Development and growth of spinouts from MRC research

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Ipsos UK

Contents

1 Introduction

This paper sets out an overview of the investment and growth outcomes achieved by spinouts that have been linked to intellectual property developed with Medical Research Council (MRC) since 2008. The analysis is based secondary information compiled in relation to a database of spinouts maintained by MRC, assembled from records reported through the Researchfish platform and other sources (such as MRC annual reports).

1.1 Structure of this report

The analysis covers two periods:

- **Post-2008 spinouts:** Spinouts established after MRC introduced translationally targeted research funding in 2008. The MRC is thought to have close to comprehensive accounts of commercial entities that were established by universities and/or principal investigators from 2008 onwards, giving a close to complete account of the economic outcomes associated with spinouts established over this period.

- **Pre-2008 spinouts:** Records of spinouts associated with earlier research funding are less systematic and have been compiled from a variety of sources (including MRC annual reports). It is anticipated that records are likely to be skewed towards 'known successes.' As such, while the analysis is likely to understate the overall economic outcomes associated with this group of firms, direct comparisons cannot be drawn with the portfolio of spinouts that emerged from 2008 onwards.

2 Post-2008 spinouts

This section provides an overview of the investment and economic growth impacts associated with spinouts that are linked to intellectual property developed with Medical Research Council (MRC) grant funding since 2008.

The section also provides comparisons between the volume and value of spinouts emerging from research funded through two of MRC's translationally targeted research programmes (Developmental Pathway Funding Scheme and Impact Accelerator Account - formerly Confidence-in-Concept) and MRC's broader portfolio of research programmes. These schemes were introduced in 2008 and accounted for £577m of the £4.9bn in funding committed by the MRC between 2008 and 2023 (and 589 out of 5,513 awards made).

2.1 Methodology

The following analysis provides an assessment of the commercial development of spinouts associated with MRC funded research, bringing together:

- **Spinouts:** A database of spinouts primarily reported through the Researchfish platform attributed to research grants awarded by MRC since 2008 (and complemented by other sources of intelligence gathered by the MRC). The dataset included details of 341 companies established from 2008 onwards, of which 146 were linked to MRC's translationally targeted research funding and 195 to other MRC funded research. The dataset is thought to provide a close to comprehensive account of the external commercial entities that have been established by universities to exploit intellectual property developed through research supported by the MRC. MRC may not always be the sole funder of research that has contributed to the background IP upon which firms are based, implying that the investment outcomes reported below cannot be solely attributed to MRC.

- **PitchBook:** Details of these companies were then linked to the PitchBook data platform. PitchBook compiles and structures information on disclosed venture capital and private equity investments as well as exits (in the form of IPOs and mergers & acquisitions), drawing on information from regulatory filings, press releases, and websites. It was possible to link 206 of the 341 companies to the PitchBook data platform (60%) based on its name and other company details (with manual searches used to trace companies that had changed names). For the purposes of the analysis below, it was assumed that the 135 companies that were not linked to PitchBook did not raise any investment over the period. However, while PitchBook data is close to complete for significant fundraisings, there are gaps in coverage for smaller or undisclosed investments (such as those made by angel networks or if companies are operating in 'stealth mode'). As such, the following analysis may omit some smaller investments.

- **Nature of results:** The following analyses traces the development of the commercial entities established by universities to exploit the relevant intellectual property. This will not provide a complete view of the MRC's contribution to the economy owing to:

  - **Licensing:** In some cases, universities may opt to commercialise intellectual property by licensing the relevant IP to an existing commercial operator rather than by establishing a new external commercial vehicle. The economic impacts of these outcomes are not captured in the following analysis and can be significant. For example, Professor Amit Nathwani led the initial development of two gene therapy candidates for Haemophilia B through MRC funded research. The relevant IP associated with one of these was used to underpin the spinout Freeline Therapeutics that was established in 2015. The IP associated with the other candidate was licensed to the Dutch

biotechnology company uniQure for further preclinical and clinical development. The rights were ultimately acquired by CSL Behring in 2020 (resulting in Hemgenix becoming the first gene therapy for Haemophilia receiving market authorisation).

- **Acquisitions:** The costs associated with bringing novel healthcare technology products to market can require substantial volumes of capital that can only be provided by large companies. Some spinouts have been acquired by large pharmaceutical or healthcare technology companies with the intention of further developing assets (e.g. through costly Phase 3 clinical trials and market authorisation processes). While the following analyses identify where acquisitions have taken place, further investments in R&D and commercialisation by the acquiring company are difficult to separate from its broader portfolio of activities and are not included.

- **Company development:** As spinouts develop, they often expand their portfolio of candidates under investigation. In some cases, these will be directly connected to the intellectual property developed with support from MRC, and in other cases, there may be little connection (e.g. if a spinout acquires another firm to diversify its operations). The analysis below focuses on the development of the relevant companies and may capture the economic outcomes associated with some activities with little direct connection to the originating IP.

2.2 Firm characteristics

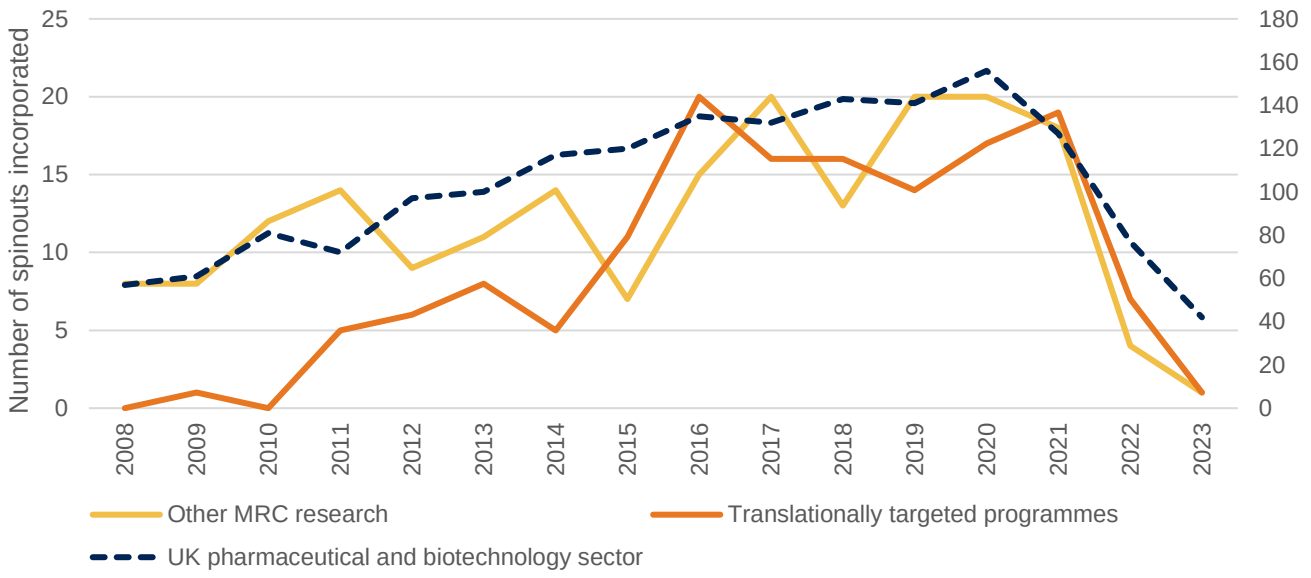
2.2.1 Year of incorporation

The number of spinouts established annually to exploit intellectual property developed with the support of MRC funding increased from 10 to 12 per annum between 2008 and 2011, stablishing at around 30 to 40 per annum between 2016 and 2021. As illustrated in the following figure, increased levels of interest in commercialising the outputs of MRC funded research was principally driven by dedicated translational research programmes introduced in 2008/09.

The drop in the number of spinouts reported from 2022 is partly driven by recording lags (and is not thought to reflect a drop in the productivity of MRC funded research). However, data from PitchBook indicates that the overall number of start-ups in the UK pharmaceuticals and biotechnology sector has fallen steadily since 2021 (suggesting that market conditions may have been challenging for the sector in recent years).

Data obtained from Companies House indicates that of the 341 companies established, 237 remained active in May 2024. The remainder had been dissolved, were dormant, or were in liquidation – and will include those companies that had failed to secure private investment to progress their R&D programmes (PitchBook records indicate that just nine companies that did secure external finance subsequently went out of business).

