RUSSELL GROUP

Spending Review 2021:

Science, Innovation and Skills – a smart investment for Britain

The value of the scientific expertise, innovation, and the wide range of skills developed in Britain's universities has been showcased like never before in the last 18 months.

Ground-breaking vaccines and treatments developed at pace have been the cornerstone of the Government's roadmap out of lockdown and provided protection against future outbreaks. Experts who have been trained at our world-leading universities have become key advisers to governments in all four nations, helping to steer them through the pandemic.

Now, as Government considers how to deal with the challenges of revitalising the UK economy, delivering on its green ambitions and balancing the books, it must find smart investments that will create jobs and boost opportunity in every town and region across the country.

We will deliver maximum value for every pound of public money

The Government has rightly identified the UK's R&D strengths as a good investment and a major competitive advantage internationally – promising to increase its spending on science to £22 billion per year by 2024/25. In a challenging economic climate, this is a welcome recognition that the country's future will depend more than ever on ideas and talent to deliver sustainable growth. As a sector focused on delivering world-class research and innovation for the country, we recognise it is our responsibility to help Government extract maximum value for every pound.

To achieve this, we recommend Government:

- Build the investment needed to reach its £22bn target commitment in an even and consistent way, cumulatively adding £2.37bn extra to the baseline research and innovation budget in each year between 2022/23 and 2024/25. This will leverage significantly more private investment and faster – every pound of public investment in R&D stimulates between £1.96 and £2.34 of private money – giving UK science the stability it needs to deliver against challenges like net zero.
- Increase Quality-Related (QR) research funding and equivalent streams in the devolved nations by 20%. This low-bureaucracy, agile funding stream is used by the best universities to commit to longer term challenges or deal with new and emerging issues. For example, the Oxford AstraZeneca vaccine was built on the back of long-term pandemic research started in 2005 when the University used QR funding to help establish the Jenner Institute after identifying pandemics as a future threat.
- Guarantee the full funding needed for the UK's participation in Horizon Europe for the duration of the programme underlining Britain's reputation as a global actor.
- Deliver against the long-standing commitments to fund public grants for research at a minimum of 80% of full economic costs (FEC) and ensure core funding for Research Councils is uplifted accordingly whilst reducing regulatory burdens and bureaucracy that hamper universities. Without this, key Government targets such as boosting Britain's R&D workforce by 150,000 will be at risk because there are significant shortfalls in funding for postgraduate research training.

As a package, we estimate the funding required to deliver these proposals is less than half the additional investment already pledged by Government to make the UK a 'science superpower'. This means the remainder can be invested in other R&D and innovation priorities such as ARIA, the National Institute for Health Research and emerging cross-Government challenges.

We will create high value opportunities through innovation

Russell Group universities are represented in every region and country of the UK. As hubs for innovation that deliver highly-skilled graduates and turn ideas into real world impacts, they are magnets for investment. This creates high-value jobs, new homes and vital infrastructure in towns and communities across the country.

To maximise the impact of that work, we propose a three point plan to nurture and scale up new or existing clusters of innovation, revitalising regional economies, drawing in more private investment, and creating more jobs.

To achieve this, we recommend Government:

1. Scale up existing innovation schemes such as the Higher Education Innovation Fund and the UK Research Partnership Investment Fund with a track-record of proven returns. Under our proposals a net increase of just under £600m over the three years to 2024/25, can deliver a return of £2.7bn to the UK's economy and society.
2. Introduce a new deep-tech university seed fund, with a one-off investment of £200m, targeted at innovative ideas within the Innovation Strategy's seven priority technology families. This would develop genuinely disruptive technologies, transforming regional economies and creating export revenue.
3. Reform VAT rules and eligibility for R&D-related tax credits to encourage increased collaboration between business and universities that will leverage further private R&D investment to anchor critical research in the UK, reduce red tape, and ensure more SMEs can benefit from the expertise of the sector.

We will strengthen the pipeline for high-level skills right across the country

A high-quality education delivers for the individual *and* for Britain: a single cohort of UK-domiciled students at Russell Group universities is estimated to contribute more than £20bn to the economy over the course of their working lives.

The UK must build on the strength of this asset by improving access to high-value degrees and maintaining their quality alongside investment in higher level technical skills to create the pipeline of skilled workers needed by employers.

To achieve this, we recommend Government:

- Guarantee teaching grants on a *per student* basis for the duration of this Spending Review at levels that at least match existing funding. Since 2018 we estimate the value of tuition fees and Government teaching grant has fallen by 7.1% because of inflation and increases in student numbers. If that trend continues, it risks not only the high-quality education provided by Russell Group universities but undermines the pipeline of high-skilled recruits needed by employers.
- Deliver a multi-year commitment for the Turing Scheme which is helping students across the UK gain new experiences and learn new skills to help them succeed in life. In its first year, almost half of the places went to students from disadvantaged backgrounds.

Investment in science, innovation and high-quality teaching and learning provided Britain with the resilience to respond to the global threat of Covid-19. Our proposals will protect and ensure that resilience for the future. They will also ensure every country and region of the UK has the opportunity to succeed and the skills required to respond to longer-term challenges and opportunities such as net zero, the ageing population and disruptive new technologies such as AI as they become commonplace.

Spending Review 2021: strengthening UK prosperity and resilience through science, innovation and skills

1. Becoming a science superpower – securing strategic advantage in science and technology and realising the benefits for the UK's citizens

Summary

The scientific response to Covid-19 has drawn on exceptional UK capabilities in research and innovation across a range of disciplines. The UK's world-leading universities played a crucial role in developing vaccines and treatments at pace, enabling the Government to roll back restrictions and drive forward the economic recovery. This has only been possible because universities could tap into existing basic research and redirect resources at speed, demonstrating how patient long-term investment in R&D supports UK resilience, agility and future prosperity.

The economic benefits of R&D investment in universities are clear. For every £1 of public research funding they secure, our research-intensive universities deliver an average return of £9 to the UK economy. For the UK to become a science superpower, this year's Spending Review must set out how the intended increases in public investment will be achieved with a clear trajectory to 2024/25 – and preferably beyond, recognising the need to deliver value for the taxpayer and positive economic, social, environmental and health impacts across the whole country. As a priority we recommend the Government:

- Build the investment needed to reach the Government's £22bn commitment in a consistent and predictable way, cumulatively adding £2.37bn extra to the baseline research and innovation budget in each year between 2022/23 and 2024/25. This would help improve business confidence, leveraging in more private investment earlier. It would also set the UK on a course to beat its target to invest 2.4% of GDP in R&D, key to maintaining strategic advantage in science and technology and remaining globally competitive.
- Ring-fence sufficient funding for the UK's association to Horizon Europe for the full duration of the programme. This would enable the UK to be at the forefront of major projects on climate change, AI and other challenges, supporting UK businesses and universities to generate high-impact outputs and realise significant economic benefits.
- Invest in the UK's future resilience and agility by increasing QR research funding and equivalent streams in the devolved nations by at least 20%. This approach offers a long-term, low bureaucracy route to funding a pipeline of new ideas to underpin innovation in areas which have not yet emerged as the global challenges of the future.
- Ensure research funding is sustainable for the future by delivering on previous commitments to increase the level of full economic costs (FEC) covered on all public grants to at least 80% and boost Research Council core funding accordingly. This would ensure universities have the capacity to deliver the cutting-edge R&D the country needs without compromising on the excellence of British research as the volume of our activity increases. It will also be critical to growing the UK's R&D workforce and delivering on the Government's ambition for the UK to become a science superpower.

As a package, these proposals are designed to create the critical underpinning for UK research but equate to just under half of the additional funding the Government has indicated it will provide up to 2024/25 to reach the £22bn target. This is intentional. We expect the remainder to be used to invest in other Government priorities including the Advanced Research & Invention Agency (ARIA), the National Institute for Health Research (NIHR), the Strength in Places Fund, and commitments to be made in the forthcoming Levelling-Up White Paper.

Securing strategic advantage in science and technology

1.1 The UK undoubtedly has one of the best research systems in the world[1] and the exceptional nature of British capabilities in research, technology and innovation across a range of disciplines has been demonstrated through the scientific response to Covid-19. Research-intensive universities have been critical to developing vaccines, virus treatments, ventilator technologies and outbreak simulation models, amongst numerous other areas. This is reflected in the Government's new Vision for Life Sciences, which rightly highlights the leading position of UK universities.[2]

1.2 The rapid pace of progress in vaccine development and treatment of Covid-19 was only possible because universities could tap into established basic research and redirect existing resources at pace. For example, researchers at the University of Oxford used cutting-edge vaccine technology developed over a number of years to rapidly create a safe and effective vaccine against Covid-19. Patient long-term investment in R&D, and especially in basic research, is key to supporting the UK's resilience and agility, enabling the research base to respond to new threats and challenges and play a critical role in supporting a prosperous economy and society.

1.3 The breadth and depth of expertise in the UK's world-class universities means there are few research and innovation challenges they can't tackle with the right support and demand. Where research institutes and businesses may focus on a specific area of research and technology, universities can bring together science, technology, design and social science thinking to tackle challenges from all angles. Often it is not just a technological 'solution' that is needed, but one that encompasses behavioural and human factors to be effective. Capturing the opportunities presented by AI, for example, requires a multi-disciplinary approach to the application and governance of data use bringing together social and data sciences[3], while de-carbonising the economy requires a multi-faceted approach with climate scientists, engineers, policy and behavioural experts working in tandem to effect change.[4]

1.4 The UK has a track record of success in commercialising university research (and other ideas) for the benefit of our economy and society. According to the Global Innovation Index, the UK is the world's fourth most innovative economy, ranking third on the quality of its innovation outputs.[5] UK institutions are more efficient in their commercialisation activities than their US counterparts, with a total research expenditure per patent of £4.6m in 2018/19, compared to £6.4m per patent in the US. Active spin-offs and start-ups originating from Russell Group universities alone employ over 40,000 people (FTE), have an estimated

[1] With only 3% of the world's researchers, the UK produces 7% of the world's publications and 14% of the world's most highly-cited research.

[2] Life Sciences Vision, HM Government (2021)

[3] The University of Edinburgh's Data-Driven Innovation (DDI) initiative comprises a cluster of innovation hubs that bring academic disciplines together to delve into some of the world's most pressing challenges – using data to innovate. As part of the DDI, the Edinburgh Futures Institute works with industry, government and communities to understand the ethical implications of data analytics and artificial intelligence and the future infrastructure needed to drive social, economic, environmental and cultural inclusion, with applications across fintech, the creative industries, tourism and public services. While Edinburgh's Bayes Centre brings together academic experts in mathematical, computational, engineering, and natural sciences to develop innovative technological solutions in data science and AI. Within 2 years of establishing, the Centre had attracted 52 corporate R&D teams, established 15 high-growth ventures, attracted £91m in external investment and created over 370 high-value jobs.

