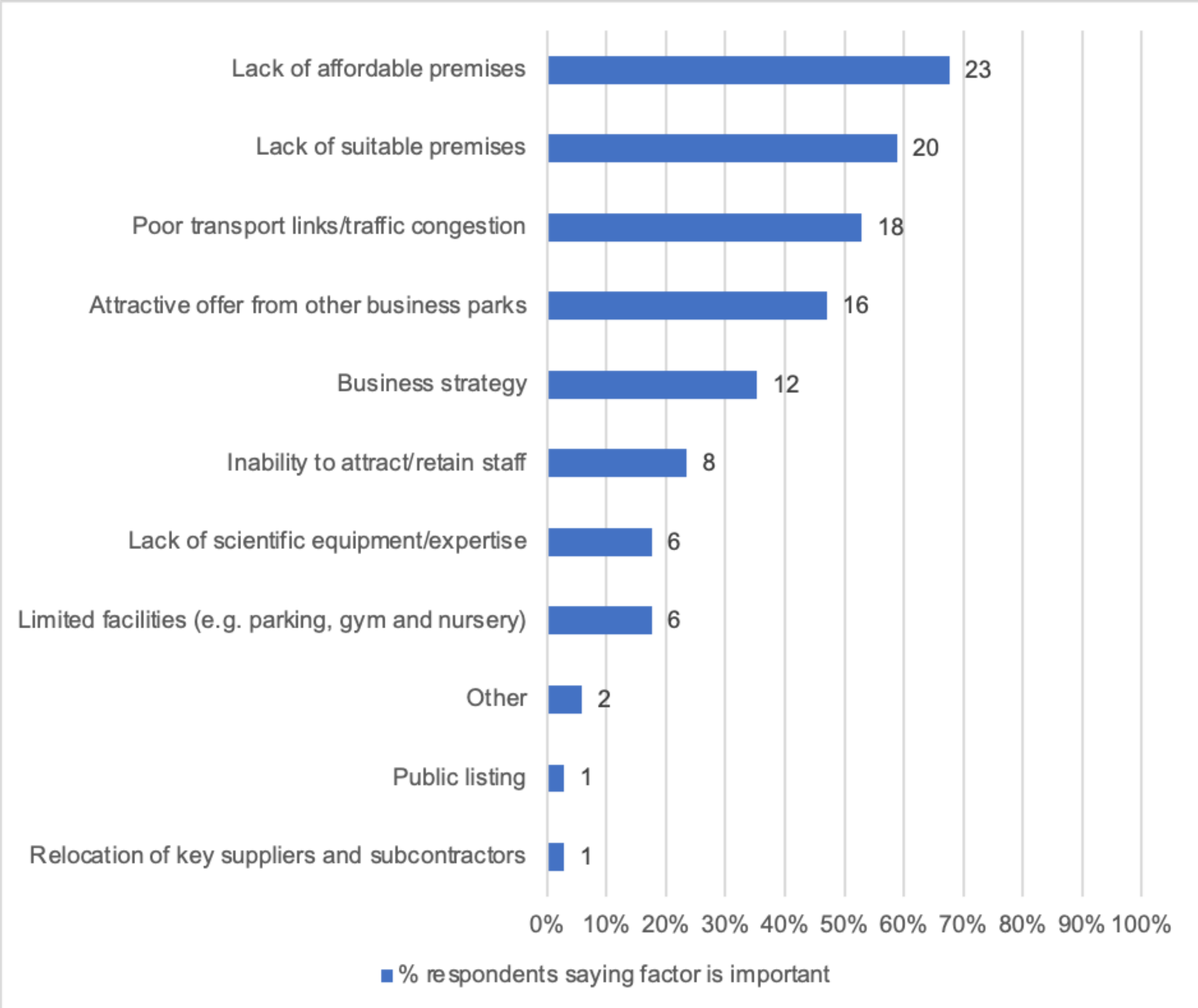
Number of responses: 35
Source: CBR.

4.92 About 9 out of 10 Campus companies view the establishment of successful collaborations with other companies and research institutions locally, nationally and globally as one of their major achievements to date. The ability to prove their core technology (80.0%) and to build a strong IP/patent portfolio (71.4%) also feature among the three most important achievements. Other factors that rank highly are the ability to grow (68.6%) and develop (60.0%) their employees, the consolidation of their brand and reputation (65.7%), and the fundraising activity to support their scientific programme (65.7%). Along with the international customer base and other achievements summarised in Figure 4.14, some respondents are proud to be ultimately helping patients who suffer from cancer or other major diseases.

Relocation of activity

4.93 To cast further light on the distinct proposition offered by the BRC, we asked Campus companies to consider the factors that might make them consider moving off the BRC and the areas where their activity might be relocated. Figure 4.15 shows the reasons that might motivate Campus companies to seek an alternative location for their business.

Figure 4.15 Factors that might make Campus companies consider moving off the Babraham Research Campus



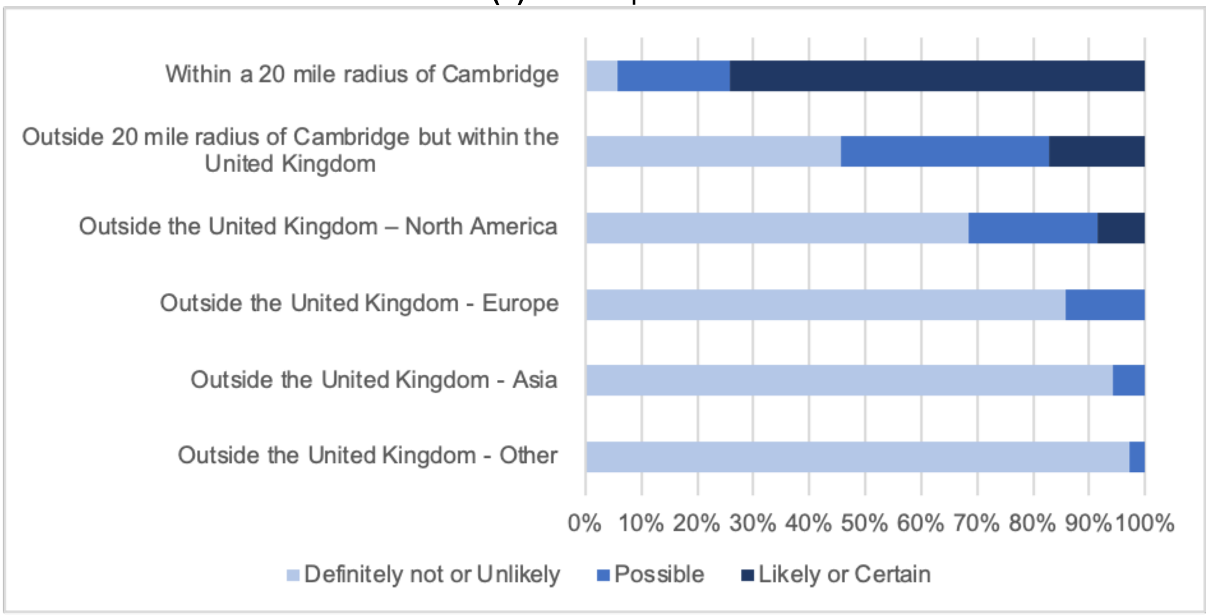
Number of responses: 34
Source: CBR.

4.94 Campus companies' decision to remain on site appears to depend largely on the cost and nature of the laboratory and office space provided by the BRC. The lack of affordable (67.6%) and suitable (58.8%) premises are the two most important factors that might make respondents consider moving off the BRC, followed by poor transport links (52.9%) and an attractive offer from other business locations (47.1%). One-third of the respondents indicated that their decision to relocate might be part of a broader business strategy, while other factors seem less important to Campus companies' relocation decisions.

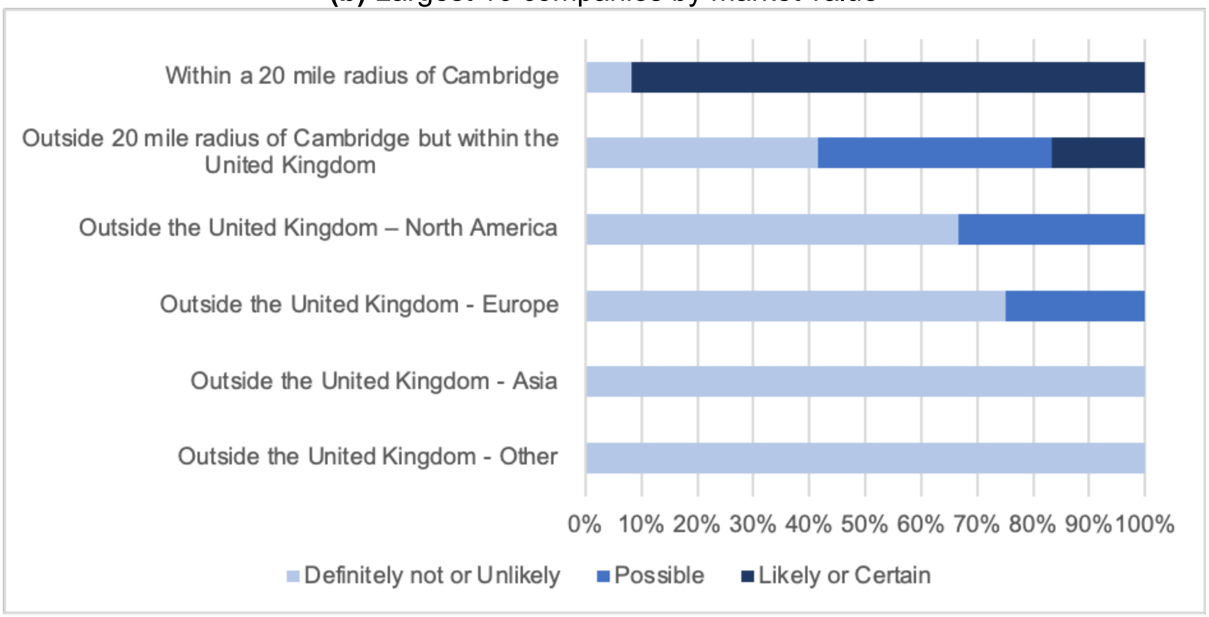
4.95 We also questioned Campus companies on the areas where their activity might be relocated. Survey participants were asked to indicate how likely they would move to each of the following areas: elsewhere within a 20 mile radius of Cambridge, outside Cambridge but within the UK, North America, Europe, Asia and other countries. For each area, participants could select only one answer (definitely not, unlikely, possible, likely or certain). The first part of Figure 4.16 shows the results for all companies, while the second part considers only the largest 16 companies by market value.

Figure 4.16 Areas where Campus companies' activity might be relocated

(a) All companies



(b) Largest 16 companies by market value



Number of responses: 35 (all companies); 12 (largest 16 companies by market value).
Source: CBR.

4.96 The most common destination of a departing business might be elsewhere within a 20 mile radius of Cambridge, with 20.0% of the respondents regarding this as possible and 74.3% as likely or certain. Therefore, more than 9 out of 10 respondents feel that it is possible, likely or certain they would relocate elsewhere within the Cambridge region should they decide to move off the Campus. *These figures provide strong evidence that companies located on the BRC are keen to continue to be part of the Cambridge cluster.*

4.97 The other areas tend to be regarded with less interest by Campus companies. If one focuses on the percentage of the respondents that would possibly, likely or certainly move to another area outside Cambridge, about half of them would consider relocating their activity elsewhere in the UK (although only 17.1% regard this option as likely or certain). One-third might move to North America, reflecting the stable presence that some of the Campus companies already have there (particularly on the East Coast of the US), and 14.3% to Europe. A move to Asia or another part of the world is viewed as far less attractive by Campus companies.

4.98 The desire of Campus companies to remain within the Cambridge region is apparent from the responses given by the largest 16 companies on the BRC by market value. Almost 92% of these companies indicated that it is likely or certain they would relocate their operations to elsewhere within a 20 mile radius of Cambridge. A larger share of the largest companies (relative to all companies) also view North America and Europe as possible destinations.

4.99 These results suggest that these highly valued companies regard the Cambridge region as a unique location to do business and might have to relocate somewhere overseas to be able to find a similar ecosystem. The relocation of these companies outside the UK would result in a substantial loss of jobs and economic value in favour of other countries.

5. Assessing the scale of investment in Campus companies and investor returns

Over the past decade, companies located on the BRC have been able to attract a considerable amount of commercial investment from a diverse pool of investors, including IP Group, BGF, LifeArc Ventures, M Ventures, Sofinnova Partners and SV Health Investors. Campus companies have raised over £1.6bn to date, up from £1.2bn in the 2019 study.

The survey findings show that the support structure provided by the BRC has made an important contribution to the fundraising activity of Campus companies. Four out of five respondents consider their location on the BRC as having some importance for facilitating their fundraising, with one out of four respondents feeling that their BRC location was either very important or critically important. Campus companies estimate that being located on the BRC has accelerated their fundraising by 6 months (2019 survey: 3 months) and increased the amount of funds raised to date by 20.0% (2019 survey: 10.0%).

Fundraising by Campus companies has been facilitated further by the support provided by the University of Cambridge. Over the years, a number of current and past Campus companies have been sponsored, developed or financed with the help of Cambridge Enterprise and Cambridge Innovation Capital.

Our ownership concentration analysis for the largest 16 Campus companies by market value suggests that investors' appetite for these companies has increased over time. The majority of the companies saw their ownership become more dispersed over the last five years, reflecting their ability to secure funding from an increasingly large pool of investors. Some companies were also fully acquired in recent years, again demonstrating the appetite of the market for these innovative bioscience businesses.

The comparison with other business locations in the wider Cambridge region further illustrates how dynamic (and successful) Campus companies have been in their fundraising activity. The BRC has one of the highest total amounts of funds raised by companies located on business and science locations over the last three years, with 5 out of 6 companies raising finance over the last five years. The Campus also has the largest total amount of finance raised by life science companies across all locations.

Overall, the business locations analysis points to an ever more dynamic fundraising activity by Campus companies at the last count. Whilst the average annual amount raised by each company has remained unchanged (£4.3m in both the 2023 and 2019 studies), total fundraising in the last three years has increased from £169.7m in the 2019 study to £208.3m in the current study. The number of BRC-based companies raising finance during the same period has also gone up from 34 in 2019 to 47 in 2023.

Investors painted an extremely positive perception as to what they considered to be the quality of the Babraham Research Campus and the very significant and positive impact it was making to building the capacity of the life science sector in Cambridge and the UK economy overall. The Campus is also one of the investors in StartCodon[27].

Introduction

5.1 The analysis presented in Chapter 4 revealed that Campus companies have raised a remarkable £1.6bn funds to date, with companies operating in the core biopharmaceutical sector contributing the largest share. This chapter further explores the fundraising activity by Campus companies by assessing the scale of investment that has occurred on the BRC and the returns that have been obtained by investors.

5.2 This element of the work addresses the following main objectives:

- To establish the role of the BRC in facilitating fundraising by Campus companies.

[27] https://startcodon.co/partners

- To compare fundraising by Campus companies with those located on other business and science locations in the wider Cambridge region.
- To analyse the scale and type of investments received by Campus companies over time.
- To assess the ownership structure of Campus companies and identify their main investors.

Methodology

5.3 We assessed the scale of investment in Campus companies and investor returns using data from our survey of companies located on the BRC and from the CBR corporate database.

5.4 The survey allowed us to collect information on the contribution of their location on the BRC to the fundraising activity of Campus companies, the amount of funds they have raised to date and the extent to which they regard fundraising as an achievement or challenge (or both). Alongside information from our survey of Campus companies, we used data from the CBR corporate database to compare fundraising by Campus companies with those located on other business and science locations in the wider Cambridge region. CBR corporate data was also used, in combination with other sources, to quantify the growth in value of Campus companies over time.

Investment in Campus companies

5.5 Our survey identified access to finance as one of the most important factors influencing Campus companies' ability to attain their growth objectives. More than half of the respondents indicated that future growth in terms of number of employees and floor space occupied will depend on the availability of specialised finance, a finding that mirrors those from the 2019 survey.

5.6 At the same time, fundraising emerged as one of the key achievements of Campus companies to the present time. Two-thirds of the respondents highlighted their successes at raising funds, pointing to the central role played by access to finance in helping Campus companies reach their current position. Over 40% of the respondents also indicated that they are currently actively fundraising.

5.7 To establish the contribution that the BRC has made to Campus companies' funding successes, we asked survey participants to reflect on the importance of their location on the BRC for facilitating fundraising. *Our results show that almost four out of five respondents consider their location on the BRC as having some importance (from slightly important to critically important) for facilitating their fundraising, with one out of four respondents feeling that their BRC location was either very important or critically important. Campus companies estimate that being located on the BRC has accelerated their fundraising by 6 months (2019 survey: 3 months) and increased the amount of funds raised to date by 20.0% (2019 survey: 10.0%).*

5.8 Overall, the survey findings suggest that the support structure provided by the BRC has made an important contribution to the fundraising activity of Campus companies. Among the main ways in which the BRC has been offering support to companies on site with accessing finance is the Babraham Investor Conference (BIC), an annual event for investors taking place on the Campus, and Accelerate@Babraham, the pre-seed company support programme offered by the BRC.

5.9 The BIC, which is organised by BRCL, is aimed at investors with a focus on early-stage and scale-up life science and med-tech companies. Selected start-up and scale-up companies have the opportunity to pitch to investors to seek funding typically in the range of £250k-£20m. The conference also allows Campus companies to network with other companies operating in the same or related sectors. The last edition (17th edition) of the BIC took place in September 2023 and brought to the Campus more than 150 company founders, investors and industry leaders. The conference featured a panel discussion on how the UK can accelerate translational research to benefits patients while improving the return on investment. The delegates also heard an early preview of the work conducted by the 2023 cohort of Accelerate@Babraham.

5.10 First launched in 2018, Accelerate@Babraham has helped 26 early-stage ventures start up their business. A competition is run each year to select five/six companies who will participate in the programme, based on a range of criteria including quality of technology or research, technology and commercialisation readiness levels, and market need. Selected companies will benefit from a bespoke eight-week taught programme and receive expert mentoring and support, along with 12-month access to free lab and office space. Participation in the programme also comes with a £10,000 cash prize in the form of non-dilutive funding. An impact analysis of the Accelerate@Babraham programme is presented separately from this report.

5.11 All these initiatives point to the BRC as an extremely supportive ecosystem for facilitating Campus companies' fundraising. Therefore, it is useful to examine how the fundraising activity of companies located on the BRC compares against other business and science locations in the Cambridge region. An analysis for the latest year as well as the last three and five years is reported in Table 5.1.[28]

[28] The average annual amount raised (last column in Table 5.1) is calculated across the subset of the companies who did raise funds over the last five years.

Table 5.1 Comparison of companies on business and science locations: fundraising

BUSINESS & SCIENCE LOCATIONS	Latest Year		Total over last 3 years		Over last 5 years	
	Number of companies raising finance	Total Funding raised £,000	Number of companies raising finance	Total Funding raised £,000	Number of companies raising finance	Average annual amount raised £,000
Babraham Research Campus	27	208,335	47	705,918	50	4,313
Cambridge Research Park	14	123,935	35	154,200	41	3,135
Cambridge Science Park	48	308,762	99	1,168,182	119	3,134
Chesterford Research Park	11	73,874	17	354,728	17	5,795
Granta Park	10	166,481	14	512,752	17	14,053
Iconix Park	3	48,061	6	107,573	7	5,081
O2h Scitech Park	4	3,077	5	3,640	5	228
Wellcome Genome Campus	4	1,026	7	57,063	7	2,366
Cambourne Business Park	14	8,488	30	45,433	38	397
Cambridge Business Park	13	5,925	39	18,080	46	1,989
Harston Mill	2	2,421	4	23,980	4	1,654
Melbourn Science Park	1	1,048	4	17,887	5	896
St John's Innovation Centre / Park	61	79,644	139	304,450	154	573
Cambridge Commercial Park	3	3,450	11	9,224	11	201
Colmworth Business Park	15	1,743	37	10,765	46	90
Lancaster Way Business Park	12	6,420	50	29,044	61	251
South Cambridge Business Park	18	592	64	3,564	77	17
Vision Park	30	141,617	95	278,083	106	1,315
Total	**290**	**1,184,900**	**703**	**3,804,566**	**811**	**1,820**

Source: CBR.

5.12 The BRC has the second highest total amount of funds raised by companies located on business and science locations over the last three years (after Cambridge Science Park). Total funds raised by BRC-based companies accounts for approximately one-fifth of total funding raised by companies located on these locations. A total of 50 of the approximately 60 companies based on the BRC have raised finance over the last five years, showing that the overwhelming majority of Campus companies have actively raised funds in the recent period. The average annual amount raised by Campus companies over the past five years is also one of the highest among all business and science locations.

5.13 Table 5.2 looks more closely at differences in fundraising between the BRC and other locations in the region by investigating how funds raised over the last three years are distributed across sectors.

Table 5.2 Sectoral distribution of companies on business and science locations: fundraising activity (over last three years)

TOTAL OVER LAST THREE YEARS	Life Science		ICT		Other KI		Non-KI	
BUSINESS & SCIENCE LOCATIONS	Total finance raised £,000	%	Total finance raised £,000	%	Total finance raised £,000	%	Total finance raised £,000	%
Babraham Research Campus	692,973	98%	0	0%	12,945	2%	0	0%
Cambridge Research Park	8,224	5%	2,646	2%	27,106	18%	116,225	75%
Cambridge Science Park	583,192	50%	223,976	19%	215,335	18%	145,680	12%
Chesterford Research Park	338,324	95%	0	0%	15,554	4%	850	0%
Granta Park	491,813	96%	0	0%	20,863	4%	76	0%
Iconix Park	95,877	89%	586	1%	11,110	10%	0	0%
O2h Scitech Park	2,221	61%	1,415	39%	0	0%	4	0%
Wellcome Genome Campus	56,597	99%	466	1%	0	0%	0	0%
Cambourne Business Park	3,042	7%	40,469	89%	377	1%	1,545	3%
Cambridge Business Park	44	0%	4,219	23%	0	0%	13,817	76%
Harston Mill	7,081	30%	1,568	7%	15,331	64%	0	0%
Melbourn Science Park	1,048	6%	798	4%	16,000	89%	42	0%
St John's Innovation Centre / Park	33,120	11%	192,598	63%	28,776	9%	49,955	16%
Cambridge Commercial Park	40	0%	106	1%	3,812	41%	5,265	57%
Colmworth Business Park	0	0%	239	2%	1,644	15%	8,882	83%
Lancaster Way Business Park	247	1%	24	0%	5,230	18%	23,544	81%
South Cambridge Business Park	0	0%	47	1%	438	12%	3,078	86%
Vision Park	87,358	31%	23,143	8%	136,176	49%	31,405	11%
	2,401,201	**63%**	**492,300**	**13%**	**510,697**	**13%**	**400,368**	**11%**

Source: CBR.

5.14 The figures presented in Table 5.2 further illustrate how dynamic (and successful) Campus companies have been in their fundraising activity. The BRC has the largest total amount of finance raised by life science companies across all locations, significantly above the equivalent figures for Cambridge Science Park, Granta Park and Chesterford Research Park. Campus companies contributed about one-fourth of the total finance raised by life science companies located on business and science locations over the last three years.

5.15 Our analysis of fundraising activity across locations also confirms the focus of the BRC on life sciences, reinforcing the findings based on R&D data. Total finance raised by Campus companies operating in the life science sector represents 98% of the total finance raised by all Campus companies, compared with an equivalent figure of 50% for Cambridge Science Park and 11% for St John's Innovation Centre – both of which host a more diverse range of sectors. The Wellcome Genome Campus (99%), Granta Park (96%) and Chesterford Research Park (95%) have a sectoral composition that is more similar to the BRC's.

5.16 The comparison with the 2019 study provided in Chapter 4 points to an ever more dynamic fundraising activity by Campus companies. Whilst the average annual amount raised by each company has remained unchanged (£4.3m in both the 2023 and 2019 studies), total fundraising in the last three years has increased from £169.7m in the 2019 study to £208.3m in the current study. The number of BRC-based companies raising finance during the same period has also gone up from 34 in 2019 to 47 in 2023.

5.17 Overall, our business park analysis highlights the key role played by the BRC in attracting commercial investment into the wider Cambridge life science cluster.

Investors in Campus companies

Ownership concentration of Campus companies

5.18 Over the past decade, companies located on the BRC have been able to attract a considerable amount of commercial investment from a diverse pool of investors. The analysis shows that Campus companies have raised over £1.6bn to date, up from £1.2bn in the 2019 study. These figures point to increasing attractiveness of Campus companies among life science and other investors.

5.19 We examined the ownership structure of the largest 16 Campus companies by market value (£20m or more), with the aim of assessing whether their ownership has become more or less dispersed over time. For each company, we calculated the percentages of ownership held by the top 1, 5 and 10 shareholders over the last five years (or since the company was founded if later). The results of our ownership concentration analysis are summarised in Table 5.3.

Table 5.3 Ownership concentration of the largest 16 Campus companies by market value

Company	Top 1 shareholder %		Top 5 shareholders %		Top 10 shareholders %	
	Latest year	5 years earlier (or foundation if later)	Latest year	5 years earlier (or foundation if later)	Latest year	5 years earlier (or foundation if later)
Abzena Limited (Astro Bidco)	100.0	100.0	100.0	100.0	100.0	100.0
Alchemab Therapeutics Limited	27.9	57.5	83.5	100.0	98.6	100.0
Artios Pharma Limited	9.5	16.0	39.7	60.9	63.4	90.1
Biosceptre International Limited	15.5	16.3	38.5	42.2	51.1	57.9
Bit Bio Limited	13.0	30.9	49.9	82.0	69.1	99.7
Closed Loop Medicine Limited	21.4	37.0	66.5	71.4	84.5	87.7
Crescendo Biologics Limited	18.8	20.8	65.8	79.1	78.4	95.1
F-star Therapeutics Limited (invoX Pharma)	100.0	28.8	100.0	72.6	100.0	84.1
Harness Therapeutics Limited	27.5	37.0	89.8	98.0	100.0	100.0
Inivata Limited (NeoGenomics)	100.0	31.1	100.0	87.7	100.0	90.5
Kymab Limited (Sanofi)	100.0	26.5	100.0	53.7	100.0	67.5
Maxion Therapeutics Limited	76.0	100.0	100.0	100.0	100.0	100.0
Mission Therapeutics Limited	27.9	21.5	71.9	78.7	91.5	85.7
PetMedix Limited (Zoetis)	100.0	45.5	100.0	100.0	100.0	100.0
Storm Therapeutics Limited	14.8	17.8	62.5	86.3	88.3	100.0
ViaNautis Bio Limited	13.1	23.8	49.6	71.4	74.7	100.0

Source: CBR's calculations based on data from Fame, Bureau van Dijk.

5.20 Our analysis suggests that investors' appetite for Campus companies has increased over time. The majority of the companies saw their ownership become more dispersed over the last five years, as shown by the lower percentage of ownership held by the top 1, 5 and 10 shareholders in the latest year compared with five years earlier. Artios Pharma, Crescendo Biologics and Storm Therapeutics are but a few examples. These figures reflect the ability of Campus companies to secure funding from an increasingly large pool of investors, who are attracted by their core scientific programme and the financial returns these companies may generate.

5.21 In addition, the figures presented in Table 5.3 indicate that some companies were fully acquired in recent years, which again demonstrates the appetite of the market for these successful and innovative bioscience businesses. Campus companies that were fully acquired are F-Star (acquired by invoX Pharma in 2023), Inivata (acquired by NeoGenomics in 2021), Kymab (acquired by Sanofi in 2021) and PetMedix (acquired by Zoetis in 2023). In turn, Abzena was acquired by Welsh, Carson, Anderson & Stowe (Astro Bidco), one of the world's leading private equity investors, in 2018.

Main investors across Campus companies

5.22 We explored the full list of shareholders of the largest 16 Campus companies by market value to identify the main investors across these companies. The results of our analysis show that companies located on the BRC have been able to attract funding from a wide range of world-leading life science and technology investors, including IP Group, BGF, LifeArc Ventures, M Ventures, Sofinnova Partners and SV Health Investors. These investors have supported Campus companies at various stages of their growth, from seed financing to Series B and C rounds.

5.23 Among the most active investors in Campus companies is IP Group, who has supported a total of more than 500 companies and invested over £1.8bn in science-based businesses.[29] IP Group owns shares in 4 of the 16 Campus companies included in our ownership concentration analysis, with an average share of 6% in the latest year. BGF, LifeArc Ventures, M Ventures, Sofinnova Partners and SV Health Investors back three Campus companies each, with an average share ranging from 4% (LifeArc Ventures) and 12% (BGF).

5.24 Fundraising by Campus companies has been facilitated further by the extensive support provided by the University of Cambridge, primarily through Cambridge Enterprise, its commercialisation arm, and Cambridge Innovation Capital, a preferred VC investor for the University of Cambridge. Collectively, the University of Cambridge holds shares in 3 of these selected companies, with an average ownership stake in the latest year of just over 4%. Over the years, a number of current and past Campus companies have been sponsored, developed or financed with the help of Cambridge Enterprise and Cambridge Innovation Capital, pointing to the important role played by the University in supporting the Cambridge life science cluster.

5.25 Another major investor in Campus companies is Pfizer, one of the leading research-based biopharmaceutical companies in the world, which has invested in 3 of the 16 largest companies on the BRC by market value. In the latest year, the average share of ownership it held in these companies was 9%. Global biopharmaceutical company Takeda is also an active investor in Campus companies via its corporate VC arm Takeda Ventures, owning just under 20% in two companies.

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[29] IP Group website, https://www.ipgroupplc.com/about-us/our-story (accessed on 29th April 2024).

5.26 Besides equity investment, these and other leading biopharmaceutical companies provide an additional source of investment in Campus companies through strategic, high-value deals. Collaborations with biopharmaceutical companies fulfil much of the same purpose as equity investment and may generate substantial injections of cash for companies on site, for example in the form of upfront and milestone payments, R&D funding and royalties. These deals provide a springboard for further growth and a route to a global market, while adding credibility to a company's core scientific programme or platform.

5.27 Other investors with a significant share in at least one BRC-based company include Andera Partners, DCVC, IQ Capital, Longwall Ventures, Quan Capital and RA Capital just to name a few, illustrating the prominence and diversity of investors who are backing Campus companies.

Perceptions of Campus investors

5.28 There are a number of companies and individuals investing in companies on the Campus and during the course of the study they were surveyed to establish their views on the impact of the Campus and what it had achieved. For each area of enquiry they were asked to score their assessments on a scale of one to five where five was most important and one was of low importance. Table 5.4 shows the views of the investors on the importance of the Campus in building the capacity of the Cambridge Life Science sector in the provision of property and also securing funds for the sector.

Table 5.4. How important do you consider the BRC has been in building the capacity of the Cambridge Life Science innovation system with respect to the following finance and property factors? (Average scores in descending order for Investors 2024 responses)

Respondent group	Investors 2024	Investors 2019
Providing new start-up and accelerator space	4.5	4.89
Overcoming property market constraints that inhibit Life Science based dev	4.42	4.44
Providing Scale-Up space	4.25	4.9
Attracting funds from Research Councils	4.18	4.71
The provision of facilities and services to assist Life Science Companies	4.17	4.67
Attracting funds from Venture Capitalists/Business Angels	4.09	4
Attracting Corporates for R&D collaborations	4.09	4
Providing shared meeting space	3.91	4
Attracting business investment from the rest of the United Kingdom	3.7	4.22
Attracting business investment from other countries	3.7	4
Providing soft-landing programmes that help encourage and shape business dev	3.67	3.89
Attracting funds from Charitable Foundations	3.67	4.29
Attracting funds to assist with Proof of Concept in the Life Sciences	3.55	3.88

NB: Average score based on range where 1 was 'Not at all important' to 5 being of 'Major Importance'.

Source CEA Ltd. 2024

5.29 Investors considered that the role of the Campus in providing new start-up and accelerator space was of major importance, reflecting their views some five years before. They pointed particularly to the

Campus in overcoming property market failures that were inhibiting the growth of the life science sector and this was in-line with their views five years earlier. Attracting funds from Research Councils and Venture Capitalists/ Business Angels was also considered an important feature of the Campus. The provision of facilities and services was also rated as very important.

The research probed the importance of the Campus in building the capacity of the Cambridge Life Science innovation system in terms of commercialisation and skill factors (Table 5.5). The findings highlighted the importance of the Campus in building networks, particularly with university departments and other research/medical facilities. Its ability to assist with the commercialisation of life research and attracting management and commercial talent remained a strong feature of the Campus, as it had been five years earlier.

Table 5.5. How important do you consider the BRC has been in building the capacity of the Cambridge Life Science innovation system with respect to the following knowledge, commercialisation and skill factors? (Average scores in descending order for Investors 2024 responses)

Respondent group	Investors 2024	Investors 2019
Building research networks, particularly with university, other research institutes & medical facilities	4.11	4.11
Enabling the commercialisation of Life Science Research	4.1	4.5
Facilitating Recycle of Technologies & Talent	4.1	4.38
Attracting Management and Commercial Talent	4	4
Building business networks	3.9	4.33
Encouraging Life Science related public engagement	3.88	4
Enabling collaboration to occur	3.8	4.25
Contribution to the Life Science knowledge base	3.78	4.33
Enabling entrepreneur driven businesses to form	3.7	4.11
Building international networks	3.63	4
Attracting Leading Researchers	3.6	3.5
Enabling new academic spin-outs to occur	3.5	4.11
Enabling business spin-outs to occur	3.5	4.2
Helping researchers become aware of commercial opps from their res	3.44	3.8
Encouraging educational progs & research that promote dev of skills	3.43	4.1
Providing businesses with the skills to Scale-Up	3.25	3.9
Enabling researchers to have bus skills req to commercialise their res	3.13	3.7

NB: Average score based on range where 1 was 'Not at all important' to 5 being of 'Major Importance'.

