

BUILDING ON SCIENTIFIC STRENGTH

THE NEXT DECADE OF R&D INVESTMENT

Science and innovation are essential to solving challenges facing Government and citizens. Concerted and coordinated action from Government is needed to capitalise on the UK's strength in research and development (R&D) to ensure the nation benefits from their potential.

The Government has set a target to increase the UK's research intensity by approximately a half over 10 years, increasing the amount invested in research across the economy from 1.7% to 2.4% of GDP, and 3% in the long-term. This welcome ambition is shared by political parties across Parliament. CaSE commend the Government for setting out a long-term ambition for increasing investment in R&D. It is in line with calls CaSE and others have made so that the UK can meet the economic, health, security and environmental challenges facing society.

Meeting this target will require ambitious and coordinated action from Government, nurturing a strong platform for R&D, and using all the levers available to amplify the benefits of R&D.

CaSE CALLS ON THE GOVERNMENT TO:



INCREASE PUBLIC R&D INVESTMENT

Create a vision with a plan and budget that attracts cross-Government support and global R&D attention

Sustain the unique breadth of the UK's academic science base

Grow R&D capability by investing in infrastructure



INCENTIVISE PRIVATE R&D INVESTMENT

Package the UK's innovation offer simply and with appreciation of business needs

Support start-ups

Use the power of Government procurement to adopt innovation faster

Update R&D tax credits to make the fiscal environment for R&D competitive



INVEST IN PEOPLE AND SKILLS

Grow the talent pool for R&D by widening diversity, training more researchers and attracting overseas talent

Strengthen provision for careers guidance and education

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ABOUT THIS BRIEFING

In this policy report we set out recommendations on how the Government can stimulate a rise in the UK's research intensity, in line with its target, that will deliver improvements in economic growth, productivity and wellbeing across the UK. CaSE sets out actions the Government should take on public R&D investment; creating an attractive environment for private R&D investment; and actions needed on people and skills. CaSE has designed these recommendations based on views gathered from its members through a series of roundtable events and one-to-one interviews from February 2018 to March 2019. They represent views gathered through discussions with members, R&D stakeholders and officials on the barriers to and enablers of raising R&D activity towards the 2.4% goal.

#CaSEforResearch

Alongside this report we are setting out a vision for what increased research intensity can achieve for the UK economy, people's lives and their health and wellbeing by publishing a series of thought pieces by CaSE members and stakeholders on our website. They can be found on our website at:

www.sciencecampaign.org.uk/our-work/campaigns/caseforresearch.html

SUMMARY OF RECOMMENDATIONS FOR GOVERNMENT

INCREASE PUBLIC INVESTMENT

2.4% VISION

- Set out a vision for what reaching the target will achieve, with Cabinet level buy-in across Departments and Devolved Administrations
- Set out the long-term budget for public investment up to 2027 in line with the ambition for R&D investment to reach 2.4% of GDP
- Deploy departmental R&D budgets in line with Departmental aims, the industrial strategy and government research needs
- The Industrial Strategy Council must develop outcome measures with clear accountability for delivery by relevant Cabinet members

SUSTAIN BREADTH

- Sustain the unique breadth of the UK's academic science base by maintaining the diversity of public funding available for R&D
- Set out the contribution Quality-Related funding will make to research spending, upholding the dual support system
- Ensure that specific disciplines and types of support for R&D aren't adversely affected by any loss of EU funding

INFRASTRUCTURE INVESTMENT

- Allocate infrastructure funding guided by a long-term research and innovation infrastructure strategy
- Establish ambitious and intelligent support for R&D capacity building through the Shared Prosperity Fund
- Create a capital fund for research institutes with predictable allocations



INCENTIVISE PRIVATE INVESTMENT

THE UK'S INNOVATION OFFER

- Create a digital shop window for the UK innovation offer
- Create an attractive and competitive offer for business to partner in programmes such as the ISCF

SUPPORT START-UPS

- Continue to act on the recommendations of the Patient Capital Review
- Strategically invest in and incentivise development of 'grow on' space
- Ensure clarity of purpose and appropriate level of support for the Catapults
- Implement Connell Review recommendations on Small Business Research Initiative