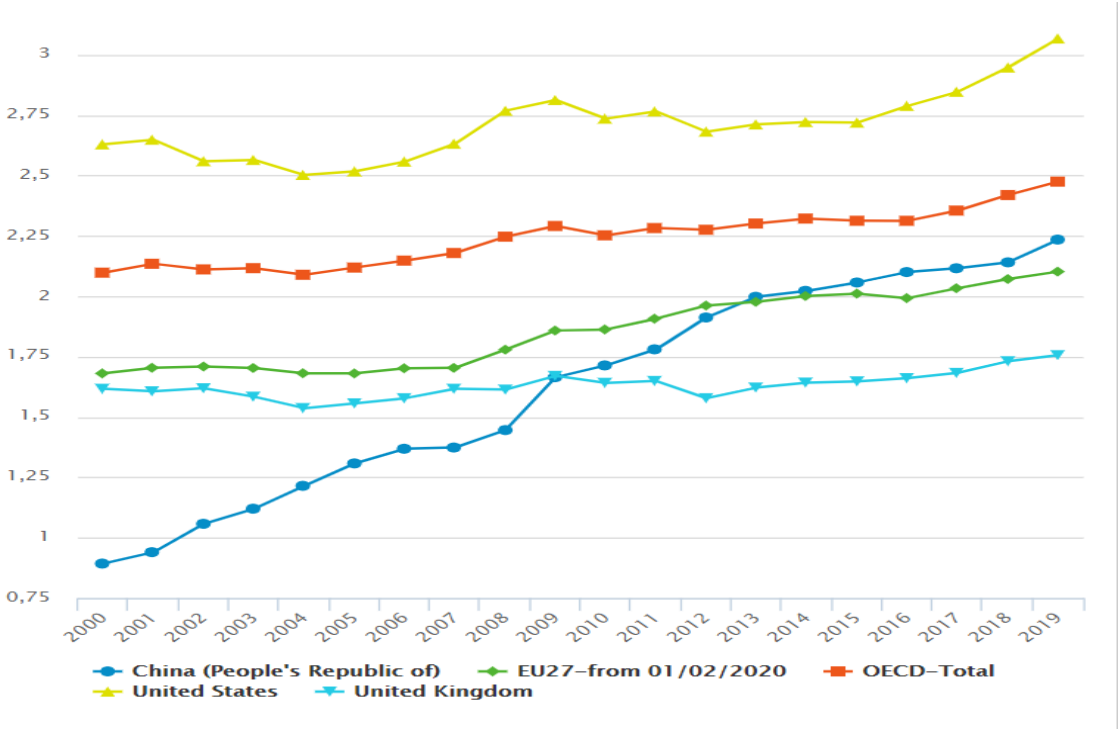
[4] For example, Imperial College London is supporting work in Scotland to develop a smart, green energy network where customers can sell available electricity capacity to help meet local demands. Imperial is working with private sector businesses and local authorities to develop sustainable business models which will favour renewable energy sources and boost uptake of low carbon technologies. It is estimated that by 2050, this approach could save customers across the UK £236 million in bills and reduce the UK's carbon emissions by 3.6 million tonnes.

[5] Global Innovation Index 2020, World Intellectual Property Organization

turnover of £6.2bn, and have leveraged £2.8bn in external investment.[6] In order to improve the UK's innovation performance, investment is needed to scale up R&D and innovation activities rather than make changes to the structure of our research and innovation systems.

1.5 For many years, the UK has lagged behind competitor nations in R&D intensity. The latest figures show the UK's R&D investment (equivalent to 1.76% of GDP in 2019) is well below the EU27 and OECD average (both 2.47%) and below European countries such as France (2.19%), Germany (3.18%), and other major research economies such as the USA (3.07%) and Korea (4.64%).[7] See **Figure 1** below.

Figure 1 - R&D intensity in the UK vs OECD, EU27 and selected other countries, 2000-2019[8]



1.6 Our international competitors are seeking to build on this advantage, investing to increase their R&D intensity further. In the US, for example, the Biden administration recently proposed the largest-ever increase in non-defence R&D spending. China's spending on R&D has climbed steeply, reaching a record high 2.4% of GDP in 2020 and is targeting annual increases of 7% or more in each of the next five years.[9]

1.7 In the Integrated Review the Government set out its ambitions to become a scientific superpower and maintain strategic advantage in science and technology. [10] While the UK is already punching above its weight in producing and commercialising excellent research, achieving these ambitions will require significant public as well as private investment. Such investment will be crucial in enabling universities, businesses and a range of other stakeholders to support a rapid economic and social recovery from the Covid-19 pandemic,

[6] Taken from the Higher Education Statistics Agency (HESA) 2020/21 Higher Education Business & Community Interaction (HE-BCI) survey
[7] OECD, Main Science and Technology Indicators, March 2021 release
[8] OECD, Main Science and Technology Indicators (2021)
[9] https://www.sciencemag.org/news/2021/03/china-announces-major-boost-rd-plan-lacks-ambitious-climate-targets
[10] Build Back Better: Our Plan for Growth (2021); Global Britain in a Competitive Age: the Integrated Review of Security, Defence, Development and Foreign Policy (2021)

generating scientific discoveries and novel technologies and helping spark prosperity in towns and cities across the country.

Leveraging private investment in R&D: setting a trajectory to £22bn by 2024/25

1.8 The Government has made a very welcome commitment to invest £22bn per year in R&D by 2024/25. [11] This is one of the most significant moves made by any UK Government to back our science and ingenuity. Delivery of the commitment is essential if the UK is to catch up and keep pace with its international competitors and realise the economic, social and health benefits of increased R&D activity. Moreover, this public commitment is a global signal to business and other investors that the UK is open for business and determined to develop its science superpower credentials.

1.9 Public spending is vital in boosting business confidence and crowding in the private investment in R&D which the UK will need to achieve a rapid recovery from the pandemic. Analysis for BEIS shows each £1 of public R&D stimulates between £1.96 and £2.34 of private R&D in total, with the 'leverage effect' beginning in the same year.[12] Public investment is particularly important in high-risk, high-reward basic research which can lead to genuine technological breakthroughs but is often too risky for businesses to invest in without public backing.

1.10 To meet the Government's ambition to reach 2.4% of R&D intensity by 2027/28 and to enable us to compete more effectively with the rest of the world, additional public *and* private investment will be required. Other R&D intensive countries have been willing to make significant public investments and are reaping the benefits. The need to invest in people and ideas to support a rapid recovery and improve prosperity for all UK citizens has never been more urgent.

1.11 To make the Government's ambitions a reality, this year's Spending Review must set out how the increases in public investment will be achieved with a clear trajectory to 2024/25, recognising the need to deliver value for the taxpayer and positive economic, social, environmental and health impacts across the whole country.

1.12 **We recommend the Government builds the additional investment needed to reach the £22bn target in a consistent way, providing an extra £2.37bn cumulatively each year between 2022/23 and 2024/25 (a "linear" model of increased investment), rather than backloading the additional investment with less in the early years and more at the end of the period (a "hockey stick" model).[13]** See **Figure 2** below.

1.13 A linear increase of an extra £2.37bn in public R&D spending added to the baseline each year from 2022/23 to 2024/25 would leverage in more private investment and do so more quickly than a "hockey stick" approach, meaning the benefits for the UK's economy and citizens will be felt sooner. Our modelling (based on BEIS figures on the "leverage effect") shows that by setting a linear trajectory to invest £22bn in R&D by 2024/25, the Government could expect to leverage more than double the amount of private investment over a three year period compared to a "hockey stick" model – see **Table 1** below.

[11] At the March 2020 budget, the Chancellor committed to invest £22bn in R&D by 2024/25 and this commitment was reiterated in the Government's R&D Roadmap published in July 2020.
[12] 'The relationship between public and private R&D funding', BEIS Research Paper Number 2020/010
[13] For illustrative purposes we have modelled a "hockey stick" trajectory as an additional £1bn in 2022/23, then £2bn in 2023/24, followed by a sharp increase to over £7bn in 2024/25. Further details about the benefits of a linear trajectory to £22bn by 2024/25 and the assumptions underpinning our modelling can be found in our policy paper 'Becoming a science superpower: setting a trajectory to £22bn by 2024/25'.

Figure 2 – (£bn vs. time) a linear trajectory to £22bn by 2024/25

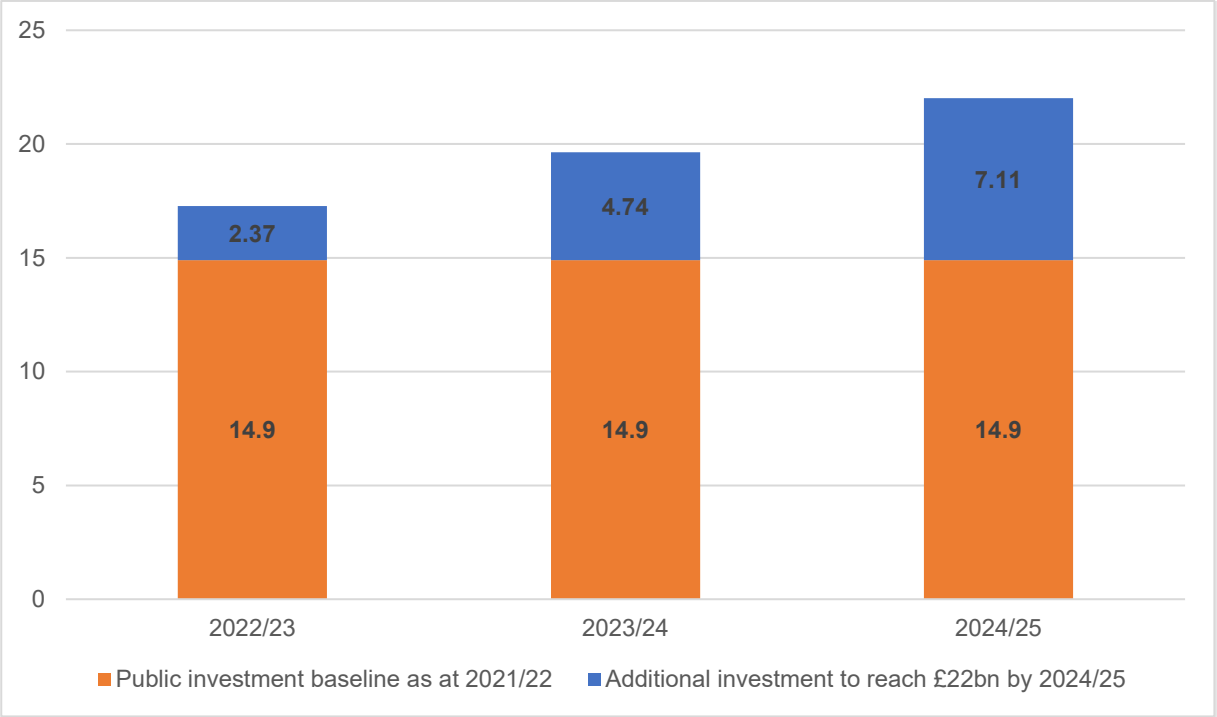


Table 1 – the effect of the distribution of additional public investment to 2024/25 on leveraging in additional private investment and improving the UK's R&D intensity[14]

