Introduction

The Covid-19 pandemic has posed unprecedented questions and challenges for the UK and its citizens. The UK's response to the pandemic has highlighted the importance of having a world class research and innovation base. The UK's universities, research institutions, charities and innovative businesses have come together to respond to this crisis: undertaking research to understand the origins and characteristics of the virus, working to develop effective vaccines or therapies to combat Covid-19, using advanced mathematics to model the effects of the pandemic or redirecting engineering expertise to develop key components for ventilators. Rising to the challenges posed by the pandemic has only been possible due to the strength of our research ecosystem.

Recovering & Rebuilding

The economic upheaval caused by the pandemic may change the makeup of the UK's economy. Difficult decisions are already being made by organisations across the UK about their future operations and many have faced significant hardships. This Government has identified research and innovation as part of its economic plans. Increasing the public research budget to £22bn by 2024/25, a welcome commitment, provides the UK Government, UKRI and others with the opportunity to be more creative in how they support research and innovation and the economic recovery.

However, the Covid-19 pandemic has put serious pressure on the ability of the sector to continue to fund and facilitate research. This not only brings unprecedented questions about the way in which research-intensive organisations need to be supported in the short and medium term, but also poses questions about how the UK public sector can most effectively and sustainably invest in research to create the best outcomes for the citizens of this country.

In seeking to respond to the pandemic, we have witnessed the ability of parts of the UK research system to adapt and work together to tackle the unprecedented threats the country has faced. The UK's ability to rise to future challenges rest on the strength and breadth of capabilities that exist. What remains imperative is that the UK Government supports those parts of the research sector that have been acutely affected by the pandemic. Many organisations across the research and innovation ecosystem have been forced to significantly reduce their research activities and will need to be supported to avoid lasting damage.

The UK's world-leading Higher Education sector is facing loss of revenue over this and future academic years placing increasing pressure on already stretched research budgets. Research charities have faced immediate drops in fundraising revenue and are projecting deep cuts to their budgets starting immediately. Innovative businesses have in many cases been forced to put R&D activity on hold causing short term and long term disruption.

The interfaces of research between organisations, geographies and research disciplines are particularly vulnerable at this time of uncertainty. These interfaces are vital for the science base to contribute to an R&D-led economic recovery and to levelling up across the UK. However, these connections are fragile. Current financial pressures mean that partners from public, private and third sectors will experience 'pain and recovery' at different times, making it even more difficult to participate in collaborations. Some of the UK's strategic R&D assets take this multi-partner form and could be subject to such fragility. Packages for individual sectors should be complemented by a system that sustains valuable cross-sector partnerships through limited periods of financial strain for one or more of the participating stakeholders. This should help ensure regrowth of R&D activity is encouraged both internally and externally in R&D organisations.

Immediate effects of the Covid-19 pandemic on research and innovation

Innovative businesses

Business R&D accounts for 70% of all R&D expenditure in the UK[1]. About a quarter of that business R&D occurs in sectors that have been hardest hit by the coronavirus pandemic: aerospace, automotive, oil and gas. CaSE has heard directly from companies in those sectors that R&D has been scaled right back as companies focus on keeping cash in the business. R&D is vital to give these companies a leading edge, but is dispensable in the short to medium term. We hear that regrowth of R&D activity in these companies will take years. There may be a significant focus on prioritising only the most critical R&D in that regrowth in future-facing parts of the business, meaning that major technological shifts that are approaching may come more quickly.

Difficult decisions lie ahead for multinational R&D companies who are active across the world. In the UK, over half are headquartered abroad and these globally-mobile companies can readily move their R&D activity[2]. We have already heard of agile movement of R&D activity around the world in response to the Covid-19 lockdown and easing of lockdown. It is imperative that the UK keeps these large R&D-intensive businesses here as they regrow. It is an important part of the research ecosystem with extensive connections to universities, SMEs and supply chains. Therefore, to support vital smaller business R&D activity, the UK Government needs to support and promote the environment in the UK as being the home of next generation innovation for R&D businesses. We already have the breadth of excellence across science, engineering and social science to make exceptional innovations that work and are well received.