Source CEA Ltd. 2024

5.30 Investors considered the benefits of the Campus to the UK economy as a whole (Table 5.6). The responses were very positive and were similar to five years before. Increasing the infrastructure and skill base of the life science sector were seen as strong contributions. And there was a particularly strong response to increasing the presence of life science business in key markets, increasing employment and the global impact of the sector.

Table 5.6. How important do you consider the benefits of the BRC are to the UK economy? (Average scores in descending order for Investors 2024 responses)

Respondent group	Investors 2024	Investors 2019
Increasing the infrastructure base of the UK Life Science sector	4.33	4.5
Increasing the skill base of the UK Life Science Sector	4.33	4.2
Increasing the presence of UK Life Science businesses in key markets	4.33	4.2
Increasing the growth of employment in the UK Life Science sector	4.22	4.7
Increasing the global impact and value from UK Science	4.22	4.22
Attracting international Corporates for R&D collaborations	4	4.2
Enhancing the growth of sales of UK Life Science businesses	4	4
Increasing the growth of UK Life Science exports	4	4.25
Improving health outcomes in the UK	3.38	4
Providing wider societal benefits	3.29	4.11

NB: Average score based on range where 1 was ‘Not at all important’ to 5 being of ‘Major Importance’.

Source CEA Ltd. 2024

5.31 Investors compared the Babraham Research Campus with other campuses within the UK with which they were familiar. Table 5.7 shows just how much the investors considered the Babraham Research Campus to be of outstanding quality. Of particular note was the ability of the Campus to attract Research Council funding, attract Corporates for R&D collaboration, providing network events and building business networks. All the average scores had risen over the last five years.

Table 5.7. We would like to obtain your view as to how the BRC compares to other campuses in the UK with which you are familiar (Average scores in descending order for Investors 2024 responses).

Respondent group	Investors 2024	Investors 2019
Attracting Research Council funding	4.71	4.5
Attracting Corporates for R&D collaborations	4.71	4.67
Providing networking events	4.71	4.11
Building business networks	4.71	4.2
Attracting Management and Commercial Talent	4.63	4.78
Attracting leading researchers	4.57	4.71
Facilitating business to business collaboration	4.57	4.13
Building research networks, partic between research institutions & medical facs	4.43	4.63
Allowing businesses to scale-up	4.38	4.7
Attracting Venture Capital	4.38	4.7
Providing skills to enable researchers to commercialise their research	4.38	4.25
Providing services and facilities to support Life Science businesses	4.29	4.89
Accommodating new start-ups	4.25	4.8
Commercialising R&D	4.25	4.44
Attracting funding from charitable foundations	4.17	4.17
Attracting business investment from outside the UK	4.13	4.57
Attracting business investment from within the UK	4.13	4.63

Facilitating Proof of Concept	3.75	4.56

NB: Average score based on range where 1 was ''Much worse' to 6 being 'BRC unique location.

Source CEA Ltd. 2024

5.32 Investors considered the overall contribution that the BRC has made to the economy of the Cambridgeshire sub-region. Table 5.8 shows that investors rated the building of the overall capacity of the Life Science cluster highest, followed by increased economic growth.

Table 5.8. We would like to obtain your views on the overall contribution that you consider the BRC has made to the economy of the Cambridgeshire sub-region (Average scores in descending order for Investors 2024 responses)

Respondent group	Investors 2024	Investors 2019
Built the capacity of the overall Life Science cluster	4.33	4.6
Increased economic growth	3.89	3.89
Increased presence of International Corporates	3.88	3.8
Expanded the Life Science knowledge base	3.78	4.2
Commercialisation of Life Science R&D	3.78	4.1
Increased jobs	3.67	3.8

NB: Average score based on range where 1 was 'None' to 5 'Major effect'

Source CEA Ltd. 2024

Views on what would have happened in the absence of the Campus

5.33 Investors expressed their view as how much businesses on the Campus would have grown in the absence of the Campus development. This was clearly quite difficult to assess. *However, it is of interest that the response receiving the highest average score was that current business activity would be between 0-25% less and this was similar to the 2019 position (Table 5.9).*

Table 5.9. If the BRC had not developed its infrastructure in recent years how much do you consider the businesses on the campus would have developed (Average scores)

Respondent group	Investors 2024	Investors 2019
0-25% of current business activity	3	2.44
26-50% of current business activity	2.38	2.22
51-75% of current business activity	2	2.22

NB: Average score based on range where 1 was 'Not likely' to 5 'Highly likely'

Source CEA Ltd. 2024

5.34 The investors considered where the business investment currently on the Campus might have been located in the absence of the Campus development (Table 5.10). The two highest rated options were developed elsewhere in the Cambridgeshire sub-region, or elsewhere in England or elsewhere in the world (not Europe) and this was similar to the position in 2019.

Table 5.10. If the BRC had not developed its infrastructure in recent years would the businesses currently on the campus have (Average scores)

Respondent group	Investors 2024	Investors 2019
Developed elsewhere in the Cambridgeshire sub-region	2.78	2.8
Developed elsewhere in England	2.56	2.6
Developed elsewhere in the United Kingdom	2.11	2.3
Developed elsewhere in Europe (not UK)	1.89	2.3
Developed elsewhere in the world (not Europe)	2.56	2.3
Developed more slowly elsewhere	2.5	3.6

NB: Average score based on range where 1 was ''Not likely' to 5 being 'Highly likely'

Source CEA Ltd. 2024

Summary of investors' perceptions

5.35 Overall, investors painted an extremely positive perception as to what they considered to be the quality of the Babraham Research Campus and the very significant and positive impact it was making to building the capacity of the life science sector in Cambridge and the UK economy overall.

6. Assessment of contribution to science and knowledge

The evidence shows that the strategically focussed effort at BI "through excellence in discovery life sciences research and training………. to be an international leader for research on lifelong health and healthy ageing" provides a critical mass of talented research leaders, having overlapping but distinct research areas that can produce outstanding scientific outcome. The BI research output is generally world leading and the model is entirely fit for purpose. We should note that the Babraham Institute is strategically funded by UKRI-BBSRC in terms of both programmes and core capabilities.
This is not to say that BI are the only world leaders in the mechanism of ageing, nor that the critical mass is the only key ingredient to the BI model. Indeed, it is the unique combination of strategic focus, state of the art serviced research facilities, with their own agenda of excellence in innovative methodology development, and the BRC providing a translational culture and collaboration opportunities. This provides a research drive that also looks beyond the fundamental scientific research discovery to the potential impact of the research findings in lifelong health.
Achieving and maintaining this environment has been the passion of the Leadership teams and their ability to work in concert with the researchers and support staff, so that discovery is driven from all levels. During the current review period there has been a high staff turnover with a number of new Group Leaders establishing themselves at BI. Their areas of expertise and track record to date suggest that BI are continuing to make 'high-flying' appointments, but this will be tested in the next period when their publication and output metrics should begin to match those of the established GLs.
Furthermore, the success of the strategic vision to produce significant understanding of "Proteostasis across the life course**"** is a Key Performance Indicator of the BI model and its ability to drive advances in a singularly focused theme through cross ISP collaboration, without dilution of the Institute Strategic Programmes (ISP) themes. The evidence for spin-out is also encouraging with some new foundations established in the current review period having exciting potential. However, success, dissolution and general progress of these spin-out companies also provides useful lessons in translation and longevity, many of which are also being learned by the BRC companies.
There is good evidence that the BI Knowledge Exchange and Commercialisation(KEC) team has provided entrepreneurial mentorship and brokered translation of research innovations from within, but it is more difficult to assess whether this can be improved and the unique environment can be further exploited to enable more early translational high risk research and development, without compromising the BI mission for fundamental innovative excellence in science. At one end, the BRC provides a wealth of experience in active translation and at the other end BI provides excellence in Discovery Science and science facilities.
Is the space in between also world leading in the BI/BRC model?

Introduction

6.1 According to BI's stated mission, "through excellence in discovery life sciences research and training, the Institute aims to be an international leader for research on lifelong health and healthy ageing." This is in line with the BBSRC Portfolio and Priorities in Frontiers of Bioscience to "understand the rules of life" but is also addressing ageing challenges in healthcare as recognised in the UK Government Life Sciences Vision and the UKRI Strategy 2022-2027.

6.2 The Babraham Institute engages in fundamental discovery research. As the founder of the campus, it sits at the heart of the BRC and, through provision of services and opportunity for cultural mixing, provides outward facing links to the Bioscience Industry, that catalyse technology transfer "helping translate early stage science into outcomes for social and economic benefit and establishing the Campus as a leading location for commercial bioscience."

6.3 Although the culture still resonates strongly with the Max Plank Institute (MPI) edict that "knowledge must precede application" (see 2019 review), in comparison with research institutes worldwide, the Campus environment clearly enables and embeds Knowledge Exchange & Commercialisation (KEC) and overtly recognises the unique positioning of BI alongside the BRC in enabling a culture of entrepreneurship within BI at the ISP level. Building on previous activity in commercialising Institute science, including spinout companies, collaborations with pharmas and licensing agreements, there is clear increasing involvement of Babraham Institute Enterprise (the commercialisation arm) and a KEC team that is led from within, by a Senior Group Leader in the Epigenetics ISP. Activities for networking, commercialisation and training projects also bring together Institute Industry scientists, from the Campus BBSRC CTP PhD studentships, and students and post docs on the Campus mentoring scheme, catalysing "sustainable scientific and technological solutions[cf Frauenhofer 30]" to be translated. This may not be the core goal of scientific excellence in research for BI but, it clearly does provide a more applied infrastructure, hinterland and 'tea-room' dialogue, allowing awareness of opportunities to contribute to innovative developments that can empower advances for the benefit of society. This can be compared with the Frauenhofer Gesellshaft mission[30], but the Babraham Campus/ Babraham Institute arguably sits at a unique interface where a symbiotic value proposition is achieved for both academic and industrial progress in bioscience, as presented in other sections of this review.

6.4 BI is profoundly "academic" in this symbiosis, delivering cutting edge research with a goal that is well defined by its mission to understand the mechanisms of ageing. Currently, this continues to be focused on three Institute Strategic Programmes: ISPs (Immunology, Epigenetics, and Signalling), as also reported in the 2019 review.

6.5 However, with a philosophy that collective research excellence results from individual creativity, the group leaders drive their research through their own innovation, within the strategic broad masterplan. Nevertheless, this framework and academic freedom can only yield long term successes and continuing excellence for the institutional goals by undertaking regular strategic planning and enabling new effort to be focused on areas of emerging knowledge and rapid growth when needed. This also implies that if the research outcomes reach a plateau or become iterative in contributing to world leading outcomes and/or revealing new directions for cutting edge advances, then the research group or main ISP has to be considered for refocus or closure. While the major areas of research have not changed since 2019, there has been some refocussing and several new appointments, as well as departures (see Table 6.1).

	Nuclear Dynamics	Signalling	Immunology	Epigenetics	Epigenetics /Signalling
Departures	2	2	4	4	

[30] Frauenhofer Gesellshaft Mission: https://www.fraunhofer.de/en/about-fraunhofer/profile-structure/the-fraunhofer-gesellschafts-mission-and-dna.html#challenge

Arrivals		4	1 (+1 arrival 2024)	2	2
Honorary Arrivals		2	2	2	

Table 6.1. BI Group Leader departures and arrivals since the 2019 review and not reported in previous review. (Note: Nuclear Dynamics was reported for closure in the 2019 Review. This is now complete.)

6.6 In addition to the departures in Table 6.1, two research groups will be closed (within Signalling and Immunology) completing their work in the next year and two further Group Leaders from the Signalling ISP will retire in 2025. The latter will mark a 30 year partnership between Len Stephens and Phill Hawkins with their strong focus on PI3Ks (see Signalling ISP).

New Appointments

6.7 The departures of Group Leaders (Table 6.1) combined with closure of two groups, have refocussed the BI programme and enabled changes in future research capability through new appointments. The repositioning, including a greater bridging of ISPs with, for example, new appointments being made across epigenetics and signalling is in line with the BBSRC goal to promote multidisciplinary collaboration[31] and demonstrates a widening strategy of collaboration across the ISPs to seed work in the virgin gaps at the interfaces of the programmes. This has also been promoted through cross-ISP seed funding from the Institute Development Grant (IDG) and the Science Policy Committee (SPoC).

	ISP	Expertise	Area of Research Focus	Strategic Focus
Claudia Ribeiro de Almeida	Immunology Reported in 2019 Review	molecular biology of B cell selection	biology of RNA helicases	Regulating gene expression and transcription
Peter Rugg-Gunn	Epigenetics Reported in 2019 Review	Embryo development	understanding of the epigenetic environment of human early embryo development and reproductive health	Human Developmental Biology Initiative (HDBI)
Oliver Florey	Signalling Reported in 2019 Review	lysosomal biology	Autophagy	Proteostasis: stress signalling, stress biology and ageing autophagy and lysosome biology
Maria Christophorou	Epigenetics	chromatin biochemistry	susceptibility to age-related erosion	interface between cellular metabolism and chromatin regulation seeking to understand links between nutrients and ageing
Sophie Trefely	Epigenetics/ Signalling	Sub-cellular metabolomics	links between nutrients and chromatin	
Teresa Rayon	Epigenetics/ Signalling	biological and biochemical basis of timing; protein half-life	impact on epigenetic stability	
Philipp Voigt histones	Epigenetics	chromatin biochemistry	susceptibility to age-related erosion	
Arianne Richard	Immunology	biology of CD8 T cells	how T cells sense information from infection and physiological environment to generate appropriate immune responses	inter-relationship between metabolism and epigenetics in determining cell fate.

31 The UK's excellence in bioscience is founded on the creativity of our research and innovation community. BBSRC invests in research to deliver new knowledge and to sustain and grow our national capability across the breadth of bioscience disciplines. In doing so, we promote multidisciplinary collaboration to enhance bioscience discovery, whilst also remaining responsive to emerging needs and opportunity. https://www.ukri.org/what-we-do/browse-our-areas-of-investment-and-support/frontier-bioscience-understanding-the-rules-of-life/

Della David	Signalling	protein aggregation and healthy ageing *C. elegans*	Protein quality control outside cells and the role regulatory molecules play in ageing of the brain	Proteostasis: stress signalling, stress biology and ageing autophagy and lysosome biology
Rahul Samant	Signalling	drugs targeting the molecular chaperone HSP90	Protein quality control and senescence	
Ian McGough	Signalling	morphogens	Protein translation: Wnt signalling in tissue maintenance	
Hayley Sharpe	Signalling	influence of cellular microenvironment on protein tyrosine phosphatases	Protein phosphatase/redox signalling	
Kai-Michael Toellner	Immunology Appointed 2024	cellular interactions and differentiation processes that happen in lymphoid tissues		

6.8 Furthermore, in anticipation of the retirements mentioned above during the next ISPG cycle, five new signalling appointments have been made; the first already reported in the 2019 review. This strategically re-focused the Signalling ISP research direction towards ‘stress signalling, stress biology, proteostasis and ageing’ to create a core researching the principal mechanisms that collapse the proteostasis network during the life-course and cause physiological decline. This also makes connections with underlying imbalances in metabolism and epigenetic gene regulation that drive the ageing process (the MERiDA/Epigenetics-ISPG) including decline in immunity (ImmResRep/Immunology-ISPG).

6.9 The other two appointments, already reported in the 2019 review strengthened capability in the molecular biology of B cell selection and built focus around the biology of RNA helicases in regulating gene expression and integrating cellular processes such as transcription and DNA repair.

6.10 Four new appointments have now been made at the interface between cellular metabolism and chromatin regulation seeking to understand links between nutrients and ageing and, as mentioned above, two of these appointments were made jointly between the Epigenetics and Signalling Programmes. A final appointment is addressing how epigenetics and post-transcriptional gene regulation controls immune memory. Together with the earlier appointment reported in 2019, this is a new direction for the Immunology Programme.

6.11 Part of the stated strategy is to develop greater emphasis on human development, enabling transition and translation from yeast and mammalian cells into organoids and whole animal study. Cross ISP activities are also increasing in all areas and due to the strategic recruitment outlined above, there is now a critical mass of research on proteostasis with all ISPGs contributing to the “**Proteostasis across the life course”** theme**.**

	2023	**2022**	**2021**	**2020**	**2019**

	Project Groups	Team members	Project Groups	Team members	Project Groups	Team members	Project Groups	Team members	Project Groups	Team members
Epigenetics	8	71	8	82	7	72	6	66	6	68
Immunology	7	52	7	53	6	57	7	63	7	60
Signalling	10	58	10	58	9	51	8	54	8	55
Total	**25**	**181**	**25**	**193**	**22**	**180**	**21**	**183**	**21**	**183**

Table 6.2 ISP Team numbers and Project Group Leaders

6.12 The refocus of the programmes has been achieved within the number and distribution profile of the ISPs already described in 2019. Compared with the previous period (2014-2019) the total number of Project Groups has increased slightly, although the team members are close to a steady state (Table 6.2) (disregarding overlap between new and outgoing appointments). Additionally, a new category of Honorary Group Leader in now included, which provides strategic affiliation with BI that *"seeks out exciting and complementary science to forge new collaborations and deliver benefits for both parties".* The first appointment was made in July 2020.

Six Honorary GLs are identified:

- Martin Howard (@ John Innes) – brings skills in "mathematical modelling to help unlock deep biological mechanisms", joining the Epigenetics ISP but collaborating across all 3 ISPs.
- Valerie O'Donnell (@ Cardiff) – co-Leader of the Wellcome Trust LIPID Metabolites And Pathways Strategy (LIPID MAPS) (previously with the past BI Director, Michael Wakelam) housed at BI, providing a database with access to globally used lipidomics resources.
- Kathy Niakan (@ Francis Crick) – already collaborating through the Wellcome Human Developmental Biology Initiative and joining the Epigenetics ISP to expand collaboration.
- Yiliang Ding (@ John Innes) – brings a focus on understanding the dynamics of RNA structure in living cells, relevant across all ISPs; already collaborating within the Immunology ISP on understanding how the RNA folding landscape of B-lymphocytes changes during differentiation.
- Adrian Liston (@ Pathology) – former Senior Group Leader at BI in the immunology ISP, made a Fellow of the Royal Academy of Medical Sciences in 2021.
- Wolf Reik (@ Altos Cambridge Institute) – appointed as honorary GL after stepping down as BI Director to set up Altos Labs Cambridge. The appointment will maintain the strong connections with BI and shared research with Altos.

Publication metrics

6.13 The content of the publications from BI provides some broad insight into the advances achieved by the BI ISPs. As would be expected from a successful strategically focussed research programme, citation metrics are relatively high. This is consistent with the position of the overall programme, at a forward moving edge of mechanistic understanding in cellular processes, connected with ageing. As noted in the 2019 review, the singular BI approach to a highly focused research challenge, combined with academic freedom of individual research groups to undertake innovative research in their area combines to create a unique research environment.

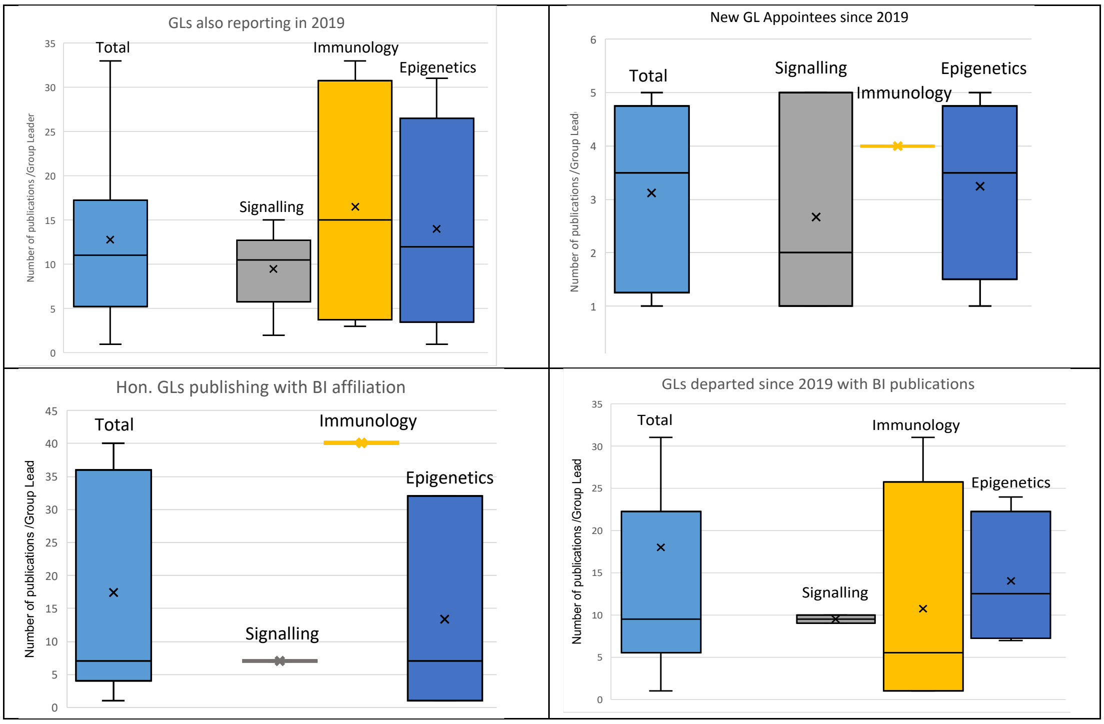


Figure 6.1: Number of publications from BI 2019-23 given as total across all programmes and within the individual programmes (Signalling, Immunology, Epigenetics).

6.14 Compared with the top Universities worldwide, publication and citation records are on par with groups of similar group size and stage of career development. In the period considered from 2019-2023 each Group Leader (GL) published between 1-40 manuscripts in peer reviewed journals, of work undertaken at BI (Figure 6.1). This is generally consistent with the previous review for the period 2014-19, although at that time a small number of GLs also recorded a highly productive period with output >45 and >70. Nevertheless, the period from 2019 has been one of exceptional changes: since the 2019 review there have been 9 new appointments (adding to the 3 new appointments reported in 2019) and 12 GL departures (including two in the area of Nuclear Dynamics and one in Nuclear Dynamics and Epigenetics, completing the refocussing reported previously with closure of Nuclear Dynamics'). As a result, approximately half the Group Leaders are building their research groups *de novo* at BI and are still in a 'pre-equilibrium' period, whereby the output, still gaining international recognition (in terms of BI citation), is comparatively lower. To illustrate the impact of these changes and career stage post appointment, the data have been treated in 4 categories (Figs 6.1-6.4):

- GLs already in post for the last review and reported within the data recorded therein
- Newly appointed GLs, reporting for the first time in this review at BI
- Honorary GLs, not featured in the last review
- Past GLs, whose output at BI is still being published and cited during this period of review

6.15 In the 2014 – 2019 period the median and mean publication numbers were nearly coincident ~20, whereas although the mean remains ~15 for the combined established GLs and leavers, the current data show more divergence between mean and median. As would be expected, the GLs who have recently departed are still contributing to the dissemination of knowledge through publication, with a median of 10 publications in the period (mean ~18). This is similar to the 'established GLs' and slightly higher than the honorary GLs, although in all cases where the median is lower than the mean, a strong separation of the Group Leaders is suggested with higher publication rates. In contrast the newly appointed GLs have a median of ~3.5 (mean ~3) and are not yet sufficiently established to draw significant conclusions. Their contribution to each ISP and the added value of their specific expertise will become more evident in the next 5 year period.

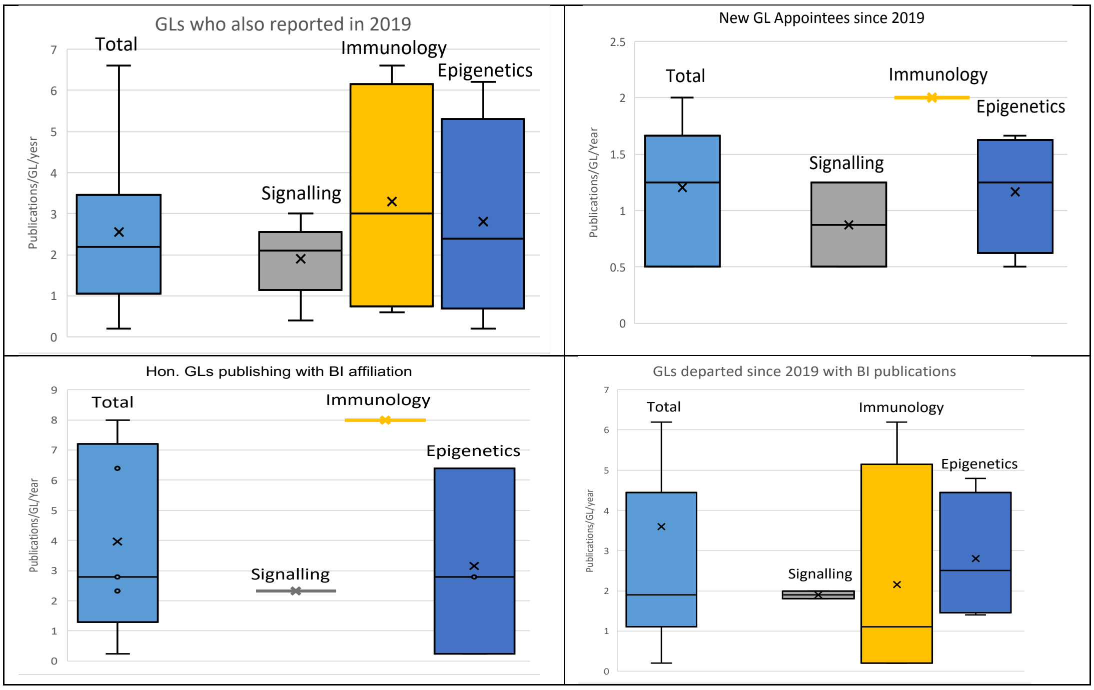


Figure 6.2: Annual BI publication output per GL from 2019-2023 given as total across all programmes and within the individual programmes (Signalling, Immunology, Epigenetics)

6.16 The current average annual publication data for each GL lies in the range of 1-8 (Figure 6.2) with similar divergence in median and mean, but of special note is the relatively lower output in the Signalling ISP compared with Immunology and Epigenetics. The impact of publication across the ISPs, as measured from the citation data (figure 6.3) no longer identifies a separation in the GLs with the higher publication output and citation rate in the Signalling ISP, as it did in the 2019 review; indeed there is greater convergence between the mean and median and fewer highly cited outliers. This is partly accounted for by the loss of Michael Wakelam (past Director of BI) during Covid-19, although his posthumous impact still influences the citation metrics of the data for the GLs departed since 2019 (figure 6.3).

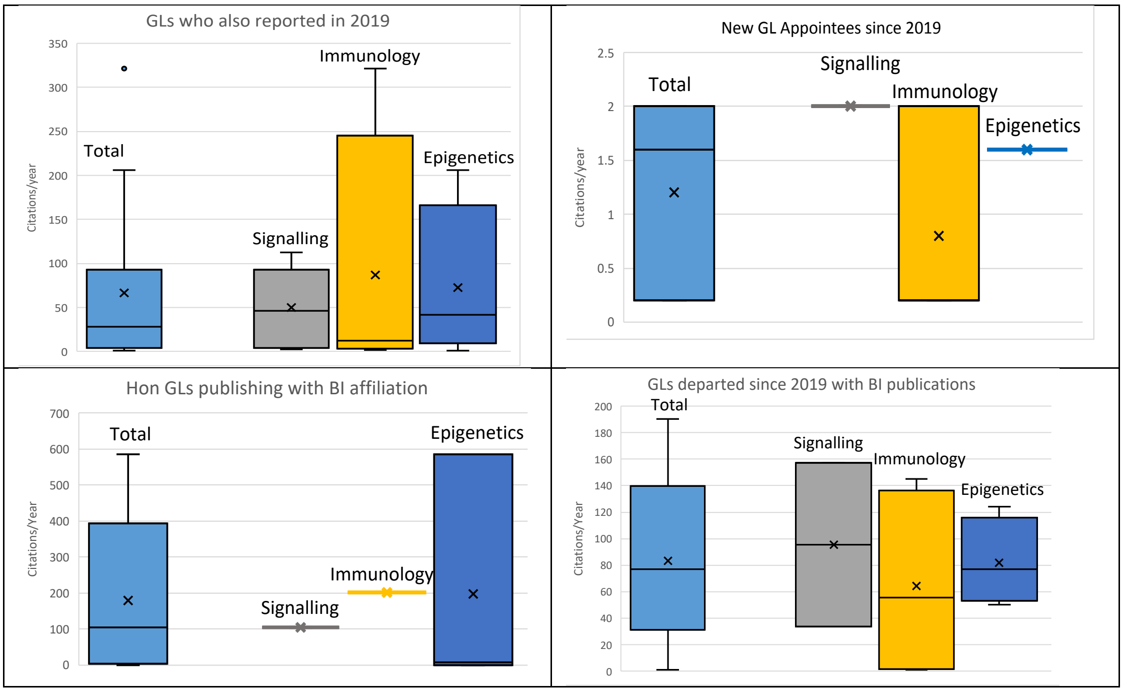
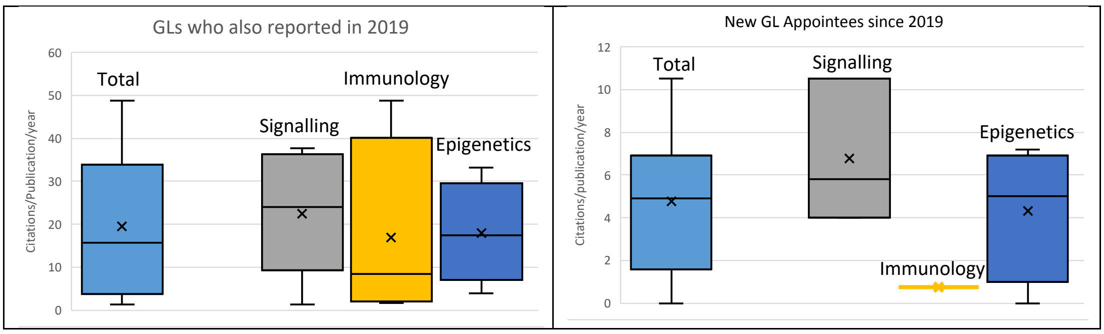


Figure 6.3: Annual Citations from BI publications from 2019-2023 given as total across all programmes and within the individual programmes (Signalling, Immunology, Epigenetics)

6.17 As expected the publications from the newly appointed GLs have yet to have time to create citation impact, but it is especially noteworthy that some of them are already receiving any citation. This highlights the 'currentness' of the knowledge that is being produced at BI and the importance of the understanding of the mechanistic pathways that they are researching for others working in the field.



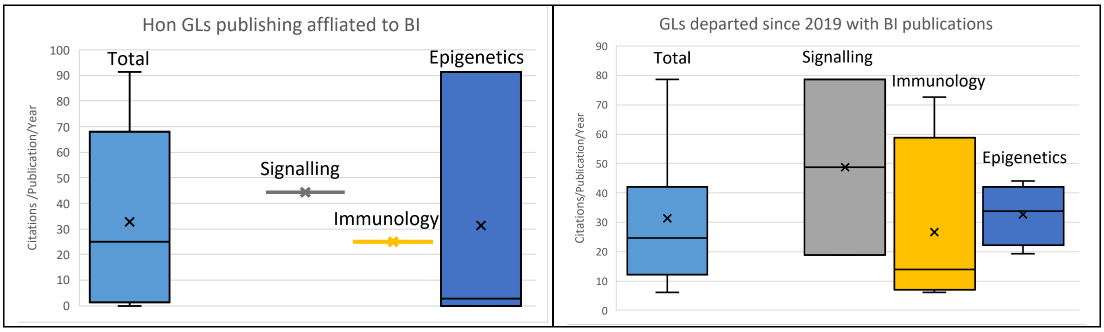


Figure 6.4: Annual Citations per Publication from BI publications from 2019-2023 given as total across all programmes and within the individual programmes (Signalling, Immunology, Epigenetics)

6.18 Publications from the established Group Leaders involving BI in the period 2019-23 yielded a mean citation rate of 19.6/paper/year and a median of 15.6 (Figure 6.4). As noted in the 2019 review these figures still embrace some extremes, although they are slightly lower than those reported in the previous review. Furthermore, as commented previously new data emerges at different rates depending on the maturity of the programme or the discovery of mechanistic knowledge, such that a publication can be ahead of the body of worldwide research. In such cases, the publication can either lead to a surge of research in the area or require time for others to take the findings on board.

However, it is worth noting that the GLs that have recently departed from BI still yield a mean citation rate of 31.2/paper/year and a median of 21.7 for publications in the current period for research review, undertaken at BI. It is to be expected that it will take a little time before the new GL appointees are filling this gap. Nevertheless, publication and citation data rarely provide robust information about the progress of cutting edge knowledge and as noted in section 6.4, there is clear evidence that very significant progress continues to be made in understanding the mechanisms of ageing.