Total public investment of £22bn by 2024/25	**Linear trajectory**	**Hockey stick trajectory**	**Additional realisable value of the linear trajectory**
3-year leveraged private investment (2022/23 to 2024/25)	£5bn	£2.1bn	**+£2.9bn**
6-year leveraged private investment (2022/23 to 2027/28)	£29bn	£24bn	**+£5bn**
R&D intensity[15]	2.34%	2.26%	**+0.08%**

1.14 In addition, our modelling suggests that a linear trajectory to £22bn will result in private investment making up a greater proportion of the UK's total R&D spending over time, bringing the UK more into line with our international competitors where around two-thirds of R&D is undertaken by the private sector.[16]

1.15 The linear trajectory to £22bn would also:

[14] Leveraged private investment based on an economic leverage ratio of £1 of public spend yielding £1.36 of private spend over a ten-year period.
[15] This is based on an estimated GDP of £2,528bn in 2024/25 in line with the March 2021 OBR update.
[16] Under a linear trajectory, by 2024/25, 63% of the UK's R&D activity would be funded by private sources compared to 61% under the "hockey stick" model. Of the world's top 15 R&D spenders, the average share of R&D expenditure by business (as opposed to public sources) is 67.9%. Unesco Institute for Statistics.

- Signal the seriousness of our intent to boost investment in R&D immediately, thus stimulating business confidence and making it easier for universities to attract foreign direct investment for the benefit of UK Plc.
- Set the UK on a course to meet its 2.4% target early and put it on track to compete more effectively with other research-intensive industrialised countries, which will be key to maintaining strategic advantage in science and technology.
- Provide a greater opportunity to capitalise on the UK's R&D strengths earlier. This will mean research and innovation can be translated into tangible benefits more quickly for citizens right across the country and for the economy, helping to deliver the Government's – and our – ambitions for a fairer, greener, healthier and more prosperous Britain.
- Enable universities, businesses and other research-performing organisations to plan effectively for scaling-up research and innovation activity and to do so efficiently, securing staff with the appropriate qualifications and experience, ensuring equipment and facilities are available with the required capacity, and developing partnerships to share resources and maximise impact.

Supporting future break-throughs and improved resilience for the UK

1.16 The UK's dual support system of investment in research plays an essential part in sustaining research of the highest quality, ensuring the UK's leading universities remain internationally competitive. Quality-Related 'QR' funding is a highly competitive funding source which allows universities to engage in long-term strategic planning for research and to respond quickly to emerging opportunities, giving them an edge against international competitors.

1.17 QR and its equivalents in the devolved nations provides institutions with the autonomy to deploy funding strategically – both to commit to long-term investments and to respond quickly to new challenges. This has been exemplified during the Covid-19 crisis where our universities have used internal QR funding to support the swift redeployment of researchers to pandemic-related work even before Government schemes were put in place. It also allows universities to invest in basic research to build expertise and capacity in areas which they anticipate will become the priorities of the future. Stability and predictability are key to unlocking new discoveries and long-term knowledge building – it is very hard to build a strategic and long-term sustained research effort based on three-year grants alone.

1.18 In addition, QR funding allows universities to pursue high-risk, high-reward ideas deemed too risky for the Research Councils or business to invest in; it helps them leverage funding from business and support smaller companies to grow and innovate; and it is used for training and career development for staff, especially early-career academics who may not yet have won independent research funding, but who show potential.[17] QR also frees researchers from red tape and bureaucracy by allowing universities to invest in teams to focus on long-term objectives so they do not have to re-apply for grant funding every few years.[18]

1.19 Perhaps the most critical feature of QR funding is that it provides a low bureaucracy mechanism to get public funds into the hands of those undertaking excellent research and to do this quickly. Empowering universities to make decisions on how and which projects and people to support ensures the funding is used efficiently and effectively, backed up by the established cycle of Research Excellence Framework (REF) assessment exercises as a

[17] UKRI estimates around 20% of QR funding is used by universities to support their research talent directly: UKRI (2019) UKRI Annual Report and Accounts 2018-19.

[18] For more information on QR funding with practical examples of how Russell Group universities use these funds, see our briefing 'Supporting future breakthroughs and improved resilience for the UK: the importance of 'QR' funding'.

robust external validation mechanism of the excellence and impact of university research activity overall.

Case studies: QR funding supporting the UK's Covid-19 response

Having identified future pandemics as a key global threat, the **University of Oxford** used QR funding to help establish the Jenner Institute in 2005, specialising in vaccine development. Decades' worth of investment meant the team working on the SARS virus was already in place and able to be re-deployed rapidly at the outbreak of Covid-19, thus allowing the team to develop their safe and effective vaccine against Covid-19. The Oxford-AstraZeneca vaccine is now in use in more than 40 countries around the world and is playing a crucial role in protecting public health in the UK, enabling the Government to roll back restrictions on social interaction and supporting the economic recovery.

University College London used QR funding to collaborate with industry partners to create breathing aids to keep Covid-19 patients out of intensive care. The flexibility of QR funding enabled UCL to redeploy a team to create, manufacture and supply 10,000 units of the UCL Ventura breathing device to the NHS within a month, with regulatory approval given to the device before the Government launched its first 'Rapid Response' funding calls. UCL's Technology Transfer Office also worked to make the design of these breathing aids freely available to manufacture worldwide. More than 1,900 active licenses have been issued to partners in 105 countries.

QR funds allowed **Queen Mary University of London** to help set up the Nightingale hospital in London and to provide leadership and direction to the clinical research programmes that flowed from the new hospital. QR funding also supported the design and testing of the genomic platforms at the University that now underpin the on-going UK-wide analysis of how Covid-19 patient genomes relate to clinical outcomes.

1.20 Despite its vital role in driving the UK's research and innovation performance, since 2010 QR funding has declined by 17% in real terms. This has happened at a time when funding for research has increased from £9.7bn in 2007 to £14.9bn in 2021. Indeed, the balance of funding between QR and Research Council funding has fallen from 80p in the pound in 2007, to 64p in the pound in 2021/22.[19]

1.21 **To safeguard the UK's future resilience and agility in the face of significant challenges such as climate change, health emergencies and other disruptive and unpredictable forces, the Government should increase QR funding – and equivalent streams in the devolved nations – by at least 20% from 2022/23**. This would return the value of QR to 2010 levels and would create maximum competitive advantage for the UK. This approach to funding the best research also offers a long-term, low bureaucracy route to funding a pipeline of new ideas to underpin innovation in areas which have not yet emerged as the global challenges of the future.

1.22 **As devolution settlements differ across the UK, it is important that increases in QR funding delivered by Research England should also be cascaded by the devolved governments** and that additional funding for QR is not taken from other research and innovation funds.[20] We recognise that other mechanisms may be needed to ensure this happens in practice, which UKRI could explore. However, a substantial boost now for

19 BEIS R&D budget allocations 2021/22 (footnote 16)

20 This is particularly important as QR funding and its equivalents in the devolved nations has failed to keep pace with inflation in recent years. For example, in Wales QR funding has remained static for around a decade, equating to a significant real-terms cut. Yet there is evidence that QR funding has enabled Welsh universities to better compete for other sources of research funding. HEFCW estimates that QR investment in Wales has facilitated the capture of more than 60% more funding from the UK Research Councils and around 180% more funding from other sources including industry, UK central government and the EU.

fundamental research across the whole of the UK will strengthen cohesion and ensure the UK can continue to hold its own alongside other research-intensive nations.

1.23 UKRI's total budget has barely increased over the period from 2018 to 2022 (rising by only 6% overall and falling in 2021/22 as a result of ODA cuts), whilst the Government's core research and innovation budget has risen by 66% over the same timeframe (from £9bn to £14.9bn). This means the proportion of R&D funding going to UKRI has dropped from 65% of total Government R&D spending in 2018/19 to just 52% in 2021/22, and is leading to a significant squeeze on responsive mode funding and training.[21]

1.24 Responsive mode grants are highly valuable because they allow researchers at the forefront of their disciplines to identify the research challenges of the future. They are also crucial for supporting fundamental basic research. Major advances can often be traced back to fundamental research where the applications could not have been foreseen at the start. Lasers, DNA, genetics and magnetic resonance imaging are a few examples where there are a growing range of applications in everyday use. While blue skies research is vital to the creation of new knowledge and discoveries, research investors such as business and charities typically underinvest in these areas as the path to impact is long and typically deemed high risk. Within the research funding system, Government is thus often the only actor willing to fund this sort of fundamental research at scale.

1.25 UKRI also undertakes important work supporting training, studentships and researcher career development to ensure a strong talent pipeline for the future. Increasing core Research Council budgets would help to support ongoing work to improve the UK's research and innovation culture as part of the implementation of the People and Culture Strategy.

1.26 **We recommend the Government set aside a significant portion of its additional R&D funds over the coming years to boost core Research Council budgets. This would ensure excellence and the pipelines for radical ideas and talent are maintained alongside a substantial uplift in R&D intensity.[22]**

Supporting the sustainability and excellence of the research base

1.27 The Covid-19 pandemic has exposed the fragility of the current funding model for research. This Spending Review is a timely opportunity to put research on a more sustainable footing to deliver the scientific, social and economic returns needed for the UK to recover and prosper. While the Research Councils have previously committed to supporting 80% of the full economic costs (FEC) of research grants, data from the OfS shows funding from the Councils has hovered between 71%-74% FEC since at least 2016.[23] Overall, this has contributed to an annual deficit of over £4.6bn in university research – see **Figure 3** below.