GOVERNMENT PROCUREMENT

- Follow up on the recommendations of the Barber review
- Create a procurement for innovation hub located in the Cabinet Office
- Embed the innovation principle in the Government's approach to regulation

R&D TAX CREDITS

- Review and update the definition of eligible activities for R&D tax credits to reflect current R&D practices
- Expand and better communicate Advance Assurance for R&D tax credits
- Allocate sufficient resource within government to administer R&D tax credits, EIS, SEIS and other incentives



INVEST IN PEOPLE AND SKILLS

AVAILABILITY OF TALENTED PEOPLE

- Front-load funding for PhDs and training in the long-term budget
- Make sure the immigration system works for science and engineering
- Coordinate central analysis and monitoring of diversity data in education and the R&D workforce to inform UKRI and wider government action

CAREERS AND EDUCATION

- Update and fund an ambitious careers strategy for young people and those retraining with resource, expertise and reach to deliver
- Prioritise evidence-based intervention to transform teacher retention and recruitment in schools and colleges, including addressing the core issues of workload and pay
- Ensure sustainable funding for Higher and Further Education that supports delivery of high-quality STEM provision

THE PRIZE AND THE OPPORTUNITY - THE CASE FOR INVESTMENT

Why R&D?

Research and development (R&D) and innovation are essential to solving challenges facing Government and citizens. Tackling anti-microbial resistance, cutting transport times, supporting an ageing population to work for longer, securing sustainable energy and more, all require research and innovation.

Similarly, most official measures of national well-being such as health, education, earnings and environment depend on or are linked to the fruits of research and innovation [1]; from creating more good jobs, increasing life expectancy and reducing pollution, to connecting people, creating safer neighbourhoods, and improving physical and mental health.

At a national level, investment in R&D, along with complementary investment in infrastructure and skills, is linked to core national aims of productivity growth and economic returns across the UK. Therefore, prioritising and supporting R&D is ultimately a way of serving the public, both now and for generations to come.

Why Government?

Concerted and coordinated action from Government is needed to capitalise on the UK's strength in research and innovation and ensure the nation, and indeed the world, benefits from their potential. There are a few areas in which the UK truly leads the world. R&D is one of them. The UK has benefited from its research strength both culturally and economically. It puts the UK in prime position to shape the future direction of new technologies, industries and sectors. But these benefits aren't inevitable and Government action is needed to realise them.

More broadly, public funding of research, particularly at early stages, develops new knowledge, techniques, and skilled people. This sustains the breadth of excellence that is a unique strength of UK research and that allows the UK to draw on diverse expertise to shape societal and technological changes. It also provides an attractive platform for companies to do more high-risk, high-return projects and do them in the UK. It is an essential building block of a competitive environment to anchor business investment and jobs in the UK, with evidence showing that public investment 'crowds in' private investment, attracts overseas investment, and raises private sector productivity growth [2]. This is recognised by the Government.

"We do not invest enough in research, development and innovation ... we must build on our strengths in science and tech innovation to ensure the next generation of discoveries is made, developed and produced in Britain"

Chancellor Philip Hammond,
Autumn Budget 2017 [3]

Why now?

The UK is going through a period of change, driven in part by leaving the European Union. Political attention is focused on economic and social inequalities in the UK and on global challenges and technological change taking place at an unprecedented pace. The Industrial Strategy and the commitment to significantly grow R&D investment were forged in recognition that business-as-usual will not address these issues or deliver the economic and social returns we need to see in the coming decades.

"If we want to be leaders, we've got to go for it. Half measures won't get us there."