CaSE has put forward a number of recommendations in conversation with our members that the government should adopt to make the UK stand out, including a digital shop window for innovation support and boosting the research capacity element to the Shared Prosperity Fund. Other pressing concerns from the sector include the speed at which support is deployed to companies, particularly SMEs, and a need to widen the scope of R&D tax credits[3].

Medical research charities

Medical research charities that rely heavily on public fundraising for their income have been particularly badly affected by the pandemic. 70% of clinical trials and studies funded by Association of Medical Research Charities (AMRC) members have been stopped, paused or delayed. AMRC's members are planning for an average 41% decrease in their research spend in FY20/21, resulting in a projected reduction in UK medical research investment of between £252 - £368 million[4].

Cancer Research UK predicts their income to fall by 30% in the next financial year as a result of the pandemic[5]. Existing CRUK institutes and response-mode grants have already been cut by between 5% - 10% and CRUK have stated that they will look to make cuts to their centres and other infrastructure by up to 20%.

A major research charity has informed us privately that it is predicting losses of £10m per month which stands to have a severe impact on their ability to fund the next waves of life-changing

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[1] https://www.ons.gov.uk/economy/governmentpublicsectorandtaxes/researchanddevelopmentexpenditure/bulletins/businessenterpriseresearchanddevelopment/2018

[2] Ibid

[3] https://www.sciencecampaign.org.uk/resource/nextdecade.html

[4] https://www.amrc.org.uk/Handlers/Download.ashx?IDMF=359e3762-05ee-46fa-90ed-c7169a925a33

[5] https://www.cancerresearchuk.org/about-us/cancer-news/press-release/2020-07-15-cancer-research-uk-plans-to-rebuild-and-adapt-to-changed-world-following-ps300m-drop-in-income

research. Their commitment to extend funding for research activity already running by just four months is expected to cost between £9.2m and £14.5m. The same organisation estimates that for their portfolio of high value clinical trials, a 6 month pause/delay will cost in total around £3.3m. Maintaining patients for trials is a major issue and has also been highlighted by private companies.

Higher Education

The UK's Higher Education sector is world-leading and is a key reason why the quality of research and innovation in the UK is so high. A significant risk to universities is a drop in the intake of students for this academic year and in future, with the pandemic potentially increasing the number of deferrals by home students and loss of the international student market which may dramatically affect university income[6].

Due to the ongoing pandemic, one issue that has come under renewed focus is the 'research deficit' across UK universities. This is the shortfall in funding for research, where the university has to find additional funding from across the institution to make research projects viable, including income from student fees. This deficit in English HEIs has grown from £1.8bn in 2010/11 to £3.7bn in 2017/18[7]. This means universities are required to work increasingly hard to find funding to make these research projects economically viable.

Historic lessons

The 2008 global financial crash occurred in different circumstances than the current economic downturn but still represented a significant drop in UK GDP. From the point of view of Government support for science and innovation, UK R&D finds itself in a significantly different position than 12 years ago. Following the downturn in the UK economy and the formation of the coalition Government from May 2010, a period of deep austerity cuts began. At that time, the then Department for Business, Innovation and Skills, along with groups such as CaSE, fought for science and research budgets to be protected and ring-fenced. As a result, Government spending on the science base was protected over the 2010 parliamentary session with a flat-cash-ring-fenced budget for annual 'resource' spending distributed by the research councils and Higher Education Funding Councils.

This flat cash settlement saw the UK fall behind many global competitors on the familiar measure of proportion of GDP spent on R&D. Having just emerged from this period of austerity it is unlikely the research sector could withstand real-terms cuts in funding such as those of the 2010s.

The role of research and innovation in supporting post-pandemic economic growth

The current Government have endeavoured to increase the UK's research intensity to 2.4% of GDP, including a significant increase to public investment in R&D to £22bn by 2024/25[8]. The Government sees investing in research and innovation a way to support economic recovery from the pandemic. A recent publication by BEIS has detailed the ways in which concerted investments in R&D can lead to economic growth and providing more job opportunities to the resident population[9].