1.28 As a key area of university activity which generates a surplus, income from international student fees plays an important role in maintaining the sustainability of research, along with revenue generated from business conference hire, endowments and the provision of some student accommodation. The result of the pandemic is such that these income streams are likely to be unreliable for a number of years, putting additional financial pressure on universities and impacting their ability to meet the full costs of their research, particularly as public R&D investment rises. The market for international student recruitment is also

[21] Data taken from '2021/22 budget allocations for UK Research and Innovation' and 'The allocation of funding for research and innovation' BEIS, June 2018

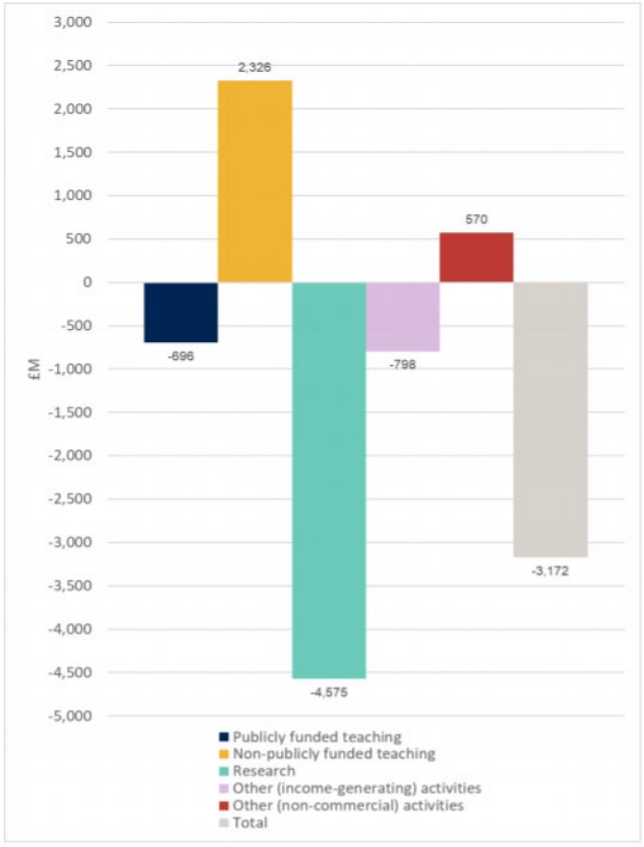
[22] For the purposes of costing our proposals, we have assumed core Research Councils budgets would increase by 5% per annum from 2022/23 to 2024/25.

[23] OfS Annual TRAC reports 2016-17, 2017-18, 2018-19 and 2019-20

becoming increasingly competitive, which means sustaining international student flows in future is likely to become more challenging.

1.29 The R&D Roadmap makes a welcome commitment to "consider opportunities to fund a greater proportion of the full economic cost of research projects in universities. This includes asking whether government should fund at a higher rate, to safeguard the sustainability of the research we fund".[24] If we do not take this opportunity to put research on a more sustainable footing, we are missing the chance to secure the sovereignty of our research. Furthermore, if the UK's top universities struggle to make it financially viable to bid for new grants, we risk making the system less competitive. In the context of an increasing budget for research there should be scope for the volume of research activity to increase alongside a sensible increase in the FEC that universities can recover, which will be necessary to maintain the highest quality outputs expected of world-leading UK institutions.

Figure 3: TRAC full economic cost surplus/ deficit by activity, 2019/20 (all UK HEIs)



1.30 **Increasing the level of FEC recovered on grants, including from Research Councils, Government departments and NIHR to at least 80%, will ensure universities have the financial capacity to deliver the world-leading R&D the country needs**. This represents excellent value for money for taxpayers as universities will continue to cover 20% of the costs of undertaking research projects themselves, deploying their own resources and leveraging in external investment. It would also ensure universities remain efficient in their use of research funding.

[24] UK Research and Development Roadmap (June 2020)

Maintaining UK leadership in global R&D collaboration

1.31 Realising the Prime Minister's ambition for the UK to become a science superpower hinges on our ability to collaborate on research and innovation with the best minds in Europe and across the world. To maintain and enhance the UK's strategic advantage in science and technology, we must build on our strong links with Europe as well as developing closer links with the rest of the world.

1.32 The UK's association to Horizon Europe, the world's largest ever programme for multi-country collaborative R&D, offers a unique opportunity to strengthen these links and to develop our relationships with EU member states, other re-associating third countries such as Israel and Norway, and those likely to associate for the first time including Canada, Singapore, South Korea and New Zealand. Through collaborations in Horizon Europe, the UK will have the opportunity to be at the forefront of major scientific projects on climate change[25], AI and other grand global challenges, strengthening our links with private[26] and public sector partners in other European countries and enabling us to attract and retain world-leading scholars from Europe and beyond.

1.33 We welcome the Government's decision to commit additional funding to support the UK's association to Horizon Europe in 2021/22: this is as important and significant to business as it is to universities. **The 2021 Spending Review provides an opportunity to make a longer-term commitment by ringfencing sufficient funding to participate in Horizon Europe for the full duration of the programme. This could be funded out of the Government's commitment to invest £22bn in R&D by 2024/25 and would maximise the ability of UK universities and businesses to lead projects, generate high-impact outputs and realise a range of economic, health, environmental and social benefits for the UK**.[27]

1.34 A focus on maintaining our strong research links with Europe could be complemented by efforts to scale up the UK's international research collaboration activity with the rest of the world. We expect Government will want to consider commitments to boost international research collaboration in trade deals, leveraging investment from overseas partners and capturing new opportunities as they arise. This is something we would support – for example, where additional new funding is allocated to strengthen bilateral research efforts with partners across the world.

Strengthening the research workforce pipeline

1.35 To reach the Government's ambition of investing 2.4% of GDP in research and innovation by 2027/28, a significant increase in the research workforce will be required. The Government's People and Culture Strategy estimates a need for at least an additional 150,000 people in the UK R&D workforce by 2030. Efforts will be needed to recruit many more postgraduate research (PGR) students to form the pipeline of the future R&D workforce, as well as

[25] For example, through an international research consortium supported by Horizon 2020 academics at the University of Bristol have worked with researchers across Europe to develop a roadmap for how to create 'green' cities where people can live in an environmentally sustainable way, minimising their energy needs and reducing waste. This forms part of the Integrated Climate forcing and Air pollution Reduction in Urban Systems (ICARUS) project.

[26] The EU's research framework programmes support joint initiatives enabling major university-business collaboration at significant scale. The University of Nottingham, for example, is working with industry through the Clean Sky initiative to deliver major advances in electrical power distribution and energy management systems to support the development of next-generation passenger airliners.

[27] Further information on the benefits of association to Horizon Europe can be found in our separate policy paper 'Horizon Europe: maintaining UK leadership in global R&D collaboration'.

considering how to retain current R&D workers in the field, encourage others to return, and to attract further talent from overseas.

1.36 The number of PGR students enrolling in UK universities has been almost flat since 2010.[28] Increasing PGR recruitment to grow the R&D workforce and meet the Government's ambition for the UK to become a science superpower will require the delivery of PGR training to be placed on a more sustainable financial footing, and for issues around research culture to be addressed effectively.

1.37 TRAC Full Economic Costs data shows that the current recovery rate for training and supervising PGR students is only 45.6%, the lowest recovery rate across all externally funded research activities. Even when accounting for the use of QR funding to cross-subsidise this activity, we estimate only around 56% of the costs of PGR training and supervision are covered on average, meaning universities are required to find other income sources to meet the deficit. This is likely to become increasingly difficult as income streams such as international student fees, business conference hire, endowments and philanthropy remain unreliable for several years because of the pandemic, and crucially, as the shortfall in PGR funding increases with more students entering universities.

1.38 Without improvements in the retention of existing R&D workers and/or greater recruitment from overseas, an additional 91,000 PGR students would be needed, in turn resulting in a funding deficit of £11.9bn over the period 2020/21 to 2027/28 based on the current FEC rate.[29] Even if improvements in worker retention and recruitment from overseas meant only a third as many PGR students were needed (say 30,000), this would still leave a deficit of £10.8bn over the same period. It would be very difficult for universities to cover the shortfall from other income sources, and this would place a limit on growth in PGR student numbers as well as undermining the ability of universities to provide appropriate support and career development opportunities to PGR students and post-docs.

1.39 **Alongside other measures to retain and recruit R&D talent, increasing the level of full economic costs recovered on the training and supervision of PGR students to at least 80% will be crucial to growing the UK's R&D workforce. We recommend the Government:**

- increase the recovery rate on UKRI-funded PGR training and supervision,
- work with other funders and universities to explore how a greater proportion of the costs of non-UKRI-funded PGR training might be met, and
- ensure QR (through RDP and its equivalents in the devolved nations) at least keeps pace with the increasing scale of PGR training and supervision.

1.40 Efforts by universities and funders will also be needed to improve the retention of research workers post-PhD. Russell Group universities are committed to taking a lead in ensuring we have a research culture and environment which truly supports every member of staff to reach their potential and pursue a fulfilling career. In our report "*Realising Our Potential: Backing Talent and Strengthening UK Research Culture and Environment*" and accompanying Toolkit of Ideas,[30] we set out some of the challenges and examples of good practice for enhancing research careers, the experience of working in research, and fostering inclusive and respectful environments. Improving career stability and progression, especially for early career researchers, will be key to retaining talent within the R&D system and this should be a

[28] HESA data, 2010/11 to 2019/20

[29] Assuming PGR numbers grow in line with research intensity to 2.4% by 2027/28 and covering all PGR training from all funders (Government, charities, industry etc).

[30] Russell Group, Realising Our Potential: Backing Talent and Strengthening UK Research Culture and Environment (2021) https://realisingourpotential.russellgroup.ac.uk/

priority for action within the proposed “New Deal for postgraduate researchers”. To achieve this, coordinated action will be needed by universities, funders and industry.

1.41 To improve the UK’s offer to overseas talent, the Government may also want to consider any further incentives in the new immigration system to boost our competitive edge. This could be done by brokering national deals including visa concessions, fee reductions and waivers for talented researchers from a wider range of countries. Existing schemes such as the Commonwealth Scholarships and the Rutherford Fund could also be expanded to continue to build the pipeline of high-skilled research talent from overseas.