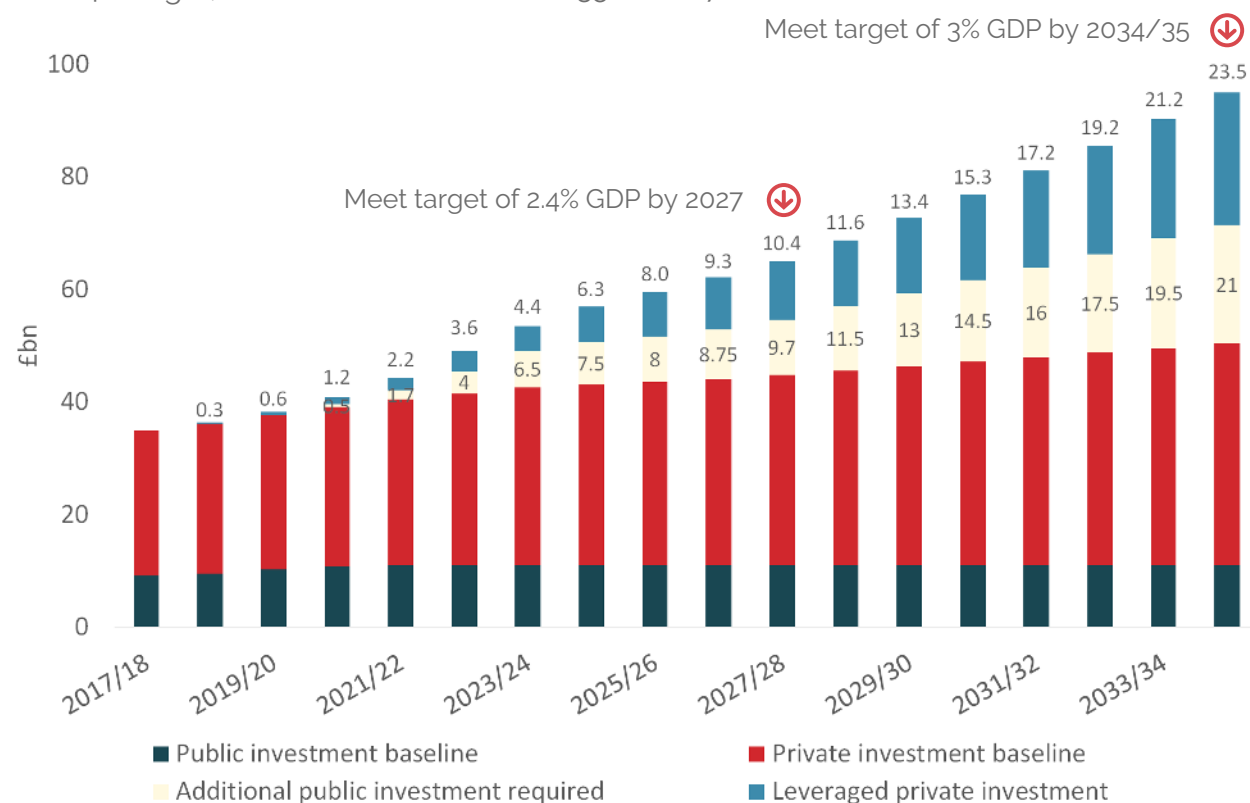
CaSE FTSE 100 industry member

The UK cannot rest on its laurels. To counteract uncertainties for research arising from Brexit, historic underinvestment in R&D, and rising international competition the UK must do more in the next five years than in the past to grow confidence in our research base, to actively attract business investment and create good jobs in the UK.

The Government must coordinate and deploy all its levers, from funding for R&D, to tax incentives, procurement, and skills policy if the UK is to reap the rewards.

MODELLING R&D INVESTMENT TO REACH 3% OF GDP

CaSE has developed a model for public and private R&D investment to reach an intensity of 2.4% of GDP by 2027 and 3% in the long term (2034/35). The assumptions used in the model are set out below. Broadly speaking the model shows public investment in R&D must double by 2027 to reach the target. Total R&D investment will need to be £65bn in 2027/28 to reach the 2.4% target, from the current level of £35bn (2017).



UK R&D INVESTMENT TARGET

	2017	2027	2034
Public R&D investment	£9bn	£21bn	£32bn
Private R&D investment	£26bn	£44bn	£63bn
Total	£35bn	£65bn	£95 bn
	1.7% GDP	2.4% GDP	3% GDP

Model assumptions:

- The 1.36 leverage ratio [4] was applied over 10 years to calculate the growth in public investment required to reach the target, assuming GDP grows according to OBR forecasts.
- The model begins at 2017/18, using the latest year of available data on the Gross Expenditure on R&D (GERD) in the UK [5], split into public and private spending using GERD categories. The £2.3bn extra announced in Autumn Budget 2017 becomes part of the new baseline level.
- The baseline for public expenditure remains flat in cash terms and the private expenditure baseline increases in line with GDP growth, as per trends in the past decade, using OBR forecasts for GDP growth in the short [6] and medium term [7].
- To meet the 2.4% target, the Government would need to commit an additional £20.2bn over the five years 2020-2024, around 3 'times' the £7bn additional funding committed between 2016-21.



