

# Leveraging our world-leading capabilities to innovate, grow and prosper

National Centre for Universities and Business, proposals for economic growth





### **About NCUB**

The National Centre for Universities and Business is the collective voice of our members, the UK's universities, and leading businesses. By promoting and shaping their collaboration, we champion its value in securing the UK's future. We're committed to bringing organisations together to leverage the skills and talent fostered by our universities and to strengthen further the UK's world-class research and development.

# Introduction

The last decade has been marked by significant social, economic and political volatility.

Throughout this period the UK research and innovation sector has leveraged its world-leading strengths to innovate and deliver solutions that have enabled the country to respond to local, national and international challenges. The Oxford AstraZeneca vaccine, enabled by long-term public funding, provided one means to manage the Covid-19 pandemic, prevent further loss of life, mitigate further economic damage and enable a return to normal life for many. Across all sectors, across decades, collaboration between universities and businesses has been fundamental to the UK's success as a knowledge economy. The future prosperity of the UK requires a strong research and innovation sector. Continued support for the collaboration between universities and businesses that underpins this is vital.

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**The future prosperity of the UK requires a strong research and innovation sector.**

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- 3** Equip universities to deliver a highly skilled workforce
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# Harness public investment commitments to grow the strength of the UK research base

Higher levels of research and development activity (R&D) are associated with higher levels of productivity. Productivity drives growth. To realise this, successive governments have set out a target for R&D investment to reach 2.4% of GDP by 2027.

£1 of public R&D eventually stimulates between £1.96 and £2.34 of private R&D.<sup>1</sup> The ratio of private against public spending on R&D in the UK is above OECD average, but the UK's total R&D spending is lower because both public and private sectors invest proportionately less. This suggests that whilst the UK's public investments in R&D investments are efficient at leveraging private investment, they need to grow to encourage a greater level of private expenditure.

The Autumn Budget and Spending Review 2021 began to deliver against this with a commitment to increase public funding to £20bn by 2024-25, and an ambition for the government to spend £22bn on R&D by 2026-27.

Fundamental research underpins the UK's innovation system. This depends on sufficient public funding. The growth in Quality Related funding for universities, and devolved equivalents, has not kept pace with growth in grant funding from all sources. This includes government grants, but also investment in university research by charities and businesses. As a result, universities are taking on

1 BEIS (2020). *The Relationship Between Public and Private R&D Funding*, p. 7. Available at [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/897470/relationship-between-public-private-r-and-d-funding.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897470/relationship-between-public-private-r-and-d-funding.pdf), accessed on 22/08/2022.

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projects with businesses and others at a cost that must be met from other (often non-research related) sources. This is not sustainable and perversely disincentivises universities from engaging with businesses on contract or collaborative research that could bring great benefit to the economy and society. Additional, dedicated support through schemes like the Higher Education Innovation Fund (HEIF) is essential.

### Actions

- I. Honour the commitment to invest £22bn in R&D by 2024/25, set out in the Autumn Budget and Spending Review 2021.
- II. Maintain the target for total UK R&D spending to reach 2.4% by 2027 and 3% in the longer-term
- III. Maintain the principles of the UK's highly efficient and effective Dual Support System for funding of research but amend the balance so that universities are not disincentivised from working with businesses and others.
- IV. Continue to grow investment in the Higher Education Innovation Fund (HEIF) alongside growth in research funding, so that universities can further grow their contribution to the innovation system.



## Case study

# Managing Parkinson's symptoms

**According to the NHS it's thought around 1 in 500 people are affected by Parkinson's disease. A diagnosis of Parkinson's disease is life changing. Once diagnosed, patients will need long-term treatment to control their symptoms, and they may eventually have to adapt the way they do simple everyday tasks.**

Charco Neurotech, an award-winning Imperial College London startup, is developing a medical device, CUE1, that has shown promising results for people with Parkinson's, based on over two years of research with patients and clinicians.

CUE1 is a non-invasive medical device worn on the chest that uses controlled vibration and cueing to offer relief and improvement to a wide range of physical symptoms of Parkinson's disease. The device alleviates motor symptoms, such as slowness, stiffness and freezing while walking.

The company was founded in 2019 by Lucy Jung, then a student on Imperial's Master's Programme in Innovation Design Engineering, and physician Dr Floyd Pierres. After taking part in

the Imperial-led White City Innovators programme and the MedTech SuperConnector that provided training and mentoring for entrepreneurs, they went on to receive a seed investment from the Imperial College Enterprise Fund. This early support and funding helped them establish the credibility they needed to raise \$10 million in a further seed round that was reportedly the largest 2021 seed round for a health technology startup in Europe.