2. Levelling up – driving prosperity across every region and nation through innovation and skills provision

Summary

Spreading innovation into the economy is crucial for productivity growth. Drawing on their research excellence and commercialisation expertise and bringing together businesses large and small with public sector partners, Russell Group universities have been instrumental in developing regional innovation clusters. This has led to vibrant new communities centred around R&D-intensive businesses, accompanied by new infrastructure, homes and high-value jobs.

By supporting emerging innovation clusters centred around research-intensive universities across the UK, there is an opportunity to revitalise Britain’s regional economies. We recommend the Government pursues a three-point action plan to grow new, and scale existing innovation clusters across the UK and help deliver a rapid recovery from the pandemic. This should include:

1. Scaling existing innovation schemes with a track-record of proven returns. Our proposals represent a net increase in spending of just under £600m over the three years to 2024/25, delivering a return of £2.7bn to the UK’s economy and society.
2. Introducing a new £200m deep-tech university seed fund, targeted at innovative ideas within the Innovation Strategy’s seven priority technology families. This would create around 350 new deep-tech spin-outs, developing genuinely disruptive technologies, transforming regional economies and creating export revenue.
3. Encouraging greater collaborative R&D and leveraging more private R&D investment by reforming VAT rules, eligibility for R&D-related tax credits and cutting bureaucracy.

Investing in the talent pipeline for future high-level skills will be critical for the UK’s economic recovery. A high-quality university education delivers for the individual *and* for Britain: a single cohort of UK-domiciled students at Russell Group universities is estimated to contribute more than £20bn to the economy over the course of their working lives. Improving access to high-value degrees alongside investment into higher level technical skills will ensure a steady supply of talent across all regions of the country. To achieve this the Government should:

- Seek to maintain the highest quality university education that meets the country’s skills needs by guaranteeing teaching grants on a *per student* basis and in real-terms for the duration of this Spending Review at levels that at least match existing funding. Per student funding through the Strategic Priorities Grant has already declined by over 19% since 2018/19 and any further reductions in the unit of resource (either fees or grants) would damage the skills pipeline and significantly disrupt efforts to level up.
- Ensure opportunity is spread evenly across every single part of the UK, by working with universities together with other partners (including schools, employers and local agencies) to dismantle the obstacles faced by disadvantaged students in accessing higher education.
- Agree a multi-year commitment for the Turing Scheme to provide opportunities for students to study abroad, developing the skills they need to succeed in the UK’s future workforce.

Developing a network of regional innovation clusters across the UK

2.1 Spreading innovation into the economy is crucial for productivity growth. Russell Group universities help businesses of all sizes to innovate, providing expert advice, access to state-of-the-art facilities and equipment, and undertaking commissioned research projects for UK businesses operating in a wide range of sectors. In 2019/20, Russell Group universities provided £1.4bn worth of support and services to SMEs, larger firms, and not-for-profits (with £6.7bn provided in the last 5 years), and they attracted over £1bn in funding to undertake collaborative research projects to drive business innovation.[31]

2.2 Drawing on their research excellence and commercialisation expertise and bringing together multinational companies, SMEs, NHS Trusts, other public sector partners and local and national governments, Russell Group universities have been instrumental in developing regional innovation clusters which can help deliver the Government's levelling up agenda.

2.3 Established innovation clusters in places like Manchester, Cambridge, Oxford and London are exploiting areas of national and regional competitive research and innovation strengths, facilitating the exchange of ideas, and spurring collaboration across a range of technology areas, by bringing together state-of-the-art facilities, firms of all sizes, and highly skilled research, innovation, and commercialisation talent. These long-term collaborations are leading to vibrant new communities centred around R&D-intensive business, accompanied by new infrastructure, homes and high-value jobs – creating significant new "pull factors" into local communities and the surrounding towns as well as delivering economic impacts for communities much further afield.

Case studies: regional innovation clusters driving UK prosperity and economic growth

The **University of Cambridge** is at the heart of Europe's largest technology cluster, with particular strengths in Life Sciences and Computing. The Cambridge Cluster is home to 5,000 knowledge intensive companies turning over more than £18bn and employing nearly 70,000 people from a regional population of 600,000. The University of Cambridge powers the cluster as a major employer, technology provider, and a source of knowledge and skills in the region. The University is also working in partnership with local councils and the Local Enterprise Partnership having secured £1bn in funding to accelerate the building of thousands of new homes, underpinning further growth in high-value jobs and creating a fit-for-the-future transport network.

The **University of Manchester's** new 18.2 acre, £1.5bn, innovation district, 'ID Manchester' will help to commercialise cutting-edge research in the North West, creating incubators, collaboration spaces and accelerating the University's R&D base into jobs and growth in leading edge sectors such as advanced materials, health innovation, and industrial biotechnology. The new district will be a major pull factor for the Manchester City Region, bringing new and established businesses to the North West and driving regional economic growth. Economic forecasts project ID Manchester will support up to 10,000 new high-quality jobs on site in a wide range of technology-rich growth sectors and add £800m GVA to the regional economy annually.

Together the **five London-based Russell Group universities** (Imperial College London, King's College London, London School of Economics, Queen Mary University of London and University College London) have driven the creation of London's high-tech 'super' cluster with strengths in Life Sciences, Biotech, Defence, FinTech, Healthcare, and Computing. London is the UK's highest ranked innovation cluster in the Global Innovation Index and Russell Group universities have

[31] HESA 2019/20 from the HEBCI survey

played a key part in its formation through the commercialisation of their research, supporting academics, staff and graduates to spin-out commercially promising IP for economic value.

2.4 Emerging innovation clusters centred around research-intensive universities also have the potential to revitalise regional economies across the UK through innovation-led growth. These clusters are already delivering benefits for local economies, creating high-value jobs and new companies, boosting productivity, and building critical research, innovation and social infrastructure. With targeted local and national Government support, there is an opportunity to scale these emerging pockets of regional innovation excellence, enabling them to deliver much greater benefits for their local areas and the surrounding communities and to begin to rival more established clusters in the UK and overseas. To note, the examples below are for illustrative purposes only – the full list of emerging innovation clusters is available in our briefing 'Levelling up through regional innovation clusters'.

Case studies: developing regional innovation clusters with potential for significant impact

The development of Belfast's emerging technology cluster is being supported by the highly skilled research base at **Queen's University Belfast**, with the University's Institute of Electronics, Communications and IT (ECIT) and Centre for Secure Information Technologies playing a key role in bringing innovative ideas to industry. Queen's has supported the creation of nearly 100 technology start-ups, adding 2,700 jobs to the regional economy. An additional 1,800 roles have been created via a cutting-edge cybersecurity cluster based around the University's ECIT.

The **University of Bristol's** Temple Enterprise Quarter is a £500m project that will bring together private and public investment to deliver 22,000 jobs and 7-11,000 homes for the South West. It will boost digital innovation, enhance the skills base and create green jobs through investment in low carbon industries. A new £300m campus will be at the centre of the Temple Enterprise Quarter including a new £43 million Quantum Technologies Information Centre and an innovation hub based on the successful Engine Shed model, with the aim of helping more start-up businesses to thrive. The Quarter will renew 130 hectares of brownfield land over the next 25 years, and the development is forecast to add £1.6bn to the city's economy annually.

Cardiff University is lead partner in a consortium which has created the world's first compound semiconductor cluster in Wales. Compound semiconductors are at the heart of many devices we use today and are set to play an increasingly important role in next generation technologies. The compound semiconductor community currently provides more than 1,500 highly skilled, high value jobs in Wales across 12 partner organisations and in the supply chain – a number that economic modelling suggests will double in coming years. The work Cardiff University researchers are supporting will position Wales firmly as a global leader in enabling new and emerging technologies that will boost connectivity, improve healthcare and support the shift towards net zero.

The **University of Sheffield's** Advanced Manufacturing Research Centre (AMRC) employs more than 500 highly qualified researchers and engineers from around the globe, linking them with industry partners from global giants like Boeing, Rolls-Royce, BAE Systems and Airbus as well as SMEs to help overcome manufacturing problems. The University is now working with Doncaster Sheffield airport and industry partners to develop a high-value innovation district around the airport. The district will build on regional strengths in advanced manufacturing, with the potential to create up to 35,000 jobs and 3,000 new homes worth £6.5bn to the local economy by 2037.

2.5 We propose a three-step plan that can help the UK grow new, and scale existing, tech-themed innovation clusters to maximise the regional and national economic benefits of this

activity and help deliver a rapid recovery from the pandemic.[32] We would encourage the Government to ensure these proposals feed into the development of the Levelling Up White Paper expected later this year.

Step 1: Scaling innovation funding schemes with a proven track record

2.6 The Innovation Strategy recognises the UK's 'research, development, and innovation system as a critical national asset that will more than pay for itself'. We do not need to reinvent the wheel – there are several existing funding streams which have a proven track record in delivering economic impact in the regions, supporting universities to improve collaborations with new partners and subsequently leveraging business investment in research and innovation. Channelling additional funds through these schemes would be much more efficient, and with quicker returns, than trying to create new programmes from scratch. The issue is therefore one of scale, rather than a lack of effective funding schemes.

2.7 As a priority, we recommend scaling the following funding programmes:

- **The Higher Education Innovation Fund (HEIF)**: HEIF underpins universities' core innovation activities, including leveraging private investment, building co-location spaces, and helping to commercialise promising university tech. Every £1 of HEIF received by large research-intensive universities returns £12.46 in impact for society and the wider economy. HEIF allocations are capped at £4.3m per institution but a £10m supplement is distributed to those institutions who can demonstrate that the cap is a constraint to their support of economic growth. Increasing the supplement by £70m per annum would enable those institutions affected by the cap to increase the economic impact of their innovation efforts and provide an additional return of £2.5bn over the next 3 years for the economy and wider society. This would deliver a higher return on investment than simply increasing the main HEIF allocation by the same amount as research-intensive universities affected by the cap deliver much greater economic benefit in their use of HEIF funding.[33]
- **UK Research Partnership Investment Fund (UKRPIF)**: Competitive grant funding through UKRPIF has funded 54 state-of-the-art research centres and facilities across the UK since 2012. Awards are conditional on double-matched non-public co-investment, meaning that for every £1 awarded through UKRPIF, universities must attract £2 from non-public sources: to date, UKRPIF has leveraged over £2bn in non-public co-investment as well as accelerating progress towards net zero, by creating low carbon or carbon-neutral R&D facilities, and research facilities dedicated to developing green technologies. Introducing a new round of funding worth £330m (a 50% increase on the latest round of funding) would leverage at least £660m in private investment, and help to create new, and scale existing, regional innovation clusters. Government may also want to tweak the criteria for the competitive awards, so that UKRPIF is granted to institutions in all UK geographies, including the North East which has yet to secure any UKRPIF funding.
- **Knowledge Transfer Partnerships (KTPs)**: KTPs link businesses with an academic partner to help the business innovate to improve productivity, grow sales, and hit other strategically important objectives. Every £1 of KTP grant invested has resulted in between £7.50 and £8 of net extra GVA and has stimulated increased profits, new jobs and innovation training across the UK. Increasing funding by 50% by 2024/25 represents a total increase of £6m across 3 years and could return a net extra GVA of between £45m and

[32] Further information on our proposed three-step plan to grow tech-themed innovation clusters across the UK can be found in our separate briefing 'Levelling up through regional innovation clusters',

[33] Based on Research England's data, increasing the supplement by £70m would return over £131m more annually in net return on investment than if HEIF core allocations were increased by £70m. This includes a 31% higher return for core knowledge exchange income.