INCREASE PUBLIC INVESTMENT

2.4% VISION

The Government has set a target to increase research and development (R&D) investment in the UK to 2.4% of GDP by 2027 as part of its Industrial Strategy. This long-term transformation of R&D will require ambitious and coordinated action, including a significant uplift in public investment in R&D.

To achieve this and reap the benefits across the economy and society CaSE call on Government to articulate a vision for the 2.4% target, set out the public R&D budget up to 2027, and to coordinate action and delivery across Government. UKRI and BEIS cannot deliver the transformation of the UK R&D environment alone.

"This is not simply, if at all, in the gift of the Business Department. It requires a whole-country commitment to investing in the foundations of productivity. "

Business Secretary Greg Clark,
House of Commons, 2018 [8]

The Government should set out a vision for what reaching the target will achieve, with Cabinet level buy-in across Departments and Devolved Administrations

The Government has set out the 2.4% target, but such a target could be met in different ways. What added value could increasing research intensity achieve for the UK, both economically and socially? The Industrial Strategy provides some context but the aims of public investment in R&D are broader than that of the Industrial Strategy alone. A clear vision will be essential both to win support from across government, business and the public, and to steer decision making towards the target.

The Government should set out the long-term budget for public investment up to 2027 in line with the ambition for R&D investment to reach 2.4% of GDP

To create an environment in which R&D can thrive, investment must be at a level that can support quality ideas, not just safe ideas, and provide stability and flexibility to commit to longer term projects and emerging priorities. The long-established principles and mechanisms for funding research have contributed to the UK being a highly efficient research nation.

"A short-term strategy is a contradiction. These commitments must endure, they have to be made by successive governments, by institutions and by companies over a long period of time."

Business Secretary Greg Clark,
Industrial Strategy speech, 2018 [9]

A long-term plan gives confidence for long-term R&D investment decisions by the private sector and for long-term partnerships between the public and private sector. Every country that has successfully raised R&D intensity by a similar amount has done so through raising both public and private investment [10].

Members have told CaSE that leadership and long-term R&D investment from Government enables them to plan and gives industry confidence to keep on investing in R&D. Public investment also drives increased private investment, with a time-lag. Government analysis shows that an extra £1 of public spending gives rise to an increase in private funding of £1.36 over a ten-year period [11]. Furthermore, for companies that have previously chosen to invest in R&D elsewhere, a bold, long-term, investment plan, could catch their attention and make the UK a candidate destination for new investment.

The challenge of ensuring public money is spent well is exacerbated by short term budgets with near term aims, as we've seen in recent years [12]. A long-term budget will enable the development of a detailed strategy and delivery plan that will allow for efficient use of the funding, minimizing wastage and maximizing leverage. It would enable Government to consider the appropriate balance of funding and make transparent, evidence-based decisions about how to most effectively use public R&D investment and levers.

Deploy departmental R&D budgets in line with Departmental aims, the industrial strategy and government research needs

At present 30% of public R&D spend falls outside UKRI and outside BEIS. Therefore, the Government should deploy departmental R&D budgets in line with departmental aims and Government research needs, making the most of research to meet policy needs. This will help reach the 2.4% target and lead to better, evidence-based policy outcomes and public service delivery. All UK Government departments and Devolved Administrations have a role to play.

However, in a time of austerity and budget cuts, cutting departmental R&D has often been seen as an easy option. From 2005 to 2016 civil departmental R&D spending fell 30% in real terms, excluding BEIS and its predecessors and the NHS (NIHR) [13]. Over the same time period Ministry of Defence R&D spending fell 40% in real terms [14].

"Government needs to be brave enough to implement policy based on research evidence"



CaSE University Member

There is great potential for R&D investment to directly benefit delivery of public services by government. How can the severity of road traffic incidents in cities be reduced? What action should be taken to prevent or respond to adverse weather conditions or disease outbreak? What is the best use of police resources in different scenarios? Departmental R&D budgets, if used well, can be used to tackle such questions and support more effective and efficient policymaking and public service delivery and to assess policy outcomes against objectives.