Figure 2.1: Number of spinouts by year of incorporation



Source: Researchfish, MRC, Companies House

2.3 Equity Investment

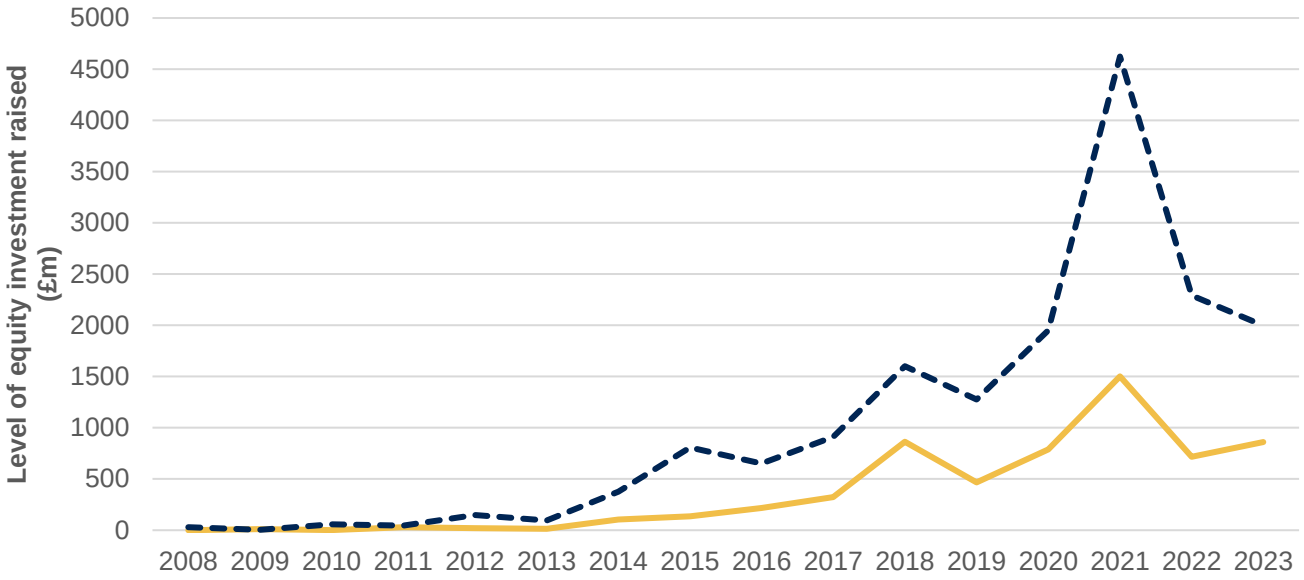
2.3.1 Total equity investment

Spinouts established to commercialise technologies linked to MRC funded research have proven effective in raising capital to support their ongoing activities. PitchBook records indicated that the group of companies had collectively secured £5.7bn in equity investment between 2008 and 2023, with 185 of the 341 spinouts established attracting some level of external capital investment (54%). As highlighted above, this does not capture any subsequent investment in the relevant technologies that may have occurred following any acquisitions of these companies by another entity (though investments prior to M&A transactions are captured).

Spinouts linked to MRC funded research accounted for around 34% of the total capital raised by start-ups in the wider UK pharmaceutical and biotechnology sector founded between 2008 and 2023 (which raised a total of £16.8bn over the period). It should be noted that some of the wider companies raising significant levels of external funding over this period (e.g. Immunocure and Adaptimmune) are also linked to MRC research that was funded prior to 2008 (which are outside of the scope of this paper).

As illustrated in the Figure 2.2, the bulk of funding was raised between 2017 and 2023 - with peaks in 2018 and 2021 driven by highly significant investments in a small number of companies. This volatility in investment levels is characteristic of the sector, and patterns in fundraising have mirrored broader trends across the UK pharmaceutical and biotechnology sector.

Figure 2.2: Equity investments in spinouts established to exploit healthcare technologies linked to MRC funded research, 2008 to 2023 (includes private investments and fundraising on public capital markets)



Source: Researchfish, MRC, PitchBook user defined query

2.3.2 Sources of funding

Spinouts were largely reliant on venture capital funds for funding:

- A total of £3.8bn in private investment was raised from venture capital funds and other private investments over almost 500 funding rounds.
- Around £1.3bn was raised from public capital markets via an Initial Public Offering (IPOs) or a secondary offering (2PO). Publicly traded companies also attracted a further £0.7bn in funding from privately placed investments.
- While public markets have helped some firms attract significant levels of capital, they have not frequently accessed this type of funding. Only 11 of the 341 companies in the portfolio floated on the stock market over the period. Nine of these floated on the NASDAQ (and only one on the London Stock Exchange), suggesting that the depth of capital markets in the UK may not be sufficient to support the large programmes of R&D and capital expenditure required to develop and commercialise advanced therapies.

Table 2.1: Equity investment raised by source of funding, 2008 and 2023

Source of investment	Capital raised (£m) between 2008 and 2023	Number of deals
Accelerator/Seed/Angel	298	200
Venture Capital	3,459	299
IPOs	879	11
2POs	453	5
Private investments in public equity (PIPE)	675	15

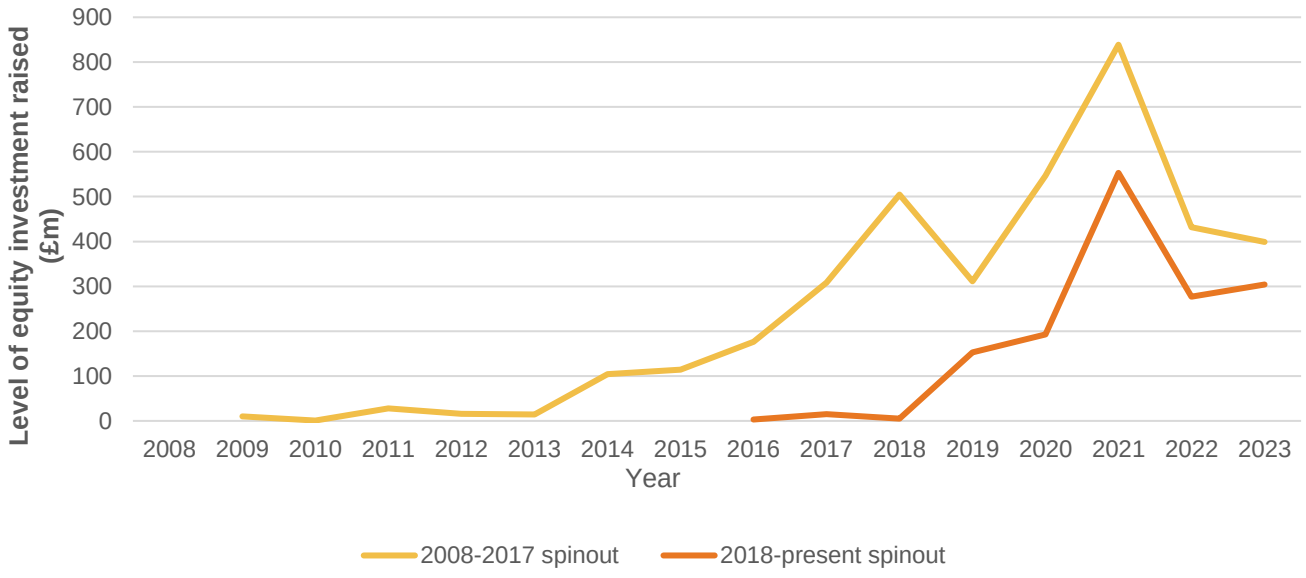
Source: Researchfish, MRC, PitchBook user defined query

2.3.3 Investment by cohort

This analysis updates a prior analysis which focused on investment in the cohort of spinouts established between 2008 and 2017 – by including later fundraising efforts by this group of firms, alongside investments in more recently established spinouts. The analysis indicated that:

- Spinouts associated with MRC research funded between 2008 and 2017 accounted for £4.3bn of the total amount raised. As illustrated in the following figure, this group of firms continued to raise significant amounts of external capital in the period between 2018 and 2023.
- The more recent group of spinouts associated with research funded between 2018 and 2023 had secured around £1.5bn of external equity investment at the end of 2023 and appeared to be developing at a similar rate to the prior cohort (noting that most firms in the prior cohort were incorporated between 2013 and 2017).

Figure 2.3: Equity investments in spinouts established to exploit healthcare technologies linked to MRC funded research, 2008 to 2023 (includes private investments and fundraising on public capital markets)



Source: Researchfish, MRC, PitchBook user defined query

2.3.4 Translational programmes and other MRC research

Spinouts associated with dedicated translational programmes tended to be more likely to raise external funding than those associated with other MRC funded research:

- Despite (on average) being established for a shorter period (based on the date of incorporation), 59% of spinouts linked to research funded through MRC's translationally targeted research attracted external equity investment between 2008 and 2023 (relative to 51% for those associated with other MRC funded research).

- Spinouts associated with research supported by dedicated translational programmes also raised higher levels of funding on average between 2008 and 2023 (£35.6m vs £27.3m).

- The findings indicate that MRC's translationally targeted research funding has been relatively efficient in leveraging private investment into the further development of the underlying technologies. Spinouts linked to MRC's translationally targeted research funding raised approximately £3.1bn of external equity investment between 2008 and 2023, relative to £577m in research funding committed. This would equate to a gross leverage ratio of £5.30 to £1 of MRC funding, though it should be noted that other public funders may have also contributed to the body of research underpinning the relevant companies.

Table 2.2: Comparison between spinouts linked to translationally targeted research and other MRC research

Measure	Translationally targeted research	Other MRC research
Number of spinouts	146	195
Number of spinouts securing external investment	86	99
% of spinouts securing external investment	59	51
Total amount of external investment raised between 2008 and 2023 (£m)	**3,060**	**2,705**
Average amount raised (£m) amongst spinouts securing external investment	35.6	27.3

Source: Researchfish, MRC, PitchBook user defined query

2.3.5 Notable companies

A large share of the total investment in the portfolio of spinouts linked to MRC funded research (both dedicated translational programmes and other MRC research) was accounted for by a relatively small number of companies. Twenty-two companies each attracted more than £50m in investment over the period and, in aggregate, accounted for £4.5bn in investment (i.e. 78% of the total raised). Details of the nine leading companies that attracted more than £150m in equity investment are set out in the following table:

- The companies attracting the highest levels of investment were all active in advanced therapies. This included companies seeking to develop and commercialise gene and cell therapies, as well as other types of novel therapeutics (e.g. peptide-based therapeutics).

- While MRC funding may have been instrumental in providing the basis for these spinouts, their commercial focus has developed with time and has become less directly connected to the outputs of studies directly funded by MRC. Many companies had diversified their portfolio of clinical development programmes by applying the platforms developed with MRC funding to new indications, acquiring intellectual property assets from other firms, or entering collaboration agreements with large pharmaceutical companies.

- Only one company had obtained market authorisation for one its candidates (Limbeldy – a gene therapy developed by Orchard Therapeutics) at the time of writing, though other companies were at advanced stages of clinical development (e.g. MeiraGTx and its gene therapy for X-linked RP).