£48m, while leveraging investment from businesses of all sizes, and spurring collaboration that can help scale regional innovation clusters.

- **The Connected Capabilities Fund (CCF)**: The CCF complements HEIF by awarding funding competitively to projects that facilitate the sharing of good practice and capacity within the university sector, as well as forging external partnerships. CCF has proven effective at spurring innovative activities, with over 1,000 projects set in train to create new products or services and 28 new spin-out companies created since 2018. Introducing a new £100m round of funding for 2022/2025, with £25m top-up funding available in 2024/25, would equate to an increase of 12.2% on current levels of funding. This would help create more spin-out companies, leverage private investment, foster working between regional innovation clusters and further expand the UK's commercialisation talent pool.
- **Innovation to Commercialisation of University Research (ICURe)**: This pilot programme of commercialisation support for teams of early-career academic researchers provides them with access to crucial market intelligence. To date, the scheme has returned nearly £4 for every £1 invested and created over 100 new companies and over 500 new jobs. Expanding the programme to all geographies in the UK, and doubling funding to £24m per annum, could help to return an additional £144m to the economy over the 3 years ending 2025, create durable new spin-outs, and support hundreds of new jobs.

2.8 In sum, our recommendations to scale existing funding streams would represent a net increase in spending of just under £600m over the 3 years ending 2024/25, compared to maintaining existing funding over the same period. This would deliver a return of almost £2.7bn to the economy and wider society as well as leveraging a minimum additional £678m in private investment.[34]

Step 2: A new seed-fund for early-stage 'deep-tech' spin-outs and IP

2.9 UK universities have become world-leading innovation powerhouses, exploiting promising IP and creating dynamic new companies that bring high-value local jobs, leverage private investment, and create products and services which benefit UK consumers, regional economies, and patients. The **University of Southampton's** Zepler Institute, for example, is at the centre of a world leading photonics cluster with spin-out companies from the Institute employing more than 400 people directly and generating turnover of more than £100m/yr.

2.10 Domestic investors, venture capitalists and industry partners have, however, shown a historic reluctance to spend on deep-tech, defined as early-stage technology start-ups or IP which require extensive research and development and capital investment before commercialisation. In this respect, the UK lags behind other innovation powerhouses, with early-stage venture capital investment in the US roughly five times as large as the UK, after controlling for population.[35] While these technologies have the potential to be genuinely disruptive, they are high-risk and need time to develop, with private capital markets favouring more immediate returns.[36] Research teams developing deep-tech outside of the South East most acutely struggle to access venture capital.[37]

2.11 Research-intensive universities have a proven track record of effectively spinning out promising technologies and are therefore well placed to invest additional funding for deep-

[34] The return on investment figure is based on projected net returns for additional investment in HEIF, KTPs and ICURe based on the impact these funds have had to date. The leveraging figure solely comprises the additional investment we would expect UKRPIF and CFF to stimulate. We have not attempted to calculate the return on investment from other initiatives. The real return on our package of proposals is therefore likely to be higher.

[35] Gornall, Will and Strebulaev, Ilya A., The Economic Impact of Venture Capital: Evidence from Public Companies (6/21)

[36] I.e. around 5 years or less

[37] London and the South East attract over double the amount of venture capital as the rest of the UK combined according to the British Private Equity & Venture Capital Association (BVCA).

tech, but they are limited in how many spin-outs they can nurture. As outlined above, HEIF allocations used to commercialise research are capped with many competing demands on the funding, meaning capacity to invest in deep-tech is limited. This means some highly promising deep-tech ideas will either not be developed or will rely more substantially on foreign investment, limiting the returns made to the UK economy and to the Exchequer.

2.12 The Government has recently proposed a number of new schemes to overcome the lack of access to venture capital facing early-stage spin-outs. These include the new Life Sciences Investment Programme, the Future Fund, a UK-wide training programme to encourage private lenders to invest in early tech, and reforms to regulation around pension schemes, enabling them to invest in illiquid assets. While helpful, these reforms will not solve the challenges facing deep-tech, since they are most likely to benefit spin-outs which have already started to generate revenues and cover a limited number of key technology areas.

2.13 **A new deep-tech university seed fund, targeted at innovative ideas within the Innovation Strategy's 7 priority technology families[38], could help level up communities across the country, by developing genuinely disruptive technologies** that can transform regional economies and create new national export revenue streams in the next 15-20 years. Seed funds could be spent on protecting IP, early-stage proof of concept and taking innovations up the technology readiness levels (TRLs). This new fund would require a one-off commitment of £200m, which would support over 350 new deep-tech spin-outs across 3 years.[39] It could be reviewed after 5 years, with follow-up funding provided if universities demonstrate they have spent their initial allocation effectively.

Step 3: Low-cost reforms to taxation and cutting bureaucracy

2.14 The Government can further encourage the growth of regional innovation clusters through a series of low-cost policy measures. The following proposals will encourage greater collaborative R&D, leverage more private R&D investment from businesses of all sizes, and make research and innovation infrastructure projects more appealing:

- **Tweak the eligibility criteria relating to R&D tax relief**: The R&D SME tax relief and Research and Development Expenditure Credit (RDEC) have both proven effective at leveraging additional private R&D expenditure.[40] Tweaks to the eligibility criteria could help unlock the full potential of these schemes, stimulating additional private investment across a range of industries. We propose introducing automatic eligibility for SMEs undertaking collaborative R&D with universities and allowing firms operating in all areas of the economy to apply to the SME tax relief and RDEC for SHAPE[41] research projects.
- **Taking back control of VAT application for infrastructure used for collaborative R&D between industry and universities**: The application of VAT rules around capital investment for the purposes of R&D acts as a barrier to university-business collaboration, with universities required to pay full VAT on buildings where usage exceeds 5% for commercial activities (such as collaborative R&D with businesses) at any point in the 10 years after construction. These rules, deriving from application of VAT rules originating in the EU, hold back business innovation, acting as either a disincentive for business to

[38] These are: Advanced Materials and Manufacturing; AI, Digital and Advanced Computing; Bioinformatics and Genomics; Engineering Biology; Electronics, Photonics and Quantum; Energy and Environment Technologies; and Robotics and Smart Machines. 'UK Innovation Strategy: leading the future by creating it' (2021)

[39] Based on the average seed fund investment in UK IP (£569,000) in 2019, reported by the BVCA.

[40] The R&D SME tax relief stimulates SME demand for collaborative R&D activity, by providing tax relief to those undertaking innovative research. Every £1 of cost to the Exchequer returns an additional R&D expenditure of between 75p and £1.28. RDEC can be claimed by firms of all sizes, where they are undertaking research projects in STEM areas. HMRC's evaluation of the scheme demonstrates that every £1 of RDEC stimulates additional private sector investment of between £2.40 and £2.70.

[41] Social sciences, Humanities, Arts for People, and Environment/Economy

engage in R&D or resulting in business/university R&D occurring in buildings which are more than 10-years old, rather than state-of-the-art facilities. To address this issue, new buildings built or acquired by universities for charitable purposes should be zero-rated for VAT in the first instance, with universities submitting annual VAT self-charge adjustments – reporting and paying VAT on any commercial or non-research use of the building each year up to 10 years. This would be consistent with other existing VAT schemes used by HMRC, such as the Capital Goods Scheme adjustment.

2.15 Cutting red-tape: The Government's review of research bureaucracy is a key opportunity to reduce unnecessary costs within the research system and maximise the return on investment for public spending. These costs have grown over a number of years due to a lack of shared understanding of the volume and impact of bureaucracy on the efficiency of the UK system, leading to a corresponding lack of 'ownership' of this agenda. The duplication of similar compliance and monitoring requirements across funders is a key source of unnecessary bureaucracy and going forward, BEIS should take the lead in engaging and working with funding bodies, charities and universities to foster co-ownership of this agenda, including auditing and monitoring the creation of new regulation.

Highly skilled graduates driving rapid economic recovery

2.16 Investing in the talent pipeline for future high-level skills will be critical for the UK's economic recovery. It will also provide opportunities for individuals whose prospects have been hit by the pandemic. People at the start of their careers are impacted disproportionately by recessions. Increasing the options open to them will help mitigate the challenges they are facing and deliver social mobility as well as wider prosperity.

2.17 A robust university education delivers for the individual *and* for Britain. Numerous studies link the accumulation of graduate skills and higher education qualifications with increased productivity and GDP growth in the economy.[42] [43] [44] Indeed, a single cohort of UK-domiciled students at Russell Group universities is estimated to contribute more than £20bn to the economy over the course of their working lives, including a total of £11bn in tax and NI contributions. [45]

Boosting skills in the regions

2.18 UK universities are driving the growth of skills in their regions, with over 50% of graduates remaining local to their university after graduation[46] and 70% of Russell Group graduates working in areas outside of London five years after their studies.[47]

2.19 Across all forms of work, Russell Group graduates are significantly more likely to occupy high-skilled roles than graduates from other UK universities. 80% of the 2018/19 cohort of students graduating from Russell Group universities were in highly skilled employment 18

[42] ONS estimates about a fifth of the rise in productivity between 1994 and 2019 can be attributed to improvements in the quality of the workforce, especially those with HE qualifications: Written answer to Parliamentary Question to Lord Duncan of Springbank, 7 Jan 2020.

[43] National Institute for Economic and Social Research found that an accumulation of graduate skills is likely to be even more strongly correlated with productivity growth in future as a result of rapidly-developing technology in the workplace: 'Graduates boost productivity', NIESR https://www.niesr.ac.uk/blog/graduates-boost-productivity

[44] Between 1994 and 2005 the accumulation of graduate skills was the driver of between 14-20% of GDP growth in the UK according to BIS 2013 'The relationship between graduates and economic growth across countries'.