Institute Strategic Research Plan

6.19 The BI academic vision and direction has supported three interconnected and collaborative ISPs: Immunology, Signalling, and Epigenetics, that are investigating the mechanisms of ageing. As stated earlier, appointments within these ISPs are made strategically, but the GLs exercise academic freedom in the design and management of their research. Figure 6.5 shows the extent of world-wide academic collaboration and that collaboration with other countries often involves multiple partners and that collaborators may be involved in multiple projects.

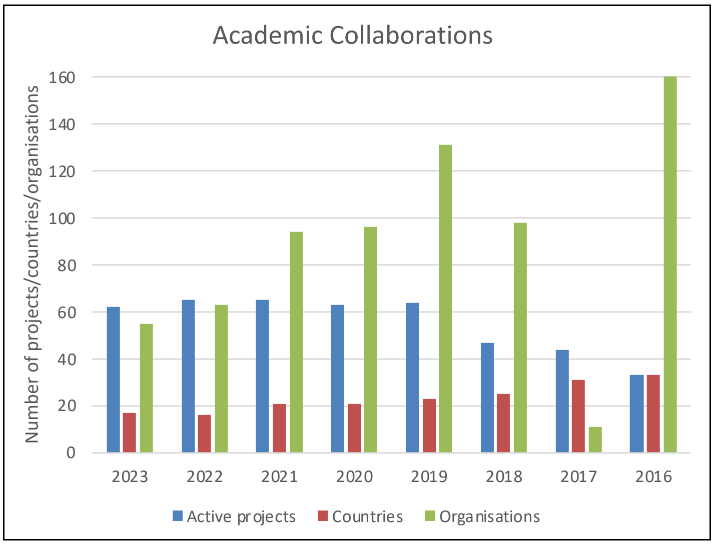


Figure 6.5 Collaboration profile for BI research

6.20 For example, the Annual reports and Director's statement refer to links summarised in an excellent figure from the Director's statement (figure 6.6), including:

- CIMR, and LMB, Gurdon Institute, (Cambridge)
- the Wellcome-MRC Stem Cell Institute and The Sanger,
- the Crick Institute
- John Innes Centre
- other BBSRC Institutes (Pirbright, Earlham, JIC, Roslin)
- MRC PPU (Dundee)
- UKRI Institutes (e.g., MRC Toxicology Unit)
- the MPI Biology of Ageing, Köln
- Buck Institute, California
- NIH BioResource

as well as UK (including Dundee, Liverpool, KCL Newcastle, Oxford, UCL) and international universities and institutes.

6.21 Some of the collaborations involve the institutions hosting the strategic honorary appointments (see 6.2) with joint research and co-publishing one of the outcomes. In the previous review it was observed that GLs engaging in external collaboration produced a higher publication rate. This correlation is also made in this review, although no significance is deduced.

Figure 6.6 The ISPG core with collaborative research and commercialisation links reproduced from the Director's statement 2023. Reproduced with permission from BI.

Signalling

6.22 The Signalling ISP investigates the mechanisms for stress resilience and cellular fitness and their relationship with the promotion of healthy ageing. It hosts the ISPG investigating the "Mechanisms governing Homeostatic responses to stress across the life course" (MechHomAge). It is concerned with both receptor-mediated signalling pathways (PI3K, MAP Kinase, PTPases, GTPases, Wnt) and stress-induced signalling pathways that converge on autophagy and proteostasis processes.

6.23 At the previous review (2019), there was a strong emphasis on outcomes of the work on the phosphoinositide 3-kinase,PI3K, pathway, implicated in phospholipid signals, regulating metabolism, immunity, ageing and growth and heavily mutated in human cancer. Since then, a key molecular mechanism has been identified by which PI3K is regulated by cell surface receptors in neutrophils, during response to pro-inflammatory stimuli. This has a role in the regulation of growth, metabolism, and immunity. Progress has also been made in understanding how the hydrophobic chain composition of relevant phosphoinositide phospholipids regulates their synthesis and function.

6.24 Previous work on extracellular signal-regulated kinases (ERKs) that are critical to cell division, relevant to aging and cancer, identified distinct thresholds of ERK activity that maintain cell division or drive cell senescence. New data on the ERK1/2 and ERK5 protein kinase signalling pathways has now been revealed (e.g. showing an ERK1/2-regulated protein, MCL1, in survival of melanoma cells – in collaboration with AZ).

6.25 The impact of RAC-GEFs (guanine nucleotide exchange factor) in the immune system was also reported in the 2019 review, following migrating white blood cells, approaching sites of infection and in the maintenance of blood glucose levels. A family of Rac-GEFs (called P-Rex) (previously discovered at BI) have been found to be involved in white blood cell mechanism for fighting disease, regulated by the protein norbin, controlling P-Rex1, by suppressing the neutrophil-mediated innate immunity. The role of SOS-family RasGEFs in primed neutrophils have also been defined and the role of neutrophil-inflammatory drug interventions.

6.26 Other areas where progress has been made in receptor-mediated signalling have been highlighted in publications and Annual Reports which include:

- better molecular understanding of receptor-mediated signalling pathways, for example, how reactive oxygen species and PTPases regulate epithelial barrier integrity; how the PI3K network is rewired during ageing; how the V-ATPase transduces lysosomal stress. In the antagonistic actions of kinases and phosphatases in reversible phosphorylation of protein tyrosine residues, an interesting comparison of protein tyrosine phosphatase receptors types K and U (PTPRK and PTPRU) has shown that PTPRK (with tumour suppressing activity), enables cells to respond dynamically to changes in their environment, and its deletion alters cell morphology and suggests regulation of cell adhesion. In contrast, a competitive binding role is indicated for PTPRU, a (non-active) pseudophosphatase, able to bind PTPRK substrates, which will focus further investigation.
- the mechanism has been deduced by which the afadin adhesion protein is recruited to PTPRK, with implications for cell-cell adhesion and gut health
- the dominant role for IKKα in inflammatory activation of NF-κB activation in colorectal epithelial cells has been demonstrated.

6.27 Investigation of stress induced signalling pathways have been reported across different research projects since the last review that have included: (i) canonical autophagy (related to life- and health-span); (ii) lysosome function and (iii) the integrated stress response. They also seek to identify regulatory mechanisms in the production and removal of endogenous protein aggregates during normal ageing. This could provide opportunities for therapeutic intervention to mitigate age-related physiological decline.

6.28 Some of the areas of new knowledge from the Signalling ISP since the last review have built on how autophagy is controlled and works on pathways of selective autophagy (mitophagy and aggrephagy), which have driven the direction of research towards proteostasis. This has resulted in strategic cross-theme collaboration, influencing new appointments. Some of the published reported highlights extend outcomes from the previous review and include:

- o demonstrating inhibition during mitosis by CDK1 taking the role of mTORC1
- o discovery of a new pathway of non-canonical autophagy (called CASM) and a molecular marker unique to the 'non-canonical' autophagy pathway, with genetic and biochemical parameters that distinguish it from autophagy; then identifying components that are critical for CASM activation and maintenance of lysosomes, with implications for maintaining cell and organismal health.
- o the 'non- canonical' autophagy pathway, utilising some autophagic machinery to target ATG8 lipidation to endolysosomal membranes has been identified, which now prompts further research to elucidate the functions of ATG8 proteins at these membranes.
- o modelling of selective autophagy and demonstrating a mechanism that will generate oscillatory behaviour during live imaging of a targeted mitochondrion.
- o Together with collaborators, the BI researchers previously revealed rearrangements of cell membranes during mitophagy and generated computer models of autophagy. These have been extended in the current period of review, using live imaging data and a possible explanation discovered for sequential translocation of autophagy components in the process of mitophagy. Progress has also been made on understanding autophagy pathways showing degradation of damaged and otherwise toxic proteins and, via the same pathway, how invading viruses are identified and targeted for autophagic destruction
- o by tagging key members of the proteostasis network in primary human fibroblasts, tracking of misfolded protein accumulation and clearance using super-resolution microscopy has been possible.

6.29 Since the last review, there has been significant progress in contributions to the deconvolution of some of the signalling pathways of ageing. The unique positioning and strategic focussing associated with the BI structure, provides the critical mass to collectively address such a complex research challenge, and enable refocus through regular strategic overview. Review of the 'whole picture', alongside outputs of individual research excellence, has allowed gaps and outliers to be recognised and filled or converged respectively. This is seen in the stress-induced signalling pathways by the introduction of a new focus on ageing and proteostasis called *'proteostasis across the lifecourse'*. This theme has a major collaborative cross-cutting activity also involving the Epigenetics and Immunology programmes and will identify common, conserved communication pathways between different clearance systems of the proteostasis network and investigate how these are re-wired during replicative ageing (yeast) and senescence (mammals).

Immunology

6.30 The Immunology ISP is investigating the molecular and cellular basis of immunity to enable protective interventions to be designed to combat weakening of the immune system and increased risk of illness with advancing age. Improved vaccine design and immunisation strategies are some of the potential outcomes of this ISP which hosts the Immunity, Response and Repair (ImmResRep) ISP Grant.

6.31 In the 2019 Review BI reported on research directed to the role of lymphocytes in the immune system and understanding the mechanism of RNA binding proteins (RBPs), that control the stability of messenger RNA and alternative transcript start- and end-points and splicing of introns. They have now detected transcripts from over 9,500 genes and identification of an increasing number of RBPs and assignments to specific transcript isoforms, from genes with multiple variants. Progress on identifying the RBP interactions has included:

- identification RBP interactions that characterise B cells actively undergoing antibody gene rearrangements
    - discovery that the RNA helicase, DDX1, is required for B cell differentiation in antibody secreting cells and impacts antibodies produced.
- finding many RBPs interact with RNA in response to protein kinase ATM (ataxia-telangiectasia mutated)-initiated DNA damage signalling.
- RNA-binding proteins (ZFP36 and ZPF36L1) identified that mediate T cell activation, thereby regulating cytotoxic lymphocytes.
- cytokine production limitation by effector memory T cells, is regulated by RBPs, but since T cell activation depends on co-stimulation by the CD28 pathway, CD28 transcription must also be a critical loss in aged cells.
- absence of the RBP in T cells led to higher survival following influenza infection in mice
- vaccine stimulated pro-inflammatory signalling has been linked with reduced immune response, suggesting that inflammation could be targeted with vaccination to boost immune responses in older people.
- further new mechanisms regulating metabolic pathways in T cell activation have been identified.
- killer T-cell function in different oxygen environments studied and mapped to understand how oxygen is linked to age-related declines in the immune system.

6.32 The effect of the RBP polypyrimidine tract binding protein-1 (PTBP1), necessary for antibody maturation in the germinal centre (GC), has also been quantified. Since the GC provides antibody secreting plasma cells in post-infection antibody-mediated immunity, it is important in vaccination design. In the previous 2019 review the BI team reported that dendritic cells and CD4+ helper T cells have impaired activation with age with reduced function of the GC. They have now established that vaccination-induced formation of the specialist CD4+ cells (*T follicular helper,* Tfh, cells) is impaired in older people. Restoration of interferon signalling boosts dendritic cell number and function and antigen-specific Tfh cells but does not fully restore the GC B cell response. However, it has been discovered that supplementing aged mice with T cells to localise within the GC, restores the dendritic network.

6.33 Studies on reduction in the production of B-lymphocytes in bone marrow with age were also reported in the 2019 review, correlated with genes dysregulated in ageing and the effects on epigenetic mechanisms. The insulin-like growth factor receptor signalling pathway has now been identified as impaired and might be targeted for restoration of the immune system in ageing B cells.

Epigenetics

6.34 The role of Epigenetics in cell diversification was instrumental in BI's contribution to establishment of the first systematic molecular map of cell fate decisions in early mouse development (as reported in the 2019 review). Investigation of the methylome and transcriptome and exploring how epigenetic tags are set up and modified by diet and age, are key to understanding how the epigenome promotes health across the lifespan. The Epigenetics ISP hosts the **Mechanisms underlying Epigenetic Resilience in Development and Ageing (**MERiDA) ISPG.

6.35 The correlation of epigenetic DNA methylation with chronological age and the role of environment were previously reported by BI as linked with the acceleration of ageing. Since the 2019 review, understanding the impact of **epigenetics has advanced in the context of environmental pressures and has shown, for example:**

- in mice, dietary restriction protects against age-associated DNA methylation changes in the liver and high-fat diet during gestation has been connected with addictive behaviours, obesity and insulin resistance for up to three generations.
- in *C. elegans*, the worms adapted to heat stress by inducing desaturation of fats in membranes. Using classical genetics and lipidomics it was found that in response to environmental temperature, a neurohormonal signal regulates the membrane lipid composition, extending lifespan. The researchers propose that a similar neurohormonal actuation aids healthy ageing in humans.
- in yeast, conflicts between replication and transcription leading to chromosomal changes and extrachromosomal DNA, drive copy-number variation of environmentally-responsive genes.
- accumulation of extrachromosomal circular DNA during ageing can accelerate adaptation to challenging environments and/or the expression of environmentally-responsive genes may provide an adaptive advantage by increasing genetic heterogeneity, promoting drug resistance (e.g. in cancer cells) and mediating changes in cell physiology.
- increased methylome and transcriptome heterogeneity was found in muscle stem-cell ageing
- the first non-human 'epigenetic ageing' clock was developed in mice, capturing lifespan interventions including dietary impact and rapamycin treatment.

6.36 Previously BI reported on the use of a nematode model *Caenorhabditis elegans* to identify key gene expression switches, while a yeast model was used to consider the impact of nutrition on cells and the dichotomy in fitness of different cells according to age. Investigation of *C. elegans* has now produced a Gene Regulatory Network of ageing, with 50 new potential ageing genes (of which 86% are reported by BI to have human orthologues). The nature of available dietary carbon source was also identified in defining health of aged yeast and it has been observed that coupling to a transcription start site (H3K4me3) is progressively lost with age.

6.37 A new method to map DNA damage and replication has been developed, that is scalable from yeast to mammalian cells, with ways to detect DNA replication forks and DNA damage genome-wide. It has been applied to challenges investigating the mechanism of adaptive genome change and how yeast cells maintain their genomes, to understanding how anti-cancer drugs impact DNA replication in tumour cells.

6.38 As noted in the previous review, the interest in epigenetics follows from the embryo, with BI researchers reporting the ability to map chromatin states in very small numbers of cells allowing genes that depend on DNA methylation to be distinguished, separating maternal and paternal chromosome information. Cells from human embryonic stem cells that resemble the first activated embryonic gene cells from human embryos have now been identified which will enable study of this early state; changes in the epigenetic machinery have been identified that contribute to the early embryonic cell-state. One aim is to understand how **factors such as a mother's age and/or diet have consequences for the development and health of a child, but also to deconvolve core epigenetic pathways in the development, for example:** alternative epigenetic tags that regulate silenced genes have been identified and the challenge of understanding the control of genetic elements that carry the epigenetic memory between generations. Other research advances also contribute to the knowledge pool that continues the rich pool of knowledge emerging from BI:

- genes and pathways that are involved in establishing pluripotency in human cells have been identified that have important roles in controlling gene activity and epigenetic modifications to DNA.
- genomic parasites - endogenous retroviral elements, co-opted during evolution as gene control modules, control an imprinting in a tissue-specific manner, controlled by the epigenetic machinery
- in eggs in mice, DNA methylation of key sites was not affected by age, but methylation and gene expression in eggs from aged mice showed less activity and less consistency so there were gene-specific changes coupled to gene transcription differences.
- a new state of Polycomb gene silencing has been identified modulated through Single Nucleotide Polymorphisms (SNPs). In the example studied, the slowed growth initiated by low temperature, allows the concentration of a stable protein to rise.

Covid-19 BI response

6.39 During the COVID-19 pandemic BI showed important applicability of its expertise and facilities; in the early phase, it was able to provide rapid diagnostics supporting the effort to manage the spread. They also ran immune phenotyping studies in patients to predict which individuals are prone to develop severe Covid-19 symptoms, requiring hospitalisation, and the patterns that correlate with a poor response to Covid-19 vaccines.

6.40 ISPG funding was repurposed to enable preclinical work on the Oxford AstraZeneca COVID-19 vaccine (AZ-1222), collaborating with the Jenner and Pirbright institutes. As a result it was shown that immunogenicity in aged mice could be boosted by a second dose of vaccine, which informed the clinical response for vaccination. Their work also showed that immunity from AZ-1222 depended on the GC response. A finding consistent with their core work in the GC and suggesting a mechanism to bolster immunity in older people. In collaboration with the Jenner Institute, Oxford, they published a pre-clinical study of the Oxford/ AstraZeneca Covid-19 vaccine in aged mice (Linterman Lab).

6.41 In 2020, BI Facility staff joined the Covid-19 Mass Spectrometry Coalition (https://covid19-msc.org), contributing to the use mass spectrometry skills/ best practice to increase knowledge of the Covid-19 virus mechanisms and drive therapeutic/vaccine development.

Training of PhD students and outreach

6.42 According to BI Director's Report, 59 researchers have completed their PhD level during this period (figure 6.7). All students registered with BI have completed their PhDs since 2017, some with approved extensions.

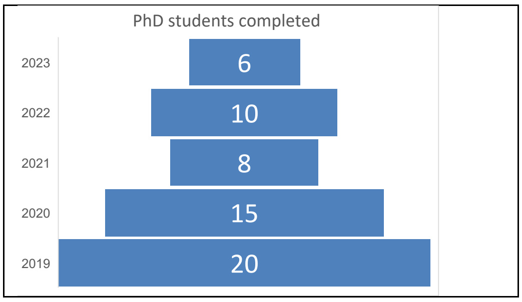


Figure 6.7 PhDs completed by year

6.43 BI is a recognised postgraduate University Partner Institution (UPI) within the University of Cambridge, with all Babraham PhD students members of Colleges with full access to the University infrastructure. BI supervisors undergo training as active members the Postgraduate School of Life Sciences (PSLS) within the University. There have been various schemes for collaboration and funding since PhD students were first admitted at BI; for example in October 2022 two new PhD students joined the McGough lab, funded by the MRC and the Cambridge Trusts. The Houseley Lab has a new collaboration with AstraZeneca to train a PhD student studying the acquisition of drug resistance during chemotherapy. On average there have been four jointly-supervised PhD studentships with BRC Companies active each year. In 2022 BI and BRCL secured a UKRI-BBSRC Collaborative Training Partnership (CTP) supporting 15 CASE PhD studentships, extended in 2023 to support a total of 22 studentships. It is a structured programme with skills training and scientific and industry supervision. The first six students joined the programme in October 2022 and over the period of the award, thirteen different Institute research groups will host students in partnership with thirteen Campus companies, where each CTP student will spend time working. For example, Cook and Samant Labs are collaborating with BRC companies: Mission Therapeutics and PhoreMost respectively on the CDT programme and Sharpe Labs has a collaboration underway with AstraZeneca through the CDT.

6.44 The scheme is well tailored to the co-existence of BI and BRCL with the students also shadowing early-stage life science ventures, gaining key commercial knowledge as they participate in a Campus' five-month bioentrepreneurial programme, Accelerate@Babraham.

6.45 Attention has also been given to under-represented groups and addressed the challenge that students from disadvantaged backgrounds face in gaining laboratory experience. A five week programme run through the BI Research Access Programme, in partnership with In2Science. "The students completed projects relating to the work of their host group, experienced life as a PhD student, and learnt about a variety of Institute based careers". In 2021 eight students were trained through virtual placements and in 2022 five students joined groups for an in-person placement.

6.46 BI also participated in the Horizon ORION Open Science project embedding open science and responsible research and innovation to inspire others. A public engagement Virus Fighter was co-created between researchers, school students and a games development company with participation in a public dialogue project. LifeLab', supported by the European Commission, took to the road with pop-up labs simultaneously in Cambridge, Peterborough, and Ely and BI has continued to host students as part of the Institute's Schools' Day events, marking over 3000 secondary and sixth-form students participating in hands-on lab projects, since the scheme start. The scheme adapted to a virtual formal during covid, but in Dec 2022 BI reopened its doors for the Sixth Form Conference with a theme of 'Healthy Ageing'. Together with other initiatives, there have been nearly 150 events, involving over 400 researchers and despite the fact that numbers haven't returned to their pre-Covid levels, more that 17,000 participants have joined these initiatives (8000-9000p.a pre Covid).

Company collaborations, Spin-offs and commercial development

6.47 It is estimated that over 80% of the Institute's research groups participate in national or international collaborative projects, ranging from those examining a specific topic for a few months to strategic relationships lasting some years.

6.48 The Institute is co-located with the bioscience companies of the Babraham Research Campus, which creates an entrepreneurial local culture of opportunity with some analogy with the Boston Biotech ring. It has played a significant role in supporting early-stage commercial companies on site through research collaboration and by providing a service of research expertise, company staff training and science facilities. BI has active research and development collaborations with 12% of the companies on site. As reported in 2019 with support from the Babraham Institute's Babraham Research Campus Collaboration Fund (BRCCF), researchers at BI were able to establish important and novel collaborative work with scientists at Campus companies. In 2021, the Campus partners (Babraham Institute, BBSRC and BRC Ltd) renewed a joint strategy for continued development of the Campus, continuing the strategic objective to ensure the output of excellence in research (both academic and commercial) with facilities on site to support both the start-up and scale-up phases of a bioscience company development.

6.49 The translation and commercialisation of the Institute's research are facilitated by two main support structures: the Knowledge Exchange and Commercialisation (KEC) programme and Babraham Institute Enterprise (BIE) Limited. The KEC team helps to provide entrepreneurial mentorship and broker translation of research innovations with potential commercial benefit for licensing and/or successful spin-out. Figure 6.8 shows a steady flow of ~35 IP agreements annually of which ~10% are typically new agreements. Thus, IP agreements can provide a revenue source for the Institute, alongside consultancies and collaborations with BRC companies. Of particular note, work from the Reik Lab on applying epigenetic reprogramming to reset cell age, resulted in the licensing of the IP (published by Reik in 2022) to Altos Labs Inc and the establishment of Altos Cambridge Institute of Science in 2021, with Reik as Director.

6.50 A total of 27 R&D collaborations with BRC companies have been undertaken in the period from 2019-2023. This has not excluded other collaborations (as indicate in Figure 6.8).

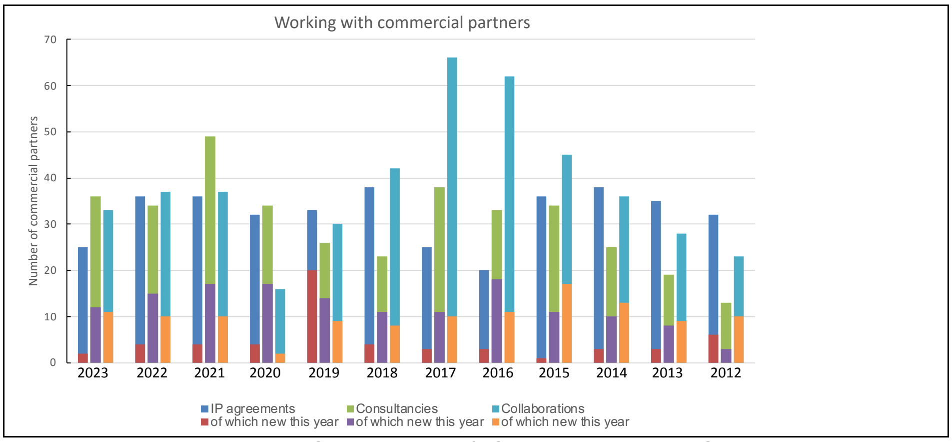


Figure 6.8 IP agreements, Consultancies & Collaborations with Commercial Partners

Some examples:

- A multi- centre collaboration involving BI (Ktistakis), ALBORADA Drug Discovery Institute, MRC Mitochondrial Biology Unit (coordinated by the Milner Therapeutics Consortium) funded by Astex, Eisai and Eli Lilly, aiming to discover novel, actionable autophagy targets in neurodegeneration.

Ongoing collaborations with AstraZeneca have

- identified a protein, MCL1, critical for the survival of melanoma cells which provides a novel drug combination to kill melanoma tumour cells
- shown that the magnitude of ERK1/2 activation drives the reversibility of tumour cell resistance to clinically approved MEK inhibitors

- (Cook) Ongoing collaboration with PhoreMost (BRC),
- (Florey) Ongoing collaboration with Casma Therapeutics (US) has revealed a link between activation of the pathway and maintenance of the lysosomal system, which may underlie the functional role of non-canonical autophagy.

6.51 Alongside the KEC team, the translation and commercialisation of the Institute's research is facilitated by Babraham Institute Enterprise (BIE) Limited. BIE, a wholly-owned subsidiary of BI, supports the delivery of the commercialisation of the Institute's science.

6.52 As reported in 2019 BIE also held shares in two BI spin-out companies, Crescendo Biologics Limited and Discerna Limited, as well as in Aitua Limited. Discerna Ltd showed a loss for the year of £1K in 2019 compared with a profit of £10K in 2018; this was attributed to the expiration of the licensing agreement during 2018/19. Discerna Limited was liquidated in 2020 resulting in a BIE loss of £23K. Aitua Ltd reported a profit of £408K in 2019 (2018: loss £392K). BIE held 90% of the share capital of Aitua Limited and 50% of Discerna Limited. Aitua in turn owned the remaining 50% of Discerna. Aitua was also liquidated in 2020. The shares held in Aitua have now been transferred to BIE and further action regarding their sale is being considered.

6.53 Crescendo Biologics is developing novel, targeted T cell enhancing Humabody® oncology therapeutics. It continues to show strong potential for success; it has 73 granted patents and 52 pending. It formed a collaboration with BioNTech in 2022 with $40M upfront followed by $750M at multiple programme milestones targeting immunotherapy. It announced a further $32M investment from existing shareholders and new investor Kreos Capital in 2023 for an ongoing Phase 1b trial of CB307, a bispecific antibody fragment targeting prostate-specific membrane antigen (PSMA), enhanced with a new pembrolizumab (anti-PD-1) combination for solid tumours.

6.54 During the current period of review there have been a further 3 spin-outs arising from 21 patent families, for example:

- (Fraser Lab) The GenLink3D™ platform integrates molecular biology with machine learning to map the 3D structure of the genome at high resolution. Enhanc3D Genomics Ltd were awarded European Research Council (ERC) Proof of Concept funding in 2020, secured further seed funding in March 2021(£1.75m), was awarded the Johnson & Johnson Innovation QuickFire Challenge Grant in March 2022and raised an additional £10m in series A funding in October 2022. Enhanc3D Genomics was one of the first four start-up companies to join the Start Codon business acceleration programme. The company now employs over fifteen full-time research staff and bioinformaticians.
- (Liston lab) developing a pioneering innovative anti-inflammatory biologic technology to treat CNS injuries and disorders: Aila Biotech, spun out from the Institute's Immunology programme in 2022 from research on mouse models leading to targeting IL-2 to astrocytes to mitigate pathological neuroinflammation, demonstrating promising pre-clinical efficacy. Builds on research undertaken with collaborators at VIB and KU Leuven in Belgium.

- Elithium Bio is incorporated in US by a PDRA from the Rugg-Gunn group using BI patented stem-cell technology for the IVF market. Currently raising funds supported by BI and Stanford University TTOs. Shareholding agreements currently under discussion.

BI Structure and Funding

6.55 According to the description of governance for BI (https://www.babraham.ac.uk/about-us/governance-and-funding), the running of the Institute is managed by the Institute Director, with support of the Executive Committee consisting of senior scientists and managers across the ISPs and support functions. The structural hierarchy for research management sets out the 3 ISPs, each with its own or joint GLs. Postdoctoral Researchers are appointed to each GL team. Due to the sudden death of the Director, Michael Wakelam, during the Covid-19 pandemic in 2020, Prof Wolf Reik was appointed as interim Director and then Director but almost immediately moved to head up the Altos Cambridge Institute in 2021. Simon Cook was then appointed first as interim Director and thence Director in 2022. Considering exceptional working during Covid and the turnover of staff from Director to Group Leaders this has been a period of considerable disruption and change. However, the Institute has shown remarkable resilience and many scientific successes culminating in the successful renewal of its strategic funding from BBSRC (~£48M) in 2024.

6.56 Also contributing to the oversight of the scientific strategy and scrutiny of the ISPs, is a Science and Impact Advisory Committee. The working of this committee will be considering not only each ISP but also the new cross ISP theme of "**Proteostasis across the life course"**, this will require a further level of scrutiny:

- GL team output and impact
- ISP output and impact
- Proteostasis output and impact

How this is delivered and plays out will be critical to the next review, since it migrates from a broad strategic vision defined by the ISPs to a very focused headline end vision.

6.57 As previously, appointments are mainly made on tenure track (6-7 years). Together with the appointment of postdoctoral researchers and the involvement of students and visiting researchers there remains a high turnover at BI that maintains an academic freshness and enthusiasm for research. At present the high number of incoming GLs who are developing their reputation at BI means that output is still in the 'acceleration' stage and hasn't reached the more steady-state equilibrium of the established GLs.

6.58 The BBSRC funding model is a core 5 year reviewable block grant which is highly focused and provides a longer timescale than is typical of most University Department Research project funding. The grant consists of the three science-themed ISPGs held in our three Programmes (Signalling, Epigenetics and Immunology) and the Core Capability Grant which pays for our Administration team and the Science Facilities (see 6.63-6.70 below) that underpin the Institutes research and are extensively used by the BRC tenant companies. The direction of research is determined top down, through a strategic plan, which is kept under review and adjusted to reduce iterative research effort while accelerating innovation in fast moving areas on the mechanism of ageing. As a result of the critical mass of complementary but somewhat overlapping expertise at BI, and the rigid strategy of purpose, and the core ISPGs, individual research outcomes can feed into adjacent research immediately and significant advances be achieved more rapidly.

6.59 As introduced in the previous section, in addition to the grant income, commercial income is generated through BIE from (Figure 6.9):

- IP commercialisation.
- Research collaborations with industry partners.
- Scientific consultancy to industry.
- Commercial use of BI scientific facilities and services.

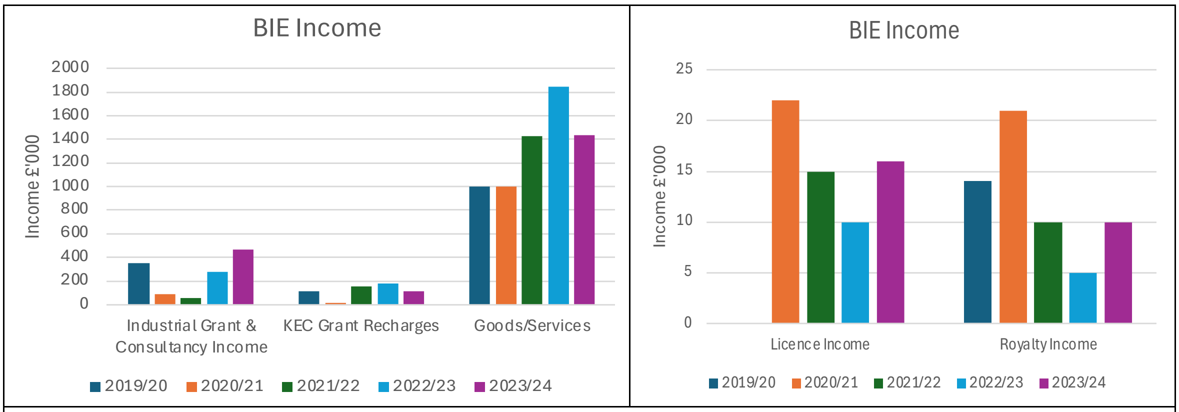


Figure 6.9 BIE Income by category.

6.60 It was noted in the 2019 review that BI's IP revenue portfolio had lowered compared with earlier years, attributing the downward trend to the relatively low level of antibody out-licencing compared with previous years (note also the liquidation of Discerna, section 6.7). The number of IP agreements has been consistent for 10 years between 25-35 except in 2016/17 and most recently in 2023 (the latter figure may be due to incomplete data). In the previous period, IP accounted for less that 3% of the total commercial income. Current data for Licence and Royalty Income from the past 5 years shows ~1.4% of the total BIE income (~6% excluding Goods and Services). This is similar to previously reported IP income in 2017/18 of ~£27K (range £15K - £42K for 2020-2024, excluding 2019 when Covid impacted licensing) and suggests that there is currently a steady state without the major out-licensing seen in earlier years, but with a number of promising discoveries being explored with future licensing and revenue earning potential (as suggested from the spin-outs recorded in the previous section).

6.61 The BIE income from Industrial Grant & Consultancy also shows a steady state compared with 2017/18 figures (£253.6K) with a mean of £248.4K and median of £277K (figure 6.9). The difference between the mean and median is accounted for by the low income in the post Covid recovery years of 2020-2022 and the true trend may now be upwards. This should be confirmed by 2024/25 performance.

6.62 Figure 6.10 shows the breakdown of BI funding across income sectors. Despite the core ISP grant, the BI also seeks research project funding from other UK and International funding bodies. In comparison with the snapshot for 2017/18 available in the previous review there has been a significant increase in competitive grant income, with >£6M now being recorded year on year since 2021 from UK funders. This is largely a result of increased Wellcome funding (figure 6.11) which accounts for 42% of the total competitive research funding and 53% of the UK competitive funding. This substantial increase is encouraging, even though competitive funding is, by its nature, transient and may not be sustained indefinitely. There is no information on the length of these grants and the success rate in obtaining funding for the established and newly appointed GLs.