# Unleash the regulatory and funding environment to incentivise private investment in R&D

The impact of the pandemic on business R&D and innovation activities has been varied. Many companies have experienced significant disruption.

This includes reduced capacity to collaborate with universities, with small and medium sized enterprises particularly badly affected.<sup>2</sup> Continued economic volatility, including high levels of inflation, can discourage investment in R&D. Public investment leverages private investment. Honouring public investment commitments is essential to give businesses the confidence to maintain and grow their own commitments. Additional factors affecting private R&D and innovation investment decisions range from the availability of skills, datasets, buildings and laboratories to regulation, tax as well as funding. Action is needed to understand the relative importance of these various factors

to optimise the UK's regulatory and funding environment and maximise private R&D investment.

A combined offer from Government, involving trade, education, health and Treasury would, therefore, appeal to businesses and motivate them to invest both time and money in research and innovation. Such an offer should seek to untangle the web of tax incentives, regulation and funding pots to make them easier for businesses to access. However, there is a lack of evidence on the relative importance of different factors. Further analysis and review would enable better policy design.

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<sup>2</sup> National Centre for Universities and Businesses (NCUB) (2021). *Innovation and resilience in a crisis. The impact of Covid-19 on UK business R&D.*





Looking forward, some sectors and types of R&D or innovation activity are likely to recover more quickly than others. This could have significant implications for the shape of the UK's future economic growth and its global competitiveness. The impacts of other major drivers of business change, such as the Net Zero target, are also very heterogenous. This adds weight to the need to better understand and distinguish between investment drivers in different sectors. This is essential so that the UK can ensure that, in a time of constraint, the regulatory and funding environment is incentivising private R&D investment in national priority areas.

## Actions

- I. Further review of the tax system to incentivise R&D investment and ensure that VAT rules and the employment tax regime does not disincentivise not-for-profit organisations from collaborating with the private sector.
- II. Set out a series of "commercial missions" that build on the strategic technology priorities set out in the Innovation Strategy. These should focus on specific commercial opportunities, where targeted public support could secure a dominant global market position for the UK while also leading to broad societal benefit.
- III. Establish Innovation Collaboration Zones. The purpose of the Innovation Collaboration Zones would be to leverage all R&D and innovation drivers, from tax incentives and deregulation of land use, through to co-location of expertise and research facilities, to deliver the commercial missions from research through to development and innovation.
- IV. Enhance targeted Government support for major, often first of a kind, projects to deliver on key national priorities, including achieving Net Zero. This can include a broad toolkit of measures.



## Case study

# Increasing the efficiency of electric vehicles for a brighter future

**Electric buses are key to reducing air and noise pollution in cities. Just having one e-Bus travelling approximately 200 km per day can save about 60 tonnes of carbon dioxide per year, compared to even the most modern diesel buses.**

Electric buses can be powered onboard by battery or fed continuously from an external source. Industrywide, there is still little known about how batteries lose performance and degrade over time.

Siemens identified a gap in their understanding of battery degradation and knew that obtaining this knowledge would be a significant development task; not something that could be achieved through their current staff or by consultancy.

It was only through collaborating with the unique offering of Newcastle University's experts and academics that a ground-breaking solution would be developed – together. The project was funded by UKRI through Innovate UK's Knowledge Transfer Partnership programme.

As a direct result of this Knowledge Transfer Partnership, an artificial intelligence algorithm was developed to enable the complex management of when



and for how long electric vehicles, like buses and trucks, are recharged in large depots.

Using this new algorithm reduces the total E-fleet charging cost by up to 27% and a total reduction in maximum power peak of up to 50%, compared to unmanaged charging. The savings for e-depot operators are significant, pressure is taken off the grid at peak times, and there is less unnecessary power usage as electric vehicle battery charging can be scheduled based on estimated energy requirement for their next trip.

# Equip universities to deliver a highly skilled workforce

A successful and productive economy will be driven by people. A more research intensive, innovative and digitally-enabled economy will not just require a larger R&D workforce.

R&D is just one part of the innovation process. To see a return on investment from exploratory R&D, businesses also have to invest in developing business applications, design, revenue models and markets for new products and services. These activities require skills gained in a broad range of academic disciplines and professional contexts. The future calls for a larger, more adaptable and more diverse graduate workforce.