- Although most companies had sought capital funding by launching their IPOs on the US based Nasdaq exchange, they maintained a significant UK presence (with only one company moving its HQ to the US). Analysis of company accounts indicates that these ten companies had created significant numbers of jobs (approximately 1,800, largely in the UK) – predominantly in research, manufacturing, and clinical occupations. Many companies had also developed manufacturing capabilities in the UK.

- Only one company had been acquired - Orchard Therapeutics – which was purchased by a large Japanese pharmaceuticals firm in early 2024 (and implications for UK operations are unclear at this stage).

- Some companies – particularly those active in cell and gene therapies that launched IPOs between 2015 and 2020 – had faced difficult market conditions between 2022 and 2024 as increasing interest rates across developed economies made modalities with a high-risk profile less attractive to investors. The share prices of many of these companies fell significantly during this period, forcing some to consolidate their clinical development programmes to preserve their cash ‘runways’.

- In some cases, the candidates developed with MRC funding have been paused or abandoned (despite positive clinical data) as they were aimed at low prevalence indications where the underlying economics were likely to be unattractive to health systems or where they had been outcompeted by another company.

Table 2.3: Details of spinouts raising more than £150m in equity investment

Company	Relevant MRC funded research	Development of the spinout
Autolus (£738m raised by end of 2023)	The MRC awarded Clinician Scientist Fellowship funding to researchers at UCL to undertake preclinical research to refine a chimeric T-cell receptor specific to the CD19 protein and engineer autologous T-cells into an effective therapy for Chronic Lymphocytic Leukemia (CLL). As well as refining this candidate CAR-T therapy, the funding also aimed to support testing in animal models and the preparatory work needed for Phase 1 clinical trials. The researchers involved also received a number of grants from BBSRC to support the development of the technology platform and preclinical research.	Autolus was founded in 2014 and has raised £1.2bn in external investment since it was established (including £430m in 2024 that is not captured in the figures above). The company was established to develop and commercialise the CAR-T platform developed with funding from MRC and other funders. Its lead candidate (obe-cel) reportedly met its primary endpoint in interim analysis of evidence gathered through Phase II trials announced in June 2023, though the company has developed a broad portfolio of product candidates for a variety of tumour types. The company was valued at £259m in May 2024. The company has developed a manufacturing footprint in the UK – it current produces investigational product operations

Company	Relevant MRC funded research	Development of the spinout
		at the Cell and Gene Therapy Manufacturing Centre in Stevenage but has also invested in a 70,000 square foot manufacturing facility nearby for future commercial supply (with capacity to produce 2,000 batches per year), with GMP operations expected to go live in late 2023. Its UK operations employed a total of 342 workers in 2022 (principally in R&D occupations).
Orchard Therapeutics (£640m raised)	The MRC funded researchers at UCL to take forward the development of a gene therapy for Adenosine Deaminase Deficiency (ADA) - that leads to severe immunodeficiency, with affected children unable to resist infection. Preclinical development of the technology - which involved the development of a lentiviral vector as a means of introducing a working copy of the ADA gene into patients - was funded through two Confidence-in-Concept awards in 2013 and 2014. DPFS funding was also used to support an early Phase I/II trial to establish its safety in humans and explore its effectiveness over a 10-year period.	Orchard Therapeutics was founded in 2015 to take forward clinical development programmes in ADA-SCID and MPS-IIIA. It has raised £699m in investment over eight funding rounds as it refocused its clinical development programme to metachromatic leukodystophy, mucopolysaccharidosis type I and Type IIIA, frontotemporal dementia and Crohn's disease. The company has globalised – opening sites in North America and in several European countries – and employed 139 staff in the UK in 2022. The firm's lentiviral gene therapy for early onset MLD was approved by the EMA in 2020 – based on clinical studies demonstrating a 100% survival rate for children receiving treatment (with a maximum follow-up of 8.7 years) relative to 37% amongst untreated children in a natural history cohort. The company has opened qualified treatment centres in Manchester, Paris, Utrecht, Tubingen, and Milan. The company reported revenues of $31.5m from sales of Limbeldy in 2022 and 2023 (Q3) – though with a reported price of $4.5m, this would suggest the number of children receiving treatment has been relatively limited to date. The company has also been able to diversify its revenues through a collaboration with Pharming, in which the latter acquired global rights to develop and commercialise Orchard Therapeutics' preclinical candidate for hereditary angioedema. Orchard Therapeutics will receive up to $189.5m in payments for development, regulatory, and sales milestones and will oversee the manufacturing of the product for clinical trials. The company was acquired in January 2024 by Kyowa Kirin for $477m[1].
Bicycle Therapeutics (£372m raised)	Bicycle Therapeutics emerged from research undertaken by the MRC Laboratory of Molecular Biology (LMB). Researchers conceived and developed a new class of	Bicycle Therapeutics was founded in 2009 to develop and commercialise a novel class of therapeutics based on bicyclic peptides. It launched an IPO in 2019 and raised a total of

[1] This deal data was not included in the analysis, as the deal period analysed was from January 2008 to December 2023

Company	Relevant MRC funded research	Development of the spinout
	therapeutics that combined the features of small molecule and antibody therapeutics by creating bicyclic peptides - short peptides wrapped around a small molecule kernel. Bicyclic peptides exhibit target specificity usually associated with antibodies, but in a small molecule arrangement so that it can be rapidly absorbed through the tissue. They also have an adjustable half-life, to optimise the amount of time it spends inside the body, limiting any toxicity.	£372m in external funding by the end of 2023 – and recently announced talks in relation to an additional £442m in development capital from a consortium of private investors. The company is taking forward four clinical development programmes aimed at providing treatments for cancer. Its leading candidate targeting Nectin-4 is currently in Phase II/III trials as a treatment for metastatic urothelial cancer, with other products targeting EphA2 and MT1-MMP in a range of cancers are currently in Phase I trials. The company also has a wide range of parallel candidates at preclinical stages of development. The company has entered into several collaboration agreements to take forward development and commercialisation – including with Cancer Research UK, Genentech, Bayer, Novartis, and DKFZ. These agreements generated revenues of $25m in 2023. The company was valued at £361m in May 2024, and employed 266 workers across its UK and US sites in 2023.
Freeline Therapeutics (£349m raised)	Researchers at UCL were awarded DPFS funding to undertake preclinical evaluation of a novel AAC vector that aimed to transfer a normal copy of the Factor VIII gene to patients with Haemophilia A (building on prior work to develop and test gene therapies for patients with Haemophilia B funded by the MRC prior to 2008). The study was funded to support preparations for clinical studies, including undertaking testing the safety and efficacy profile of the technology using clinical as opposed to research grade vectors. The researchers later obtained further DPFS funding to take forward a Phase I/II clinical trial of the technology to establish its safety and efficacy in humans.	The approach developed was considered transferable to other indications and Freeline Therapeutics was established in 2015 to take forward preclinical and clinical research into candidates for Haemophilia A and B, Gaucher Disease Type 1, and Fabry Disease. The company raised over £225m in venture capital funding over four funding rounds by June 2020 (with Syncona becoming a major investor in 2018), before launching an IPO in July 2020 (through which it raised a further £124m and placing the value of the company at £488m). The company also acquired a German manufacturing platform to produce AAV vectors in 2018. The company has faced headwinds more recently as competitors (uniQure and CSL Behring) were first to market with a gene therapy for Haemophilia B approved by the FDA in 2022. The company has been taken back into private ownership under Syncona, and has consolidated its focus on Gaucher Disease and disposed of its German subsidiary to help manage cashflow issues. The company employed 250 workers in 2023 although this is expected to fall in light of the above.
Achilles Therapeutics (£297m raised)	The MRC funded researchers at Cancer Research UK to explore the relationship between mutations in the DNA of breast and colorectal cancer cells as they evolve and resistance to cancer drugs, as a means of identifying new targets for cancer therapies that are less able to acquire resistance.	Achilles Therapeutics was founded in 2016 to take forward precision T-cell therapies targeting clonal cancer neoantigens. It has two programmes currently in Phase I/II trials – aimed at non-small cell lung cancer and recurrent and metastatic melanoma. The company attracted £170m in VC funding over

Company	Relevant MRC funded research	Development of the spinout
		four funding rounds by late 2020 and launched an IPO in 2021 in which it raised a further £127m (valuing the company at £527m). However, the company subsequently saw its market capitalisation fall to £38m in 2023 and 2024. The company employed 223 workers in the UK in 2023.
Barinthus Biotherapeutics (£236m)	The MRC provided a series of funding awards to researchers at Oxford University through the CIC and DPFS programmes to develop and trial a AAV vectored vaccine based on an inactivated chimpanzee virus (ChAdOx-1 and ChAdOx-2). This technology was used to develop a variety of vaccines for infectious diseases – including malaria and influenza – and was later used as the basis for vaccines against MERS and COVID-19 (i.e. the Oxford/AZ COVID-19 vaccine).	Barinthus was established in 2014 under the name Vaccitech to develop and commercialise the vaccine delivery platform for therapeutic purposes. The company raised a total of £157m in venture capital funding over four rounds by 2021, prior to launching an IPO in April 2021 (raising an additional £80m and valuing the company £418m). The company has a wide-ranging clinical development programme based on its proprietary vaccine delivery platforms. These typically use the ChAdOx vector for the primary dose, with a booster using a Modified Vaccinia virus Ankara (MRA) platform. The company also diversified by acquiring the US based Avidea Technologies, giving the company an additional synthetic vaccine delivery platform (SNAPvax). The company has six candidates in Phase I or Phase II trials, involving therapies for chronic hepatitis B, persistent human papillomavirus, prostate cancer, NSCLC, MERS, and Zoster. The company was also involved in the development and distribution of the Oxford/AZ COVID-19 vaccine through a partnership with AstraZeneca and Oxford University in 2020. The company received a $2.4m upfront payment in July 2020 and was entitled to a 1.4% royalty on sales of the vaccine through to July 2021 (which led to revenues of $43.7m that were recognised in 2022). Barinthus Biotherapeutics now operates from locations in the UK, US, Australia, Italy and Switzerland and has 123 employees (89 of which are based in the UK).
Pepgen (£205m raised)	Oxford University used Confidence-in-Concept funding to support groundwork in developing a novel delivery platform for oligonucleotide-based therapeutics for neuromuscular diseases. This funding was used to deliver preclinical studies demonstrating that the technology enhances oligonucleotide delivery to heart and skeletal muscles.	PepGen was established in 2018 and has raised £275m in external equity investment (including £63m from a 2PO in early 2024 that is not captured in the figures above). The company has two candidates in clinical development stages – aiming to halt disease progression in Duchenne muscular dystrophy and myotonic dystrophy type 1. PepGen was incorporated in the US following its Series A financing in 2020 (with the UK remaining as the key research hub). The company's latest filings with the SEC show that the company employed 64 employees in