In every scenario that the paper used as part of the economic modelling, UK GDP grew when compared to a reference case where R&D investment remained flat. In absolute terms by 2027, R&D investment could add £30bn to the UK economy and create 80,000 new jobs. The report shows that

[6] https://www.universitiesuk.ac.uk/news/Documents/uuk_achieving-stability-higher-education-april-2020.pdf
[7] https://www.ucl.ac.uk/research/sites/research/files/supporting_uk_research_nov_2019.pdf
[8] https://www.gov.uk/government/publications/budget-2020-documents/budget-2020
[9] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/897462/macroeconomic-modelling-of-2-4-r-and-d-target.pdf

if the UK were to continue with a drive to increase research intensity to 3% by 2040, UK GDP could increase by £180bn and create over 900,000 jobs. This is why the Government's commitment to increase public investment in R&D can only be maximized by being part of a long-term plan. This includes the spillover benefits of research and innovation, where the fruits of R&D are felt beyond the sector carrying out the work and benefit all those across the UK.

While public commitments to investment have been significant, the majority of R&D in the UK is funded by private enterprise. It is vital to support private companies in order to deliver on economic growth and provide new jobs for the UK. In an increasingly globally-competitive market, remaining an attractive destination for inward investment is paramount. Globally mobile innovative companies need to have a reason to locate in the UK over anywhere else in the world, a history of operations are no longer sufficient to tie a company to a location. The Smith-Reid review of future international frameworks contains several examples of companies who have chosen to locate in the UK for a number of reasons[10]. We are pleased to see that the Government is seeking to expand the activities eligible for R&D tax credits, including use of data as recommended by CaSE[11]. Tax credits afford a degree of flexibility to decisions taken by businesses, which has become increasingly important in a time of great disruption.

Investing in research will lead to jobs for future generations, but facilitating growth in research and innovation requires a talented workforce today. It is perhaps more important than ever to protect and support postgraduate, postdoctorate and early-career researchers. Many postdoctorate and early-career researchers in universities are employed by fixed-term research grants whose work has been halted due to the pandemic. Our members have told us that UKRI's immediate response to the pandemic by automatically extending research grants was positive, but serious concerns remain over where their next opportunity will arise. These individuals may seek careers elsewhere, leaving a reduced pool of workers within the pipeline of researchers.

How can Government support research and innovation in the UK?

There are a number of measures the Government can take to support the research and innovation sector, both in the short and long-term.

- **Continue to reaffirm commitments to increase public investment in R&D to £22bn by 2024/25.**

We were pleased to see the Government reaffirming the Chancellor's commitment to increase public research investment by 15% this year by significantly increasing research budgets for BEIS, UKRI and other public bodies. The Government should use this investment in the short term to protect the science base, and help universities, charities and innovative businesses weather the immediate economic storm. Standing by the R&D investment commitment will also signal the UK's ambition to be the destination of choice for the world's leading researchers, entrepreneurs and innovative industry.

- **Put research and innovation at the heart of the UK's economic recovery plan**

Research and innovation offer an opportunity to boost productivity and create new high skilled high wage jobs in areas right across the country. To this end, the Government should continue with its plans to develop a long-term strategy to grow the UK's research intensity. In our report "The Power

[10] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/844488/Changes_and_Choices.pdf p18

[11] https://www.sciencecampaign.org.uk/resource/nextdecade.html

of Place" we set out some of the ways research and innovation can support local economic growth and the "levelling-up" agenda. These include a focus on nurturing excellence no matter how small or nascent, and encouraging and supporting strong local leadership on R&D issues[12].

- **Sustain an agile and resilient research and innovation ecosystem**

The current crisis has shown how valuable it is to have a broad and interconnected system that can respond rapidly. The ability of the UK to rise to challenges, or mitigate against a future crisis, stems from the strength and breadth of our research and innovation capabilities. The Government should review how the pandemic has driven behaviours and decisions made that have affected the research sector during this crisis and apply those learnings to ensure the research base remains resilient.

- **Deploy a financial package to support research interfaces between organisations**

The Government should seek to protect research and innovation projects that are co-funded and co-developed across sectors, disciplines and geographies in addition to support packages for individual sectors. These projects are particularly vulnerable at a time when organisations may be forced to scale back operations, and play an increasingly important role in cutting edge research. A financial settlement to protect these interfaces can also breed confidence for research-intensive organisations to continue to build partnerships.

- **Ensure that we have the skilled people to achieve these ambitions**

To help to realise the aspirations of people up and down the UK, our education system must be able to inspire young people and provide them with the skills and careers advice needed to pursue careers in research and innovation. Our immigration system should also be amongst the world's most competitive for attracting talent from overseas to work, study, train and share ideas.