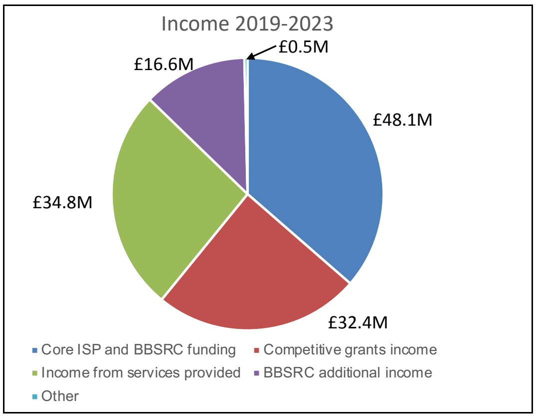


Figure 6.10 Total income for BI, 2019-2023

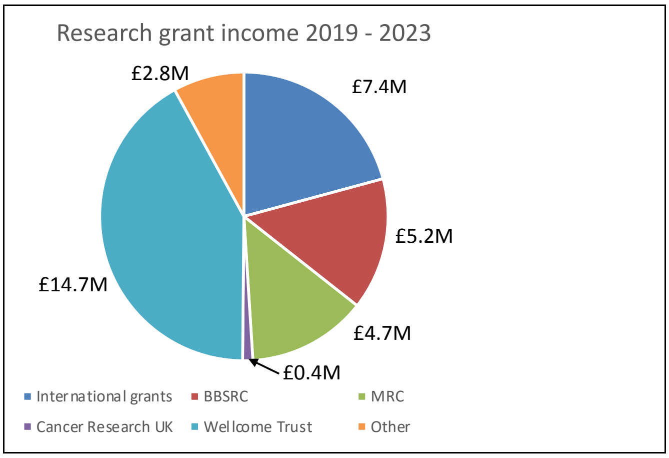


Figure 6.11 Research grant income distribution 2019-2023

Research Facilities infrastructure

6.63 One of the most outstanding features of BI is the provision of cutting-edge facilities that support the advancement of the research, supported by the BBSRC Core Capability Grant. This is an important component in the success of BI and a unique selling point in the overall Institute model. There have been several changes in emphasis since the 2019 review and as stated in the Director's statement (2023): "These are 'bespoke' facilities, having evolved to serve the Institute's specific purpose through management of facility teams by ISPG leads". There are currently 8 specialist facilities overseen by each ISP that provide facilities with an attention to cutting edge capability which is an exceptional asset to the outcomes of research in BI (Table 6.3):

Signalling:	**Epigenetics:**	**Immunology:**
• Imaging • Biological Chemistry • Mass Spectrometry	• Bioinformatics • Gene Targeting • Genomics	• Flow Cytometry • Genomics • Gene Targeting • Biological Services Unit (BSU)

Table 6.3: Oversight of Facilities by the BI ISPs

6.64 In 2021-22 Imaging, Flow Cytometry, and Mass Spectrometry, underwent transformations to update and advance their capabilities (Table 6:4). Some of the Facilities have received accreditation by:

- the Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC) in 2022 accredited the BSU as 'a beacon of good practice'.
- The International Society for the Advancement of Cytometry (ISAC) accredited the new state of the art Flow Cytometry Facility

6.65 The Biological Services Unit (BSU) has received investment of ~£20M since 2017 to maintain the infrastructure, ensuring cutting-edge facilities with new capabilities. The unit utilises robotic cage-washing technology and automated sterilisation processes to provide equipment and consumables to the bio-science units and had been trialling a new drinking valve prior to global launch. The Animal Technicians hold Home Office Personal Licences and the AAALAC accreditation and partnership with Avidity Science has enabled the first three apprentice animal technicians to complete Institute of Animal Technology (IAT) Level 2 qualifications and take up posts in the commercial sector.

6.66 The gene targeting facility was re-established in 2019 to provide desired genome modifications in cell lines and mice (table 6.6). During 2020, three new mouse lines were made as well as loss-of-gene-function embryos, without using embryonic stem cells. This enables faster delivery of mouse models using fewer mice.

6.67 Following the death of the BI Director in 2020 and the pending retirement of 2 longstanding GLs, the lipidomics facility has been closed, while retaining some staff capacity in lipidomics. This has allowed increased resource in protein Mass Spectrometry to support the cross ISP theme of proteostasis, which has been crucial for the research being undertaken by the two new joint appointees in Epigenetics and Signalling.

	New Provision	**Goal**	**Outcome**
Imaging	• Leica Stellaris point-scanning confocal microscope for multi-colour high resolution imaging • Olympus SpinSR confocal microscope for rapid 3D live cell imaging. • major upgrade to an existing Nikon confocal microscope • a Nikon super resolution microscope. • Miltenyi MACSima deep phenotyping platform with the capability to image an unlimited number of fluorescence labels in one sample.	cutting-edge facilities with new capabilities, improved sensitivity, higher resolution, greater automation, improved ease of use, better stability and the ability for remote access.	Configuration to offer maximum flexibility, optimised to accommodate the wide range of applications. Support its increasing base of commercial users, strengthening the Institute's important role in supporting innovation
Flow Cytometry	• two Aurora full spectral analysers • two additional Thermo Fisher Invitrogen Bigfoot full spectral high-speed cell sorters	The Flow Cytometry facility was "reinvented" in 2021, with investment in spectral flow cytometers and cell sorters	allowing users to build large multi-colour panels, giving more insight into cell populations, rare events and ultimately gaining more information about each cell. The facility now houses to increase capacity within the facility for full spectral analysis.
Mass Spectrometry	• Thermo Scientific Orbitrap IQ-X Tribrid mass spectrometer coupled to • Vanquish Duo ultra-high-performance liquid chromatography system	Expansion of Mass Spectrometry facility to perform direct metabolite analysis High-sensitivity mass spectrometric protein analyses including: • quantitative proteome analysis (label-free, SILAC, isobaric tagging); • identification/quantitation of proteins in purified complexes; • identification, localisation and quantitation of post-translational modifications; • detailed structural characterisation of individual proteins; • targeted protein quantitation.	Ability to analyse complex, low abundance samples in much greater detail, essential in trying to identify critical regulators of important biological processes, and to understand how they function. This facility has been crucial for the research being undertaken by the two new joint appointees in Epigenetics and Signalling.

Bioinformatics		• provide large compute cluster and an associated suite of software tools. • train scientists in the latest computational techniques and tools	provides a consultancy service to either advise researchers or perform analysis on their behalf.
Biological Chemistry		Continued Chemical synthesis of standards and reagents which are not commercially available. Analysis of biological molecules by mass spectroscopy. Development of new reagents and analytical methods. Help and advice on any aspect of chemistry/biochemistry to exploration of biological problems.	continued to support groups throughout BI on a wide range of projects from synthesis of compounds not commercially available to developing new analytical methods to analyse lipids in cell extracts.
Biological Support Unit	substantial refit in 2020, total investment of about £2.8m Continual update and improvement.	• State-of-the-art housing and care for pathogen-free rodents used in academic and private company research programmes. • Professionally qualified animal technicians providing expert support to researchers by: o undertaking regulated procedures, o maintaining the animal health barrier o undertaking animal husbandry.	four units providing flexible services to meet the dynamic requirements of biological research. BSU has formed a successful partnership with Avidity Science First three apprentice animal technicians completed Institute of Animal Technology (IAT) Level 2 qualifications
Genomics	• Introduction of 10x Genomics Chromium Controller single cell partitioning and barcoding system • improved automated RNA-seq library preparation services • outsourced “routine high volume sequencing”	• study of gene expression, copy number variation and chromatin accessibility • profile the immune system repertoire at an unprecedented level of resolution.	Contributing to epigenetics, chromatin regulation, cell signalling and immunology research agendas.
Gene Targeting	• re-established to provide desired genome modifications in cell lines and mice.	• CRISPR/Cas9-based technologies for transgenic cell lines and mice. • High-throughput single-guide RNA. • CRISPR/Cas9 reagents • Gibson assembly recombinant complex constructs. • Reagents for mechanisms of DNA repair. • Screening gene-edited cell lines using Next Generation Sequencing.	• Generation of mouse models • specialist use of Cas9-sgRNA ribonucleoprotein combined with electroporation to target various cell types
Lipidomics	• Closed	Staff retained to provide some capacity in lipidomics	Resource transferred to Mass Spectrometry

Table 6.6: Overview of BI Facilities

6.68 The Facilities also deliver innovation for broader dissemination and use, for example:

- Biological Chemistry have published their work describing how the chemistry of collagen changes dynamically during tendon stretching and the implications for this when considering changes in tendon with age.
- CellPad, a cellulose hanging ‘environmental enrichment’ for mouse cages, designed by BSU employee, became available commercially in 2020 by Datesand.

6.69 External organisations can access these facilities, coordinated by Babraham Institute Enterprise (BEI), providing income to the Institute.

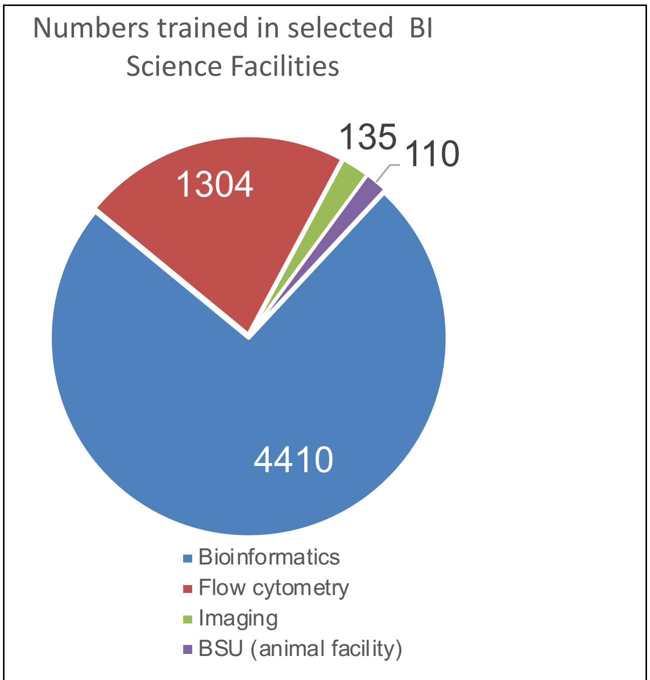


Figure 6.12 Distribution of training in selected BI Facilities

6.70 Training is also provided for some of the Facilities, enabling more independent use (Figure 6.12). Over 6000 researchers have been trained in the period 2019-2023, for example:

- the Flow Cytometry facility delivers modular training courses alongside practical training to enable independent use of the analysers. The flow cytometry training courses are held with the Francis Crick Institute. During 2020, the face-to-face training was adapted into an online virtual format and 184 delegates attended at least one module of the hybrid courses. 27 companies used this new facility in 2022 of which 20 were based on BRC.
- The Bioinformatics Facility provides training in computational biology from the in house team, composed of experienced bioinformaticians and statisticians, all with a biological background. As seen in figure 6.12, more than 4000 have been trained in the period 2019-2023 including BI, BRC companies and other organisations, including European Bioinformatics Institute, Institute of Cancer Research, University of Cambridge, The Crick Institute, ETH Zurich, Astra Zeneca, and CRAGenomica in Barcelona. Including the video content/bitesize training, created in 2023 there have been over 6000 views just for this resource.

Conclusions

6.71 Once again this review demonstrates that the strategically focussed effort at BI "through excellence in discovery life sciences research and training………… to be an international leader for research on lifelong health and healthy ageing" provides a critical mass of talented research leaders, having overlapping but distinct research areas that can produce outstanding scientific outcome. The BI research output is generally world leading and the model is entirely fit for purpose. This is not to say that BI are the only world leaders in the mechanism of ageing, nor that the critical mass is the only key ingredient to the BI model. Indeed, it is the unique combination of strategic focus, state of the art serviced research facilities, with their own agenda of excellence in innovative methodology development, and the BRC providing a translational culture and collaboration opportunities. This provides a research drive that also looks beyond the fundamental scientific research discovery to the potential impact of the research findings in lifelong health.

6.72 Achieving and maintaining this environment has been the passion of the Leadership teams and their ability to work in concert with the researchers and support staff, so that discovery is driven from all levels. During the current review period there has been a high staff turnover with a number of new GLs establishing themselves at BI. Their areas of expertise and track record to date suggest that BI are continuing to make 'high-flying' appointments, but this will be tested in the next period when their publication and output metrics should begin to match those of the established GLs.

6.73 Furthermore, the success of the strategic vision to produce significant understanding of "**Proteostasis across the life course"** is a KPI of the BI model and its ability to drive advances in a singularly focused theme through cross ISP collaboration, without dilution of the ISP themes.

6.74 The evidence for spin-out is also encouraging with some new foundations established in the current review period having exciting potential. However, success, dissolution and general progress of these spin-out companies also provides useful lessons in translation and longevity, many of which are also being learned by the BRC companies. There is good evidence that the KEC has provided entrepreneurial mentorship and brokered translation of research innovations from within. Over the last two years innovative co-working between the BI KEC and BRCL teams has been successfully established to progress translation and entrepreneurship projects. Cross-organisational long-term secondments of staff and delivery teams have been set up between BI and BRCL to enable optimal sharing of expertise and networks. These have successfully supported the Accelerate@Babraham initiative, Campus CTP PhD Programme, enhanced Campus translational training offerings, cross-Campus networks, and identified new Campus company-academic collaborations. With these recent initiatives it is interesting to consider how an innovative BI+BRCL Campus environment could grow and improve to enable further early translational high risk research and development, without compromising the BI mission for fundamental innovative excellence in science. At one end, the BRC provides a wealth of experience in active translation and at the other end BI provides excellence in scientific discovery. Is there space in between that could be world leading in the BI/BRC model?

7. Assessing the impact on the Cambridge Innovation System

Research campuses can play a major role in this respect by providing ‘neutral space’ for interaction to occur and also by encouraging educational programmes, mentoring, facilitating networks, engagement and research that will develop the understanding and the personal and interpersonal skills required. Research shows that[32] success requires attention across all the systems including building the capacity of the knowledge base, the quality of the physical place and infrastructure including the provision of premises, the financing of enterprise and also entrepreneurship and the fostering of business and industry networks.

The Babraham Research Campus has provided a major role in this respect. It runs accelerator and soft-landing programmes that shape business development and it also assists businesses to obtain funding from a wide variety of sources and obtain specialist advice and mentoring support. Venture finance from outside the Cambridge sub-region has become of increasing importance in recent years. There is co-location of a vibrant community of start-up and scale-up companies with world-leading academic research from BI, as well as the opportunity for these companies to access a range of state-of-the-art scientific facilities provided by the Babraham Institute.

The evidence from the key stakeholders across the Cambridge innovation ecosystem supports the strong contribution that BRC is making to the development of the Cambridge life science innovation system and building the capacity of the life-science cluster. Respondents emphasised that the provision of new-start up and accelerator space was of particular importance, as was the attraction of funding and the provision of facilities and services to assist with the development of life science companies. The Campus is helping to expand the knowledge base and the commercialisation of life science research. These findings are much in line with the findings from companies in 2019. Similar views tended to be expressed by each category of respondents questioned.

Introduction

7.1 The Babraham Research Campus is a unique part of the Cambridge Life Science innovation system in that, as discussed extensively in Section 8, it seeks to meet the needs of life science companies that are typically under serviced by the commercial property market. The uncertain viability, and therefore higher risk profile, of these companies make them less attractive to more commercially orientated science locations. The companies themselves may find it difficult in their early stages of development to accept the long-leases and terms offered by the standard commercial science park offering. The outcome is that this segment of the market tends to be characterised by a classic market failure that impedes the growth of the sector.

7.2 The Babraham Impact Assessment Report produced in 2020 identified the important role that the Campus played in enabling new ventures to start-up and develop rapidly by providing access to science, technology, talent and capital. This was very important in helping them to remove the barriers that might prevent

[32] *Enterprising Places; Sustaining Competitive Locations for Knowledge –Based Business*, (with Baxter, C, Moore, B, Morrison, N, McGaffin, R and Otero-Garcia M). CMI-MIT Research Series, Cambridge. 2007

them getting to the all-important scale-up phase. The research presented in this Report shows clearly that the Campus has continued to provide this role.

The earlier Babraham Economic Impact Study adopted a simple framework developed by Baxter et al (2007)[33], which considered interaction and collaboration in the Cambridge Life Science system by distinguishing four key systems which contain the people, companies and institutions that come together to translate Life Science knowledge and ideas into outcomes that enhance societal well-being and generate commercial success.

Figure 7.1 shows the framework. It comprises the:

- Knowledge System-the institutions, networks, and agents through which ideas (that can form the basis for new inventions and sustained development), develop and traverse, and through which workers gain access to technological expertise
- The Finance System-those institutions and agents that provide the capital for investment in business operations, facilities, and community infrastructure
- The Business System-the companies and other economic agents, institutions, and formal and informal networks that facilitate the commercialisation of ideas and the development of globally competitive businesses, including business decision-makers, skilled labour, as well as accountants and lawyers.
- The Place System; which embraces those agents of change that enhance the attractiveness of the place for the production of knowledge and entrepreneurial activity and thus provide the land and property (Research Campuses), infrastructure, health care, education, training, housing, schools, shops, locations, cultural facilities and the Regulatory Environment.

7.3 Successful innovation requires interaction and collaboration between all of the systems shown in Figure 7.1 but as Baxter et al discuss, the formal mechanisms by which this occur may be relatively weak. Each of the systems shown requires entrepreneurial and innovative activity and the gains to innovation are often greatest at the boundaries of the interaction. Bringing the systems together successfully takes effort and 'spanning the boundaries' is facilitated by strategic partnerships or 'intermediaries'.

7.4 Research campuses can play a major role in this respect by providing 'neutral space' for interaction to occur and also by encouraging educational programmes, mentoring, facilitating networks, engagement and research that will develop the understanding and the personal and interpersonal skills required. Research shows that[34] success requires attention across all the systems including building the capacity of the knowledge base, the quality of the physical place and infrastructure including the provision of premises,

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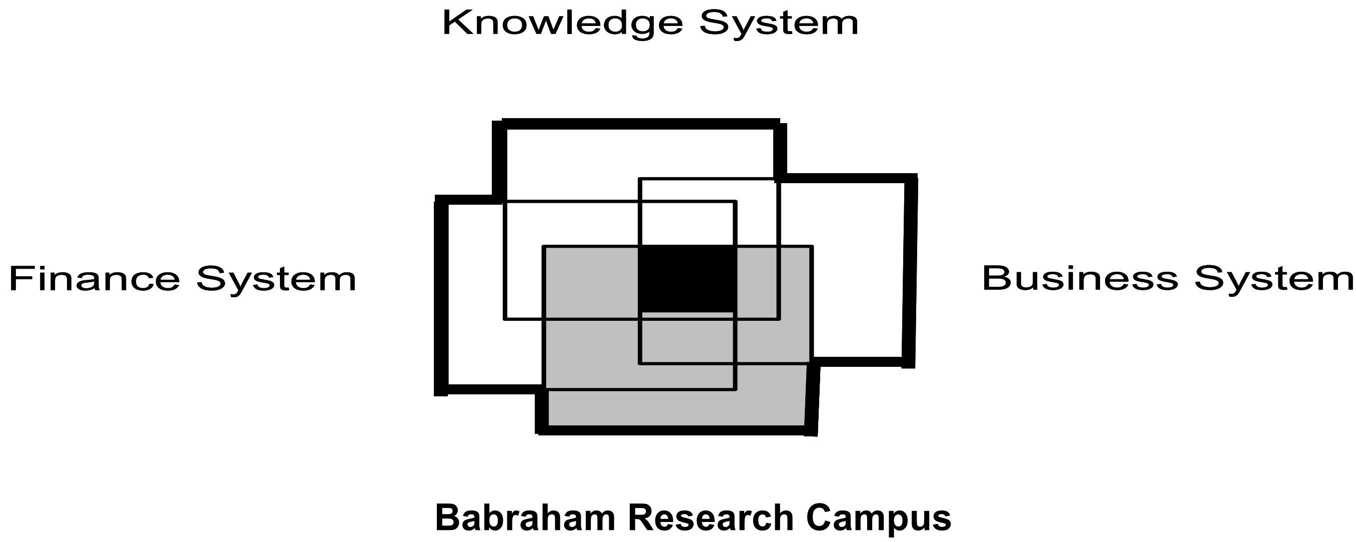
[33] *Enterprising Places; Sustaining Competitive Locations for Knowledge –Based Business*, (with Baxter, C, Moore, B, Morrison, N, McGaffin, R and Otero-Garcia M). CMI-MIT Research Series, Cambridge. 2007

[34] https://www.landecon.cam.ac.uk/pdf-files/cv/pete-tyler/copy_of_PRI_ENTERPRISING_REPORT1.pdf

the financing of enterprise and also entrepreneurship and the fostering of business and industry networks.

7.5 The Babraham Research Campus has provided a major role in this respect. It runs accelerator and soft-landing programmes that shape business development and it also assists businesses to obtain funding from a wide variety of sources and obtain specialist advice and mentoring support. Venture finance from outside the Cambridge sub-region has become of increasing importance in recent years. There is co-location of a vibrant community of start-up and scale-up companies with world-leading academic research from BI, as well as the opportunity for these companies to access a range of state-of-the-art scientific facilities provided by the Babraham Institute.

Figure 7.1. Understanding the role of the Babraham Research Campus in the Cambridge Innovation System.



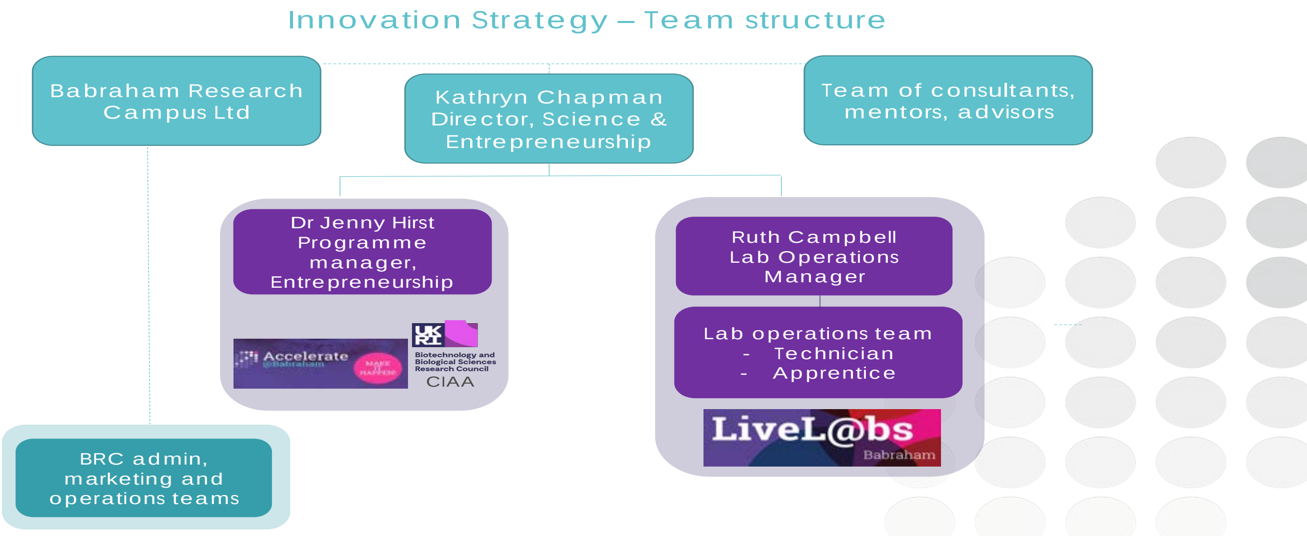
Babraham innovation services

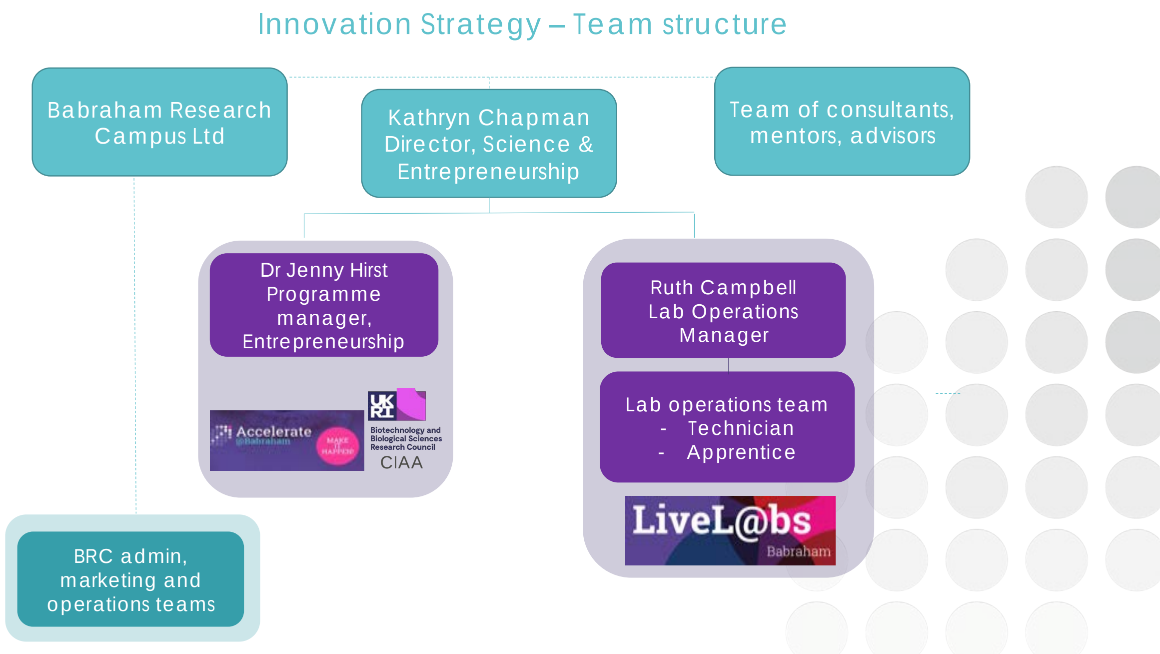
7.6 The Babraham Research Campus Vision is ‘for the Babraham Research Campus to be one of the best places in the world for discovery, bioscience research and innovation and a leading sustainable ecosystem to start, nurture, scale and grow bioscience business, capturing new opportunities’. And its underlying Mission is to deliver a growing and vibrant Campus. A Campus that enables world leading bioscience research and business to come together in a unique combination, with a focus that accelerates scientific discovery and helps and builds and scale businesses. Delivering a highly connected, sustainable and dynamic ecosystem, that creates new discoveries, therapeutics, jobs and growth to support the UK economy. Figure 7.2 shows the mechanisms by which the Babraham Research Campus is delivered through the Campus Impact Accelerator Account and the Campus Collaborative Training Partnership.

Figure 7.2 Babraham Research Campus Strategy

7.7 Figure 7.3 shows the current Innovation Team delivery structure is underpinned by a Director of Science and Entrepreneurship supported by a Programme Manager tasked with delivery entrepreneurship activities, a lab operations manager and a team of consultants, mentors and advisors.

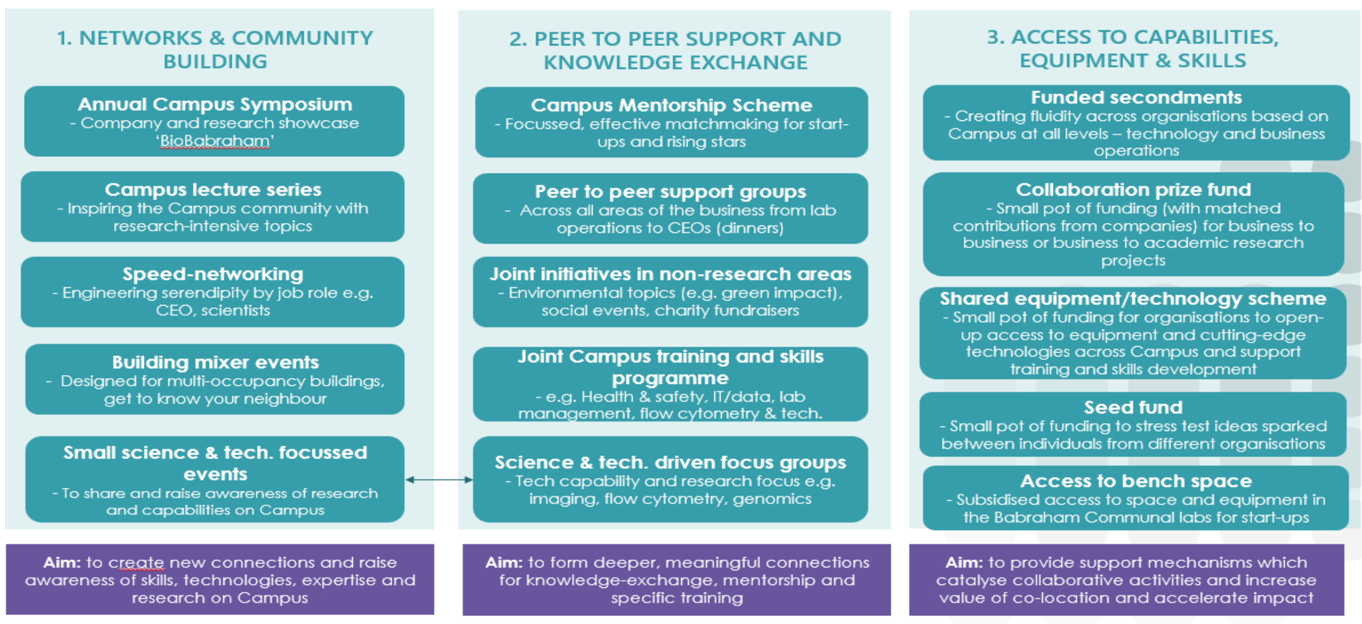
Figure 7.3. Babraham Innovation Strategy Delivery Team.





7.8 Figure 7.4 presents the activities undertaken under the three main task headings of networks and community building, peer-to-peer support and knowledge exchange and access to capabilities, equipment and skills. Figure 7.5 shows the current 2024 Babraham Accelerate programme.

Figure 7.4. Babraham Research Campus activities



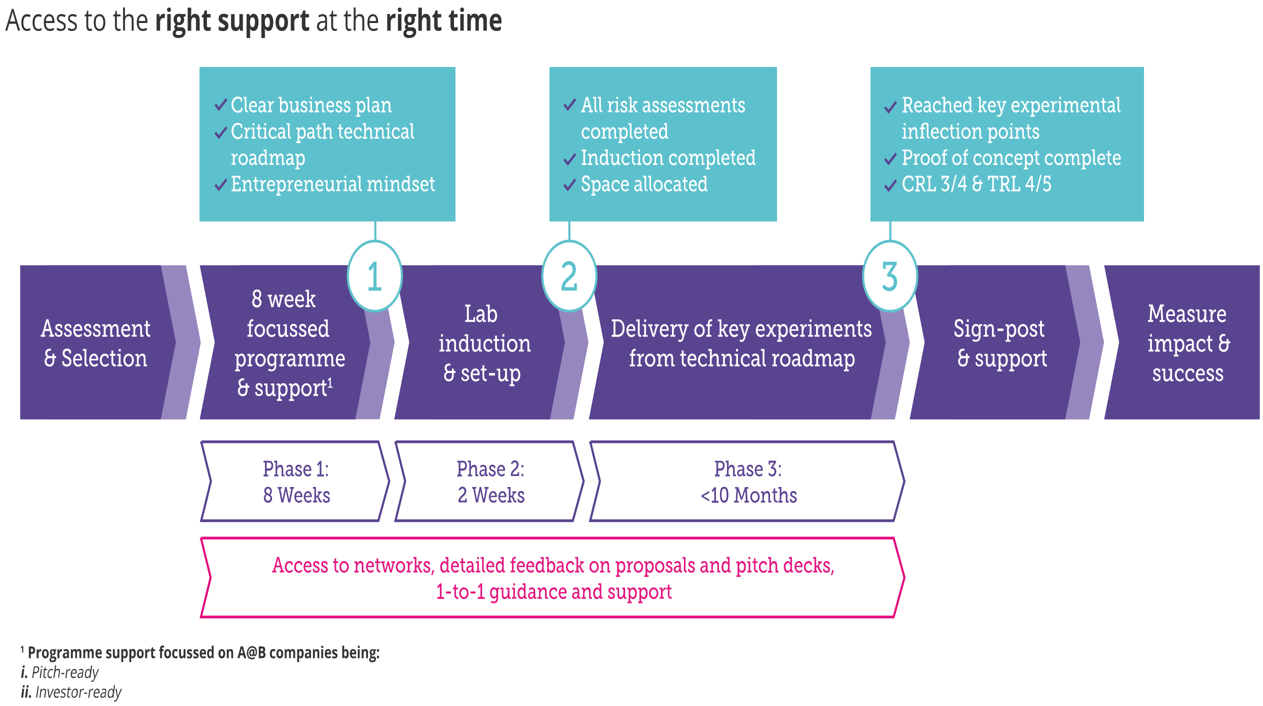


Figure 7.5. The Accelerate@Babraham 2024 Programme.