Company	Relevant MRC funded research	Development of the spinout
		December 2023 (although it is unclear how far these were located in the UK).
QuellTx (£196m raised)	The MRC has funded a wide-ranging programme of work by researchers at King's College London to address the need for long-term immune system repression in patients receiving organ transplants to prevent rejection. This has included a wide variety of research into the role of regulatory T-cells in regulating autoimmune responses and genetically modifying patient cells to recognise proteins in viruses, with the goal of allowing patients receiving transplants to continue living without the need for immune-repressive drugs that often come with severe side effects.	Quell Therapeutics was founded in 2019 to develop and commercialise Treg cells that have been genetically enhanced to control unwanted immune system activity. The company has raised £193m in private funding three funding rounds, with the most recent placing the value of the company at £232m in 2023. It's core programme in liver transplant patients is currently at preclinical stages. The company also announced a collaboration with AstraZeneca in June 2023 to develop and manufacture autogolous Treg cell therapies for Type 1 Diabetes and Inflammatory Bowel Disease (for which it was due to receive upfront payments of $85m and eligible to receive over $2bn in payments linked to further development and commercialisation milestones). The company employed 119 staff – principally in R&D occupations - at the end of December 2022.
MeiraGTx (£189m raised)	The Medical Research Council funded researchers at UCL to undertake a series of studies to develop gene therapies for hereditary retinal disease and degeneration, including preclinical research to develop an AAV vector for the treatment of retinal dystrophy caused by RPE65 deficiency, and clinical trials of gene therapies to treat Achromatopsia and Leber Congenital Amaurosis.	The resultant intellectual property was used as a basis for spinout (originally named Athena Vision in 2014) aiming to develop and commercialise ocular gene therapies based on the foundational research completed by UCL researchers. The company was subsequently merged with a New York based gene therapy developer to create MeiraGTx with a portfolio of gene therapy candidates addressing a wide range of rare genetic diseases. The company has raised almost £200m in external equity investment and was valued at £242m in May 2022. The company entered into a collaboration agreement with Jansen in 2019 to develop its leading ocular therapies for X-linked Retinitis Pigentosa and Achromatopsia (as well as collaboration in the preclinical development of therapies for other inherited retinal diseases). The company received an upfront payment of $100m to progress these activities, with Jansen funding the costs of development and commercialisation under the agreement. The company may receive further payments of up to $340m contingent on the achievement of clinical and sales milestones, as well as royalties of 20% on product sales. In February 2024, MeiraGTx announced that the extension of a Phase III trial for its XLRP candidate triggered a further $50m payment and resulted in the assets being transferred to Jansen. The company has developed a manufacturing footprint in London (with a 29,000 square foot facility with sufficient capacity to supply all its clinical trials) and a more recently completed 150,000 square foot

Company	Relevant MRC funded research	Development of the spinout
		facility in Shannon (Ireland) to increase its capacity for commercial supply. The company employed 206 workers in December 2022 – including 20 research staff, 19 clinical staff, and 149 manufacturing employees.

Source: Researchfish, MRC, PitchBook user defined query.

2.3.6 Investors

The spinouts attributed to MRC funded research attracted capital from 606 different investors in private funding rounds that made a total of 1,615 investments. Twelve investors made fifteen or more investments in the spinouts attributed to MRC funded research, as set out in the table below (note that this does not cover investments in publicly traded companies).

Table 2.4: Most active investors

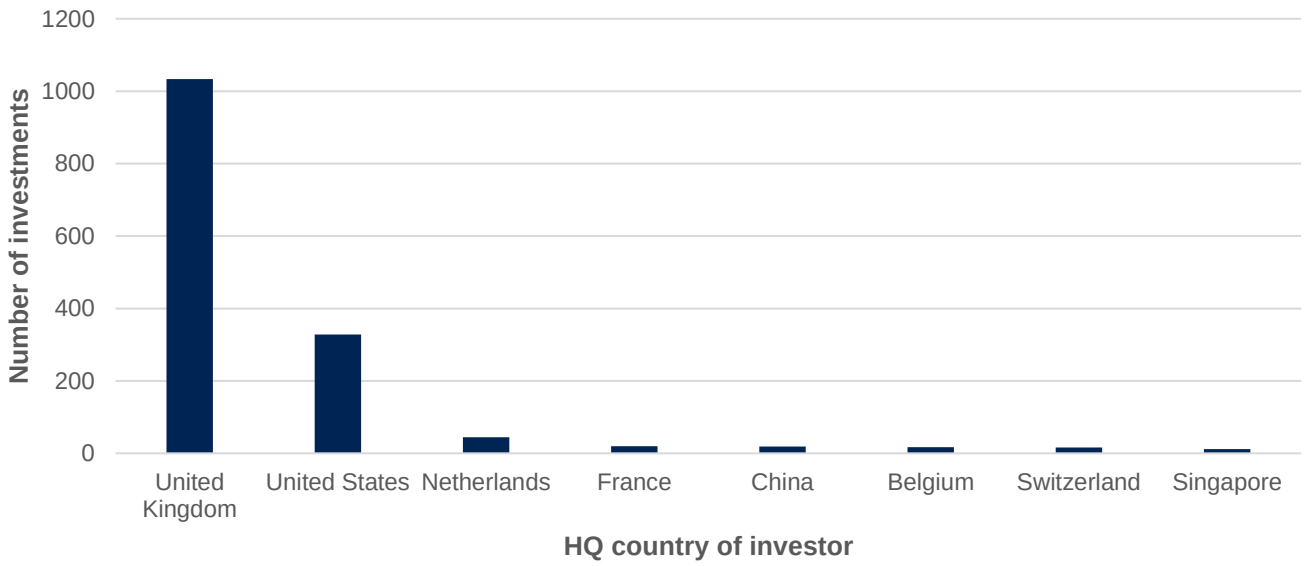
Investor	Description	No. of investments in spin-outs attributed to MRC research
Scottish Enterprise	Founded in 1991, Scottish Enterprise is a venture capital investment firm based in Glasgow, United Kingdom. The firm prefers to invest in food and drink, creative industries, financial services, business services, enabling technologies, renewable energy, energy, healthcare, med-tech, biotech, pharmaceuticals, biopharma, consumer, and manufacturing sectors.	45
Oxford Science Enterprises	Founded in 2014, Oxford Science Enterprises is a venture capital firm based in Oxford, United Kingdom. The firm only invests in companies operating in life sciences, health tech, and deep tech sectors.	41
Parkwalk Advisors	Founded in 2009, Parkwalk Advisors is a venture capital firm based in London, United Kingdom. The firm prefers to invest in early and growth-stage companies operating in the artificial intelligence, big data, life science, materials, cleantech, future of mobility, medtech and quantum computing sectors across United Kingdom or UK deep tech university and research centre spinouts.	31
Future Planet Capital	Founded in 2015, Future Planet Capital is a venture capital firm based in London, United Kingdom. The firm uses a multi-stage approach to provide growth finance to companies operating in the technologies, Climate Change, Education, Health, Sustainable Growth & Security, and life-science sectors.	25
Syncona	Founded in 2012, Syncona is a venture capital investment firm based in London, United Kingdom. The firm seeks to invest in the healthcare and life science sectors.	25
IP Group	Founded in 2001, IP Group is a venture capital investment firm based in London, United Kingdom. The firm seeks to invest in the clean technology, life sciences, and deep technology sectors.	24
SV Health Investors	Founded in 1993, SV Health Investors is a venture capital firm based in Boston, Massachusetts. The firm prefers to invest in biotechnology, healthcare services, dementia, medical technology, healthcare sectors and public equities.	21
Cambridge Enterprise	Founded in 2006, Cambridge Enterprise is a corporate venture capital firm based in Cambridge, United Kingdom. The firm prefers to invest in the life science and medical technology sectors.	21

Investor	Description	No. of investments in spin-outs attributed to MRC research
UK Innovation & Science Seed Fund	Founded in 2002, UK Innovation & Science Seed Fund is a venture capital investment firm based in Birmingham, United Kingdom. The firm prefers investing in healthcare, information technology, life sciences, advanced manufacturing, software as a service, and ag tech sectors in the United Kingdom.	17

- Other notable investors included Oxford Spinout Equity Management and UCL Business. This highlights the important role of institutions with locally or sector specific objectives (including those attached to or working in partnership with universities) in capitalising spinouts. Oxford Sciences Innovation, Cambridge Enterprise, and UCL Business all have objectives to capitalise spinouts emerging from the research undertaken within the university.

- The majority (by number of investments made) of investors in spinouts attributed to MRC research were based in the United Kingdom (64%). 20% of investors were based in the United States. As the chart below shows, there were relatively few investments from Asia and the Middle East.