Departmental Chief Scientists should be involved in decision making about their departments R&D budget and while good progress has been made on Areas of Research Interest for each department more can be done to make the most of these across all departments.

The Industrial Strategy Council must develop outcome measures with clear accountability for delivery by relevant Cabinet members

A roadmap to the 2.4% target will be important. To maximize its power across Government it should have input and support from across departments and devolved administrations. To ensure success it must have clear ownership and accountability for delivery.

The Industrial Strategy Council should develop ambitious and long-term targets and measures of success, with ownership by the relevant departments at Cabinet level so that there is support and drive for delivery from the top down. Existing targets and performance measures contained in other government strategies should be updated to support this cross-government agenda.

SUSTAIN BREADTH

Sustain the unique breadth of the UK's academic science base by maintaining the diversity of public funding available for R&D

Diversity brings resilience and spurs innovation. The UK currently has strength in breadth, which is widely regarded as an asset. It must continue to foster a breadth and diversity of funders, investment instruments, settings for research & innovation, disciplinary strengths and people. This will give the UK the potential to lead the world in new research areas, work across boundaries and create new markets.

Set out the contribution QR will make to research spending, upholding the dual support system

Quality Related (QR) funding

The dual support system refers to the principle that public research funding is allocated by two different streams of funding, which have complementary methods of allocation and evaluation. Research Council funding, used responsively to fund research grants, is allocated by prospective assessment of potential, and is confined to the purposes set out in the grant. QR research funding is used to fund institutions (universities) on a formula basis.

It is allocated by retrospective assessment of the quality of past research output and the funds are not hypothecated. It is widely regarded as a unique asset to UK research and innovation strength and resilience. Direct funding of higher education institutions (HEIs) is devolved. In England QR funding is administered by Research England, in Scotland by the Scottish Funding Council (where it is called Research Excellence Grant) and in Wales by the Higher Education Funding Council for Wales.

A recent report [15] sets out how this institutional funding complements project-based funding and is used by universities to support discovery science, research projects and infrastructure in line strategic priorities, research careers, collaboration and to leverage other funding.

In 2017, Parliament put the dual support system, or the 'balanced funding principle', into law for the first time [16]. After substantial investment in challenge funding (through the ISCF) the Government must invest in QR to sustain this balance. Over time QR funding has reduced as a proportion of higher education institutions income from a third in 2006/7 to a quarter in 2016/17. This has resulted in a change to the types of research funded and the relative level of strategic flexibility HEIs have in making research funding allocation decisions.

"We want to see the UK taking a strategic decision to maintain and build basic research strength. Basic research provides us with the tools for our business to be cutting edge and competitive internationally. This is only possible if there are people in the UK funded to do cutting edge basic research."



CaSE Industry Member

At a time when the Government is investing heavily in the industrial strategy, support must also be provided for the research that drives discovery, as promised in the industrial strategy.

The Government must ensure that specific disciplines and types of support for R&D aren't adversely affected by any loss of EU funding

The Government must seek to understand how the potential loss of EU funding could have a disproportionate effect on certain disciplines or regions of the UK that are heavily reliant on EU funding streams. It should consider mitigation measures, including new funding streams, that sustain the breadth of the UK research base.

INFRASTRUCTURE INVESTMENT

Allocate infrastructure funding guided by a long-term research and innovation infrastructure strategy

UKRI is undertaking a review of research infrastructure [17] and have published an interim report. This review must lead to the creation of a long-term, dependable, ambitious research and innovation infrastructure strategy including universities, institutes and public research infrastructure that supports ongoing maintenance and new investment to remain cutting edge and optimise use of resource funding. Any strategy must address those challenges already identified in the interim report including access to the skills needed to operate infrastructure, dealing with technological change and a whole lifecycle approach to infrastructure to address sustainability and development challenges.

Research and innovation infrastructure requirements will never be static so government must put in place robust processes at a regional and national level to assess, coordinate and act on such needs to create, upgrade, maintain and replace equipment and facilities.

"One of our biggest strategic problem is how to pay for the renewal of the university estate – making sure our research infrastructure is world class. If there is growth in research resource funding, at what point does growth become unsustainable without corresponding capital funding?"