7.9 In addition to Accelerate@Babraham, BRCL run a programme of events, activities and networks for LiveLabs and the wider Campus. For example;

- BRCL support 10 networks across a variety of business functions and stages of career ranging from the entrepreneurship and early careers network and lab managers network to the Chief Scientific Officer (CSO) and Chief Executive Officer (CEO) networks. Post-covid, 40 network meetings per year have been supported by BRCL, many with external expert speakers.
- In total, BRCL provide over 70 events per year for companies and academics across Campus.
- BRCL host an annual BioBabraham Symposium with approx. 200 attendees from all companies across Campus and the Babraham Institute.
- A Campus mentorship scheme set up in 2023 has attracted 25 pairs of mentors and mentees from across 20 Campus companies.
- BRCL has awarded 15 BBSRC-funded innovation grants for pilot collaboration studies or to share equipment or technology.

The success of the Babraham Research Campus in promoting innovation

7.10 The success of the Campus in enabling companies to start-up, grow, and secure benefits from the innovation system will determine the scale of its economic and wider societal impacts. To assess the degree of success it was necessary to undertake a qualitative analysis that involved online surveying through Survey Monkey. The online survey took place between October 2023 and April 2024. Invitations to take part were sent out to relevant groups including investors, pharmaceutical companies, the science community together with policy and service providers and other key players in the field. By the close of the survey a total of 40 usable responses had been collected and analysed. The responses by respondent are recorded in the Tables below. Overall a good spread was obtained across each of the respondent groups see Table 7.1 below which shows the breakdown of responses by the respondent group.

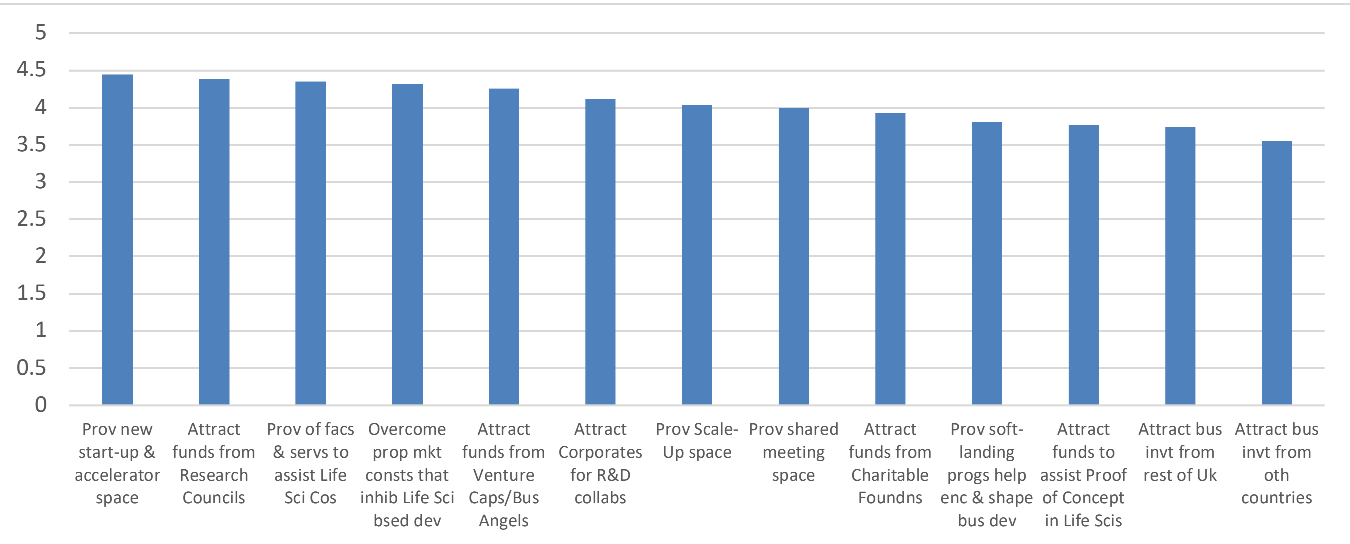
Table 7.1 Numbers of respondent to the Babraham Impact Study Final Questionnaire by respondent grouping

Respondent group	2024		2019
	No.	%	%
Investors	12	30	21.3
Pharmaceutical companies	4	10	17
Science Community	5	12.5	25.5
Policy, Service Providers & others	19	47.5	36.2
Total Respondents	**40**	**100**	**100**

Source CEA Ltd 2024

7.11 The respondents were asked to consider how important the BRC had been in building the capacity of the Life Science innovation system with respect to finance and property factors. Figure 7.6 shows that the respondents felt that the greatest contribution had been in providing new start-up and accelerator space. The attraction of funding, provision of facilities and services to assist life sciences were also emphasised. Table 7.2 shows that there had been a broadly similar set of responses in 2019. The provision of facilities and services to assist Life Science companies was strongly emphasised by the pharmaceutical community.

Figure 7.6 How important do you consider the BRC has been in building the capacity of the Cambridge Life Science innovation system with respect to the following finance and property factors?



NB: Average score based on range where 1 was 'Not at all important' to 5 being of 'Major Importance'.

Source CEA Ltd 2024

Table 7.2 How important do you consider the BRC has been in building the capacity of the Cambridge Life Science innovation system with respect to the following finance and property factors? (Average scores in descending order for All responses in 2024)

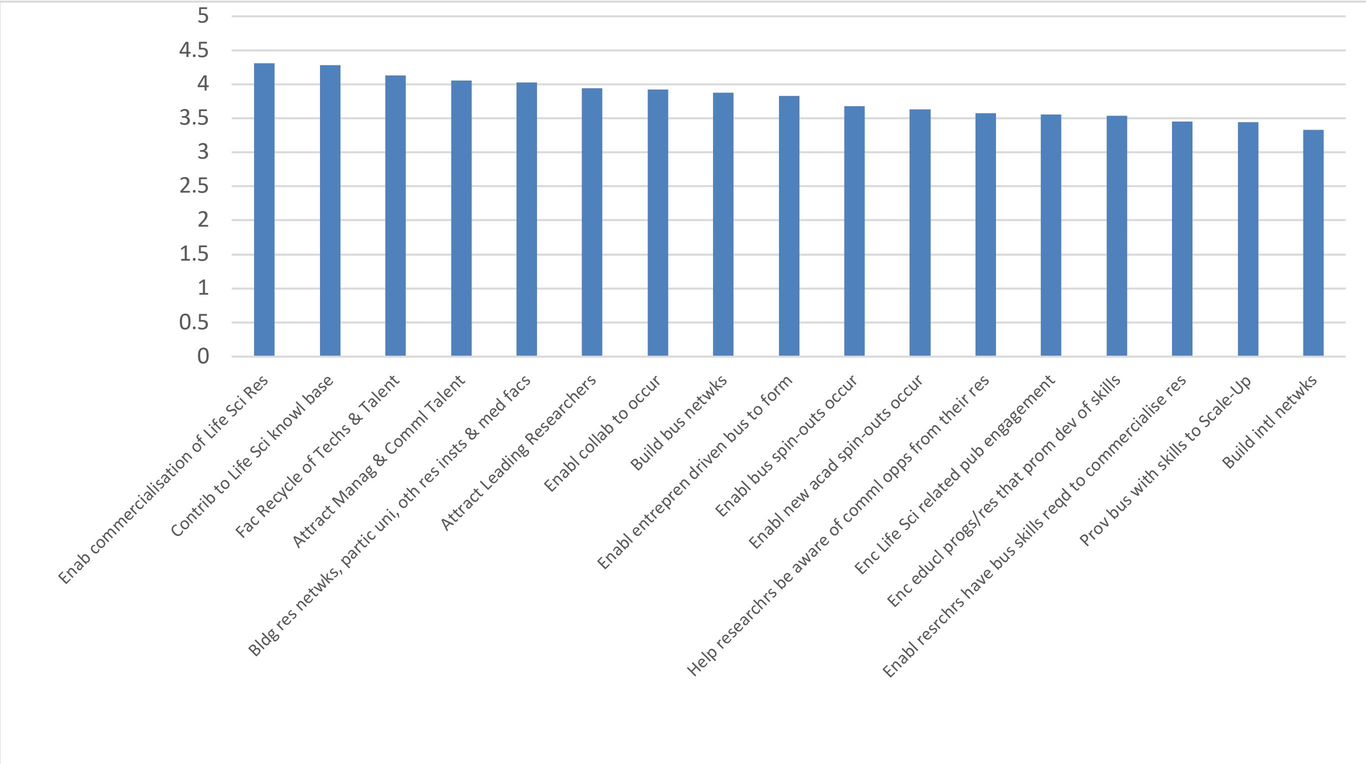
Respondent group	**Investors**	**Pharma Cos**	**Science Comm**	**Policy & Others**	**All**	***ALL 2019***
Providing new start-up and accelerator space	4.5	4.5	4.6	4.37	4.45	*4.66*
Attracting funds from Research Councils	4.18	4.5	4.6	4.44	4.39	*4.19*
The provision of facilities and services to assist Life Science Companies	4.17	4.75	4.5	4.35	4.35	*4.36*
Overcoming property market constraints that inhibit Life Science based development	4.42	4.25	4.2	4.29	4.32	*4.36*
Attracting funds from Venture Capitalists/Business Angels	4.09	4	4.6	4.33	4.26	*4.08*
Attracting Corporates for R&D collaborations	4.09	4	4.25	4.13	4.12	*3.94*
Providing Scale-Up space	4.25	4	3.75	3.95	4.03	*4.33*
Providing shared meeting space	3.91	3.67	4.25	4.07	4	*3.88*
Attracting funds from Charitable Foundations	3.67	4	4.4	3.91	3.93	*3.64*
Providing soft-landing programmes that help encourage and shape business development	3.67	3.33	3.75	4	3.81	*4.03*
Attracting funds to assist with Proof of Concept in the Life Sciences	3.55	2.5	4	4.07	3.77	*3.88*
Attracting business investment from the rest of the United Kingdom	3.7	4	4.4	3.5	3.74	*3.97*
Attracting business investment from other countries	3.7	3.25	3.8	3.42	3.55	*3.65*

NB: Average score based on range where 1 was 'Not at all important' to 5 being of 'Major Importance'.

Source CEA Ltd 2024.

7.12 Figure 7.7 shows how important respondents considered had been the contribution of BRC to building the capacity of the Cambridge Life Science innovation system as it related to knowledge, commercialisation and skill factors. Enabling the commercialisation of Life Science Research and contributing to Life Science Knowledge were strongly emphasised, with even higher responses than from the 2019 respondents. The contribution to the Life Science knowledge base and enabling commercialisation of Life Science research was particularly emphasised by the science community (Table 7.3).

Figure 7.7 How important do you consider the BRC has been in building the capacity of the Cambridge Life Science innovation system with respect to the following knowledge, commercialisation and skill factors? (Average scores in descending order for All responses in 2024).



NB: Average score based on range where 1 was 'Not at all important' to 5 being of 'Major Importance'.

Source CEA Ltd 2024

Table 7.3. How important do you consider the BRC has been in building the capacity of the Cambridge Life Science innovation system with respect to the following knowledge, commercialisation and skill factors? (Average scores in descending order for All responses in 2024)

Respondent group	**Investors**	**Pharma Cos**	**Science Comm**	**Policy & Others**	**All**	***All 2019***
Enabling the commercialisation of Life Science Research	4.1	4.5	4.6	4.29	4.31	*4.23*
Contribution to the Life Science knowledge base	3.78	4.5	4.8	4.33	4.28	*4.14*
Facilitating Recycle of Technologies & Talent	4.1	4.5	4.25	4	4.13	*3.96*
Attracting Management and Commercial Talent	4	3.67	4.2	4.14	4.06	*4*
Building research networks, particularly with the university, other research institutes and medical facilities	4.11	4.67	4.6	3.69	4.03	*3.95*
Attracting Leading Researchers	3.6	4	4.2	4.07	3.94	*3.79*
Enabling collaboration to occur	3.8	3.25	4.25	4.06	3.92	*4.07*
Building business networks	3.9	3.5	4.5	3.81	3.88	*3.95*
Enabling entrepreneur driven businesses to form	3.7	3.5	4.2	3.88	3.83	*4.09*

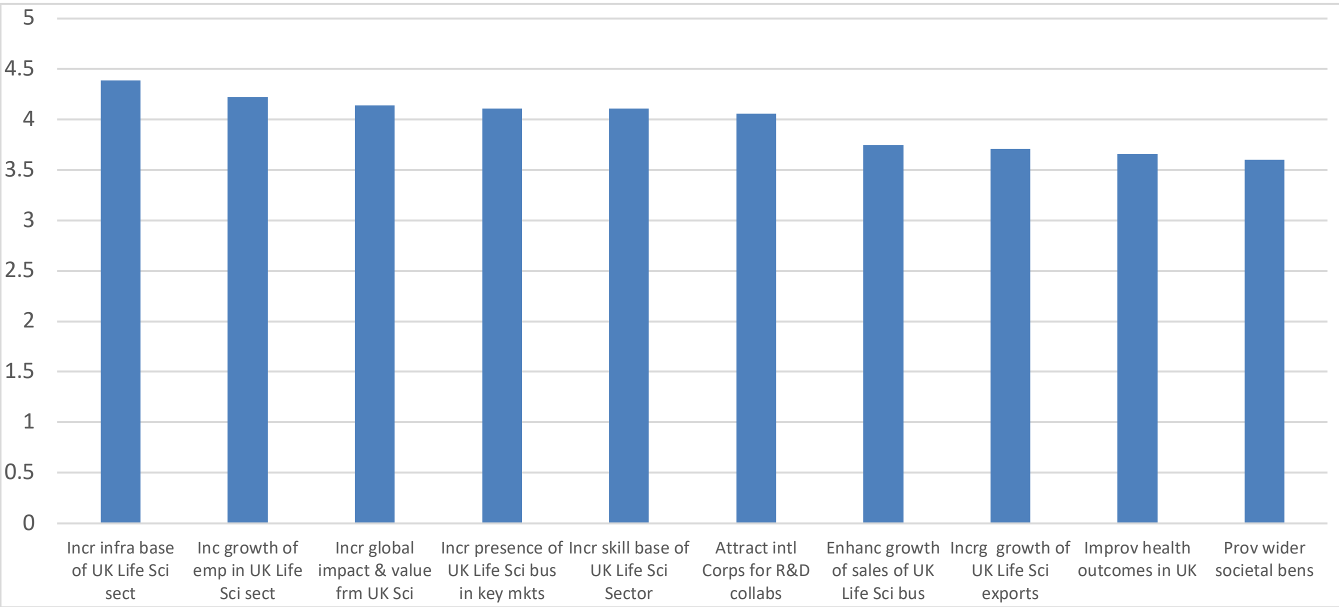
Enabling business spin-outs to occur	3.5	4	4	3.63	3.68	*3.97*
Enabling new academic spin-outs to occur	3.5	4.25	3.8	3.5	3.63	*4.03*
Helping researchers to become aware of commercial opportunities from their research	3.44	3.25	3.8	3.69	3.58	*3.76*
Encouraging Life Science related public engagement	3.88	3.67	3	3.5	3.56	*3.62*
Encouraging educational programmes and research that promote the development of skills	3.43	3.5	3.25	3.73	3.54	*3.75*
Enabling researchers to have the business skills required to commercialise their research	3.13	3.25	3.6	3.64	3.45	*3.49*
Providing businesses with the skills to Scale-Up	3.25	3.25	3.6	3.53	3.44	*3.67*
Building international networks	3.63	2.67	4	3.1	3.33	*3.61*

NB: Average score based on range where 1 was 'Not at all important' to 5 being of 'Major Importance'.

Source CEA Ltd 2024

7.13 Figure 7.8 shows the perceptions on the contribution of BRC in benefitting the UK economy. All factors scored relatively highly, but building the infrastructure capacity of the UK Life Science infrastructure was regarded to be of particular significance. This was particularly the case for the Pharmaceutical and Science communities (Table 7.4).

7.14 **Figure 7.8 How important do you consider the benefits of the BRC are to the UK economy? (Average scores in descending order for All responses)**



NB: Average score based on range where 1 was 'Not at all important' to 5 being of 'Major Importance'.

Source CEA Ltd 2024

Table 7.4 How important do you consider the benefits of the BRC are to the UK economy? (Average scores in descending order for All responses in 2024)

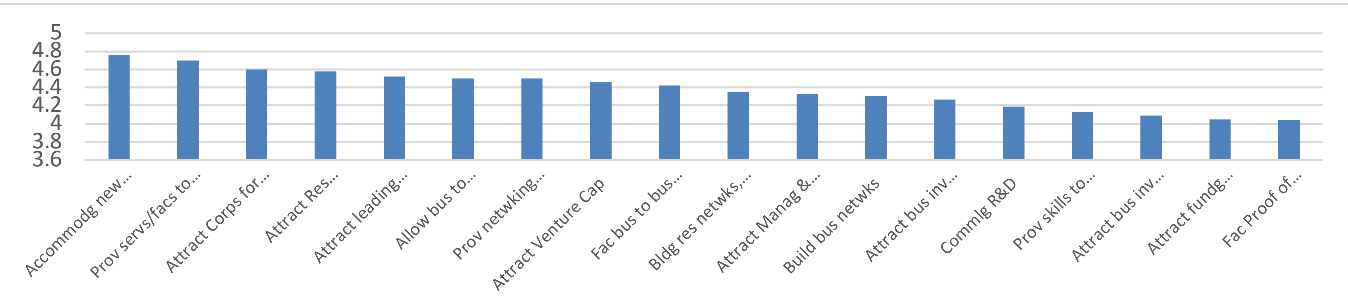
Respondent group	Investors	Pharma Cos	Science Comm	Policy & Others	All	*All 2019*
Increasing the infrastructure base of the UK Life Science sector	4.33	5	4.6	4.22	4.39	*4.33*
Increasing the growth of employment in the UK Life Science sector	4.22	4.25	4.4	4.17	4.22	*4.37*
Increasing the global impact and value from UK Science	4.22	4	4.2	4.12	4.14	*4.11*
Increasing the presence of UK Life Science businesses in key markets	4.33	4	4.6	3.88	4.11	*3.98*
Increasing the skill base of the UK Life Science Sector	4.33	3.75	4.4	4	4.11	*4.11*
Attracting international Corporates for R&D collaborations	4	3.75	4.2	4.15	4.06	*4.05*
Enhancing the growth of sales of UK Life Science businesses	4	3	4.4	3.57	3.75	*3.89*
Increasing the growth of UK Life Science exports	4	3.33	4	3.5	3.71	*3.81*
Improving health outcomes in the UK	3.38	3.33	4.2	3.69	3.66	*3.48*
Providing wider societal benefits	3.29	4	4	3.5	3.6	*3.69*

NB: Average score based on range where 1 was 'Not at all important' to 5 being of 'Major Importance'.

Source CEA Ltd 2024

7.15 Figure 7.9 shows how important respondents considered BRC compared with other research campuses in the UK with which they were familiar. The evidence points strongly to its key role in accommodating new start-ups and providing services and facilities to support the Life Science sector. Attracting corporations for R&D collaborations and attracting research council funding stand-out. The responses by respondent are broadly similar.

Figure 7.9 We would like to obtain your view as to how the BRC compares to other research campuses in the UK with which you are familiar. (Average scores in descending order all).



NB: Average score based on range where 1 was ''Much worse' to 6 being 'BRC unique location'.

Source CEA Ltd 2024

7.16 **Table 7.5 We would like to obtain your view as to how the BRC compares to other research campuses in the UK with which you are familiar (Average scores in descending order for All responses in 2024)**

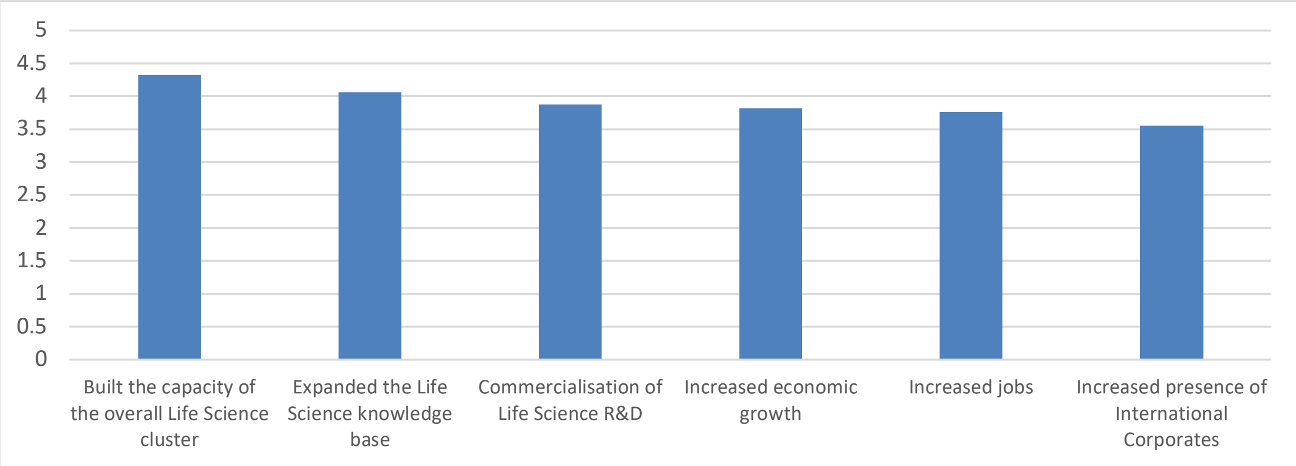
Respondent group	**Investors**	**Pharma Cos**	**Science Comm**	**Policy/& Others**	**All**	***All 2019***
Accommodating new start-ups	4.25	4.67	5.2	4.92	4.76	*4.7*
Providing services and facilities to support Life Science businesses	4.29	5	5	4.79	4.7	*4.84*
Attracting Corporates for R&D collaborations	4.71	4.33	4.75	4.55	4.6	*4.47*
Attracting Research Council funding	4.71	3	4.75	4.58	4.58	*4.71*
Attracting leading researchers	4.57	4.5	5.2	4.18	4.52	*4.62*
Allowing businesses to scale-up	4.38	4.67	4.5	4.54	4.5	*4.56*
Providing networking events	4.71	4.33	5.25	4.17	4.5	*4.41*
Attracting Venture Capital	4.38	4.5	4.75	4.42	4.46	*4.39*
Facilitating business to business collaboration	4.57	4.33	4.75	4.2	4.42	*4.38*
Building research networks, particularly between research institutions and medical facilities	4.43	4.67	5	4	4.35	*4.39*
Attracting Management and Commercial Talent	4.63	3.67	4.75	4.17	4.33	*4.57*
Building business networks	4.71	4.67	5	3.75	4.31	*4.4*
Attracting business investment from within the UK	4.13	4.5	4.6	4.18	4.27	*4.38*
Commercialising R&D	4.25	4	4.25	4.18	4.19	*4.34*
Providing skills to enable researchers to commercialise their research	4.38	3	4.25	4.1	4.13	*4.23*
Attracting business investment from outside the UK	4.13	3	4.6	4	4.09	*4.39*
Attracting funding from charitable foundations	4.17	3	4.33	4	4.05	*4.16*
Facilitating Proof of Concept	3.75	3	4.5	4.2	4.04	*4.39*

NB: Average score based on range where 1 was ''Much worse' to 6 being 'BRC unique location.

Source CEA Ltd 2024

7.17 Figure 7.10 the perceptions on the contribution of BRC to the sub-regional economy. Respondents highlighted the importance of the Campus in building the capacity of the Life Science cluster and knowledge base, as in the previous study. Pharmaceutical companies and the policy community rated the capacity building aspects strongly (Table 7.6).

Figure 7.10 We would like to obtain your views on the overall contribution that you consider the BRC has made to the economy of the Cambridgeshire sub-region (Average scores in descending order for All responses)



NB: Average score based on range where 1 was 'None' to 5 'Major effect'

Source CEA Ltd 2024.

Table 7.6 We would like to obtain your views on the overall contribution that you consider the BRC has made to the economy of the Cambridgeshire sub-region (Average scores in descending order for All responses in 2024)

Respondent group	**Investors**	**Pharma Cos**	**Science Comm**	**Policy & Others**	**All**	***All 2019***
Built the capacity of the overall Life Science cluster	4.33	4.5	4	4.38	4.32	*4.48*
Expanded the Life Science knowledge base	3.78	4.67	4	4.13	4.06	*4.27*
Commercialisation of Life Science R&D	3.78	3.75	4	3.93	3.88	*4.1*
Increased economic growth	3.89	4.5	3.8	3.63	3.82	*3.9*
Increased jobs	3.67	4.25	3.8	3.69	3.76	*3.7*
Increased presence of International Corporates	3.88	3.25	3.6	3.47	3.56	*3.53*

NB: Average score based on range where 1 was 'None' to 5 'Major effect'

Source CEA Ltd 2024.

7.18 Figure 7.11 summarises responses on how businesses on the Campus would have developed if the Campus infrastructure had not existed. The evidence was much in line with the views in the 2019 study that more emphasis tended to suggest a development being some 0-25% lower, a proportion broadly similar across different respondents.

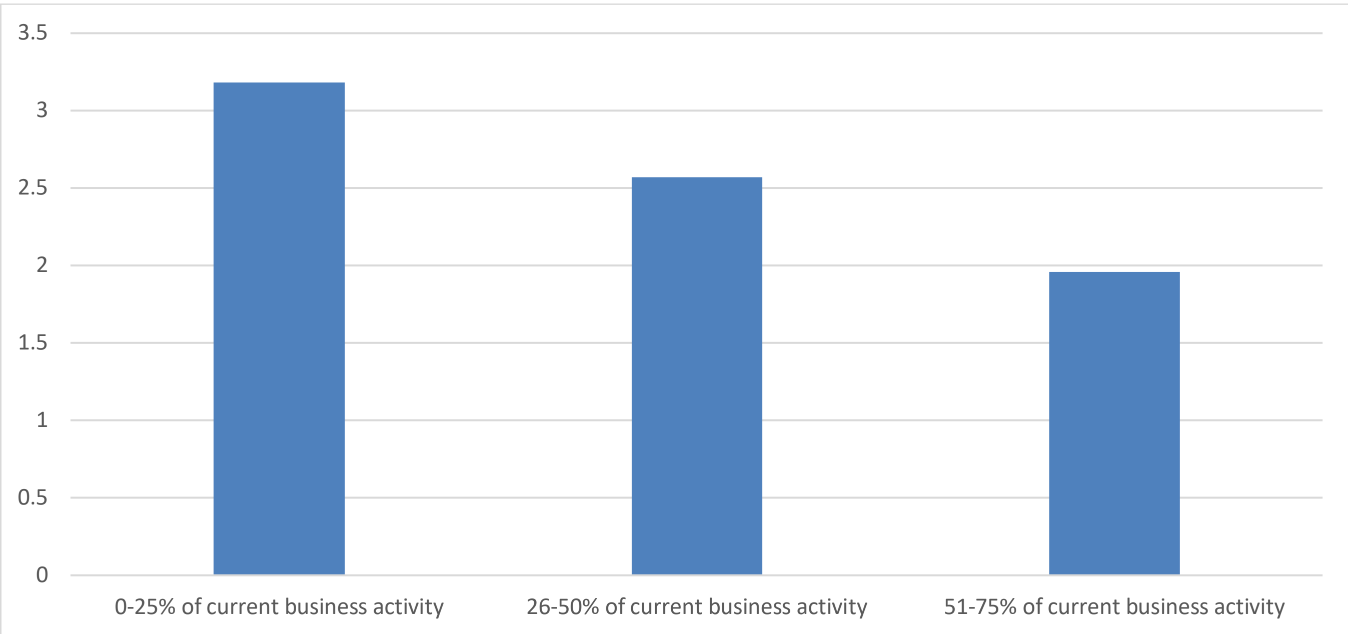
7.19 **Table 7.7 If the BRC had not developed its infrastructure in recent years how much do you consider the businesses on the Campus would have developed (Average scores)**

Respondent group	Investors	Pharma Cos	Science Comm	Policy & Others	All	*All 2019*
0-25% of current business activity	3	3.33	2.75	3.38	3.18	*2.72*
26-50% of current business activity	2.38	3.33	2	2.69	2.57	*2.64*
51-75% of current business activity	2	2.67	1	2.08	1.96	*2.09*

NB: Average score based on range where 1 was 'Not likely' to 5 'Highly likely'

Source CEA Ltd 2024.

Figure 7.11 If the BRC had not developed its infrastructure in recent years how much do you consider the businesses on the Campus would have developed (Average scores)

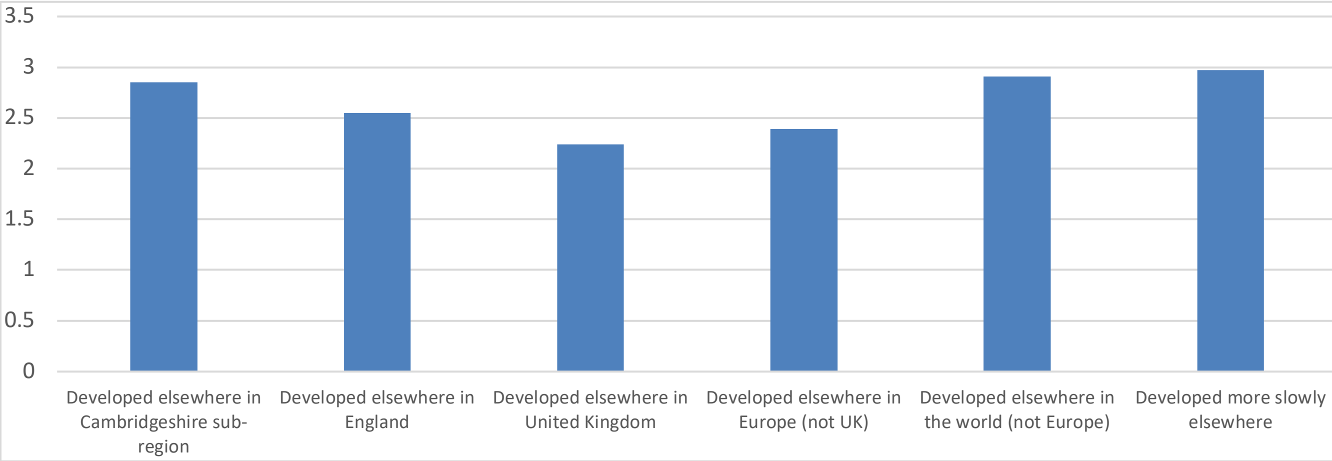


NB: Average score based on range where 1 was 'Not likely' to 5 'Highly likely'

Source CEA Ltd 2024

7.20 Figure 7.12 shows the response from respondents as to where businesses on the Campus would have located if the Campus infrastructure has not existed. The evidence suggests likely options where elsewhere in the world (but not Europe) or elsewhere in the Cambridgeshire sub-region. A slower rate of development was also considered highly. Table 7.8 shows that there are differences between respondents by category. Developed elsewhere in England and the United Kingdom, or more slowly, was emphasised by the pharma companies. The policy community considered that elsewhere in the world (not Europe) or developing more slowly were likely options.

7.21 **Figure 7.12 If the BRC had not developed its infrastructure would the businesses currently on the Campus have (Average scores)**



NB: Average score based on range where 1 was ''Not likely' to 5 being 'Highly likely'

Source CEA Ltd 2024.

Table 7.8 If the BRC had not developed its infrastructure would the businesses currently on the Campus have (Average scores)

Respondent group	**Investors**	**Pharma Cos**	**Science Comm**	**Policy & Others**	**All**	***All 2019***
Developed elsewhere in the Cambridgeshire sub-region	2.78	2.5	3	2.93	2.85	*2.98*
Developed elsewhere in England	2.56	3.25	1.6	2.67	2.55	*2.37*
Developed elsewhere in the United Kingdom	2.11	3.25	1.4	2.33	2.24	*2*
Developed elsewhere in Europe (not UK)	1.89	2.25	2.8	2.62	2.39	*2.21*
Developed elsewhere in the world (not Europe)	2.56	2.75	3.2	3.07	2.91	*2.47*
Developed more slowly elsewhere	2.5	3.25	3.25	3.07	2.97	*3.24*

NB: Average score based on range where 1 was ''Not likely' to 5 being 'Highly likely'

Source CEA Ltd 2024..

Summary

7.22 The evidence from the key stakeholders across the Cambridge innovation ecosystem supports the strong contribution that BRC is making to the development of the Cambridge life science innovation system and building the capacity of the life-science cluster. Respondents emphasised that the provision of new start up and accelerator space was of particular importance, as was the attraction of funding and the provision of facilities and services to assist with the development of life science companies. The Campus was helping to expand the knowledge base and the commercialisation of life science research. These findings were much in line with the findings from companies in 2019. Similar views tended to be expressed by each category of respondents questioned.

8. Assessing impact on the Cambridge Property Market

The impact of BRC on the local property market was assessed by in-depth analysis of the office and lab markets across Cambridgeshire, building bespoke clusters of research and science locations.

The BRC is a world-class bio-technology research campus located south of Cambridge and co-locating strat-up and scale-up companies with the academic community of the Babraham Institute. The BRC hosts 350,000 sq. ft of state-of the art facilities and including 133,000 sq. ft of flexible lab and office space delivered in partnership with BioMed. One of the key characteristics, which differentiates the BRC from the broader market, is the provision of lab space, co-located with a public funded institute and flexible lease terms tailored to R&D start-ups (average lease term of 3.4 years compared to 7-9 years in other areas of Cambridgeshire).