Figure 2.4: Geographic distribution of investors in spin-outs attributable to MRC research



Source: Researchfish, MRC, PitchBook user defined query.

2.3.7 Valuations

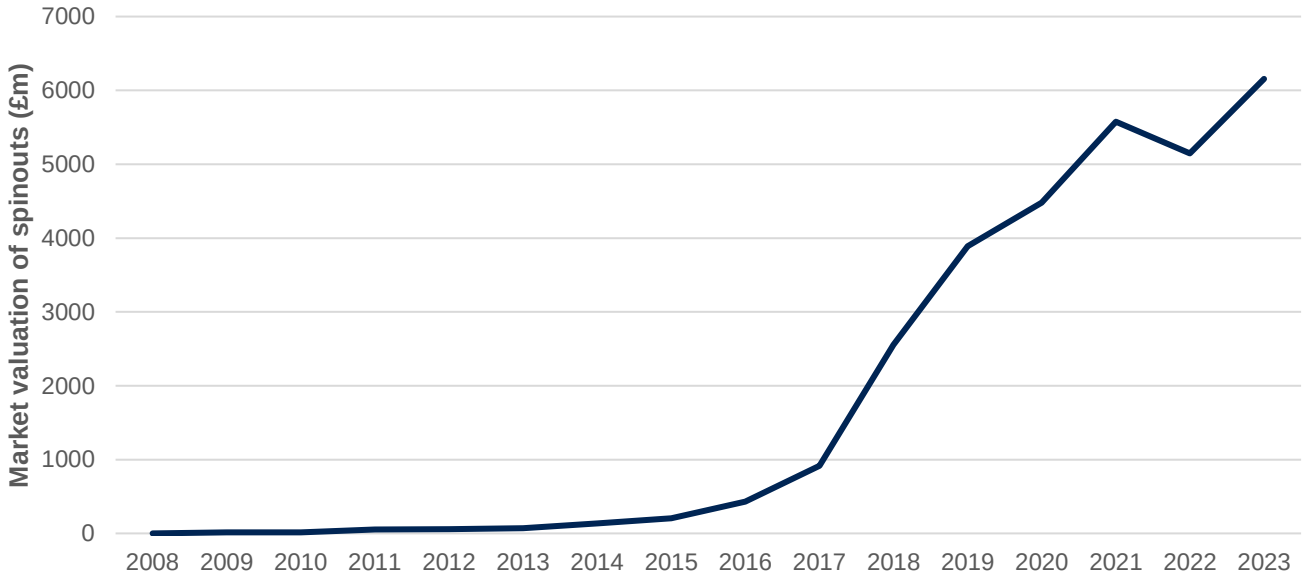
The economic value of the portfolio can be approximated based on the valuation of each firm. This provides a market-based signal of investors' risk weighted expectations in relation to future profits (which accounts for the current expectations in relation to likely future technical and commercial success but omits other important economic benefits – such as increases in incomes for workers that might be associated with the future growth of the relevant firms).

Estimates of the total value of the portfolio of spinouts linked to MRC funded research have been assembled by combining (a) post-money valuations of companies receiving private investments (which is assumed to be remain constant until another investment is placed), (b) the enterprise value of companies that are publicly traded (which is observed continuously), and (c) the realised value of companies that were acquired (which is again assumed to remain constant post-acquisition). This will understate the value

of the portfolio as it assumes that the value of companies that have not attracted private investment is zero and may be misleading when estimates of a firm's value is based on transactions that have taken place in the past (as additional development activities taking place may have enhanced or reduced the value of the company in the intervening period).

Under this approach, the value of spinouts linked to MRC research between 2008 and 2023 was estimated at £6.1bn at the end of 2023. The value of the portfolio rose steadily between 2008 and 2023, with a brief drop in value in 2022 – which is linked to wider market conditions (including rising interest rates in response to inflationary conditions). A large share of the value in the portfolio was generated by the leading companies highlighted in the preceding section and the companies subject to significant acquisition deals highlighted in the following sections.

Figure 2.5: Estimated (post-money) valuation of spinouts linked to MRC research, 2008 to 2023



Source: Researchfish, MRC, PitchBook user defined query.

2.3.8 Mergers and acquisitions

A total of 24 spinouts were acquired by another company (typically large pharmaceutical companies) between 2008 and 2023 (note that this will exclude the acquisition of Orchard Therapeutics described above). These transactions generated a total value of £1.6bn, although much of the value was driven by three major deals (with a total value of £1.3bn).

Table 2.5: Details of key M&A deals

Company	Background	Details of acquisition
NightstaRx	NightstaRx was founded in 2013 to develop and commercialise a portfolio of ocular gene therapies developed by researchers at the University of Oxford (with the support of MRC funding). Its lead candidates included treatments for choroideremia and X-linked retinitis pigmentosa, as well as programmes	NightstaRx was acquired by Biogen for £664m to take forward clinical trials for its lead candidates. However, late-stage trials of both leading candidates did not demonstrate the effectiveness of the treatments in improving visual acuity – leading to an abandonment of the technologies.

Company	Background	Details of acquisition
	in preclinical development for Stargardt disease.	
MiroBio	MiroBio was founded in 2018 to develop a new class of therapeutic agents (checkpoint agonist antibodies) to restore immune balance in autoimmune patients – based on foundational research by researchers at Oxford University. The companies leading candidate was a selective agonist of immune inhibitory receptor B- and T-Lymphocyte Attenuator – which targets T, B and dendritic cells to inhibit or blunt activation and suppress an inflammatory immune response. MiroBio also developed a proprietary discovery platform and antibody engineering techniques.	MiroBio was acquired by Gilead for £356m in 2022. Gilead is taking forward two programmes acquired through the deal which are currently in Phase 1 trials (BTLA agonist – GS-0272, and PD1-agonist – GS-0151). No updates have been disclosed on the results of these studies.
Adrestia Therapeutics	Adrestia Therapeutics was founded in 2017 to develop novel therapeutics designed to restore the biological balance in damaged, diseased, or dying cells – drawing on background research by researchers at Cambridge University to identify new therapeutic strategies to reverse shape defects in progeric and dystrophic cells. The company's platform identifies targets for genetic diseases that suppress or over-ride the harmful pathways and keep cells healthy by modulating a related pathway, enabling physicians to re-establish normality within the cells of patients to ensure their health and proper functioning. It was initially capitalised by Ahren Innovation Capital and GSK (raising £7.3m).	Adrestia Therapeutics was acquired by Insmed in June 2023 for £315.9m (with the value contingent on the achievement of clinical and commercial milestones). The company is now known as Insmed Innovation and will use the funding to continue the development of its synthetic rescue platform.

2.3.9 Other revenue generating companies

Most spinouts linked to MRC funded research were seeking to develop new therapeutics – a high-risk process that requires significant volumes of capital to bring a product to market (and many of these companies may not generate revenues before being acquired by a larger pharmaceutical firm). However, there were also a number of revenue generating spinouts that have made significant economic contributions by commercialising diagnostic services and products linked to MRC funding or research. The following table draws out details of three firms that have grown their annual revenues to more than £5m per annum by 2023.

Table 2.6: Other revenue generating companies linked to MRC research

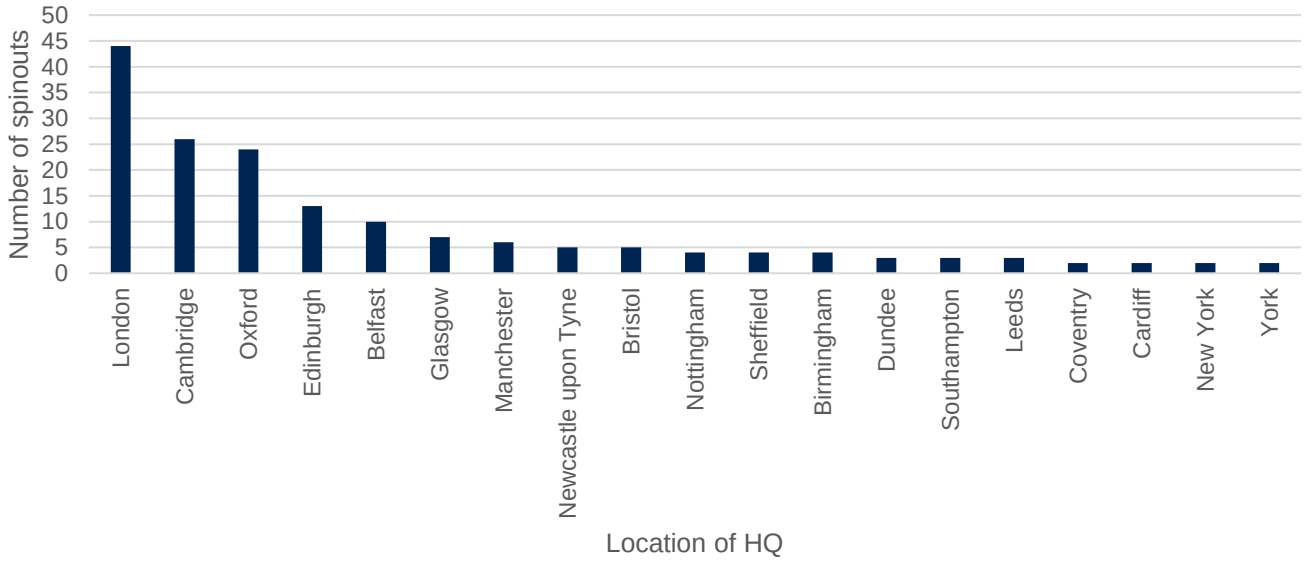
Company	Background
Imanova	Imanova was formed as a joint venture between MRC, King's College London, UCL, and Imperial College in 2011 and provides a range of imaging services for commercial clients engaged in drug discovery. The company was acquired by Invicro in 2017 for an undisclosed sum and grew its annual revenues to £18m in 2023 while employing almost 100 employees in London.
Perspectum	Perspectum is a developer of digital healthcare technologies designed to offer safe, non-invasive alternatives to traditional abdominal testing methods. The company attracted £130m in venture capital investment by 2023, and has launched a commercialised a range of products including Liver Multiscan (a noninvasive MRI scan for signs of liver disease), MRCP+ (a non-invasive tool for visualisation of the biliary tree and pancreatic duct), CoverScan (an