CaSE University Member

Ambitious and intelligent support for R&D capacity building through the Shared Prosperity Fund

The UK will no longer be able to access EU Structural Funds, including the European Regional Development Fund (ERDF), when it leaves the EU. ERDF priorities are innovation, business support, ICT and the low carbon economy, and it is targeted for use in less economically developed regions.

The Government has also announced a Shared Prosperity Fund (UKSPF) to tackle inequalities between communities by raising productivity, especially in those parts of our country whose economies are furthest behind; a form of domestic Structural Funds. Development is behind schedule, with consultation on the fund still outstanding. As it is developed, Government must ensure the UKSPF flexibly supports growth in R&D activity and benefit across the UK to meet local and regional priorities at a scale at least equivalent to the Structural Funds. The Strength in Places Fund administered by UKRI is welcome but is of an entirely different scale to the ERDF. With a £116m budget up to 2020/21, it will fund 4 - 8 programmes of between £10m - £50m. By contrast, ERDF supported 13 projects amounting to nearly £21m in 2017 in the Plymouth, Torbay and Devon region alone [18].

Create a capital fund for research institutes with predictable allocations

The Research Capital Investment Fund provides predictable formula-based funding to Higher Education Institutions. This should be maintained, with levels revised to ensure they are in keeping with the scale of resource funding.

Publicly funded research institutions do not have access to this fund and the long-term sustainability of their research, research infrastructure and world-leading research capability is at risk if this isn't addressed. The Government should create a fund similar to RCIF for these institutions in addition to their core funding.



INCENTIVISE PRIVATE INVESTMENT

THE UK'S INNOVATION OFFER

About two-thirds of the additional R&D investment to reach the 2.4% target needs to come from private investment, and in particular foreign direct investment (FDI). Public investment is essential to build a strong platform for research and innovation into which this private investment will flow. Furthermore, the Government needs to pull all the other levers it can to make the UK an attractive and competitive place for international businesses to invest in R&D.

The top three factors determining the attractiveness of a location for private R&D investment are quality of researchers, availability of researchers and access to specialised R&D knowledge [19]. These are all built and sustained through public investment and support.

Create a digital shop window for the UK innovation offer

Action is needed to make it easier for businesses to find and apply for relevant innovation support and funding. CaSE members, including small fast-growing companies [20], large prime companies [21] and other investors or funders of innovation have said that there is a lot of good innovation support, infrastructure and incentives in the UK, but that these are not effectively showcased or communicated, either domestically or internationally. There are a plethora of government websites and portals for different types of support, which means the whole is less than the sum of its parts [22].

The Government should create a digital 'shop window' that showcases in one place the many different incentives, funding, and initiatives for UK research and innovation support, alongside a clear narrative of the UK offer.

This one link could be easily shared to ensure so, for example, all business incubators have the link, that universities include it on their business facing sites, and that it is included on all relevant government webpages and communications. Government could commission this through the GovTech fund. It would be a crucial first step towards the ideal of a 'one stop shop' 'no wrong door' offer for entrepreneurs and businesses looking to start or grow R&D activity in the UK.

Create an attractive and competitive offer for business to partner in programmes such as the ISCF

New consortia and partnerships take time to build and so to genuinely spur new R&D activity and new participants, better engagement and information on upcoming calls are needed so that industry and academia and charities can develop meaningful new partnerships.

UKRI could create share an indicative calendar for the coming year on when funding calls will take place. Furthermore, a long-term budget settlement would allow time to plan wider stakeholder engagement that might promote a greater diversity of participants and consortia.

Furthermore, the Government should review comparable programmes to the ISCF by other countries and seek to maximise attractiveness of UK offer to research-led businesses. The ISCF and other programmes should also be administered in such a way that is responsive to and takes account of the needs of business.

SUPPORT START-UPS

Continue to act on the recommendations of the Patient Capital Review

The Government should take forward the recommendations of the Patient Capital Review [23], commissioned by the Treasury, to unlock investment from pension funds. Access to this investment would help businesses in the scale-up phase and could mean that innovative UK start-ups are not lost to overseas take-overs or relocations.

Strategically invest in and incentivise development of 'grow on' space

The UK has been successful in creating spin-outs from universities based on the outcomes of research. However, it has had limited success in scaling up these businesses into large, research intensive companies. The Government should consider offering non-commercial loans to scaling businesses looking to purchase a building or secure a lease, secured against fixtures and fittings. This would support scaling of small businesses in the UK. The Government could also create a competitive process to provide matched funding for new buildings that provide flexible laboratory workspace for starting and scaling companies. This must be around existing research strength and with support for bids from local or regional government to ensure wider infrastructure supports the investment.