BRC has made a significant contribution to the Cambridgeshire property market through its provision of specialised start-up and scale-up space being life science property investors on site with a joint venture with BRCL access to science facilities (e.g. cell sorting capabilities), and lease terms tailored to the needs of start-ups. Kadans and Biomed Reality have long-lease agreements with UKRI-BBSRC.

The BRC's has created an agglomeration effect, attracting inward investment and occupier demand, that has driven a significant uplift in net absorption and structurally lower vacancy amongst research locations in the surrounding area. Reflecting this, the lab market surrounding the BRC has outperformed a similar sub-market in Cambridgeshire (with comparable amenity, infrastructure, and location), with net absorption 4.9% higher per annum, vacancy 1.1% lower on average, and delivery of 97,500 sq. ft more new stock per annum.

Introduction

8.1 The BRC provides over 482,552 sq. Ft of state-of the art facilities that allow bioscience enterprise to start and scale up. In Table 8.1 we set out the various elements of the Campus, including the world-class Babraham Institute, 'grown on' space delivered by BioMed, the Kadans owned B900 building (acquired in 2019), the Medical Research Council (MRC) ARES facility and the BRCL-BMR laboratory and office building. The BRC provides a unique service to the market, providing a mix of start-up space designed for SMEs on flexible lease terms, which vary from what a commercial landlord would offer. Providing specialised space, co-located with the Babraham Institute with access to world-class facilities (e.g. laboratory space) on lease terms tailored to the needs of start-up space, has led to the creation of multiple scaled up biotechnology companies. It also provide 'grow on' space ranging from 8,000 – 50,000 sq. ft of bespoke R&D and office space. BRC have partnered with BioMed in a joint-venture to deliver approximately 133,000 sq. ft of flexible lab and office space, and with Kadans in providing additional space for companies looking to scale up and co-locate with the Babraham cluster.

Table 8.1. Summary of Space at the Babraham Research Campus Landlord / Occupant	**Sq. Ft**
Babraham Institute	144,729
MRC ARES[35]	32,292
Biomed Realty	99,160
Kadans	42,173
Babraham Research Campus Ltd	128,924
BRCL-BMR	35,274
TOTAL	**482,552**

8.1 Providing this space has positive externalities, and benefits the broader commercial market by clustering start-ups, researchers and scaled up companies undertaking world-class biotechnology. This has flow on impacts to the BRC local commercial market, making it more appealing to biotechnology occupiers and developers / investors seeking to deliver in demand R&D stock to this market.

8.2 This results in a number of benefits, including:

- Attracting investment and development in premium / A-Grade office and lab space.
- Rental premium of surrounding office and lab space, compared to other Southern Cambridgeshire sub-markets.
- Structurally lower vacancy and higher levels of demand than surrounding the campus compared with other Southern Cambridgeshire sub-markets.

8.3 The purpose of this section is to capture the property market impacts associated with the BRC's impact on its commercial property market. This section will assess the performance of the BRC's commercial property market, compared to the broader South Cambridgeshire sub-market and comparable research clusters.

8.4 The research has involved a number of stages that have included identifying the key constraints on the provision of office and R&D space within Cambridge and the rationale for the Babraham 'intervention'. It has benchmarked the performance of the BRC against comparable campuses and sub-markets within the sub-region considering rental premium, vacancy rates, new deliveries, take-up, net market absorption and the development pipeline.

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[35] MRC ARES is a Medical Research Council facility.

The Rationale for the Intervention

8.5 A key focus of the BRC is on the innovative biotechnology and pharmaceutical sectors. The BRC is set within the wider Cambridge biotech cluster which is one of the world's leading life sciences clusters. This benefits from proximity to institutes of excellence including the Wellcome Trust, Sanger Institute, Cancer Research UK and Cambridge University.

8.6 The first research science park established was the Cambridge Science Park in the 1970s. Since then the development St John's Innovation Centre, Peterhouse Technology Park, the Cambridge Judge Entrepreneurship Centre (including Accelerate Cambridge) and the ideaSpace Enterprise Accelerator have further expanded and consolidated the Cambridge R&D cluster. According to Cambridge Econometrics approximately 50% of the scientific R&D in Cambridge is dedicated to life science and med-tech research. The Cambridge life science cluster consists of 627 life science and tech companies, a specialized workforce and generates annual gross value added (GVA) worth more than £2.9 billion[36].

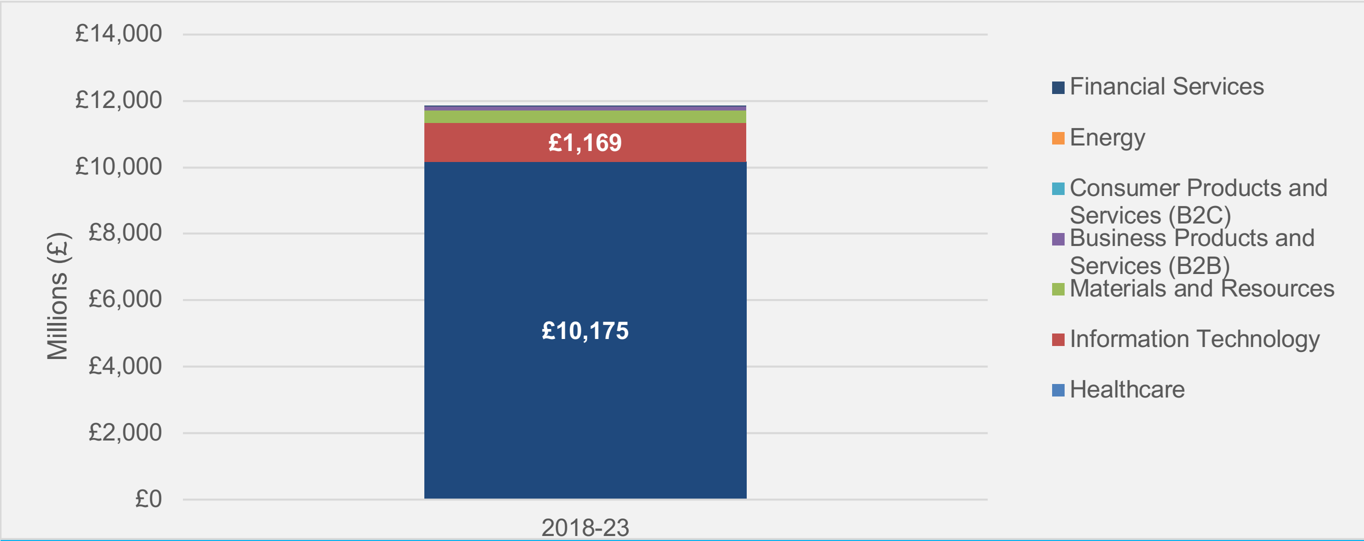
8.7 The cluster is underpinned by a number of key anchoring research institutes and universities including the two universities of Cambridge and Anglia Ruskin, four non-university research institutes including the Babraham Institute, Sanger Institute (located at Wellcome Campus), European Bioinformatics Institute and MRC Laboratory Molecular Biology and three NHS Foundation Trusts including Cambridge University Hospitals, Papworth Hospitals and Cambridgeshire & Peterborough.

8.8 Cambridge's City economic growth is hugely reliant on knowledge intensive sectors, particularly life sciences. Analysis produced by the Centre for Business Research (CBR) identified that from 2021/22 to 2022/23 employment in knowledge intensive sectors expanded by 5.7% with the life science sector a key driver expanding its employment by 11.1%.

8.9 Analysis of company investment data indicates that the majority of investment deals have been based in the Healthcare industry (which includes Life Sciences) group, followed by the Information Technology industry (Figure 8.1). This illustrates that life sciences will continue to be a source of demand for commercial space, with tech an increasingly a significant component of demand.

Figure 8.1 Total Capital Raised, 2018-23 by Industry Group

[36] AstraZeneca, Cambridge: driving growth in life sciences, 2017



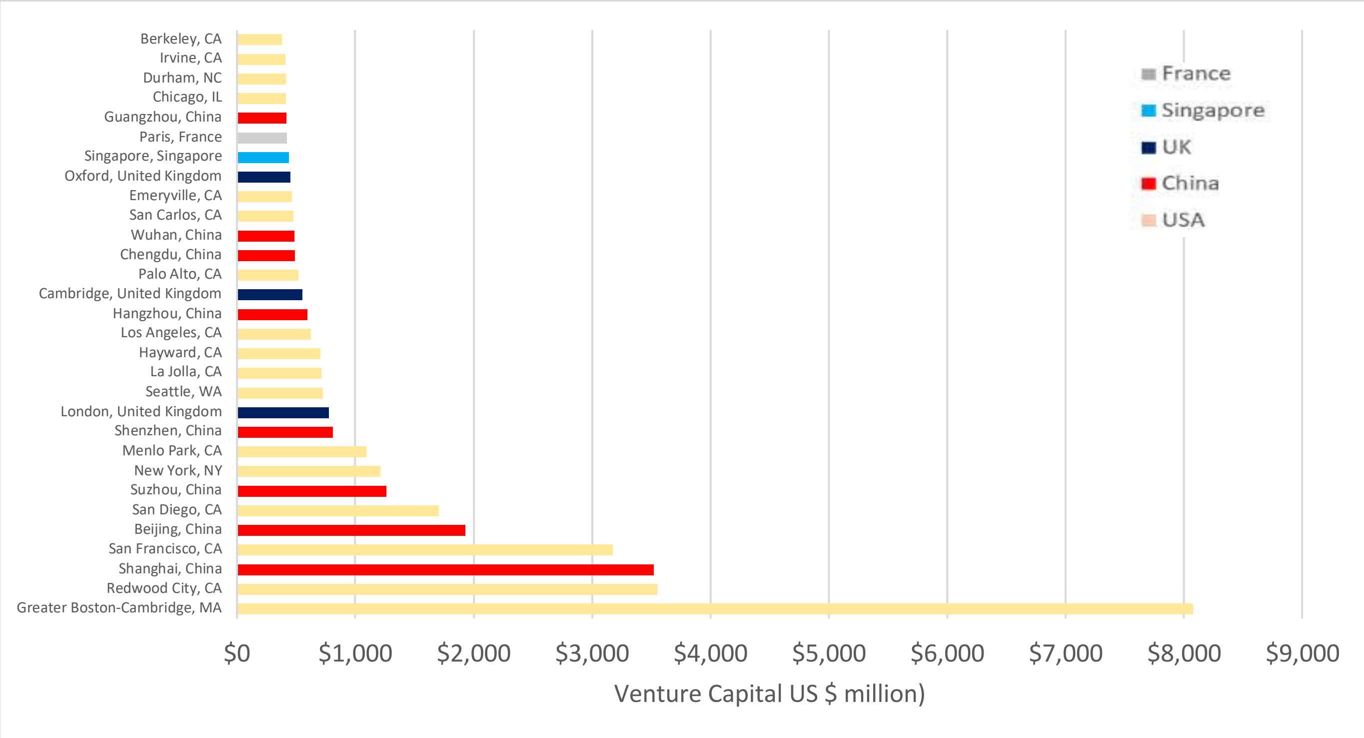
Source: Savills (2023); PitchBook (2023)

8.10 Cambridge is a key component of the UK's broader aspiration to become a 'Science Superpower,' which has seen recent commitment by the Government to invest £650 million into a Life Science Growth Package to 'drive growth and innovation in the Life Science Sector[37]. A significant part of the £650 million fund will be used to incentivise and release pension fund investment, further capitalising high growth companies an increasing employment growth and with it, property demand[38].

8.11 Figure 8.2 compares Venture Capital (VC) raised by life science companies in Cambridge, Oxford and London ('The Golden Triangle') vs competing global clusters. Cambridge in isolation is ranked 17th globally in terms of VC raised in 2022, second only to London in Europe.

[37] https://www.gov.uk/government/news/chancellor-reveals-life-sciences-growth-package-to-fire-up-economy
[38] https://www.gov.uk/government/news/chancellor-reveals-life-sciences-growth-package-to-fire-up-economy

Figure 8.2 Cambridge is a key Global cluster – supports wider growth of the UK as a 'superpower' (2022)



Source: Savills; Pitchbook (2022)

8.12 Table 8.1 illustrates the leading role Cambridge plays supporting the UK's aspiration to become a 'Science Superpower.' The Global Innovation Index (Cornell University, INSEAD, and the World Intellectual Property Organization), ranks the best global Science & Technology clusters using scientific publications and patent filings under the World Intellectual Property Organization (WIPO) data for Patent Co-operation Treaty (PCT)ranking Cambridge as number one.

Table 8.1 Global Innovation Index – 2022 – Top Clusters Globally per capita

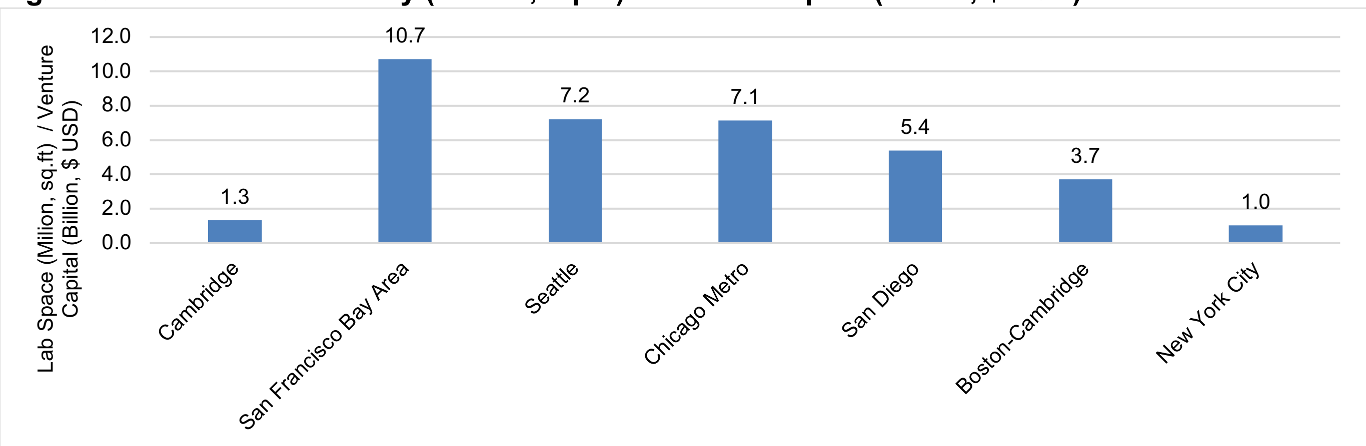
Intensity rank	Cluster name	Economy	Estimated cluster population	PCT applications per capita[a]	Scientific publications per capita[a]	Total S&T share per capita[a]	Rank change[b]
1	Cambridge	GB	470,565	6,486	37,637	1.10	0.0
2	Eindhoven	BE/NL	1,004,435	8,126	5,222	0.78	0.0
3	Daejeon	KR	1,639,385	6,274	14,525	0.75	2.0
4	San Jose–San Francisco, CA	US	6,075,112	7,059	9,561	0.75	0.0
5	Oxford	GB	530,708	2,922	34,013	0.73	−2.0
6	Boston–Cambridge, MA	US	3,735,101	4,330	19,667	0.65	1.0
7	Ann Arbor, MI	US	633,653	2,041	31,252	0.62	−1.0
8	San Diego, CA	US	3,485,292	5,556	5,936	0.57	1.0
9	Seattle, WA	US	2,345,646	5,092	8,695	0.57	−1.0
10	Lund–Malmö	SE	596,694	3,601	15,295	0.53	0.0
11	Lausanne	CH/FR	683,652	2,738	15,985	0.46	1.0
12	Raleigh, NC	US	1,509,942	1,912	19,872	0.45	1.0
13	Munich	DE	2,564,434	3,574	9,366	0.44	2.0
14	Kanazawa	JP	858,746	4,441	3,941	0.44	2.0
15	Stockholm	SE	1,930,446	3,097	10,381	0.42	−1.0
16	Göteborg	SE	781,241	2,547	12,763	0.40	1.0
17	Helsinki	FI	1,196,571	2,233	11,154	0.35	1.0
18	Nuremberg–Erlangen	DE	1,311,956	2,781	7,157	0.34	1.0
19	Zürich	CH/DE	1,845,731	1,846	12,925	0.34	3.0
20	Tokyo–Yokohama	JP	36,101,573	3,394	3,127	0.34	1.0

Source: GII

8.13 This has played a major role in enabling the growth of knowledge-intensive sectors in Cambridge, including life sciences and technology sectors.

8.14 However, compared to other global R&D clusters, Cambridge is undersupplied (Figure 8.3). One way of illustrating this is analysing the ratio between venture capital raised (which is the lifeblood of pre-revenue companies) and sq. ft of lab stock. Cambridge has a ratio of 1.3 million sq. ft of lab space for every $1 bn (USD) in venture capital raised, compared 3.7 million sq. ft of lab space for every $1 bn (USD) and in Boston-Cambridge (these figures will be further widened with the considerable pipeline in Boston-Cambridge.

Figure 8.3 Ratio of Laboratory (million, sq. ft) / Venture Capital (billion, $ USD)[39]



[39] Lab space is 2022 while venture capital is from 2021.

Source: Savills, PitchBook, Cushman & Wakefield Life Science Update October 2022

8.15 Not supplying Cambridge to comparable levels of competing global cities creates the risk that science and tech companies will seek space in these competing locations, where sufficient R&D space and ‘clustering’ exists to accommodate growth.

8.16 There are a number of challenges delivering commercial space, particularly space that caters to early stage start-ups, to meet this market demand with short-term lease terms resulting in a less predictable and consistent income and therefore return on cost. Incubator lab space typically have a lower gross-net efficiency ratio and there are higher construction cost associated with highly specialised equipment.

8.17 This limits the private sector funding into early stage incubator space for start-ups and spin outs. This has created demand for public funding to underwrite new start-up lab space. Campuses that contain research institutes such as Wellcome Genome Campus (Biodata Innovation Centre) and , the Cambridge Science Park (Innovation Centre) are examples of research institutes that provide specialised start up space. These aspects of property ‘market failure’ have been argued to underpin the rationale for the substantial public sector investment that was made in the BRC.

8.18 The institutes that anchor and manage campuses utilise public funding to provide lease terms, lab space and start up space tailored to R&D start-ups. The subsequent benefits of this come as these businesses develop, expand their operations, jobs, research / patent production. From a property perspective, this is realised through the take-up of additional space, anchoring the development of additional commercial development and higher rents.

Cambridgeshire - Research Clusters and Sub Markets

8.19 The Babraham Research Campus (BRC), and other research locations, play a key role in anchoring the research clusters within Cambridge and providing start-up space to businesses developing technologies or products relevant to human healthcare and the pharmaceutical sector.

8.20 The combination of start up space, with lab facilities, co-located with the Babraham Institute, creates an ecosystem that has attracted substantial development into the local market, both on the campus and within the nearby area.

8.21 This section seeks to identify the different sub-markets and clusters within Cambridgeshire, and specifically consider how the different clusters of research campuses are distributed throughout Cambridgeshire. It identifies the key office and R&D sub-markets comparing the headline performance of the property market across the different research campuses and business locations and considers how the campuses differ in their offer and whether they include publicly funded research institutes, lab space and start-up space.

Cambridge Office / R&D sub-markets Overview

8.22 The research identified seven key sub-markets within the broader Cambridge office market were identified (Figure 8.4). These were:

Northern Sub-Market
Northern Cluster
Southern Research Cluster
Prime Central sub-market
City Centre Periphery sub-market
Cambourne Sub-market
Southern Cambridgeshire sub-market.

8.23 The Southern Cambridgeshire sub market is differentiated from the remainder of the market, in that it is primarily made up of town centres, research campuses and business locations surrounding Cambridge's urban centre. Cambridge Prime Central comprises a consolidated urban centre, containing Cambridge Train Station, amenity and retail services and the majority of the area's housing stock. Prime Central constitutes the Cambridge market's premium price point, offering A grade office space at the centre of the CBD.

8.24 The City Centre Periphery immediately surrounds the Cambridge Prime Central sub-market. It contains Cambridge University Campus, Cambridge International Airport and a number of key business locations such as the Cambridge Biomedical Campus.

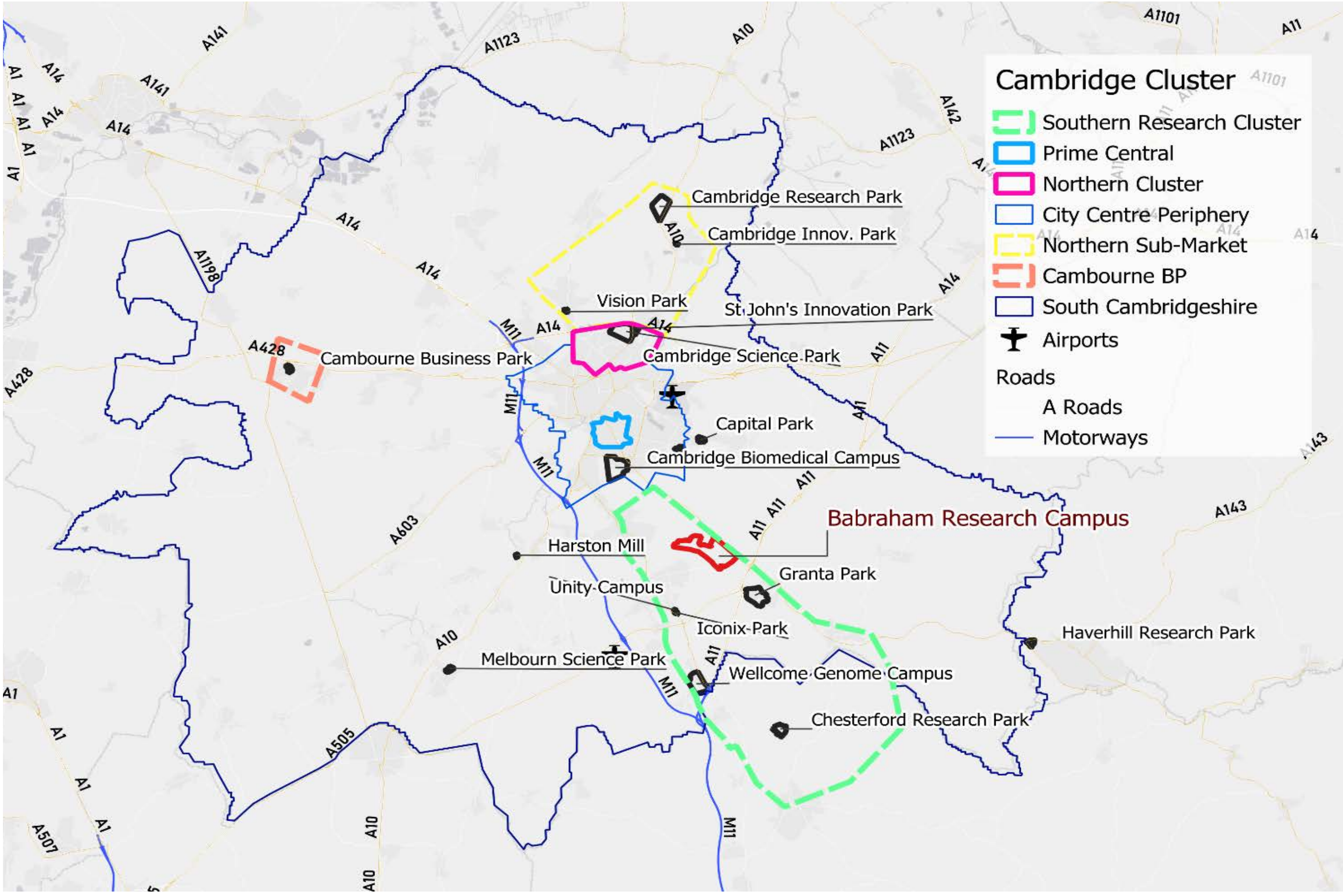
8.25 The North Cluster is immediately to the north of the City Centre Periphery, up to the A14. It includes Cambridge Science Park, St Johns Innovation Park and Cambridge Business Park.

8.26 The Northern sub-market is north of the A14 along the A10, and west to Histon. It includes Vision Park, Cambridge Research Park and Cambridge Innovation Park.

8.27 The Cambourne Business Park has recently been developed, and primarily consists of office space, though with plans to deliver laboratory space. The Northern sub-market contains a number of business locations, including Vision Park, Cambridge Innovation Park and Cambridge Research Park. While it has recently delivered and leased laboratory space, it does not contain any publicly funded research institutes or Universities, making it a useful counter-factual to compare the BRC and the Southern Research Cluster to.

8.28 While the Southern Research Cluster has ample land supply when compared to more land constrained markets such as Prime Central and City Centre Periphery, so does the Northern sub-market and Cambourne sub-markets, and the broader Southern Cambridgeshire sub-market. This indicates that the Southern Research Cluster has attracted more investment than other Cambridge markets due to demand side drivers. This is shown in Figure 8.1 below

Figure 8.1 Cambridge Sub-market and Clusters



Source: Savills 2024.

8.29 Table 8.1 below sets out property market indicators across the sub-markets and research clusters (outlined Figure 8.1) considering lab and office headline rents, lab and office average rents, office take up, office vacancy and office deliveries.

8.30 The analysis shows that Prime Central and City Periphery sub-markets have the strongest office markets, reflecting their city centre location, access to amenity, transport connections, and proximity to Cambridge University. The City Centre and Periphery achieve stronger office headline rents (£58.8 and £48.0 per sq. ft respectively) than the research clusters (£43 sq. ft in both Southern Cluster and Northern Clusters), and Cambourne (£25 per sq. ft) and South Cambridgeshire (excluding the Southern Research Cluster, Cambourne and the Northern sub-market) (£26.25).

8.31 However, take-up and new deliveries are highest in the Northern Cluster, with 461,995 sq. ft delivered and 902,990 sq. ft taken up in the last five years. The Northern Cluster is better connected to transport, amenity and the University than the Southern Research Cluster, and is more comparable to the wider City Centre Periphery.

8.32 However, when it comes to lab rents the Southern Research Cluster outperforms all other clusters and sub-markets. The Southern Research Cluster has the highest headline lab rent (£71 per sq. ft), and highest average lab rent (£53 per sq. ft).

8.33 While the Southern Research Cluster has ample land supply when compared to more land constrained markets such as the Prime Central and City Centre Periphery, so does the Northern sub-market and the broader Southern Cambridgeshire sub-market. This indicates that the Southern Research Cluster has attracted more investment than other Cambridge markets due to demand side drivers.

Table 8.2. Property Market Performance by Market

	Southern Research Cluster *(including Babraham Research Campus)*	**Northern Sub-Market** *(outside of the A14)*	**Cambourne**	**Northern Cluster** *(Inside the A14)*	**Southern Cambridge-shire** *(excluding Cambourne, Southern and Northern sub-market)*	**City Centre Periphery**	**Prime Central**
Headline Office Rent (effective, last 5 years)[1] £ per sq. ft	£43.0	£26.2	£25.0	£43.0	£26.3	£48.0	£58.80
Headline Lab Rent (effective, last 5 years)[1] £ per sq. ft	£71.0	£45.0	-	£51.00	*	£65.0	-
Office Average Rent (last 5 years) £ per sq. ft	£31.1	£24.0	£22.9	£35.9	£18.0	£29.2	£38.4
Lab Average Rent (last 5 years) £ per sq. ft	£53.8	£38.3	-	£47.5	*	*	-
Average Office Vacancy (2023) % of inventory	2.2%	4.8%	2.1%	4.1%	11.6%	2.7%	3.8%
Take Up sq. ft Office (last 5 years) sq. ft	574,717	163,535	116,460	902,990	282,816	717,871	123,490
Take Up Office (last 5 years) % of Inventory	20.2%	16.2%	41.5%	29.1%	12.9%	18.4%	6.9%
Deliveries sq. ft (last 5 years)	279,847	12,000	116,460	461,995	41,742	395,166	282,212
Deliveries (last 5 years) % of Inventory	9.8%	1.2%	41.5%	14.9%	1.9%	10.1%	15.8%

Source: CoStar 2023, Savills.

**Sample of lab leases in these market too small to report*

[1]Cambourne – check with RP - excludes <900 sq.ft deal at £49.50

LiveLabs at Babraham

LiveLabs is the Babraham Research Campus bio incubator which targets start-ups that are unable to be accommodated in the current supply of R&D space. Such undersupply is the result of a market failure where privately financed science locations are unable to deliver space tailored to start-ups and spin-outs, due to the need to maintain consistent and stable financial return over time. This model results in early-stage emerging companies being left out and lacking access to affordable commercial premises and laboratory space. LiveLabs provides flexible co-working space and fully serviced and equipped labs for early-stage life sciences companies (up to 8 people) that are embedded within the established campus ecosystem at Babraham. This is reflected in the average lease term achieved for tenants in Babraham Research Campus has been 3.4 years between 2023-2024 (with a minimum lease of 6 months), whilst the surrounding private market in the area achieved an average of 7.5 years. This is a fundamental element of the BRC's positive impact on its commercial market, providing space that supports the growth of start-ups and spin outs who then go on to take up grow on space on commercial lease terms.

Commercial Market Performance of Campuses

8.34 We have collected data on the characteristics and performance of the different business locations and research campuses within the Cambridge market. Table 8.3 overleaf outlines the major locations outside the Cambridge Prime and Periphery markets in terms of total floorspace (sq. Ft), headline rent (highest signed / asking rent), occupied space (%), new floorspace deliveries (sq. Ft) and proposed floorspace (sq. Ft).

8.35 Campuses anchored by a research institute typically have a stronger headline rent than other business locations within their respective cluster/sub-market. For instance, the BRC, which is anchored by the Babraham Institute, achieved an average rent of £32.8 per sq. Ft, significantly above other campuses in the Southern Cluster such as Chesterford which achieved an average rent of £25 per sq. Ft.

8.36 Incubator Space is another positive driver for achieving higher rents. BRC, Wellcome, Cambridge Science Park and St John's Innovation Park all provide incubator space and achieve the highest rent levels in their respective sub-markets / clusters.

Table 8.2 – Research Campuses, Science Locations and Business Locations

	Babraham Research Campus	Wellcome Genome Campus	Chesterford Research Park	Granta Park	Cambridge Science Park	St John's Innovation Park	Cambridge Research Park	Cambridge Innovation Park	Vision Park	Cambourne Business Park	Capital Park	Melbourn Science Park	Harston Mill	Iconix Park
Commercial floorspace (sq. Ft)	350,000	45,000	58,262	1,598,896	1,965,994	263,252	712,658	81,620	196,877	292,943	206,902	171,018	92,865	43,118
Occupied %	98%	100%	99%	100%	99.1%	94%	98%	100%	75%	100%	19.5%	96%	92.6%	84%
Headline Office Rent (£ per sq. Ft)	£32.8	n.a.	£24.5	£29.0	£43.0	£36.0	£23.5	£26.0	£31.0	£22.5	£23.5	n.a.	£23.0	£23.5
Headline Lab Rent (£ per sq. ft)	£71[2]	n.a.	£53	£45.0	£51.0	n.a.	n.a.	n.a.	£45.0	n.a.	£31.0	n.a.	£30.0	n.a.
Proposed sq. ft		1,042,644	65,000	435,000	200,000	140,000	107,639		-		325,000	324,000		65,000
Lab space	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	-	Yes	Yes	Yes
Incubator	Accelerate @Babraham	Biodata Innovation Centre	-	-	Cambridge Science Park Innovation Centre	St John's Innovation Centre	-	-	-	-	-	-	-	-
Institute / University	Babraham Institute	Sanger Institute	-	-	Cambridge University	-	-	-	-	-	-	-	-	-
Sub-Market / PMA	South Research Cluster	South Research Cluster	South Research Cluster	South Research Cluster	Northern Research Cluster	Northern Research Cluster	Northern Sub-Market	Northern Sub-Market	Northern Sub-Market	South Cambridgeshire	South Cambridgeshire	South Cambridgeshire	South Cambridgeshire	South Cambridgeshire

[1]CoStar average achieved rent

[2]B900 building

**Unable to source lease transactions to evidence or sample size too small*

Property Impact Analysis

8.37 The objective of this section is to quantify the impact of the BRC on the broader commercial market, by benchmarking its performance relative to the broader Southern Research Campus and other competing markets and clusters.

8.38 To measure this effect, we utilised BRC office market data, as well as office leasing and development data for the Southern Research Cluster. Measuring the Southern Research Cluster provides an indication of the indirect effect of the BRC, both in terms of producing start up and scale up businesses through its ecosystem and by attracting businesses into the Southern Research Cluster.

8.39 To measure the property impact on the local market, we benchmark the BRC and the Southern Research Cluster against key comparator markets:

- The wider South Cambridgeshire sub-market, excluding both the Northern sub-market, Southern Research Cluster and Cambourne Business Park. This represents a market that is similarly located outside the main urban areas of Cambridge, but does not contain comparable publicly funded research institutes, making it 'counterfactual' benchmark for the Southern Research Cluster and BRC.

8.40 The business locations that comprise the wider South Cambridgeshire sub-market market typically offer commercial lease terms, are privately funded and do not include a publicly funding research institute comparable to the Babraham Institute. Therefore, uplift above the South Cambridgeshire market provides an indication of the value add of research campuses within the Southern Research Cluster and BRC, compared to purely commercial delivered office space.