[45] Economic impact of Russell Group universities (2017)

[46] Analysis of HESA Graduate Outcomes Survey (GOS) data by the Bridge Group in *Staying local: understanding the value of graduate retention for social equality*, September 2021.

[47] Graduate Outcomes (LEO) data, Department for Education, 2021 relating to tax year 18/19

months after graduation compared to 67% of those graduating from other UK universities.[48] By bringing their skills to regions outside of London post-graduation, highly skilled university graduates are contributing to the prosperity of all parts of the UK over the long-term.

2.20 Not only are graduates contributing their skills to the UK's nations and regions, they are also investing their significantly higher salaries there as well. Compared to the average university, going to a Russell Group institution adds around an extra 10% to a graduate's income (even after prior achievement, social and other factors are taken into account).[49]

Delivering innovative teaching and technical skills

2.21 Russell Group universities have risen to new challenges caused by the pandemic. They have invested substantially to ensure campuses are Covid-secure, delivering a high-quality blended learning experience that combines online and in-person teaching.[50] As the new academic year begins, an element of digital learning, which was an important feature of university courses pre-pandemic, will continue – both to enhance learning and also to provide the flexibility to respond to public health measures or local outbreaks where necessary while minimising disruption.

2.22 In developing blended learning our universities are reviewing how in-person or 'contact hours' are spent to maximise the benefits of this time for students. For example, exploring how they can use digital technology to deliver lectures and seminars more effectively or make them more interactive. As well as increased student choice and flexible learning, a blended approach will help prepare graduates for an increasingly digital world that will demand agility and digital skills. More interactive learning through small group discussions and workshops also ensures that our students will be developing skills that are important in the workplace such as collaboration and effective communication.

2.23 The research-intensive learning environment at Russell Group universities helps to ensure all students can develop the personal and professional skills needed to realise their ambitions. Our students learn to be independent thinkers, to be resilient and adaptable, and to have a broad understanding of the world, meaning they are well-prepared for their future careers. Students across all disciplines are provided with opportunities to apply their learning in practical real-world environments, working with key industry partners.

Case studies: innovative education across a range of disciplines

The Geography Department at the **University of Liverpool** runs a programme of practical classes for first year undergraduate students providing them with an opportunity to learn a variety of technical skills within a laboratory environment. During the pandemic, the department created a 'virtual laboratory', filming, editing and narrating over 150 videos of lab measurements and over 500 microscope images, in the first semester alone. In the 2021/22 academic year the virtual laboratory will continue to be available alongside in-person lab practicals. Since introducing blended learning, module leaders have observed an increase in the quality of the assessment outputs from students.

The **University of Birmingham's** 'Enterprising English' module is designed to help students develop an enterprising and entrepreneurial mindset, while also developing skills relevant to local industries and employers. Each year a cohort of 40-50 students in the English Department work in

[48] 2018/19 Graduate Outcomes Survey data. Employment by Standard Occupation Classification (SOC). Includes undergraduates who studied full-time and were in paid employment 18 months after graduation.
[49] IFS, Family background has an important impact on graduates' future earnings, but subject and institution choice can be even more important, June 2018
[50] More information about blended learning at Russell Group universities is available here: https://russellgroup.ac.uk/news/blended-learning-at-russell-group-universities/

groups on 'live' briefs offered by a range of external stakeholders in the Birmingham area. Teaching is delivered by academics, enterprise professionals at the University, and visiting speakers from companies such as Google, IBM, and Lloyds Bank. Of the students who have undertaken the module, 82% have gone on to take the University's professional skills placement module in their final year, with many students securing work with their partner organisations from the course.

As a part of the **University of York's** Theatre, Film, TV and Interactive Media programme, third year students are offered a cross-disciplinary module, Esports Content Production, that brings together various links with the technology, creative and research industry. A rapidly growing form of mainstream entertainment, Esports are video games that are played competitively and watched by large audiences. Students studying York's Esports module acquire both a systematic theoretical understanding of content creation in Esports as well as hands-on, practical experience in executing an Esports production. The module was developed in close partnership with ESL, the world's biggest Esports company, and from 2021/22 will be delivered in the University's state of the art Esports production facility.

2.24 We support the Government's proposal for a Lifelong Loan Entitlement (LLE) which has the potential to provide greater flexibility for prospective learners and could encourage more individuals to train, upskill or retrain throughout their lifetime. Russell Group universities have already developed a range of provision with new entry routes for non-traditional learners. The **University of Warwick**, for example, has a long-standing partnership with four local further education colleges to offer a 2+2 articulation model for students with no formal qualifications, whilst **Queen's University Belfast** is delivering new part-time postgraduate programmes to aid individuals impacted by furlough or job loss due to the pandemic. **To ensure Russell Group universities are best placed to support the delivery of LLE we would ask that the indirect and additional costs of providing more flexible training pathways are adequately recognised through the Government's intended funding model**. Such costs will include those institutions will face for the effective administration and coordination of credit recognition and transfer; those required in order to adjust to new regulatory requirements; and those needed to support learners who are likely to require additional support and access to services over a longer time period.

2.25 Getting the regulatory balance right is critical to support innovative models of teaching and to ensure more money can go towards directly supporting the learning of students. We support the ambition of Government, to reduce unnecessary bureaucratic burden and the target it set out in February this year for the OfS to implement a "more risk-based model of regulation, with significant, meaningful and observable reductions in the regulatory burden upon high quality providers within the next 12 months".[51] We stand ready to work with the OfS to consider how this can be achieved to ensure savings for the taxpayer and universities, for the ultimate benefit of our students.

2.26 Russell Group universities are working closely with colleges and businesses to address local skills needs. They are driving up UK technical skills by delivering high-quality apprenticeships and Level 4 and 5 qualifications across a range of disciplines, collaborating with local employers and colleges. In total, 14 of our members deliver higher apprenticeships and five are leading or supporting the establishment of Institutes of Technology to deliver higher technical qualifications from 2022 in collaboration with other higher and further education partners, and business.[52]

[51] https://www.officeforstudents.org.uk/media/48277145-4cf3-497f-b9b7-b13fdf16f46b/ofs-strategic-guidance-20210208.pdf

[52] Four Russell Group universities are participating in the initial wave of IoTs, including: Newcastle University (Digital advanced manufacturing, Construction and the built environment); the University of Exeter (Digital, engineering,

2.27 Our universities are also working closely with professional, statutory, and regulatory bodies (PSRBs) to ensure their courses are designed to prepare students for the world of work. Over 3,500 courses across our institutions are recognised by 154 different accrediting bodies. The **University of Birmingham** alone has over 200 accredited courses, including those accredited by the Engineering Council, the Institute of Physics and the Royal Society of Biology. This represents approximately 80% of the courses offered at the University.

Case studies: delivering high-level technical skills training

Newcastle University acts as the higher education anchor for the North East Institute of Technology, led by the New College Durham FE college. The Institute is working with key regional employers, including Nissan Motor Manufacturing, Siemens and Northern Power Grid. Students will be offered industry-standard facilities and training in mechatronics, robotics and electric hybrid vehicles, alongside digital skills required in the agriculture sector. Qualifications at Level 4 and 5 will be accessible to young and adult learners looking to develop new or existing skills.

The **University of Exeter** and Exeter College have partnered on a new Degree Apprenticeship in Data Science. The programme will cover subjects such as statistics, databases, Big Data, data visualisation and machine learning. It has been developed by listening to the needs of employers in the region, and creating a progression route for learners, in areas where skills are in high demand across many sectors in the South West such as health, marketing, tourism and manufacturing.

The **University of Leeds** has worked with PwC, one of the largest graduate employers in the UK, to create a new undergraduate degree apprenticeship in computer science. This collaboration was in response to research from PwC showing 67% of UK chief executives found it difficult to recruit people with digital skills. Working together with PwC, the University is using the latest research to educate apprentices who benefit from having significant workplace training in addition to the academic content. Apprentices graduate with a degree in Computer Science and a job at PwC.

Sustainable funding for undergraduate education

2.28 The unit of resource – the total funding available from tuition fee and grant income – for undergraduate teaching has been under significant pressure over the last decade due to inflation and the rising numbers of students. The latter in recent years has been driven by last-minute changes in assessments of A-levels and equivalent qualifications in 2020 and A-level grade inflation in 2021.[53]

2.29 The Office for Students (OfS) has noted that the real terms value of the fee has fallen 17% since 2012/13, while the recurrent grant unit of resource for teaching has declined by 19.3% since 2018/19.[54] Taking these together we estimate that the value of tuition fees and teaching grants has fallen by 7.1% since 2018/19. The OfS has further predicted that by 2023/24, the total unit of resource (i.e. fees plus recurrent grant funding) will be very similar in real terms to the level it was in 2011/12. This was the year before the £9,000 fee was

manufacturing); Queen Mary University of London (Transport, engineering, infrastructure, energy, digital); and the University of Birmingham (Manufacturing, engineering). The University of Sheffield is part of a consortium that is in stage 2 of the wave two applicants' competition.

[53] In 2020 there was a 4.5% year-on-year increase in the number of placed UK domiciled students across all UK providers (UCAS end of cycle data). English Russell Group universities were particularly impacted, accepting 15% more UK domiciled students in 2020 compared to the previous year. So far data from 2021 (UCAS 28 day clearing data) shows a 2% year-on-year increase in placed UK domiciled students across all UK providers and an 8% increase at higher tariff institutions.