Ensure clarity of purpose and appropriate level of support for the Catapults

The review of the Catapult Network published in 2017 [24] concluded that the inception and implementation of the Catapult concept has been inconsistent. It was stated that Catapults have the potential to deliver a significantly greater impact on delivering innovation and economic benefits. This inconsistency was partly put down to the lack of a single, commonly agreed and consistently communicated purpose statement for Catapults applied across the network.

Implement Connell Review recommendations on Small Business Research Initiative

As set out in the Connell Review, changes need to be introduced to deliver on SBRI's full potential to boost the UK's innovative capability, support the development and commercialisation of more new technology-based products and services, and give more innovators their "first break" and a route to market.

GOVERNMENT PROCUREMENT

Follow up on the recommendations of the Barber review

Procurement accounts for a third of public expenditure at £284bn a year [25]. It is a significant lever government holds at national and local levels to contribute to delivering the 2.4% target. It brings benefits to public service delivery, public budgets and the private sector innovation environment. The public sector can use procurement to drive innovation, which can contribute to growing R&D intensity. In the Barber review, 'Delivering better outcomes for citizens: practical steps for unlocking public value' Sir Michael Barber said that "increasing productivity also requires disruptive innovation: radically new ways of doing things that deliver much better outcomes for reduced costs." [26]

Procuring for innovation can meet the twin goals of saving money and encouraging innovation in service delivery. The Treasury should "demand that disruptive social or technological innovations, which radically improve outcomes and dramatically lower costs, are routinely presented by departments in business cases and Spending Review submissions." [27]

Create a procurement for innovation hub located in the Cabinet Office

Currently Innovate UK supports government departments on procurement for innovation. This function is crucial but is not central to Innovate UK's role. To build on and expand Innovate UK's role a dedicated procurement for innovation hub in the Cabinet Office should take on the role of harnessing government procurement to support innovation for the benefit of UK economy, public service delivery and long-term cost effectiveness. This would include taking on the role of running and supporting other departments in the SBRI process as well as working with CSAs and Heads of Profession to train and equip relevant teams in departments on procurement that supports innovation.

Embed the innovation principle in the Government's approach to regulation

Embracing innovation in new areas of regulation will be essential to secure first mover advantage in new and emerging sectors and technologies. If UK regulation is not able to keep pace, or provide the opportunity for companies to develop, test and roll out innovation in the UK environment, there is a risk that these activities and subsequent market advantage, jobs and benefit will be located elsewhere. The Regulators' Pioneer Fund is a great start. However, rather than regulating to support innovation being the exception to the rule, Government should embed the innovation principle alongside the precautionary principle in their approach to regulation to support innovation and sustainability. This means assessing the impact of policy and regulatory decisions on research and innovation. This will require proactive adoption, coordination, communication and training in departments.

R&D TAX CREDITS

Review and update the definition of eligible activities for R&D tax credits to reflect current R&D practices

Evidence suggests that from 2006-11 without R&D tax credits business R&D investment would be around 10% lower and the UK would have missed out on positive spillovers on the innovations of technologically related firms [28]. Tax credits are particularly important for small and early stage companies for lowering the cost and risk of R&D. For larger companies and those attracting international R&D investment, the tax credit is also a competitive feature alongside other factors in the decision of where to invest or locate R&D, making investment in the UK go further.

However, across the spectrum of businesses CaSE has spoken to there was agreement that the definition of eligible activities for the tax credit needs to be updated in line with current R&D practices. This should include the purchase of data for R&D purposes, investment in digital infrastructure for R&D, and the training of staff on research techniques.[29]

Expand and better communicate Advance Assurance for R&D tax credit

R&D tax credits work well. Therefore, the Government should expand and better communicate Advance Assurance for R&D tax credits to reduce barriers and risk for firms not yet claiming or not yet undertaking R&D to encourage them to start. Communication should be intelligently targeted at small firms similar to those claiming but not yet doing so.