The capacity of universities to deliver the workforce of the future is being undermined by the erosion of the value of tuition fees. The tuition fee is now equivalent to around £6,600 per student in 2012 prices (the year in which a 9,000

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**7 million additional workers could be underskilled for their job requirements (which is roughly equivalent to 20% of the workforce) by 2030.**

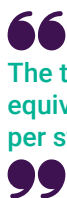
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fee was first introduced). Universities have worked hard to generate efficiencies and diversify their income. However, continued diminution of the value of the tuition fee is challenging the ability of institutions to plan effectively for the future and in some cases poses a threat to their ongoing viability, limiting the UK's capacity to generate the workforce that the future calls for. Similarly, the cost of living crisis is putting increased pressure upon students. The maximum student loan is insufficient to cover maintenance costs. This could lead to increased dropout rates, particularly among disadvantaged students thereby negatively affecting both the level of skills in the workforce as well as social equity.

Better information is needed too. Rapid changes in labour market

2 Industrial Strategy Council (2019). *UK Skills Mismatch in 2030*, p. 24. Available at <https://industrialstrategyCouncil.org/sites/default/files/UK%20Skills%20Mismatch%202030%20-%20Research%20Paper.pdf>, accessed on 22/08/2022.

needs demand greater labour market intelligence and more coordinated policy interventions. The fragmentation of organisations and groups offering labour market insight and recommendations is confusing for businesses and universities alike. Since the closure of the UK Commission for Employment and Skills (UKCES) in 2017, the UK has lacked a national body dedicated to gathering labour market intelligence to guide policy making.



The tuition fee is now equivalent to around £6,600 per student in 2012 prices

## Actions

- I. Retain the fair and sustainable funding for higher education that will help to deliver the adaptable, diverse workforce needed by the UK economy. This should include protection for disadvantaged students in the form of a maintenance grant or increased loan that provides adequate support.
- II. Establish a coordinating Future Skills Body that takes a more strategic and evidence-based approach to understanding current and future skills needs to replace the UK Commission for Education and Skills, which was dissolved in 2017.
- III. Address the UK's professional level skills shortages by developing clearer incentive mechanisms to encourage entry and retention to skills shortage professions, this could include waiving the student debt of graduates in occupations with defined skills shortages.
- IV. Identify additional interventions to shift the dial on lifelong learning to enable the upskilling and reskilling employers require.

Lifelong learning will be fundamentally important. The aggregate UK skills mismatch is predicted to worsen significantly. 7 million additional workers could be underskilled for their job requirements (which is roughly equivalent to 20% of the workforce) by 2030.<sup>3</sup> Retraining and reskilling will be increasingly important to meet shifting employers' demands. The Lifelong Loan Entitlement will have a crucial role to play. Further action may be necessary.



## Case study

# Collaborating to support the development of AI skills

**In Autumn 2021, NCUB members UCL and Cisco launched a new virtual centre: 'Cisco x UCL Global Centre of Excellence' with a vision to unlock Artificial intelligence's (AI) multi-faceted benefits for both the economy and planet. Building on a long-standing partnership between the two organisations will further their work combining their world-class expertise in AI in the centre.**

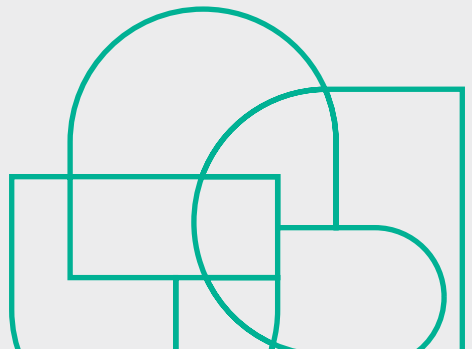
As part of Cisco x UCL Global Centre of Excellence centre, Cisco will provide research funding for UCL academics and researchers, focused on the application of AI, primarily in the fields of collaboration technology, networking and cybersecurity. The new agreement will enable academics doing relevant AI and ML research from across the university to apply for funding from Cisco.

Over the next ten years, the impact of AI on businesses across the UK and the wider world will be profound – it will be a key tool in building the new economy. The potential for AI technologies is vast – it has the potential to change the way we work through supporting and enhancing productivity.

Cisco was a founding partner of the UCL AI Centre, launched in 2019, which has now become a hub for UK innovation,

supporting the creation of a number of AI spinout companies and technologies. Cisco are also a partner of UCL's UKRI Centre for Doctoral Training in Foundational AI, central to producing PhD graduates capable of leading research breakthroughs in AI.