Company	Background
	imaging solution for the assessment of multi-organ tissue characteristics), and Hepatica (a platform for improving the accuracy of liver health and volume). The company was founded in 2012 to exploit findings by University of Oxford researchers that showed the potential of multiparametric MRI to assess patients with liver disease. The companies' revenues grew to £19m per annum by 2023 (of which over £13m represented exports), and it employed 228 workers (136 in R&D occupations and the remainder in sales and management) – with offices in Oxford, Singapore, Dallas, Boston, and San Francisco.
NorthWest eHealth	North West eHealth was founded in Manchester in 2008 to exploit the availability of electronic health records from consenting patients to support the design and delivery of clinical trials. The company offers a range of services – including the feasibility of clinical trials, trial design, data analysis, and real-time monitoring of trials, as well as two platforms – FARSITE (allowing companies to search 3.3m anonymised patient records to improve the efficiency of trial recruitment) and ConneXon (a system built to accelerate trials while increasing patient safety). The firm's revenues had grown to £6.6m per annum by 2022 and employed 94 workers.

2.4 Geographical distribution

Spinouts established were largely concentrated in 'golden triangle' locations – London, Cambridge, and Oxford. Amongst those that were linked to PitchBook, 46% had a headquarter location in these three cities (with a further cluster in Edinburgh). The remainder were distributed across a wide range of urban areas across the UK (with only three moving their HQ location overseas at some point following their initial incorporation).

Figure 2.6: Headquarter location of spinouts linked to MRC research established between 2008 and 2023



Source: Researchfish, MRC, Companies House

3 Pre-2008 spinouts

This section provides an assessment of the longer term commercial and economic impacts associated with spinouts that emerged from MRC funded research prior to 2008 (i.e. prior to the introduction of dedicated translational research programmes).

Given the long development cycles associated with the commercialisation of medical products (particularly new therapeutics), the aim of this section is to highlight the types and scale of economic impacts that can be anticipated from research investments in fundamental biology and translational research in the long run. While the previous section focused principally on the levels of investment attracted by spinouts founded to exploit findings emerging from MRC funded research post-2008, this section places greater emphasis on 'final' outcomes and the commercialisation of the underlying IP assets.

3.1 Methodology and approach

The following approach was adopted to generate the evidence set out in this paper:

- **Sample of spinouts:** A sample of 91 spinouts that were connected to research funded by the MRC was provided for the purposes of the exercise. This sample was based on records that were compiled prior to the introduction of systematic record keeping of the commercialisation of research findings emerging from MRC funded research in 2008. The sample provided is not considered to provide a comprehensive account of the total population of commercial entities established to develop and commercialise intellectual property emerging from MRC funded research prior to 2008. Owing to the mechanisms through which records have been compiled, including MRC's direct involvement in company formation, shareholding or featuring in Annual Reports, it is also anticipated that the sample of firms are skewed towards known 'successes.' As a consequence:
  - The following analysis, despite a skew for success, is still likely to understate the total economic contribution of spinouts founded based on findings resulting from MRC research prior to 2008.
  - It is not possible to draw direct comparisons with the analysis set out in the preceding section (e.g. in terms of success rates or the overall 'quality' of the portfolio of companies involved).
- **Exclusions:** Eleven companies were removed from this original sample for the following reasons:
  - **Non-existent companies:** Two companies (Iclectus and Metris Therapeutics) were removed because there was no longer any record of the entity being registered with Companies House.
  - **Duplicate entries:** Some spinouts evolved complex structures involving several legal entities. Four companies were removed from the sample because they represented subsidiaries or holding companies of other firms in the sample and would therefore be double-counted if retained.
  - **Out of scope organisations:** On further investigation, five organisations were deemed to be out of scope of the exercise because the entities involved were not directly involved in the development of medical products or provision of relevant services. This included two investors (LifeArc and MVM), one charitable company (MEND), a spinout from a corporate entity (SPT LabTech) and one non-commercial entity (UK Biobank). There was also one 'off target' company – Promethean Particles – a manufacturer of nanoparticles for carbon capture applications that span out of the University of Nottingham. This company was retained in the analysis.

- **Additions:** One company – Argenta Discovery – was demerged to facilitate the sale of separate parts of the business (Argenta Discovery 2009, Pulmagen Therapeutics (Asthma) and Pulmagen Therapeutics (Synergy)). As each entity was associated with different final outcomes, three additional records were added to the sample.

- **TOTAL:** A final sample of 83 spinouts attributed to MRC research was used in this analysis.

- **Annual filings with Companies House:** The first stage of the review involved examination of annual filings with Companies House to:

  - Establish the corporate history of each spinout – including both changes in names and changes in ownership. Many spinouts were subject to acquisition over the period in question. In some cases, the legal entity continued to survive (e.g. as a subsidiary to the acquiring company) and could continue to be tracked, though in others the relevant assets were transferred to another company (making it more difficult to trace progress made in relation to the underlying intellectual property).

  - Capture key measures of economic impact – including annual sales volumes (where applicable) and employment levels (noting that some companies did not meet the relevant size thresholds to require them to report their turnover and employment levels.

  - Review annual strategic reports prepared by directors as part of their annual filings. This was used to (a) identify the portfolio of IP assets being developed by companies, (b) the progression of those assets through the clinical development pathway, (c) sales of products that had been commercialised (where applicable), and (d) other important commercial events (including as in-licensing or out-licensing of IP assets, shifts in commercial strategy, and details of mergers and acquisitions).

- **PitchBook:** PitchBook profiles were interrogated to establish investment outcomes (in line with the approach adopted for post-2008 spinouts). However, it should be noted that many spinouts predated the creation of the PitchBook data platforms and records of deals were often incomplete (with missing deal values in many cases). As such, it should be noted estimates of the total investment raised by the portfolio of companies are understated in the figures below.

- **Supplementary IP tracing:** The above analysis indicated that the ownership of IP assets being developed by spinouts was often transferred to other companies as a result of acquisition deals or licensing agreements. As a consequence, it was not always possible to determine the outcomes of interest by exploring the history of the relevant spinouts. In these cases, a variety of supplementary online searches were undertaken to establish any further development and commercialisation of the IP assets by other parties. This involved (a) examination of annual reports of acquiring parties, (b) examination of clinical trial registries, (c) and supplementary online searches for news reports in relation to the relevant product or compound.

- **Classification of outcomes:** An objective set of criteria was developed and applied to classify the degree of success achieved in each case. These criteria are described in more detail in Section 3.3.

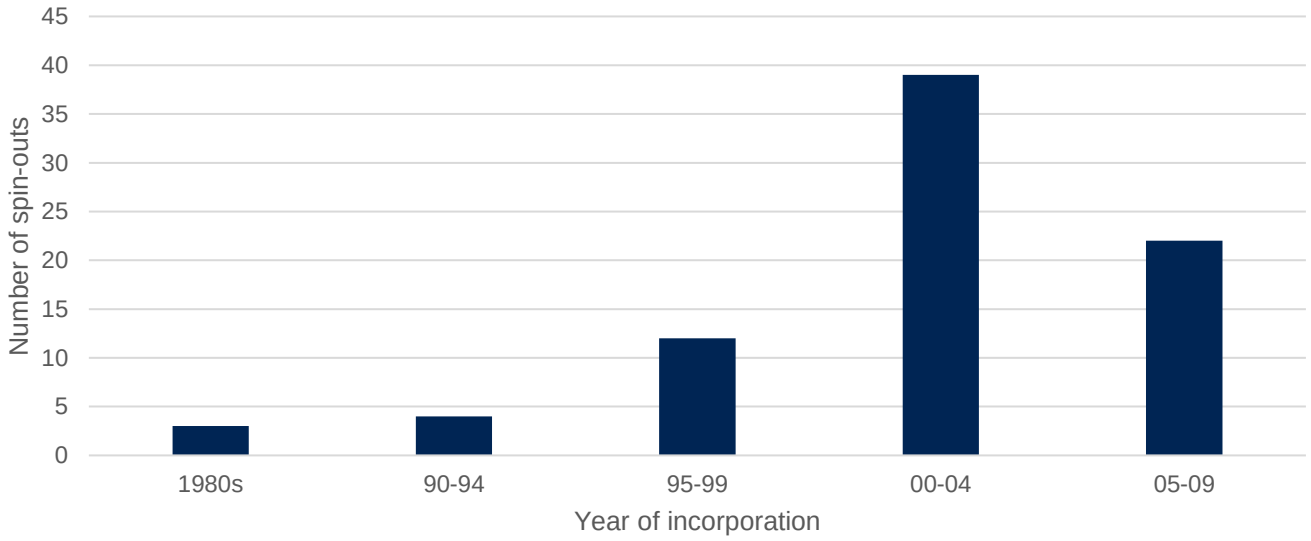
3.2 Characteristics of spinouts

The analysis revealed the following key features of the portfolio of companies:

- **Date of incorporation:** The distribution of the sample of spinouts in terms of year of incorporation is set out in the following chart. Owing to the selective nature of the sample (and the absence of electronic records pre-2000), this should not be interpreted as a measure of the productivity of MRC funded research but gives an indication of the broader economic context in which firms developed. Almost half of the spinouts (39 of 83) were established between 2000 and 2004, with a further 19 established between 1980 and 1999. As such, most firms were founded – and were seeking investment in – a very different investment landscape relative to those founded after 2008. Firstly, many firms will have faced significant difficulties in raising risk finance in the aftermath of either or both the 'dot.com' crash in 2001 and the more significant global financial crisis of 2008 (which led to a significant retrenchment in the availability of VC funding for a significant period).