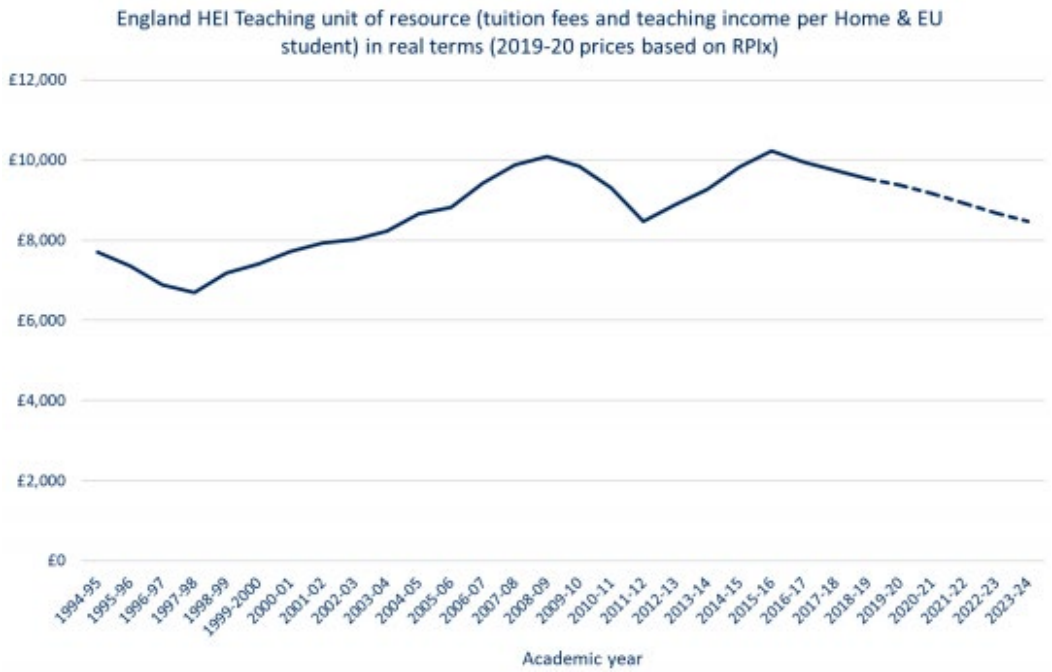
[54] See page 7 of the OfS Recurrent funding for 2021-22: Outcomes of consultation, July 2021 and Table 4 in OfS consultation on recurrent funding for 2021/2022, March 2021

introduced, and a year in which the 2007/8 financial crisis had created cuts that meant the unit of resource was at a particularly low level.[55] See **Figure 4** below from the OfS.

2.30 Due to these factors, universities now face deficits across all subjects. For example, we estimate that across the sector deficits average £2,460 for each medical student per year and £1,940 per student per year in STEM subjects.[56] Even the most inexpensive classroom-based subjects face deficits of £1,000 per student. The rate of recovery for publicly-funded teaching is typically also lower at higher tariff universities than the sector more broadly.[57]

2.31 If the overall funding envelope for undergraduate teaching does not increase in the coming years, these deficits will widen further given the expected demographic uplift in 18-year-olds[58] and as demand for higher education continues to increase.[59]

Figure 4: trends in unit of resource for undergraduate education



2.32 While universities have been able to make efficiencies in response to the diminishing unit of resource, any further reduction in funding would impact negatively on the quality of courses, through increased class sizes and reduced investment in practical teaching, infrastructure and support services, as well as limiting student choice.[60] This would have knock-on impacts for the graduate pipeline for the economy, stymying universities' ability to innovate and respond to skills gaps, and disrupting efforts to level up.

2.33 To ensure high-quality teaching provision can continue to be responsive to the country's skills needs, investment in teaching must at least be sustained in real terms and, ideally, be

[55] See Annex B, Development of OfS approach to funding, September 2020.
[56] These deficits are calculated using Table B4 in Development of OfS approach to funding, September 2020 and Table 6 in OfS consultation on recurrent funding for 2021/2022, March 2021.
[57] In 2018/19, the recovery of full economic costs on teaching was lower for Peer Group A universities (typically higher tariff institutions) than for those in Peer Groups B, C and D.
[58] See 'Being 18 in 2018' data set, Office of National Statistics, September 2018.
[59] UCAS June 30 deadline data showed a 10% increase in offers to UK domiciled 18-year-olds, this was despite a slightly lower offer rate of 0.78 compared to 0.79 in 2020.
[60] According to a survey of Russell Group finance directors with responses from 16 of our 20 English members and supplemented with interviews with those in the Devolved Nations.

enhanced so that funding more closely matches the real cost of providing undergraduate courses. **This should include guaranteeing teaching grants on a per student basis and in real-terms for the duration of this Spending Review and at levels that at least match existing funding.** This funding will help safeguard the delivery of highly skilled graduates across all regions of the UK who will be crucial for the nation's post-pandemic recovery.

2.34 While ultimately it is up to Government to weigh up the pros and cons of any changes to the student finance system, we would urge them to consider the impact of any proposed reforms on the quality and diversity of higher education available to students and the knock-on consequences for the pipeline of skilled graduates the country needs. In particular, our analysis[61] of the likely consequences of a partial or full fee cut include:

- **damage to educational quality** through increased class sizes and less investment in practical teaching, infrastructure and support services. Importantly, these impacts would affect all students even if additional funding were made available for STEM subjects and medicine as deficits would remain across disciplines.
- **reduced student choice** and hampering of universities' ability to introduce new and innovative degrees or to take forward initiatives to complement the 'levelling up' agenda, such as the provision of lifelong learning opportunities and more Level 4 and 5 training.
- **negatively impacting on research**, including postgraduate research training, which is already one of the most under-resourced university activities. This is because the costs of research activity are not fully supported by Government and instead rely on cross-subsidy from international student income and other sources which, in turn, would need to be redirected to support domestic teaching deficits.

2.35 Russell Group universities have made every effort to accommodate as many students as possible who met the terms of their offers to study because of the use of teacher-assessed and centre-assessed grades over the last two years. In total, £30m has been made available by Government through the Strategic Priorities (SP) grant to support these students, £20m of this was distributed in 2020/21 and £10m will be allocated in 2021/22. However, no commitment has been made to support the ongoing costs of teaching these students. Ensuring additional funding is provided for the duration of these cohorts' studies (3-5 years), with a commitment to ensure *per student* funding levels are sustained overall, will be important to help maintain a high-quality student experience for these students.

2.36 The ongoing costs of teaching medical and dentistry students is of particular concern. In August 2021, Government allocated an additional 456 medical and dentistry places to universities in England for the 2021/22 intake[62], this was on top of the additional 630 places allocated to universities to accommodate medical and dentistry students who deferred from 2020/21 as a result of the A-level changes.[63] The SP grant needed to support the additional 456 places in 2021/22 alone should have totalled £15.2m for their 5 years of study.[64] Whilst we do not have figures for the total *additional* places allocated in 2020/21 to be able to calculate the extra SP grant funding that should have been provided to support both cohorts of students, it is clear that the £10m additional SP grant provided for the 2021/22 will not be enough to support the teaching of the 456 extra medical and dentistry students over the

[61] We considered two possible scenarios, a fee cut to £7,500 without additional grant funding, and a cut to £7,500 with top up for STEM and medical courses (those in Price Groups A and B). Even with a top-up for Group A and B subjects, a reduction in the fee to £7,500 would lead to a £1bn deficit for English Russell Group universities alone by 2023/24 with implications for members in the devolved nations.

[62] https://www.officeforstudents.org.uk/media/9b6dafd7-5d24-4696-b8af-404455c359fe/letter-from-minister-donelan-to-ofs_090821.pdf

[63] https://www.officeforstudents.org.uk/media/9b94dd45-7262-45ea-8d86-ca5ecd729907/guidance-letter-medical-dental-intake-targets-2122-replace.pdf

[64] This is calculated on the basis of the first two non-clinical years at Price Group B level (£1,516.5 per student) plus three clinical years at Price Group A level (£10,110).

course of their studies, let alone the additional students admitted to other high-cost subject courses.

Unlocking opportunity for everyone

2.37 Key to unlocking opportunity across the regions and nations will be ensuring everyone in the UK has access to a quality education where they can make the most of their talent, determination and potential. The most under-represented students are now over 50% more likely to enter Russell Group universities than they were seven years ago,[65] and our universities have set ambitious targets to build on this progress over the next five years, reducing, or even eradicating, gaps in access, non-continuation, and degree attainment between under-represented students and their more advantaged peers.

2.38 To ensure opportunity is spread evenly across every single part of the UK, universities and Government need to work together with other partners (including schools, employers and local agencies) to dismantle the obstacles faced by students from disadvantaged and under-represented groups in accessing higher education. In our report *Pathways for Potential*, we set out bold plans to address this including a new 10-year national strategy to tackle inequality throughout the education system, beginning right from the early years to improve social mobility.[66] **Our recommendations included establishing a new Office for Tackling Inequality to ensure all Government policy supports the aim of this strategy, championing a joined-up approach between universities, schools, local authorities, charities, employers and relevant public services.**

2.39 Russell Group universities are also committed to making sure under-represented students don't just have the opportunity to get into university, but also to thrive once on campus. The transition from post-16 to higher education can a difficult time for students, particularly if they are from less advantaged or under-represented backgrounds. This year brings the additional challenge of supporting students into higher level study who may have spent most of their post-16 education online, been subjected to gaps in their education, and who may have not had access to the information, advice and guidance that they would have done in a normal year. Our universities have developed a range of transition support programmes to help students starting this year,[67] as well as working together with The Open University to curate Jumpstart University. The Jumpstart University platform provides a range of free resources to support all students, whichever university or college they are enrolling at, to prepare for and successfully transition into their studies.[68]

Investing in international educational mobility

2.40 The benefits of studying and working abroad are numerous for students and for the UK economy. Learning a language and new ways of communicating, understanding how other countries operate and the ability to navigate a global landscape all contribute to a well-rounded education and give students the skills they will need to succeed in the UK's post-Brexit workforce. Providing these opportunities for students from under-represented backgrounds plays a key part in breaking cycles of disadvantage and ensuring these students can make meaningful contributions to the UK's economy. Of the 40,000 students

[65] Office for Students access and participation data
[66] Pathways for Potential: A roadmap for tackling educational inequality and improving access to Higher Education, The *Russell Group (2020)
[67] More information is available here: https://russellgroup.ac.uk/news/support-for-students-starting-at-russell-group-universities-this-year/
[68] Find out more here: https://www.open.edu/openlearn/jumpstart-university

who will be supported to study and work in over 150 countries as part of the new Turing Scheme, 48% will be from disadvantaged backgrounds.[69]

2.41 **Following on from the success of the Turing Scheme in its first year, a multi-year financial commitment would ensure the Scheme can continue to support the UK Government's vision for Global Britain.** This would support the development of long-term global partnerships with universities across the world, which will be key to the future success and longevity of the Scheme, as well as enabling universities to guarantee study abroad places for students earlier on. A multi-year commitment would also help boost opportunities for disadvantaged students to participate, providing the necessary lead-in time for universities to support and prepare these students in making an application to study abroad.

2.42 We look forward to working with the Government as the Turing Scheme develops to ensure it delivers value for UK taxpayers and supports Government's objectives on levelling up. Other ways in which the Scheme could evolve include facilitating staff mobility which would benefit the quality of learning for all students and strengthen international partnerships.

September 2021

[69] DfE press release, 4 August 2021 '40,000 students to study across the globe as part of new Turing Scheme'