Allocate sufficient resource within government to administer R&D tax credits, EIS, SEIS and other incentives

Uptake of R&D tax credits has increased over the last decade with successful claims rising from £970m in 2009/10 to £2.6bn in 2015/16. The £2.6bn in 2015/16 was claimed against £22.9bn of R&D in the UK and the growth in claims has been predominantly driven by large increases in uptake by SMEs [30] in line with Government aims. As claims continue to grow the Government should allocate sufficient resource for the administration of applications and streamlining of application processes by developing systems for companies to claim through auto-filling and pre-filling forms.



INVEST IN PEOPLE AND SKILLS

AVAILABILITY OF TALENTED PEOPLE

Having more people with the right skills and experience will be crucial to reaching the 2.4% target. A 50% uplift in research intensity will require at least 50% more people.

Front-load funding for PhDs and training in the long-term budget

Funding for extra PhD students and training will need to be an early priority in the long-term budget to 2027 to ensure the availability of skilled researchers. CaSE recognize that the Government have made welcome steps in this direction, but it should assess what more needs to be done to ensure that the necessary skilled people are available to take on further roles in R&D.

Make sure the immigration system works for science and engineering

In addition, more mid-career research leaders will be needed. An expansion of domestic STEM talent will yield greater early-career researchers but will not expand the mid-career researcher population by 2027. It will be important that new immigration arrangements introduced when the UK leaves the EU help attract research leaders to the UK. The Home Office's single departmental plan should be updated to reflect the critical role of migration in achieving the Government's Industrial Strategy and R&D aims.

Coordinate central analysis and monitoring of diversity data in education and the R&D workforce to inform UKRI and wider government action

Government should lead the way with national statistics and coordinate central analysis and monitoring to understand causes of under-representation, ensuring evidence can inform action taken by Government and other organisations.

UKRI's creation is an opportunity to build on diversity data collected by its constituent councils UKRI should embed diversity monitoring, including publishing data on the number of studentships and fellowships which are held on a part-time basis, addressing any issues highlighted by evaluation of data.

CAREERS AND EDUCATION

Update and fund an ambitious careers strategy for young people and those retraining with resource, expertise and reach to deliver

New routes into STEM for students, including T-levels, apprenticeships, degree apprenticeships, and degrees have created pathways that can be difficult to navigate. The challenge this presents is particularly acute for those from underrepresented groups with limited social and science capital. At the same time, jobs in STEM industries are changing and growing at speed. However, “despite the proliferation of new careers and growing industries, young people continue to aspire to jobs that were desirable when their parents and teachers were entering the workforce...”[31]

The OECD has recommended that the UK strengthen career guidance services after concluding that young people in the UK have limited understanding about which career options are open to them and are unaware about new jobs in emerging industries [32]. To meet the skills challenge associated with increasing the UK's R&D intensity, and to ensure currently underserved sections of society are not left behind, the UK needs an ambitious careers strategy with resource to deliver for young people and a likely increase in the demand for retraining.

Prioritise evidence-based intervention to transform teacher retention and recruitment in schools and colleges, including addressing the core issues of workload and pay

Good quality teachers are critical to the teaching of STEM in both primary and secondary schools. However, recruitment and retention of STEM teachers continue to be problematic. Research commissioned by the Department for Education showed that workload was the single biggest factor influencing teachers' decisions to leave the profession [33]. Pay is also an issue [34], particularly for STEM teachers who can earn more elsewhere. The Government must prioritise evidence-based intervention to transform teacher retention and recruitment in schools and colleges, including addressing the core issues of workload and pay.

Ensure sustainable funding for Higher and Further Education that supports delivery of high-quality STEM provision

The Government commissioned review into post-18 education (the Augar Review) has been published [35]. The Government should ensure sustainable funding for the long term is available for higher and further education and that that funding supports high quality STEM provision. The Augar Review may have an impact on research, which the Government should assess and be aware of in implementing any recommendations.

About CaSE

The Campaign for Science and Engineering (CaSE) is the UK's leading independent advocate for science and engineering. Our mission is to ensure that the UK has the skills, funding and policies to enable science and engineering to thrive. We represent over 115 scientific organisations including businesses, universities, professional bodies, and research charities as well as individual scientists and engineers. Collectively our members employ over 336,000 people in the UK, and our industry and charity members invest around £32bn a year globally in R&D.

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