  Additionally, the R&D model of large pharmaceutical companies has evolved since the 1990s and 2000s in response to declining R&D productivity – with an increasing emphasis on externalising early-stage drug development to smaller, specialised, biotechnology firms that are thought to be more efficient in delivering new products (with large pharmaceutical companies increasing their focus on commercialisation, manufacturing and distribution, alongside two or three core therapeutic areas).[2] Many large pharmaceutical firms subsequently established corporate venture capital arms to provide equity investment to these firms, creating a greater diversity of sources of private investment for spinouts established in the post-2008 period relative to the cohort of firms covered by this analysis.[3]

Figure 3.1: Year of incorporation of the sample of spinout firms attributed to MRC research pre-2008



Source: MRC monitoring information, Companies House, Ipsos analysis

- **Sector:** Almost half of the firms in the sample (40 of 83) were predominantly focused on drug discovery. Thirteen focused on the development of digital health products, medical devices, or other

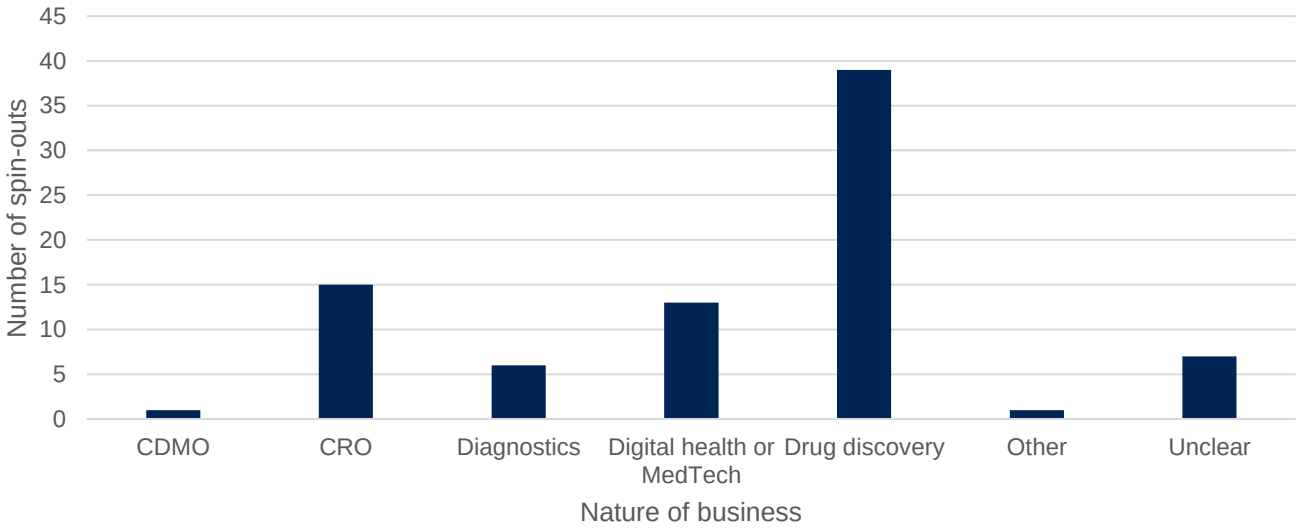
[2] E.g. EY (2019) Externalising pharma innovation is the winning strategy – now more than ever (https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/life-sciences/life-sciences-pdfs/ey-external-innovation-paper.pdf?download#:~:text=In%20the%202019%20EY%20M%26A,be%20the%20case%20in%202019)

[3] See ABPI (2017) The rise of Corporate Venture Capital investment in UK biotech (https://www.abpi.org.uk/media/bxhfxuwc/the-rise-of-corporate-venture-capital-investment-in-uk-biotech.pdf)

medical technologies for therapeutic purposes, and another six were focused on the development of novel diagnostics (devices or biomarkers/assays). In contrast to the portfolio of post-2008 spinouts, the portfolio also included several contract development and manufacturing organisations (CDMO) and contract research organisations (CRO) providing manufacturing and research services (e.g. imaging services) to the pharmaceutical sector.

The prevalence of these service companies partly was driven by MRC Technology that was involved in the effective 'privatisation' of capabilities that had been built up in research institutions (e.g. Hammersmith Imanet). However, it is also notable that some spinouts – to help raise revenues to fund R&D activity – pursued 'hybrid' business models in which they combined a focus on drug development with the provision of CRO or CDMO services to the broader market. It is clear from strategic reports that some businesses found managing the competing demands of this dual business model challenging. For example, Therexys (later Cobra Biotherapeutics) was initially established by MRC National Institute of Medical Research with the ambition of becoming the 'world's first gene therapy company' but also offered its viral vector manufacturing capabilities to wider market to generate operating revenues. The company eventually pivoted to focus on the provision of these CDMO services – becoming Cobra Biologics (and eventually a key part of the supply chain involved in the production of investigational product for the Oxford/AstraZeneca COVID-19 vaccine). The adoption of these types of dual business model may also be symptomatic of the more challenging investment landscape apparently experienced by many companies in the 1990s and 2000s.

Figure 3.2: Sector distribution of sample of spinouts attributed to MRC research pre-2008



Source: MRC monitoring information, Companies House, Ipsos analysis

- **Stage of development:** It is challenging to provide robust information on the developmental stage at which firms were founded to commercialise findings and intellectual property emerging from MRC funded research. However, it was clear from some annual strategic reports that some spinouts had been formed at early preclinical stages and prior to any in-vivo testing (e.g. Therexys was founded on the basis of research that showed its technologies could control the expression of genes in cells but without specific candidates or targets). In some cases, the firms concerned sought to in-license compounds from other companies (including large pharmaceutical companies) to diversify their asset base with candidates at more advanced stages. This again contrasts to some degree with the

portfolio of spinouts emerging post-2008 which had in many cases benefited from funding through MRC's dedicated translational research programme – allowing researchers to progress the development of the relevant assets further prior to the formation of an external commercial vehicle (in some cases as far as early clinical trials).

3.3 Overview of outcomes

The following table provides the distribution of outcomes associated with the 82 spinouts traced through this exercise (including descriptions of the objective criteria applied to provide an assessment of the overall level of success – included commercial success of firms that acquired the relevant assets). The findings of this analysis indicated that:

- **Successful commercialisation:** A total of 23 companies (27% of cases) had commercialised a product or service and were generating revenues in 2022/23. The total amount of revenue generated by these companies (as reported in their most recent account filings) was £2.9bn:
  - Most of this revenue (£2.7bn) was attributable to four companies that had achieved more than £50m in revenues (or otherwise attracted highly significant levels of equity investment). Three of these firms were involved in the development of advanced therapies and further detail on these outcomes is provided below. It should be noted that this does not include revenues earned by Abbott on sales of Humira (licensed from Cambridge Antibody Technology).
  - The remaining 19 had achieved more modest levels of commercial success, with average revenues of £15m in 2022/23. Most of these firms provided CRO or CDMO services. However, there were also several examples of firms successfully commercialising digital health products (e.g. Cambridge Cognition) and diagnostic devices and assays (ArraDx and Xstrahl). Only one of these firms (the US based Cara Therapeutics) commercialised a new therapeutic, which brought the Korsuva treatment for pruritus to market in 2022 (based on drug screening technology licensed from Glasgow University) and earning $8.3m in revenues.
- **Undetermined outcomes:** An outcome could not be determined for 28 companies (34% of cases). In the main, this was because, despite the passage of time, the underlying assets remained under development, and it is too early to assess whether the innovations will eventually be commercialised. This group includes several businesses that have attracted significant amounts of capital to fund their activities and would otherwise be considered examples of success. Examples include Heptares Therapeutics – a firm developing a pipeline of G protein-coupled receptor targeting drugs that was acquired by Sosei in 2015 for $180m whose leading candidate remains at preclinical stages and Synairgen, a spinout from the University of Southampton that has raised £120m in investment and whose leading candidate (inhaled IFN-Beta in COPD patients) progressed to a Phase III trial in 2020. It was also not possible to obtain a definitive outcome in some cases where IP assets had been transferred to other entities.
- **Commercialisation Failures:** Thirty-two companies were classified as 'failures' (around 39% of cases):
  - These were largely firms that ceased trading because they were unable to raise any significant private funding or exhausted their cash reserves and were forced to liquidate (e.g. Absynth Biologics). There was some evidence that this group of firms were adversely affected by the challenging fundraising conditions following the 2008 financial crisis.

- In 10 cases (12%), the underlying IP asset was abandoned. While this was largely because the IP asset was assessed to be unsafe or ineffective in trials, in some cases decisions to abandon development were made by large pharmaceutical or other firms that had been acting as a collaborating partner. Examples include Pentraxin Therapeutics that entered into a collaboration agreement with GSK to develop a treatment for amyloidosis that was terminated (despite positive trial results) when GSK elected to divest from the disease area in 2018. Novocellus – a developer of technologies for infertility treatment – was also dependent on a partnership agreement with ORIGIO that was terminated when it was bought out by Cooper Companies and withdrew from the partnership in 2016.