- The Northern sub-market provides an additional benchmark that measures how the Southern Research Cluster and BRC's compares to a sub-market providing lab space but lacks a publicly funded research institute.

8.41 We have ensured these property market areas do not overlap with another market areas, in order to isolate its performance. The market indicators used to benchmark the BRC, Northern Research Cluster, Southern Research Cluster and the broader Southern Cambridgeshire sub-market include Net Absorption %, Vacancy %, Rent and average lease term, Delivery of new office and Average rental growth.

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BioMed investment in the Babraham Research Campus

BioMed is one of the two a private real estate investors (the other being Kadans) that seeks to complement the Babraham Research Campus approach to supporting early venture enterprises, by expanding their campus with additional scale up research space. While this space is targeted at more established companies, it reflects the value of the start-up ecosystem created at the BRC via BBSRC funding, and perceived benefits of fostering synergies around BRC, which currently co-locates more than 60 bioscience companies.

BioMed, in a JV with the BRC, delivered approximately 134,000 sq. ft of space across three buildings. Across the BioMed presence in Cambridge (Babraham and Granta Park), it supports over 30 life sciences companies since 2012, ranging from start-ups to established companies.

BioMed's investment illustrates value of the start-up ecosystem created at Babraham, which creates a steady stream of potential tenants for the BioMed buildings and an ecosystem that companies can tap into.

8.42 Benchmarking the performance of the BRC and the Southern Research Cluster against the broader market illustrates their relative strength. However, an additional effect of the BRC, is its indirect property impact on the Southern Research Cluster. To isolate this, we have undertaken additional analysis that excludes the BRC development and leasing data from the Southern Research Cluster, and then compared this to the funding and development milestones within the BRC.

Net Absorption and Vacancy

8.43 The Northern and Southern Research Clusters are mostly contained within the Southern Cambridgeshire sub-market. The key differentiating factor between the research clusters and the Southern Cambridgeshire sub-market is the presence of publicly funded research institutes offering specialised space for start-up, incubator, lab space and proximity to research institutes.

8.44 Comparing Southern Research Cluster with other sub-markets within South Cambridgeshire, provides insight into the impact of the concentration of research campuses on the market for commercial property. We have excluded the BRC's leasing and development data from this analysis, to not distort the analysis and isolate its impact on its surrounding commercial property market area:

8.45 Between 2018-2023 the Southern Research Cluster achieved an average annual net absorption (as a % of its inventory) of 2.8%, compared to 0.8% in the Northern sub-market and -2.2% in the South Cambridgeshire (excluding the Southern Research Cluster, and Northern sub-market) sub-market (though this was driven primarily by -10.3% net absorption[40] in South Cambridgeshire in 2023, Figure 8.5)). With the exception of 2020, the Southern Research Cluster has a consistently stronger annual net absorption %, than both the Northern sub-market and the wider South Cambridgeshire market. Similarly, vacancy rates in the Southern Research Cluster are significantly below the Northern sub-market and South Cambridgeshire, except in 2020 and 2021. In 2023, the South Research Cluster has a vacancy of 2.4%, compared with 4.8% in the Northern sub-market and 10.9% across South Cambridgeshire. The South Cambridgeshire market has 2018-2023 average vacancy rate of 5.0%, lower than the Northern Cluster at 6.6%, but above the Southern Cluster at 4.0%.

8.46 This shows that the Southern Research Cluster's office market, even discounting the direct impact of the BRC, has stronger demand than both the Northern sub-market and South Cambridgeshire sub-market.

[40] Net absorption refers to the amount of space leased minus the amount vacated in a specific period.

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Figure 8.5 Net Absorption % and Vacancy %

Source: Savills, CoStar 2024

Market Rents and Lease Terms

8.47 One of the differentiating factors setting the BRC and Southern Research Cluster apart from the wider Southern Cambridgeshire sub-market is the provision of incubator space, co-located with a public funded institute. Figure 8.17 outlines the average market rent and average lease term for the BRC, Southern Cluster (excluding the BRC), Northern sub-market and South Cambridgeshire sub-market.

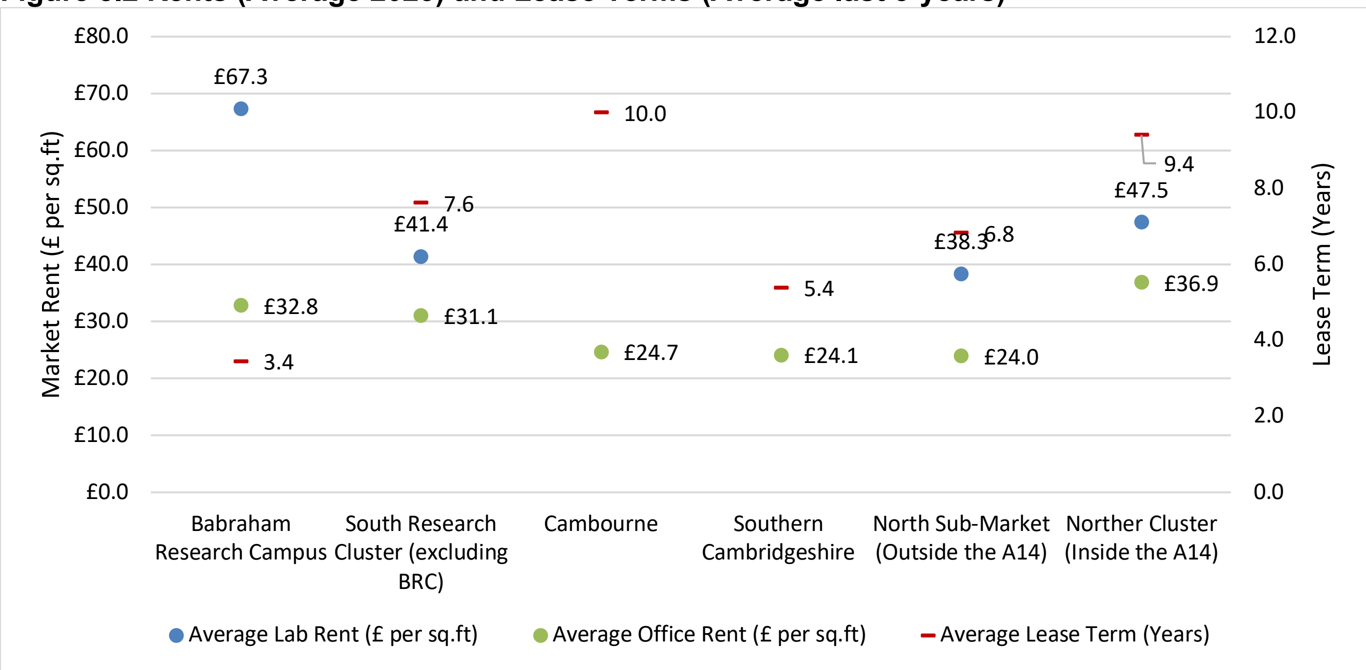
8.48 The lease term provided at the BRC are much shorter than the commercial lease term offered in other markets including the wider South Research Cluster within which the BRC is located. This directly contributes to addressing the failure of the private sector to supply shorter term leases for lab, incubator, and R&D space, highlighted in Section 3.2 of this report.

8.49 The BRC has an average lease term of 3.4 years, while achieving £67 per sq. ft average lab rent and £32.8 per sq. ft office rent. This lease term is lower than all the comparator markets[41] and clusters outlined in Figure 8.6 below:

Northern Cluster has an average lease term of 9.4 years.
South Cambridgeshire sub-market has a lease term of 5.4 years.
Southern Research Cluster (excluding BRC) has a lease term of 7.6 years.

8.50 The lease term offered in the BRC is reflective of its mandate to provide space for research and development projects. Despite this, the BRC also achieves a higher market rent than the average across the Southern Research Cluster, South Cambridgeshire and the Northern Cluster.

Figure 8.2 Rents (Average 2023) and Lease Terms (Average last 5-years)



Source: Savills; CoStar; Babraham Research Campus
**Lease terms are based on a sample of lease transactions over the last 5-years, and combines both lab and office lease transactions.*

8.51 These lease terms are reflected in the recently developed start-up space. The BBSRC

[41] Comparator market average lease terms are based on a sample of lease transactions over the last five years and combine both lab and office transactions.

received £44 m for investment in 2011 to help fund the development of the following buildings:

- Development of Moneta (approximately 17,500 sq. ft), average lease term of 1.96 years.
- Building 580, average lease term 2 years (excluding long-term lease to BI).
- Development of Jonas Webb building (approximately 14,500 sq. ft), average lease term 2.5 years.
- Development of Bennett building (approximately 20,000 sq. ft), average lease term of 5 years.

8.52 A rental rate also above all other comparator markets, and close to full occupancy in 2023, indicates that the BRC is providing space on lease terms not otherwise provided for the by private development market.

New Deliveries

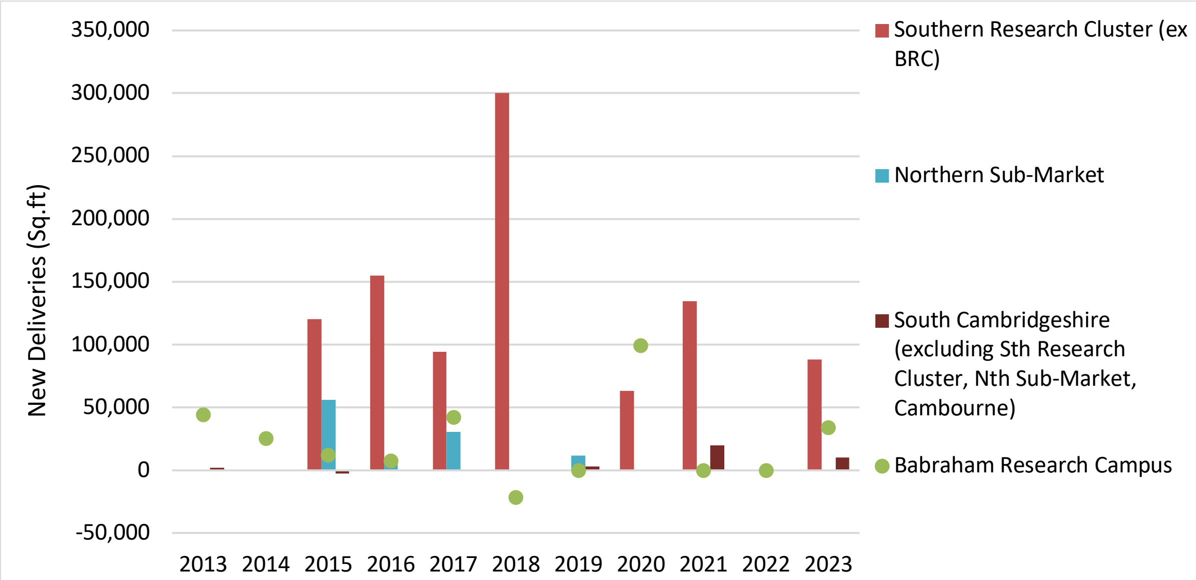
8.53 Figure 8.7 outlines delivery of new office development for each respective market. It shows that:

- Southern Research Cluster (excluding the BRC) has added on average 97,600 sq. ft per annum since 2018, equivalent to a total of 585,400 sq. ft. The BRC delivered 18,600 sq. ft per annum since 2018, equivalent to approximately 111,600 sq. ft since 2018 representing approximately 16% of new deliveries in the Southern Research Cluster.
- By comparison, the Norther sub-market only delivered an additional 12,000 sq. ft in total and the Southern Cambridgeshire sub-market (excluding BRC, Southern Research Cluster and the Northern sub-market), despite covering a much wider area, delivered approximately 33,000 sq. ft in total since 2018.

8.54 This shows that the Southern Research Cluster (ex BRC) delivered significantly more space than the broader Southern Cambridgeshire sub-market and the Northern sub-market since 2018. The Southern Research Cluster's higher delivery of new lab and office stock, is partly a reflection of the agglomeration associated with its proximity to the BRC and other research institutes and anchors present in the Southern Research Cluster.

8.55 If the Southern Research Cluster delivered stock at the rate of the Southern Cambridgeshire Submarket (4.1% of total 2013 stock), it would have delivered only 75,910 sq. ft per since 2013 some 89% lower than actual delivery (+621,200 specified above).

Figure 8.7 New Deliveries (sq. ft)



Source: CoStar, 2024; Babraham Bioscience Technologies Ltd

Property Impact of BRC Funding and Development on the Southern Research Cluster

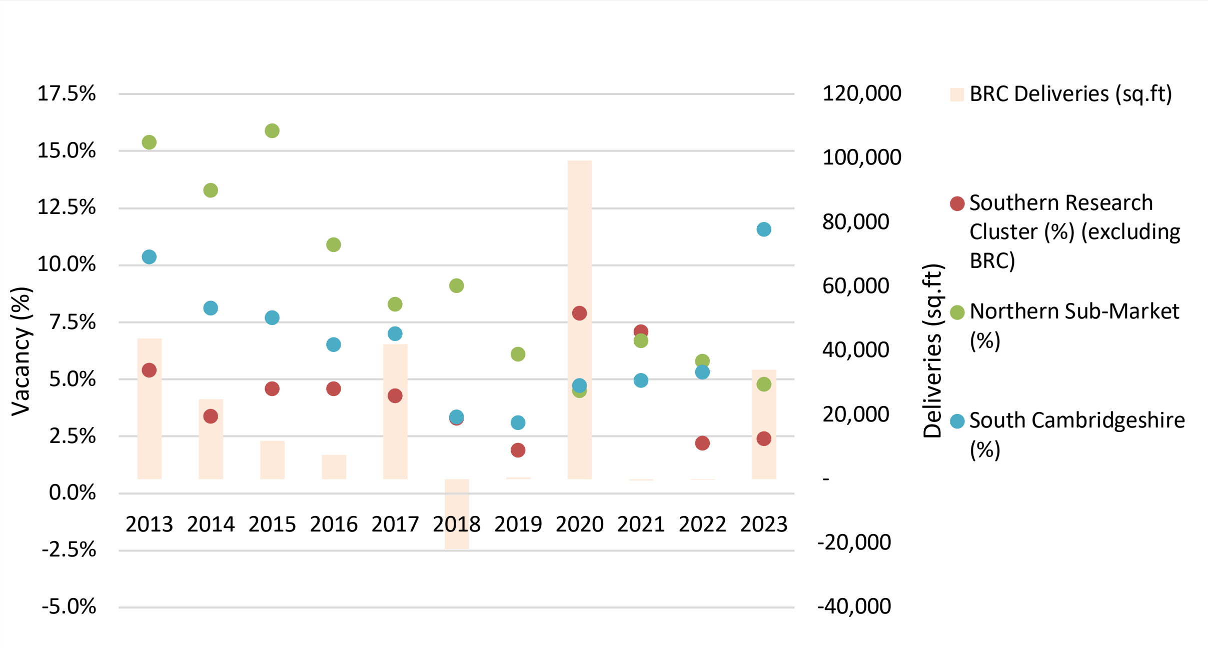
8.56 In addition to the direct impact of funding campus development, the effect of further concentrating R&D facilities in the Southern Research Cluster will have flow on effects beyond the BRC.

8.57 This section seeks to identify the flow on impact of BRC funding and development on the Southern Research Cluster. To quantify this flow-on effect, the net absorption and vacancy rates of the Southern Research Cluster were benchmarked against the Southern Cambridgeshire sub-market, identifying any uplift. This uplift was compared to key BRC development and funding milestones. To make sure this analysis measures the flow on effect of development, rather than the development and leasing of the buildings themselves, the BRC's leasing and development activity were excluded from this analysis.

8.58 Figure 8.5 compares the vacancy rate within the Southern Research Cluster (ex BRC), and the wider Southern Cambridgeshire market, against the key BRC funding and development milestones to illustrate the agglomeration impact of on-campus funding of development of new facilities on its surrounding property market.

Between 2013 and 2020, the Southern Research Cluster had sub 6% vacancy rates, below the South Cambridgeshire and Northern sub-markets.
From 2020 to 2021, during the pandemic, the Southern Research Cluster (ex BRC) saw a temporary increase in its vacancy rate up to 7.9%, with the Southern Cambridgeshire (5.0%) and Northern (6.7%) sub-markets both also seeing increases in vacancy.
In 2022 to 2023, the Southern Research Cluster saw a fall in vacancy levels, back below 2.5%, while both Southern Cambridgeshire and the Northern sub-markets saw increasing in vacancy levels.

Figure 8.5 Key BRC Development Milestones (sq. ft) and Vacancy (%)



Source: Savills 2024, CoStar 2024.

8.59 Figure 8.6 compares the net absorption rate (%) within the Southern Research Cluster (ex BRC) the Northern sub-market, and the Southern Cambridgeshire market, against the key BRC funding and development milestones.

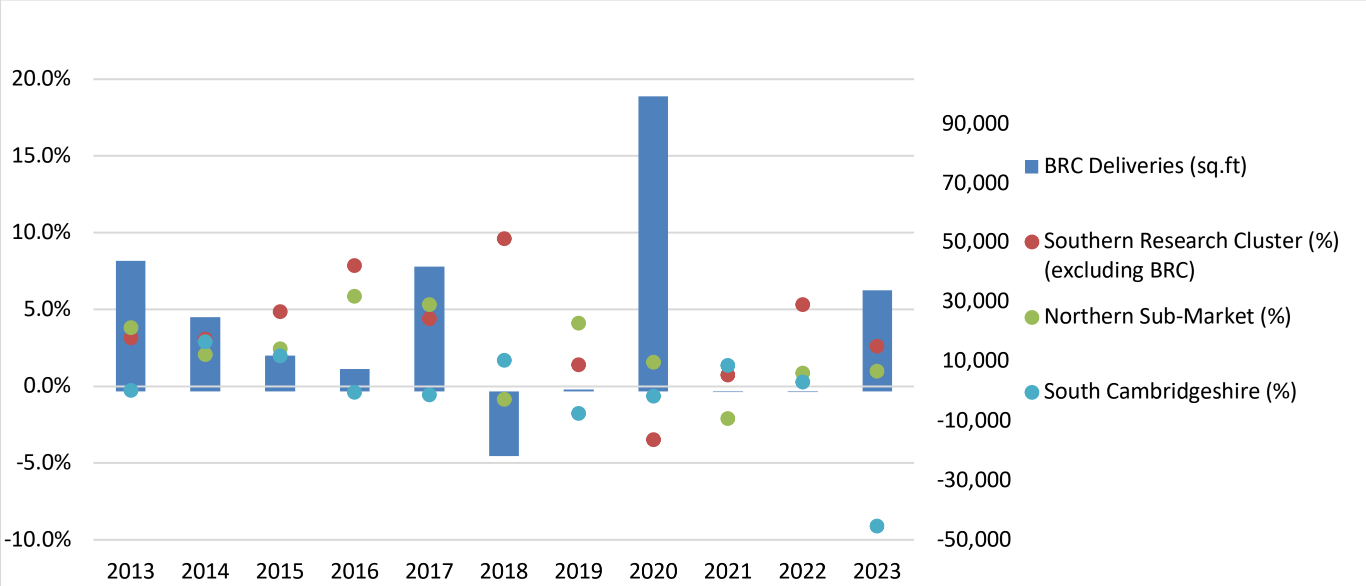
8.60 One way the BRC impacts the Southern Research Cluster is by producing R&D start-ups that scale ups, who outgrow their space at the RBC and take-up space in nearby business locations. The BRC have advised that the primary locations for previous BRC start-ups are Granta, Chesterford Research Park, Wellcome Genome Campus and Cambridge Science Park, reflecting the geography of the Southern Research Cluster.

8.61 Out of the companies that graduated from the Babraham Bioincubator (since 1999) and are tracked by the BRC and still operating (excluding companies that failed, relocated out of the UK or were acquired), 39% relocated to nearby by research locations (Granta, Chesterford and Sanger Centre), while 18% to the Cambridge Science Park in the Northern Research Cluster.

8.62 Between 2018 and 2023, the average net absorption for the Southern Research Cluster (ex BRC) was 2.8% per annum, while the Southern Cambridgeshire Sub-market was approximately -2.2% (though this varied year to year) and the Northern sub-market was 0.8%. Over this period, the BRC delivered close to 130,000 sq. ft of new space.

8.63 It is likely that the start-up ecosystem at the Wellcome Genome campus has had a similar effect on the Southern Research Cluster (though this has not been accounted for in our analysis).

Figure 8.9 Net Absorption % and BRC development



Source: Savills 2024, CoStar 2024.

Summary

8.64 The Babraham Research Campus (BRC) has made a significant contribution to the Cambridgeshire property market, providing specialised start up and scale up space, with access to world-class facilities (e.g. laboratory space) and on lease terms tailored to the needs of start-up space.

8.65 One of the key characteristics, which differentiates the BRC from the broader market, is the provision of lab space, co-located with a public funded institute and flexible lease terms tailored to R&D start-ups. The BRC's average lease term of 3.4 years is below the average for other markets, while it is achieving an average lab rental rate (£67.3 per sq. ft) above other sub-markets and research clusters:

- Southern Research Cluster (excluding BRC) has an average lease term of 7.6 years at an average lab rent of £41.4 per sq. ft.
- Northern sub-market has an average lease term of 6.8 years at an average lab rent £38.4 per sq. ft.
- Northern Cluster has an average lease term of 9.4 years at an average lab rent of £47.5 per sq. ft (though our sample of lease terms does not include incubator leases at Cambridge Science Park).

8.66 The lease term offered in BRC are reflective of its mandate to provide start up and scale up space for R&D SMEs. The BBSRC invested £44 m in the BRC in 2011, funding the development of following buildings:

- Development of Monetta (approximately 17,500 sq. ft), average lease term of 1.96 years.
- Building 580, average lease term 2 years (excluding long-term lease to BI).
- Development of Jonas Webb building (approximately 14,500 sq. ft), average lease term 2.5 years.

Development of Bennett building (approximately 20,000 sq. ft), average lease term of 5 years.

8.67 Comparing the Southern Research Cluster with the South Cambridgeshire sub market provides a counterfactual benchmark and indicator of the 'value added' associated with the Southern Research Cluster and the BRC. The Southern Research Cluster, excluding the BRC, has achieved significant uplift in net absorption and structurally lower vacancy than the South Cambridgeshire sub market. The Southern Research Cluster (excluding the BRC) consistently performs better than its key counterfactual, the Southern Cambridgeshire sub-market, since 2018 across net absorption (+4.9% per annum), vacancy (-1.1% on average) and delivery of new stock (+97,500 sq. ft per annum). This is despite the Southern Research Cluster and South Cambridgeshire sub market have comparable amenity, infrastructure and are located outside the Cambridge urban area. The key differentiator is the presence of start-up, lab, incubator and research institutes in the Southern Research Cluster, which creates an agglomeration effect attracting inward investment and occupier demand.

8.68 We can estimate this impact, by excluding the BRC's leasing and development data from the broader Southern Research Cluster and then benchmarking this against the Southern Cambridgeshire submarket. The Southern Research Cluster (excluding on-campus BRC leasing and development data) achieved an uplift above the Southern Cambridgeshire submarket that corresponds with key BRC funding and development milestones:

From 2013 to 2019 the Southern Research Cluster (ex BRC) on average saw 4.6% of its inventory taken up per annum, compared to just 0.2% in South Cambridgeshire (excluding the Southern Research Cluster and Northern sub-market) and 3.3% in the Northern sub-market.

Over this period, the BRC received £44 million in funding, and developed approximately 40,500 sq. ft of new office and lab space. This included a mix of different formats that were adapted to meet the needs of start-up and scale-up phase businesses.

While the Southern Research Cluster (ex BRC) and the Southern Cambridgeshire Submarket both saw falls in vacancy, the Southern Research Cluster (ex BRC)'s vacancy rate was still 1.8% lower than the broader Southern Cambridgeshire Submarket.

8.69 This indicates that the funding of new facilities on the BRC appears to have an agglomeration impact on the broader Southern Research Cluster B-class office stock, adding to the critical mass of space supporting R&D start up and scale up businesses.

8.70 As the funding between 2012 and 2018 was spent on campus development, the Southern Research Cluster (ex BRC) averaged a net absorption rate of 4.1% per annum, while the wider South Cambridgeshire Submarket saw a -0.1% net absorption of office stock.

8.71 Businesses that started and developed through the BRC have left the campus once they outgrew their premises. This is one source of impact the BRC has on the surrounding property market by producing companies that take-up space in nearby business locations. The development of start-up and scale-up space that further concentrates R&D activity within the Southern Research Cluster will likely continue to have an agglomeration effect, attracting market interest not just in the BRC, but within other campuses located within the Southern Research Cluster

9. Bringing the impacts together and assessing the economic additionality of the Campus

The objective of the research presented in this Report has been to assess the economic impact of the Babraham Research Campus (BRC) with a key objective being to update the findings of the research undertaken in 2019 and assess change over the last five years.

The survey results presented in Sections 4, 5 and 7 showed that the support structure offered by the BRC is a key factor enabling Campus companies to make an impact across local, national and international ecosystems. Survey respondents identified a series of property-related, facilities-related and other benefits associated with their location on the BRC, ranging from the availability of suitable premises on flexible lease terms to the proximity to the Cambridge cluster and the opportunities it brings.

This Section further explores how being located on the BRC benefits companies on site by estimating the *additionality* of the Campus to business growth. The research has assessed:

- the importance of being located on the BRC to the companies located there in terms of a) accelerating scientific advances for various outcomes, b) facilitating fundraising, c) increasing the number of employees and providing flexible and affordable space.
- the impact of the BRC on business growth.
- the growth in value of Campus companies and the contribution of the BRC to this value
- the additional UK economic activity (GVA) associated with the Campus
- the cost to the public sector contribution to the Campus and, combining this with the estimated economic benefits, to derive a Benefit Cost Ratio.

Introduction

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- the cost to the public sector contribution to the Campus and, combining this with the estimated economic benefits, to derive a Benefit Cost Ratio.

Additionality Methodology

9.4 As part of our survey of Campus companies, we asked participants about the importance of being located on the BRC for the following main outcomes:

- Accelerating scientific advances.
- Facilitating fundraising.
- Increasing the number of employees.
- Providing flexible and affordable space.

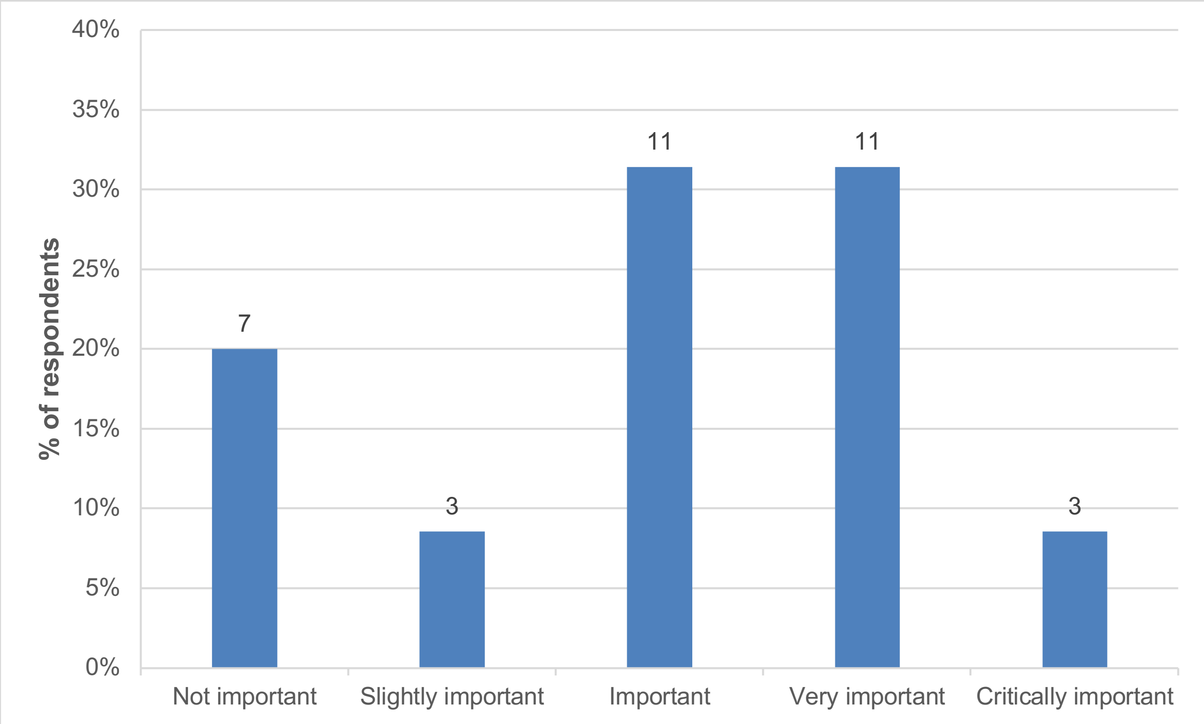
9.5 The importance of the BRC for each of these outcomes was measured on a scale of 1 (not important) to 5 (critically important). Campus companies were also asked to give an estimate (in months and percentage change) of the impact of their location on the BRC on accelerating the scientific discovery process, fundraising and number of employees.

Importance of BRC location

Accelerating scientific advances

9.6 Figure 9.1 summarises Campus companies’ responses on the importance of their location on the BRC for accelerating scientific advances. Four out of five survey respondents indicated that being located on the BRC has had some importance for accelerating their scientific advances, with two out of five respondents feeling that their location has been either a very important or critically important factor for the speed of their scientific discovery process.

Figure 9.1 Importance of being on the Babraham Research Campus for accelerating scientific advances

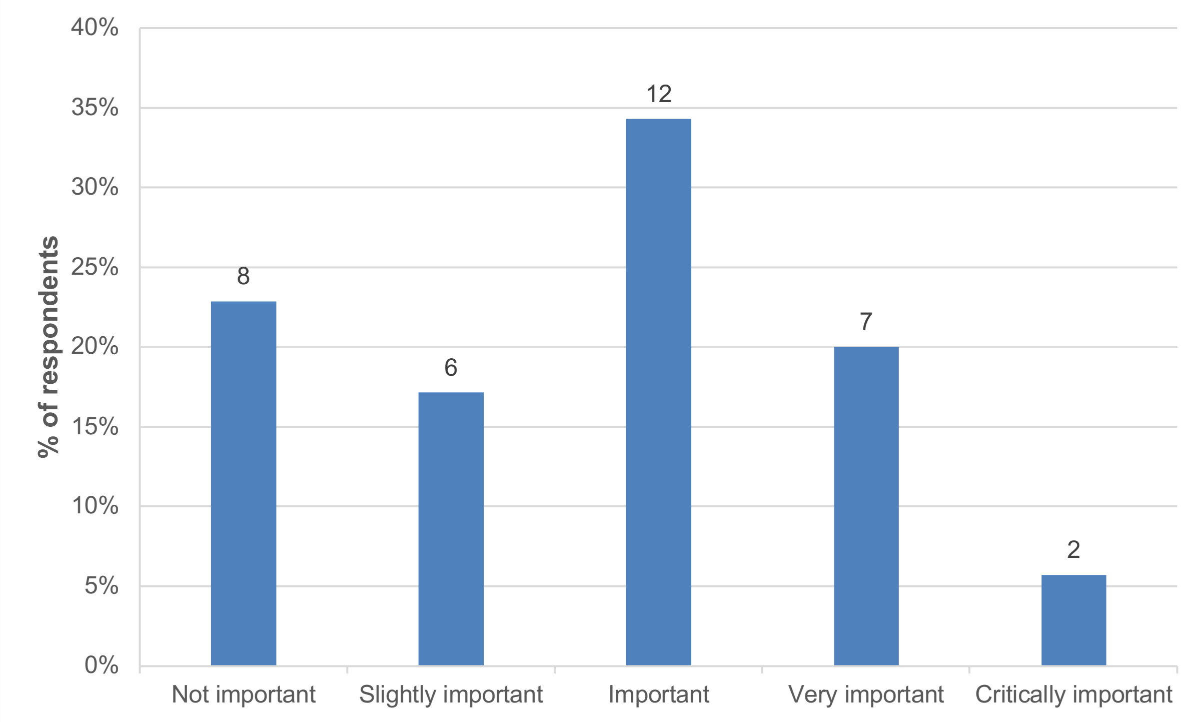


Number of responses: 35
Source: CBR.

Facilitating fundraising

9.7 The importance of being located on the BRC for facilitating fundraising is analysed in Figure 9.2. Over 77% of the survey respondents perceive that operating on the BRC has benefited their fundraising activity. Their location on the Campus is regarded as a very important or critically important factor by one-fourth of the respondents, suggesting that the support structure provided by the BRC has made access to finance by these fast-growing bioscience companies easier than it would otherwise have been.