University sustainability package

CaSE welcomed the Government's announcement of the sustainability package for universities[13]. The success of the package will be directly related to the provision of support in a timely manner. It is particularly pleasing that the package is focused on protecting research activities, showing the Government's recognition of the importance of research in academia. The pressures placed on universities to supplement research grants with money from across the institution has been magnified during the pandemic. While the package is a welcome step, more thought and endeavour must be placed into reviewing the sustainability of public research funding in UK universities in the long-term.

CaSE has written to the Science Minister to highlight the pressing case for stabilisation measures that reach across the diverse range of organisations that contribute to this country's outstanding performance in research and innovation[14].

CaSE recommended that the Ministerial University Research and Knowledge Exchange Sustainability Taskforce was given a brief to address not just higher education research and knowledge exchange, but wider issues that underpin the sustainability of an innovative economy in the UK. It could

[12] https://www.sciencecampaign.org.uk/news-media/press-releases/case-launches-new-place-report.html
[13] https://www.gov.uk/government/news/government-to-protect-uk-research-jobs-with-major-support-package
[14] https://www.sciencecampaign.org.uk/news-media/press-releases/uk-research-must-be-protected-from-covid-19.html

perform a valuable role by considering the role of the research base in an innovation-led recovery, and the measures required to sustain such a research base through this period and the coming years, within and beyond universities.

Innovative business support

The Government's Future Fund[15] was a welcome announcement to support the UK's innovative businesses. The £250m convertible debt delivered by the British Business Bank and matched at least 1:1 by existing or new investors gives businesses support through this period where they may not be able to undertake their usual activities. We were also pleased to see the significant commitment made by the Government to accelerate up to £200m of grant and loan payments for Innovate UK's existing grant recipients and extra funding made available to over 1,000 firms not currently in receipt of Innovate UK funding[16].

The success of the Future Fund, which opened in May, will need to be reviewed over the coming months. Members have told CaSE that there is a risk that some companies will be caught in between eligibility for the Future Fund and the Coronavirus Business Interruption Loan Scheme (CBILS) and miss out on receiving support. Some members have also recommended the Government should advance payments of R&D tax credit relief as an additional measure to support innovative businesses.

Life Science Charity partnership fund

As covered earlier in this submission, the research charity sector has been severely affected by falls in fundraising revenue as a result of the pandemic. Led by the AMRC, the medical research charity sector has proposed a Life Sciences Charity partnership fund[17] to support research-intensive charities to continue to fund pioneering research. CaSE fully supports the calls for support for the sector. Medical research charities often dominate the endeavours in their specific field of work, for example the British Heart Foundation fund over half of the UK's heart and circulatory-related research[18].

The AMRC is proposing a co-investment scheme based on a partnership between government and charities that ensures vital medical research charity investment in R&D remains part of the UK's diverse research base. The fund would be given provision of at least £310m of funding from government in FY21/22 to bridge the projected shortfall in sector spend, with further investments in the FY22/23 and 23/24. This investment would ensure overall sector investment is maintained over this three year period. This fund would allow charities to continue to support research in universities and industry, as well as continue to build invaluable research partnerships across academia, business and the charities sector.

About CaSE

The Campaign for Science and Engineering (CaSE) is the UK's leading independent advocate for science and engineering. Our mission is to ensure that the UK has the skills, funding and policies to enable science and engineering thrive. We represent over 115 scientific organisations including businesses, universities, professional bodies, and research charities as well as individual scientists

[15] https://www.gov.uk/guidance/future-fund

[16] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/885671/Innovate_UK_coronavirus_business_support_package_details_final.pdf

[17] https://www.amrc.org.uk/Handlers/Download.ashx?IDMF=1cf57b61-5794-46ff-b3a6-0814bc6e9127

[18] https://www.bhf.org.uk/what-we-do/news-from-the-bhf/news-archive/2020/january/bhf-funding-more-than-half-of-all-uk-heart-and-circulatory-disease-research

and engineers. Collectively our members employ over 336,000 people in the UK, and our industry and charity members invest over £32bn a year globally in R&D. We are funded entirely by our members and receive no funding from government.