Table 3.1: Distribution of outcomes – spinouts attributed to MRC research pre-2008

Outcome	Description	Number of cases	% of cases
Significant success	Company has commercialised a product or service and was generating significant levels of revenue (>£50m per annum) in 2022/23 or has attracting highly significant levels of equity investment (>£200m)	4	4%
Moderate success	Company has commercialised a product or service and was generating modest levels of revenue in 2022/23 (< £50m per annum)	19	23%
Undetermined – IP cannot be traced	The final outcome cannot be determined (e.g. as a result of IP crossing company boundaries and challenges in obtaining additional information)	8	10%
Undetermined – unclear outcome	Insufficient information could be obtained to determine the outcome	4	5%
Undetermined – investigations on-going	The relevant IP assets remain under development, and it is too early to establish whether the product or company will be a success or failure.	16	20%
Failure – did not raise private funding	Companies that ceased trading because they did not raise any significant private funding and/or exhausted their cash runway and were forced to liquidate	20	24%
Failure – commercial failure	Companies that ceased trading because they failed to generate a profit, leading to insolvency or bankruptcy	2	2%
Failure – failed in trials or abandoned	Companies (or associated IP assets) that failed in trails or were otherwise abandoned	10	12%

Source: MRC monitoring information, PitchBook, Companies House, Ipsos analysis

3.4 Investment raised

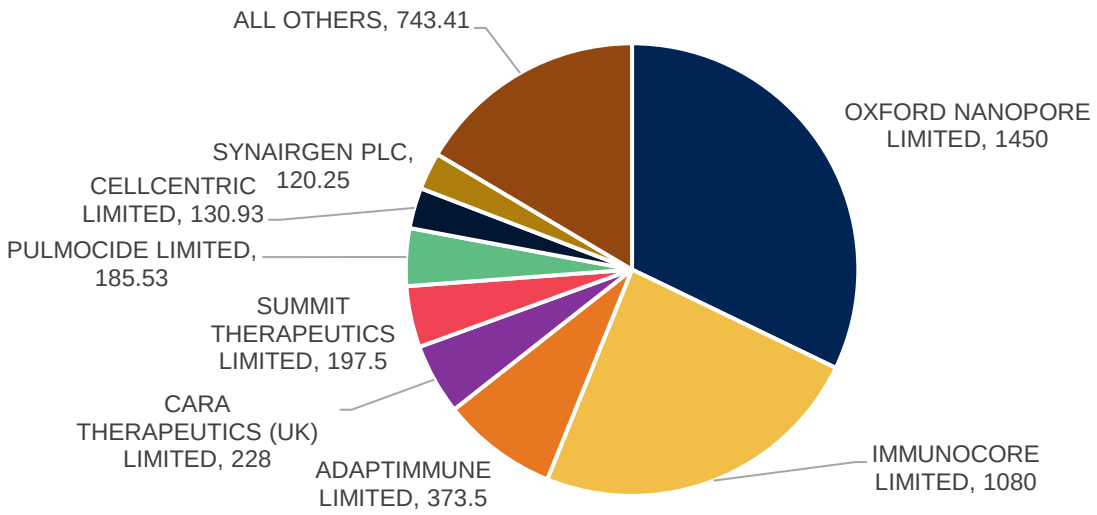
The portfolio of companies had attracted significant levels of private investment by the end of 2023:

- **Total investment raised:** A high share of firms (64%) attracted some form of external investment since incorporating, raising a total of £4.5bn of private funding. This should also be taken in the context of the relatively high share of firms operating CRO or CDMO business models that did not

necessarily require external investments to fund their on-going activities. It should be stressed that direct comparisons cannot be made with the portfolio of spinouts emerging from research funded post-2008, given the partial nature of sample of firms incorporated within this analysis.

- **Distribution of investment outcomes:** As is typical of 'high-risk, high reward' portfolios of companies, a large share of the total investment raised was concentrated in a small number of leading companies. As illustrated in the following chart, the two leading companies (Immunocore and Oxford Nanopore) accounted for 57% of the total investment raised, while the top eight companies accounted for 86%. Many companies were only able to raise capital in relatively small amounts of less than £10m.

Figure 3.3: External investment raised by 2024 (£m)



Source: MRC monitoring information, PitchBook, Ipsos analysis

- **Public capital markets:** There was some evidence that the earlier cohort of spinouts were relatively more dependent on public capital markets for external financing than those that emerged post-2008. Eighteen of the 83 companies (22%) successfully launched an IPO, relative to just 3% of those established post-2008. Additionally, 15 of these companies made their public offering on the London Stock Exchange (including its Alternative Investment Market), raising lower amounts than later cohorts of firms that have taken advantage of the deeper capital markets available in the US (particularly the NASDAQ exchange). Earlier cohorts of firms also sought funding from public capital markets at a much earlier stage of their development (with some being launched as public companies, while later cohorts tended to close several private funding rounds from VC funds). As highlighted above, it is anticipated that this was a function of the relatively weaker funding landscape that prevailed in the 1990s and 2000s.

- **Collaboration agreements:** There were also other signals that some firms from this cohort found fundraising challenging. While it is challenging to robustly quantify, annual strategic reports appeared to suggest that many spinouts sought out collaboration agreements with larger partners to provide the funding for their activities as an alternative to seeking equity funding. As highlighted above, these agreements did leave some firms exposed to external decision making that resulted (in some cases) in the termination of development programmers.

- **Mergers and acquisitions:** While buyouts have been a relatively infrequent outcome for spinouts established after 2008, M&A transactions were much more frequently observed amongst the earlier cohort. Of the 82 spinouts, 25 (30% of cases) were bought out – generally by a larger pharmaceutical or medical technology company. The total value of these transactions was £1.6bn – though this is likely to be an understatement as most deal values were undisclosed. The differences between cohorts are again likely to be a product of changes in the wider context – many pre-2008 spinouts reported explicit commercial objectives to achieve a trade sale, while later companies have tended to display ambitions to become global, independent, biotechnology companies.

3.5 Notable successes

Details of the four leading companies from the portfolio are set out in the following table:

- The four leading companies have achieved globally significant commercialisation outcomes and highlight the extreme levels of success that can be achieved by innovative companies operating in the biotechnology sector. Cambridge Antibody Technology was responsible for the IP underpinning Humira, which resulted in global sales of £214bn by 2022. Although only recently receiving market authorisation, immunotherapies and T-cell therapies developed by Adaptimmune and Immunocore are already generating revenues exceeding £100m per annum.

- While these companies have achieved significant commercial success and have created large numbers of high skilled technical jobs (Immunocore, Adaptimmune, and Oxford Nanopore employ over 2,000 workers), some questions could be raised as to how far the potential economic benefits of these technologies to the UK have been fully maximised. While Humira has generated significant income for the UK in the form of royalty payments, Abbott - which commercialised the drug – does not have manufacturing operations in the UK. Other companies are also putting in place supply chain relationships with CDMOs outside of the UK, implying that potential opportunities to create manufacturing jobs may be being lost.

Table 3.2: Significant successes – pre-2008 spinouts

Company	Background
Immunocore	Developer of T-cell receptor immunotherapies based on the IMMTac technology platform that has achieved significant outcomes since being established in 2007. After several significant private fundraising rounds, the company launched an IPO in 2021 and secured FDA approval for KIMMTRAK in metastatic uveal melanoma in 2022 (and is now approved in 38 countries). This product achieved net product sales of £116m in 2022 and £194m in 2023. The company employed 497 workers in 2023 (predominantly in Abingdon) - although investigations indicate that its manufacturing is delivered by a network of CDMOs (and the product is produced in Europe by a Dutch and a Danish CDMO). It has a range of other products at advanced stages of development including Tebentafusp which is in Phase III trials in uveal melanoma and advanced cutaneous melanoma.
Adaptimmune	Adaptimmune was established in 2007 to develop T-cell therapies in solid tumours. It has raised significant volumes of private capital and in August 2024 was the first company to receive FDA approval for 'afami-cel' for patients with synovial sarcoma (which is marketed under the brand name Tecelra). It has two other programmes - Lete-cel and Uza-cel (the latter of which the company entered into a collaboration agreement with Galapagos to develop the product for head and neck cancer). However, product sales are not yet available owing to the recency of these developments (though are projected at between $180m and $400m annually in US markets). The company earned significant collaboration revenues in 2023 from a partnership with Genentech to develop allogenic T-cell therapies for up to 5 cancer targets via a $150m upfront payment - the revenues reported by the company to date relate to collaboration income rather than product sales. The company employed 439 workers predominantly at its HQ site in Abingdon.

Company	Background
Cambridge Antibody Technology	Cambridge Antibody Technology was founded in 1989 to develop and commercialise therapeutics based on the monoclonal antibodies. The company developed the IP upon which Humira (adalimumab) – a treatment for the symptoms of rheumatoid arthritis – was based. The IP was divested to Abbott Laboratories – who took the therapy through final development and marketing and was approved for use in the US in 2002 and in Europe in 2003 – which has resulted in global sales of £214bn by 2022 (before loss of patent protection started to erode revenues from 2023). The company was bought out by Astrazeneca for £945m and merged with a US based company (Medimmune) to form its biologics arm in 2007. Accounts are still filed for the UK based operation, which generates turnover principally from the sales of Imfinzi (durvalumab) which is used to treat patients with cancer of the gall bladder and bile ducts.
Oxford Nanopore	Oxford Nanopore Technologies was established in 2005 to develop a product portfolio based on NanoPore Biosensor Platform for both point of care and laboratory testing, and by 2008 was focused on the development of the BASE technology for DNA sequencing for research and diagnostics. The firm disclosed novel proprietary electronics systems (GridION, MinION, PromethION) for the analysis of individual molecules which became the core focus of its attention and commercialisation efforts. MinION – a portable sequencing instrument – was launched in 2014, while PromethION – a desktop instrument for high throughput sequencing was launched in 2016. The company grew its annual revenues to £170m in 2023, employs 1,133 workers and has raised almost £1.5bn in external funding over its lifetime. The company was valued at £930m in mid-2024.

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