Figure 9.2 Importance of being on the Babraham Research Campus for facilitating fundraising

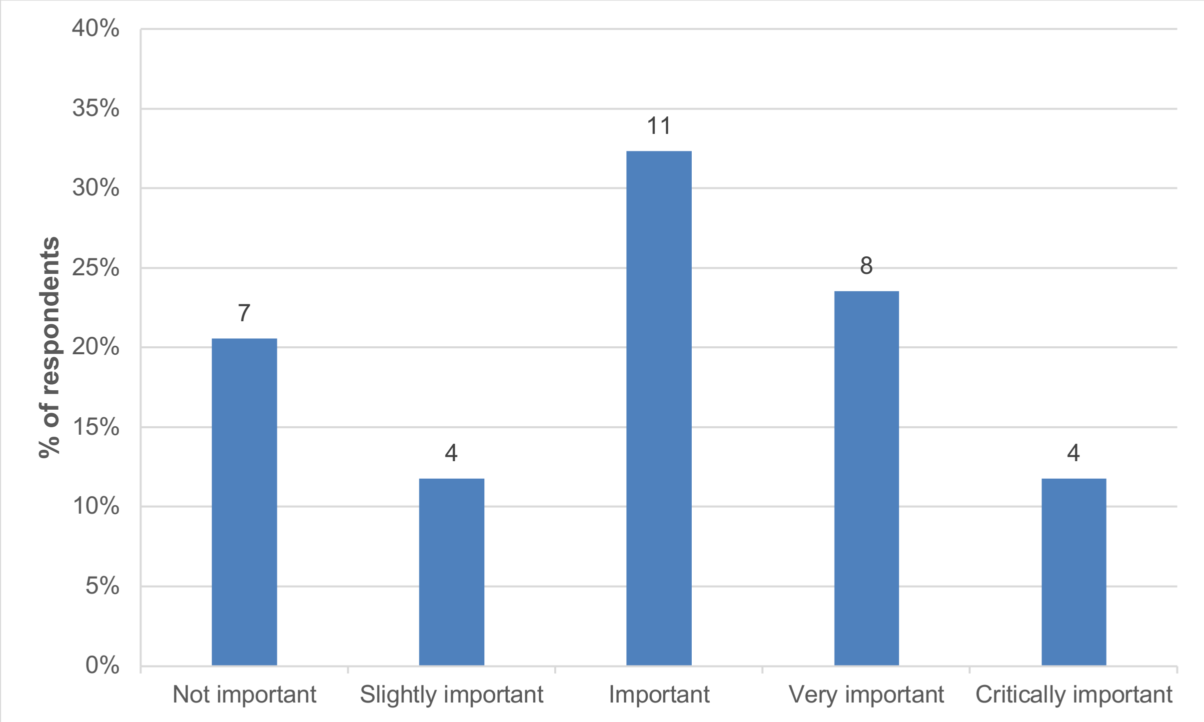


Number of responses: 35
Source: CBR.

Increasing the number of employees

9.8 Campus companies were also asked to reflect on the extent to which being located on the BRC has helped them grow their number of employees. The results are presented in Figure 9.3. One-third of Campus companies view their location on the BRC as an important factor for increasing the number of employees, while another third consider their Campus location as either very important or critically important for helping them expand the employee base. These findings are consistent with the benefits of companies' location analysed in Chapter 4, which pointed to the quality and availability of the local labour force as well as the ability to attract both national and international talent as two key benefits of operating from the BRC.

Figure 9.3 Importance of being on the Babraham Research Campus for increasing the number of employees

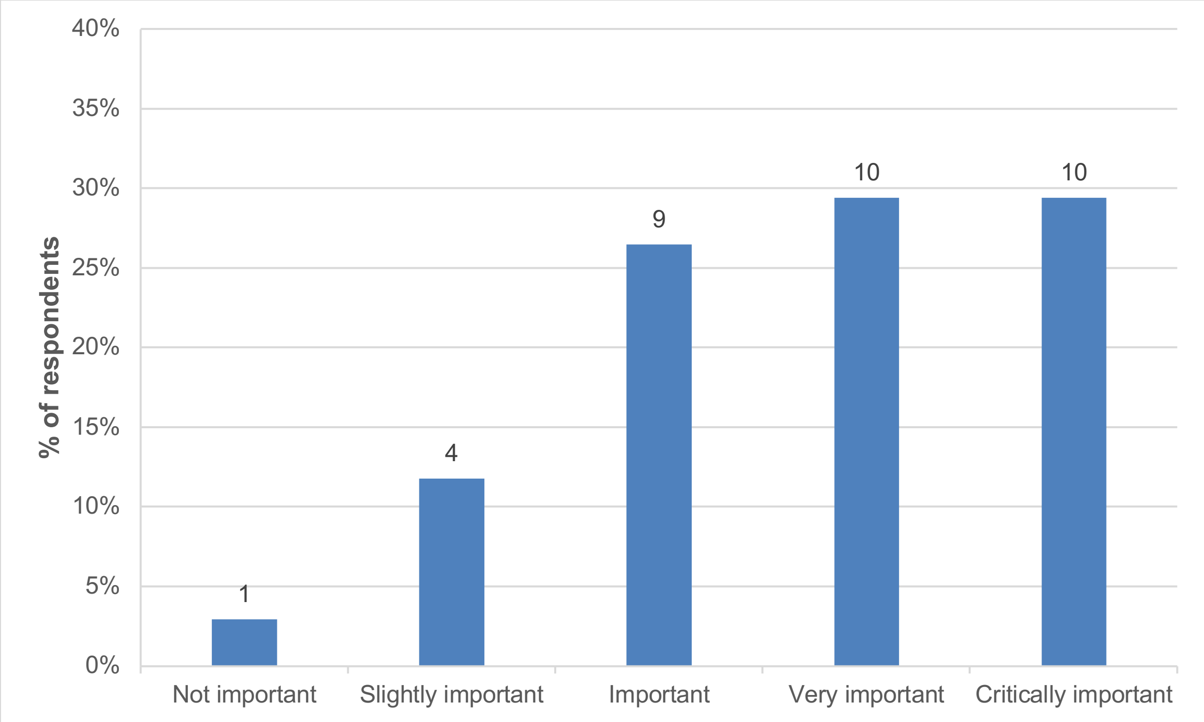


Number of responses: 34
Source: CBR.

Providing flexible and affordable space

9.9 Figure 9.4 examines whether the BRC has made a difference to Campus companies through the provision of flexible and affordable premises. Almost all the survey respondents believe that being located on the BRC has benefited their business by providing access to lab and office space on flexible and affordable terms. The role of the BRC in offering flexible and affordable space is viewed as a very important or critically important factor by almost 60% of the respondents, confirming the availability of suitable premises on flexible lease terms as a major benefit Campus companies derive from being on the BRC.

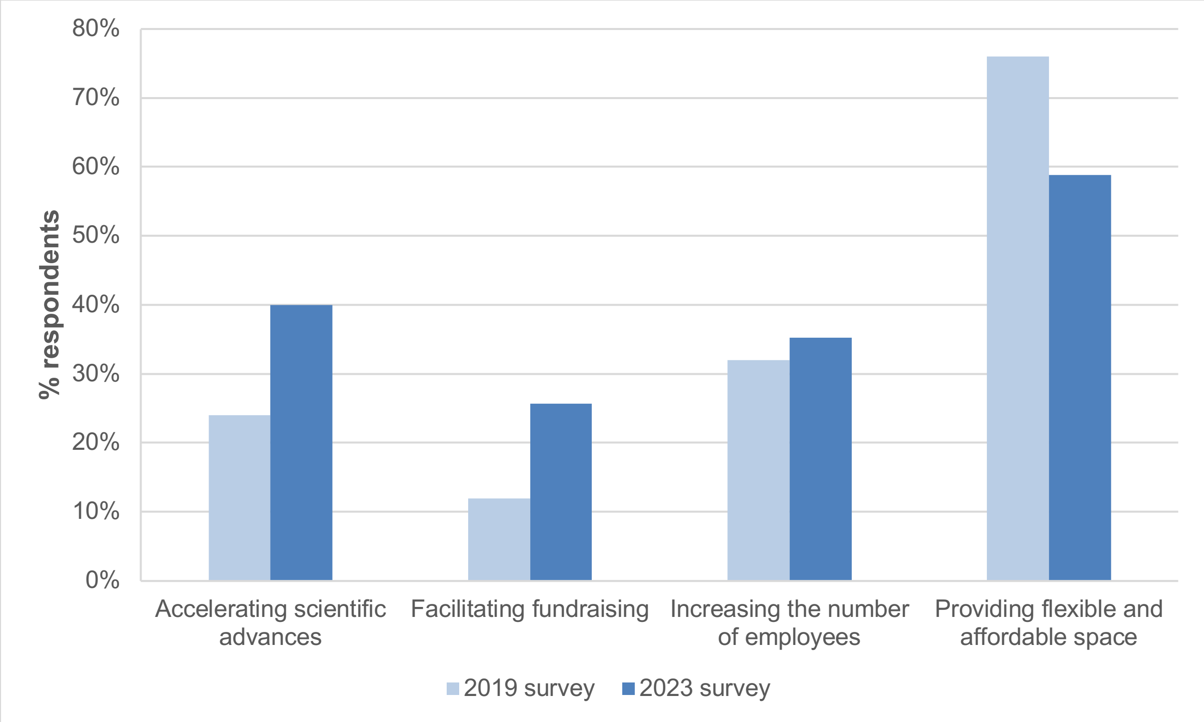
Figure 9.4 Importance of being on the Babraham Research Campus for flexible and affordable space



Number of responses: 34
Source: CBR.

It is useful to compare the latest views of Campus companies on the importance of their BRC location with the results of our 2019 study. This comparison is presented in Figure 9.5, which focuses on the percentage of respondents who felt that being located on the BRC was either a very important or critically important factor.

Figure 9.5 Percentage of respondents saying Babraham Research Campus location was 'very important' or 'critically important'



Source: CBR.

9.10 Figure 9.5 suggests that Campus companies regard their location on the BRC as being increasingly important to their business. The provision of affordable space on flexible lease terms on the BRC is viewed as a very important or critically important factor by about two-thirds of the survey respondents (the highest share across the four additionality outcomes examined in our study), but it is not as dominating over the other outcomes as it was in the 2019 survey. The percentage of respondents saying that their BRC location was either very important or critically important for accelerating scientific advances and facilitating fundraising was about twice as high as in the 2019 survey. A larger proportion of Campus companies (relative to the 2019 results) also consider being on the BRC as key for increasing the number of employees (35.3% in the 2023 survey compared with 32.0% in the 2019 survey).

Impact of BRC location

9.11 Table 9.1 summarises Campus companies' estimates of the impact that their location on the BRC has had on their business. Mean and median figures from the 2019 survey are included for comparison. Our discussion will focus on the median, which is less affected by extreme values compared with the mean.

Table 9.1 Impact of location on the Babraham Research Campus

	Mean		Median			
	2019 survey	2023 survey	2019 survey	2023 survey		
Accelerated scientific discovery process by	5.1	8.0	3	6	months	↑
Accelerated fundraising by	5.2	6.9	3	6	months	↑
Increased fundraising to date by	11.4%	25.0%	10%	20%	%	↑
Increased number of employees by	21.6%	101.6%	10%	50%	%	↑

Number of responses: 25 (2019 survey); 26 (2023 survey)
Source: CBR.

9.12 The 26 Campus companies who responded to the additionality question estimate that being located on the BRC has accelerated their scientific discovery process and fundraising by half a year. These companies also estimate that the amount of funds they have raised to date is 20% higher as a result of their location on the BRC, while the number of employees was increased by 50%.

9.13 The 2023 additionality figures are even more remarkable when compared against the 2019 figures. The estimated impact is twice as high as in the 2019 survey in terms of scientific discovery process and fundraising, and five times higher in terms of number of employees. Overall, the figures analysed in this chapter reveal an increasing additionality impact of the Campus on its companies.

Return to investors

9.14 In order to examine returns to investors and market values, we decided to focus on the largest 16 companies on the Campus by market value (£20m or more). These 16 companies represent almost 90% of the funds raised to date by all Campus companies.

9.15 Market values cannot be precisely measured and can be subject to very large changes in response to a single event such as a successful drug trial, or a new discovery by a competitor. We have made what we believe to be reasonable estimates of market value utilising one, or more, of three approaches: the value established at the latest funding round; the value given by Dealroom.co, or the value implied in the report and accounts of an investor in the company. Although we believe in the reasonableness of our estimates, we present them here in aggregate, anonymised.

9.16 The total market value of the Campus companies has risen to £3.15bn. The values range from £869m down to £0.75m. The largest 16 companies in terms of market value have 6 in the range £15m to £99m; 9 between £100m and £500m; and one valued at £869m.

These values represent significant potential returns to the investors. The total market value of the largest 16 companies is £3.07bn and, by the valuation dates, the investors have put in

£1.4bn in total. This gives a 2.2 times return on their investments on average. This ratio varies between 0.4 and 9.7 across the 16 companies.

9.17 The total market value of Campus companies in the 2023 study (£3.15bn) is somewhat lower than the total market value in the 2019 study (£4.07bn). This mainly reflects the different contribution to total market value made by the company with the highest valuation – £869m in 2023 (28% of total market value) and £2.6bn in 2019 (64%). It follows that the average market value of the other, smaller companies is much higher in 2023 than it was in 2019.

9.18 Of course, these returns represent the progress to date and can be subject to sudden and very large swings on the basis of drug trial results, change in partnerships, or an undermining success of a competitor.

Additionality of the BRC on the value of companies

9.19 The question of the scale of the value-added provided to the companies by their location on the BRC is even more difficult to answer. However, we attempt to get an estimate of this figure by drawing upon the replies given to us about the benefits they derived from their location on the Campus. If we look at their responses to how much the Campus had accelerated their scientific discoveries and fundraising, the median was 6 months in each case.

9.20 Making use of the valuations of the companies in 2023 discussed above we can estimate for each company what this represents in terms of the addition of market value per year. The total across the 16 companies that dominate the current set of companies on the BRC amounts to £356m per year. If the contribution of the BRC to this figure is taken at one-half, in line with the medians above, this puts the contribution to the growth in value of these companies at £178m per year – a sizeable achievement which is close to the £191m figure from the 2019 study. It is also important to bear in mind that these figures do not include the contribution the BRC has made to the growth in value of the ‘graduates’ (analysed in Chapter 4), who had a total valuation of £1.04bn in 2023.

Additional UK economic activity (GVA) associated with the Campus

9.21 Additionality is the real increase in social value that would not have occurred in the absence of the intervention being evaluated, where in this case the intervention supported is the Babraham Research Campus. There are benefits to society, and thus an increase in social value, from increased scientific discovery since this will translate into improvements in health and the welfare of people in society in the United Kingdom, but also around the world. Increased quality of life and reduced mortality result. These can be valued. It is also the case that additional activity created on the Campus translates into GVA and employment.

9.22 A strict, narrow interpretation, of additionality would focus simply on whether the activity would otherwise have occurred with zero (no additionality) representing all of the activity would otherwise have occurred to 100% where all of the activity is totally additional.

However, a *broader* interpretation should also include enhancements to quality of outcome and the ability of the intervention to speed things up. The evidence referred to earlier in this Section indicates that the Babraham Research Campus has been able to increase both *scale* and *speed* of delivery of the life-science product. It would be very surprising if it had not also improved *quality* as well, but that is inherently difficult to assess.

9.23 The study provided an assessment of the increase in GVA and employment associated with the Campus for the United Kingdom as a whole over broadly the period 2011/12-2022/23. Based on the views expressed by the businesses on the Campus, the *additional* GVA was calculated by removing deadweight (what would otherwise have occurred in the absence of the Campus). Evaluation Guidance varies on how long the GVA might be expected to persist and thus what should be the NPV. Research on the valuation of land and property market benefits created or supported by Government intervention has adopted a ten year profile but it is obviously possible to adopt different profiles and adjust the NPV accordingly with a lower option being only five years. This research adopts a ten year profile, which would seem appropriate given that the floorspace on the Campus is expected to continue to provide longer term benefit streams by its very nature. HM Treasury indicates that the NPV of this should be calculated using a discount rate of 3.5%.

9.24 Before assessing the NPV it is important to calculate the overall *net* additionality to the United Kingdom as a whole and this requires allowing for how much of the activity would otherwise have not been located in the UK in the absence of Babraham and also possible product market displacement. The survey of Campus companies provided evidence where the companies would have probably located if Babraham had not existed and a figure of 15% would seem to be appropriate for companies who would otherwise have relocated outside of the United Kingdom. Product market displacement has been assumed to be of the order of 20% drawing on previous research[42]. After allowing for displacement the net additional GVA NPV at the UK level is of the order of £337.7 million at 2024/25 prices.

The cost of the public sector contribution to the Campus and its development

9.25 The Babraham Research Campus has been in public sector ownership since 1948. The switch to its current biological research specialisation of epigenetics, signalling and lymphocyte signalling occurred in 1993 and the move to the provision of more commercially orientated premises to accommodate bioscience companies dates from 1998 as the timeline of development in Table 2.2, Section 2 showed. Chart 9.1 provides an indication of development since 1998, showing when the public sector has provided funding to assist the development process.

9.26 It is not straight forward to assess the true level of overall public sector support that has underpinned the development of the Campus. A number of issues arise. The public sector

[42] BIS

has provided grants and loans to encourage the development of research and, in recent years, the economic development potential of the site (as in the case of the grant from the Regional Development Agency in 2002 (EEDA) for £1.95 million). The land is owned by the public sector and as the landowner the public sector could accrue ground rent but is understood that this has only been at a pepper corn level to-date and there has thus been a level of public subsidy in this. On the credit side of the account the public sector has seen a very substantial increase in the value of the site compared to when it was used for agriculture and thus its return on the investment, should it ever seek to realise it. It is also the case that the increased commercial development of the site has generated increased tax revenue to HM Exchequer.

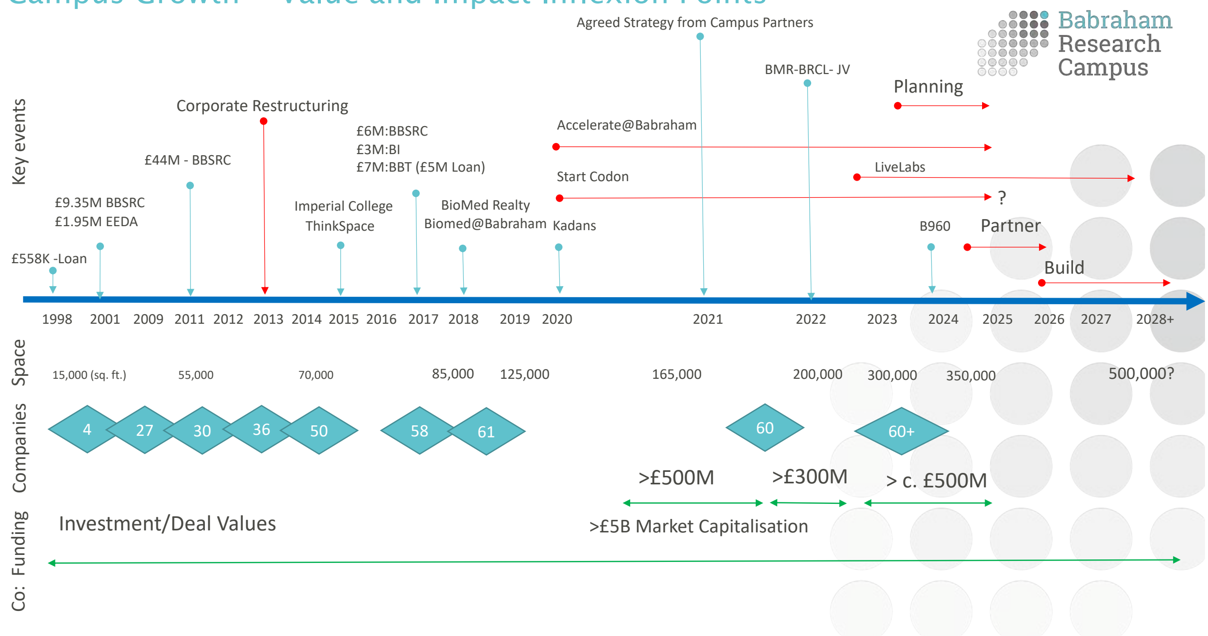
9.27 The direct public sector related support over the period would seem to be of the order of:

EEDA	Grant (£1.95m)
BBSRC	Grant (£9.35m)
BBSRC	Grant (£44m)
BBSRC	Grant (£6m)
BI	Grant (£3m)
BBT	Grant-element only (£2m)
BBSRC	Infrastructure for BioMed buildings (£2m)
BRCL	25% share of JV in BioMed 3rd building (£5.75m) (PC 2024)

9.28 Summing these, and translating them into 2024/5 using the GDP deflator, suggests the public sector costs amount to £102.5 million (2024/2025). The JV building has a practical completion of February 2024, so the BRCL share of costs for that has been profiled over 2 years.

Chart 9.1 The Growth of the Babraham Research Campus 1998-2019 and the Scale of Public Sector Investment.

Campus Growth - Value and Impact Inflexion Points



9.29 A further important issue is the period of time over which the payback from the public sector should be considered. It is to be remembered that part of the rationale for public sector support has been to encourage research that will provide health care benefits. Another part has been to enhance the economic development of the Life-Science sector and the benefits it provides to the Cambridge and United Kingdom economy. In both cases these benefits will emerge over many years. The evidence suggests that the total market value of the campus companies has now risen to £3.15bn. These values represent significant potential returns to the investors, but the forward momentum is such that there is likely to be substantial future growth in market value.

9.30 If the estimate of net economic impact of £337.7 million NPV is taken and put alongside the £89.8 million of direct public sector support, mainly from research council grant, the Benefit Cost Ratio is around 3.9 which is impressive. However, this estimate does not value the wider medical and health benefits that are, and will continue, to benefit society. If these were included, the overall societal Benefit Cost Ratio would increase, probably substantially.

9.31 **The research thus confirms that considerable value can be realised by well targeted public sector investment in this extremely important sector to the future of the British economy and its citizens.**

Annexes

Annex A1. Details of the Input Output Methodology

Direct, indirect and induced effects; terminology.

The Multiplier tool is developed by Cambridge Econometrics (CE) based on the multiplier effect theory which suggests that output and employment in one sector (the direct effect) creates additional output and employment in its supply chain (the indirect effect) as well as other parts of the economy in which workers spend their wages and salaries (induced effect).

Employment in the subsectors of Bioscience was converted into direct output using ratios calculated by CE from the UK Input-Output Table. Coefficients used in the tool to quantify backward linkages between sectors were also calculated from the Input-Output Table by dividing intermediate demand by gross output to get the breakdown of inputs to one unit of output.

Using the direct output data and the Type I and Type II Leontief Inverse Matrices, the tool calculates the economic impacts of Bioscience on gross output, GVA and employment in all sectors of the economy. The tool calculates three types of effects for each of these variables: the direct effect, the Type I affect and the Type II effect. The direct effect, as discussed above, measures the size of the sector. The Type I affect includes the direct and indirect effects; in addition, the Type II effect includes the induced effect. The ratio between the Type II effect and the direct effect is known as the expenditure multiplier.

Table A1 Sectors used to split out R&D expenditure not captured by the BBT data

I-O sectors
19: Coke and refined petroleum products
20A: Industrial gases, inorganics and fertilisers (all inorganic chemicals)
20B: Petrochemicals
20C: Dyestuffs, agro-chemicals
20.3: Paints, varnishes and similar coatings, printing ink and mastics
20.4: Soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations
20.5: Other chemical products
21: Basic pharmaceutical products and pharmaceutical preparations
22: Rubber and plastic products
23OTHER: Glass, refractory, clay, other porcelain and ceramic, stone and abrasive products
26: Computer, electronic and optical products
27: Electrical equipment

28: Machinery and equipment n.e.c.
31: Furniture
32: Other manufactured goods
46: Wholesale trade services, except of motor vehicles and motorcycles
61: Telecommunications services
62: Computer programming, consultancy and related services
63: Information services
64: Financial services, except insurance and pension funding
65: Insurance and reinsurance, except compulsory social security & Pension funding
69.1: Legal services
69.2: Accounting, bookkeeping and auditing services; tax consulting services
72: Scientific research and development services
74: Other professional, scientific and technical services
75: Veterinary services
77: Rental and leasing services
82: Office administrative, office support and other business support services
85: Education services
86: Human health services

Table A2: Sectors used to split our R&D expenditures (latest 17th May 2024)

I-O Sector
19: Coke and refined petroleum products
20.3: Paints, varnishes and similar coatings, printing ink and mastics
20.4: Soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations
20.5: Other chemical products
20A: Industrial gases, inorganics and fertilisers (all inorganic chemicals)
20B: Petrochemicals
20C: Dyestuffs, agro-chemicals
20.3: Paints, varnishes and similar coatings, printing ink and mastics
20.4: Soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations
20.5: Other chemical products
21: Basic pharmaceutical products and pharmaceutical preparations
22: Rubber and plastic products
23OTHER: Glass, refractory, clay, other porcelain and ceramic, stone and abrasive products
26: Computer, electronic and optical products
27: Electrical equipment
28: Machinery and equipment n.e.c.
31: Furniture
32: Other manufactured goods
46: Wholesale trade services, except of motor vehicles and motorcycles

61: Telecommunications services
62: Computer programming, consultancy and related services
63: Information services
64: Financial services, except insurance and pension funding
65: Insurance and reinsurance, except compulsory social security & Pension funding
69.1: Legal services
69.2: Accounting, bookkeeping and auditing services; tax consulting services
72: Scientific research and development services
74: Other professional, scientific and technical services
75: Veterinary services
77: Rental and leasing services
82: Office administrative, office support and other business support services
85: Education services
86: Human health services

Appendix A2. Questionnaire for current Campus companies (2023 survey)

The Importance of the Babraham Research Campus and Its Companies

The purpose of this questionnaire is to discover what your company has achieved so far, what it hopes to achieve, the importance of its collaborations and of its location on the Babraham Research Campus. We have pre-completed the questionnaire with the information we have been able to discover from public sources. Please amend or enhance those parts and complete those parts that we could not complete.

ABOUT YOUR BUSINESS

1 Business Name

2 Briefly describe your primary activities

3 What best describes your company's business model and current position?

4 What was the origin of your business? Who were the key founders? What was the original purpose of the business? What was the initial funding you received?

5 What contributions to medical advances and scientific discovery has your business made so far and what are your future ambitions?

Contributions to medical advances and scientific discovery:

Ambitions for future contributions to science and medicine:

6 What have been the key achievements of your business to the present time (other than the contributions above)? In what ways do you feel your business is having an impact locally, nationally and globally? *Please tick all that apply*

Use/proof of core technology……………………..…………………………………………	
Collaborations……………………………………………………………………………….	
Specific award(s)….………………………………………………………..……………………	
Brand/reputation……………………………………………………………………………….	
Employment growth..	
Fundraising…………………………………………………………………………………….	
International customer base…………………………..	
IP/patent portfolio…………………….………………….……………………………………….	
Support to companies……………………………………………………………………....	
Academic outputs…………………………………………………………….…………….	
Capital cost/risk minimisation……...	
Staff development/training………………………………………………………………………	
Products commercialised…………………………………………………………………..	
Other (Please specify)………………………………………………………………………..	

7 Please give your current number of employees at each location shown below.

(7a) Location of company's employment:

	Number of employees
On Babraham Research Campus……………………………………………….…………	
Not on Babraham Research Campus but within 20 miles of centre of Cambridge……..	
Not within 20 miles of Cambridge but within the United Kingdom………………….……..	
Outside the United Kingdom……………………………………………………….………….	

(7b) Of your employees: how many

	Number of employees
are in jobs not requiring a science qualification?……………………………………..……...	
require a work permit?………………………………………………………………………..	

8 In what ways do you feel being on the Campus and Campus activities contribute to the personal and professional development of your staff?

9 Please give the company's turnover, R&D spend and fundraising for the years shown.

(9a) Please enter figures in £,000:

	Latest year	Last 3 years (incl latest)
Turnover (£,000)……………………………..……………...…………		
of which:		
UKRI grants (including Innovate UK)……………..………………		
Other grants………………………………………………………		
Other revenue…………………………………………..…….....		
R&D spend (£,000)……………………..…………………...………		
Fundraising (£,000)……..…………………………………..……		

	Yes	No
(9b) Are you currently actively fundraising?....................................		

ABOUT YOUR RELATIONSHIP WITH THE BABRAHAM RESEARCH CAMPUS

10 What are the benefits of your location on the Babraham Research Campus?

(10a) Property related *Please tick all that apply*

Availability of suitable premises…………………………………………………………...	
Modular space providing the capacity to grow……………………………………………..	
Flexible lease terms………………………………………………………………………....	
Affordability of suitable premises….……………………………………..…………………..	
Other (Please specify)…………………………………………………………………..….	

(10b) Facilities related *Please tick all that apply*

Access to scientific equipment/expertise………..	
Availability of meeting rooms/conference facilities………………………………………	
Availability of cafeteria/restaurant…………………………………………………………	
Availability of support services/facilities (e.g. stores, waste management and security)	
Availability of free parking facilities……………..	
Availability of sports/social facilities……………………………………..………………..	
Other (Please specify)…………………………………………………………………..….	

(10c) Other reasons *Please tick all that apply*

Proximity to Cambridge cluster…………………………………………………………..………	
Presence of similar companies for collaborations/knowledge sharing…………………..	
Proximity to BI…..………………………………………………………..…………………..	
Proximity to University of Cambridge………………………………………………………..	
Proximity to key suppliers and subcontractors...	
Quality and availability of the local labour force……………………………………………	
Ability to attract national/international talent………………………………………………..	
Good transport links…………………………..	
Support from and events/activities organised by BRC……………….………………...….	
Availability of specialised finance……………………………………………………………	
Image/reputation………………………………………………………………………………	
Presence of local contacts and networks……..	
Other (Please specify)…………………………………………………………………..….	

11 What specific benefits have you received from collaborations with the organisations shown below? What is the number of such collaborations?

Organisation	Benefits	Number of such collaborations
Babraham Research Campus Ltd		
The Babraham Institute and Babraham Institute Enterprise Ltd		
Other companies on the Babraham Research Campus		
University of Cambridge		
Other academic organisations in the Cambridge area		
Other companies in the Cambridge area		
Other academic organisations outside the Cambridge area		
Other companies outside the Cambridge area		

12 How important has your location on the Babraham Research Campus been for benefiting your company in the following ways? *Please mark the appropriate box in **each** row.*

	Not important	Slightly important	Important	Very important	Critically important
Accelerating scientific advances……………..…					
Facilitating fundraising………………………..…….					
Increasing the number of employees………..…					
Providing flexible and affordable space.........….					
Other (Please specify)……………………..….…..					

13 Overall and with your best estimate possible, what impact do you feel your location on the Babraham Research Campus had on the following?

Accelerated scientific discovery process by………………………………………………	months
Accelerated fundraising by……………………………………………………………….	months
Increased fundraising to date by…………………………………….………………….	%
Increased number of employees by……………………………………………………..	%
Other impact (Please specify)…………………………………………………..………..	

ABOUT YOUR FUTURE

14 What are your objectives for your company in terms of employment and floor space occupied?

	Number of employees	Floor space occupied (sq ft)
In 2 years' time:...………		
In 5 years' time:...………		

15 What are the important challenges facing your company in attaining these objectives?
Please tick all that apply

Availability of specialised finance………………….………………….……………...……	
Success of core scientific programme/platform……….……...……………………………	
Access to skills…………………………………………………………………………………	
Availability of suitable premises……………………………………………..………….	
Successful partnerships with pharma/biotechs..	
Access to scientific equipment/expertise…………………………………………..…….	
Scaling up…………………………..	
Other (Please specify)…………………………………………………………………………	

16 What factors might make your business consider moving off the Babraham Research Campus?
Please tick all that apply

Lack of suitable premises………………….………………….……………...…………………	
Lack of affordable premises……….……...………………………………………………………	
Attractive offer from competitors…………………………………………………….…………	
Limited facilities (e.g. parking, gym and nursery)……………………….…………….…….	
Inability to attract/retain staff..	
Lack of scientific equipment/expertise…………………………………..……………...…….	
Relocation of key suppliers and subcontractors………………………………........................	
Business strategy…………………………………………………………………………..……....	
Poor transport links/traffic congestion……………………...……..…………………...…....	
Public listing……………………………..………………….……………………………..….….	
Other (Please specify)…………………………………………………………………………..	

17 If your business were to move off the Babraham Research Campus, where would your business likely to be located? *Please mark the appropriate box in **each** row.*

	Definitely not	Unlikely	Possible	Likely	Certain
Within a 20 mile radius of Cambridge					
Outside 20 mile radius of Cambridge but within the United Kingdom					
Outside the United Kingdom - Europe					
Outside the United Kingdom – North America					
Outside the United Kingdom - Asia					
Outside the United Kingdom - Other					

18 In considering whether to move to North America, what factors make this more likely?
Please tick all that apply

Size of the market………………………...………………….……………...…………………	
Higher prices for drugs…….……….…...…………………………………………………………	
Availability of finance…………..……………………………………………………….…………	
Other (Please specify)………………………………………………………………………..	

YOUR NAME:

YOUR POSITION:

Telephone:

Email:

THANK YOU FOR FILLING IN THIS QUESTIONNAIRE

ANY QUESTIONS?

PLEASE TELEPHONE OR EMAIL US AT THE CENTRE FOR BUSINESS RESEARCH:

Giorgio Caselli	**01223 765340**	**gc568@cam.ac.uk**
Andy Cosh	**07719 742202**	**adc1@cam.ac.uk**

May we contact you again if we have further questions? | **Yes** | **No** |

PLEASE RETURN THE COMPLETED QUESTIONNAIRE TO ANDY COSH

adc1@cam.ac.uk

Centre for Business Research, 12 Trumpington Street, Cambridge. CB2 1AG