In the last three years alone, Cisco has supported 18 AI masters scholarships for under-represented groups at UCL. Through an initiative to encourage girls into careers in AI, Cisco and UCL also welcomed 150 sixth-form girls onto a custom AI programme.



# Benchmark our international offer to increase the UK's share of globally mobile investment, facilitate collaboration and attract international talent



**53%**

Of business-based R&D in the UK was funded and performed by foreign-owned businesses.



**43%**

Of the total R&D employment in the UK was generated from foreign sources

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The top 20 R&D intensive businesses, make up over 28% of R&D spending amongst the top 1,000 spenders

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However, with a high proportion of UK R&D financed by foreign-owned firms, realising the 2.4% target requires an even greater share of the global market to be captured by the UK. This comes at a time as many governments now view foreign-owned multinational enterprises as central actors in their national innovation systems and competition among countries to attract FDI in R&D is rising. Coordinated action is needed to benchmark the UK's international offer, take action to increase our competitiveness and articulate a coherent ambitious vision to overseas investors.

There is a gap in the UK's research funding landscape to specifically support collaborative research with multinational enterprises (MNE's). Research intensive multinational companies in sectors like technology, pharmaceuticals and automotive make up a significant proportion of the world's private R&D spending.

4 [The 2021 EU Industrial R&D Investment Scoreboard IIRI \(europa.eu\)](https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&plugin=1)

5 <https://www.gov.uk/government/publications/supporting-uk-rd-and-collaborative-research-beyond-european-programmes>

The top 20 R&D intensive businesses, make up over 28% of R&D spending amongst the top 1,000 spenders.<sup>4</sup> Additionally to their own spending on R&D, MNE's play a critical part in stimulating research and innovation through their supply chains, thereby bringing wider economic and societal benefits to the UK.

Participation in European research programmes has been historically important to the UK research and innovation sector. Detail from government on alternative arrangements if the UK is unable to associate to Horizon Europe has been welcome.<sup>5</sup> However, uncertainty remains and there remain risks to the long-term stability of support to the UK research and innovation system.

Knowledge-intensive sectors depend on a skilled workforce. In addition to increasing the level of domestic

skills, we must continue to attract talent from across the world. Initiatives like the Global Talent Visa are essential. However, as with investment, competition for talent is fierce. The UK must continuously benchmark its own offer to ensure that it remains competitive and is effective in attracting skilled migration, particularly into those sectors and disciplines where shortages exist and absolute or comparative advantage is sought.

### Actions

- I. Create a clear FDI R&D Strategy, which takes into account both (1) boosting the attractiveness of the framework conditions to attract and retain and (2) promoting UK's research and innovation strengths on a global stage.
- II. Fund a Global Collaboration Fund (GCF) to encourage universities and businesses to pool strengths to attract inward investment from large, R&D intensive firms.
- III. Ensure stability of funding for internationally collaborative programmes in the event that the UK is unable to associate to Horizon Europe
- IV. Continuously benchmark the UK's offer to international talent to ensure that it remains competitive and is effective in attracting skilled labour.



## Case study

# Leading research into resilient transport systems

**Close collaboration between Thales and Cardiff University will allow the company to use the University's expertise in the Centre for Cyber Security Research and other leading research groups at the University, building on an established platform of existing work.**

Thales and the Welsh Government are creating a ResilientWorks campus for cyber trust at the former steelworks site in Ebbw Vale, alongside the National Digital Exploitation Centre (NDEC).

The Cardiff University team will work closely with the team at ResilientWorks to deliver a test bed facility that examines how energy and transport systems can be more resilient.

The campus includes research laboratories, a test track and model street complex. Organisations from startups to major international companies and governments will use ResilientWorks to test and develop trust in operational technology and key infrastructure for growth sectors in the economy and critical public services.



Thales (Euronext Paris: HO) is a global leader in advanced technologies, investing in digital and “deep tech” innovations – connectivity, big data, artificial intelligence, cybersecurity and quantum computing – to build a confident future crucial for the development of our societies. Thales has 81,000 employees in 68 countries. In 2020 the Group generated sales of €17 billion.

The project is part of the Welsh Government's wider plans to build a new tech cluster in Blaenau Gwent. The £7m initiative is jointly funded by Thales and the Welsh Government's Tech Valleys programme with research contributed by Cardiff University.



The National Centre for Universities and Business is the collective voice of the UK's universities and leading businesses, promoting and shaping their collaboration through research, digital insight and advocacy to secure the UK's prosperity.

**HELPING THE UK PROSPER, BY WORKING FOR  
THE UK TOGETHER**

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