Position statement

Increasing R&D investment for UK prosperity

January 2020

The UK government must plan for and deliver on its commitment to boost UK R&D, including increasing investment from 1.7 to 2.4% of GDP by 2027 in order to drive national prosperity, regain the UK's position as an innovation leader and catch up with its economic competitors' investment levels.

We call on the UK government to:

1. Plan for and deliver increased public sector investment in R&D:

→ Set out a transparent, long-term, public sector investment plan to 2027 and beyond to bring the UK's total R&D investment in line with the best of the OECD.
→ Create a 'digital shop window' for UK R&D investment that guides domestic and international researchers, innovators and investors to the UK's research and innovation offering.

2. Safeguard the UK's diverse R&D funding landscape:

→ Reverse the long-term erosion of core research budgets to protect our national research capacity and capability.
→ Ensure the proposed Shared Prosperity Fund flexibly supports the growth of R&D across the UK at a scale at least equivalent to that of the European Structural Investment Funds.
→ Ensure the balance of investment recognises the importance of curiosity-driven, discovery research as a vital element of a diverse R&D funding landscape.
→ Secure association to Horizon Europe, as well as seeking collaboration in excellent science with the rest of the world.

3. Work across departments to deliver the skilled workforce the UK needs:

→ Improve recruitment and retention of chemistry teachers, and provide more high-quality apprenticeships, more support for technical skills, and sustainable long-term funding for further education.
→ Improve the retention and progression of women in chemistry and science.
→ Deliver a UK immigration system that ensures easy movement of scientists and their families

1. Plan for and deliver increased public sector investment in R&D

The Government must plan for and deliver increased public sector investment in R&D to bring the UK's total R&D investment in line with the best of the OECD:

→ Set out a transparent, long-term public sector investment plan to 2027 and beyond to provide the stability needed to attract talent and R&D investment to the UK.

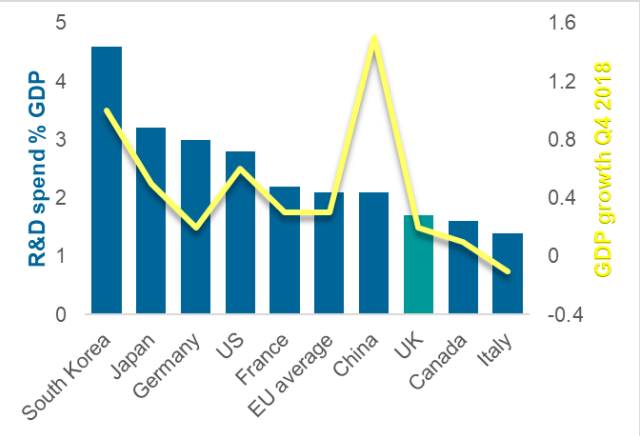
→ Create a 'digital shop window' for UK R&D investment that guides domestic and international researchers, innovators and investors to the UK's research and innovation offering.

The primary driver of long-term economic growth is the amount of knowledge and innovation that a country generates.[1] [2]

1.1 The UK is a world-leader in R&D, but risks falling behind international competitors

Increased investment in R&D will be crucial to sustaining the UK's position as a world-leader.

The UK is lagging behind its biggest economic competitors when it comes to economic growth. Many of those at the top of the charts, including South Korea, Japan, the US and China, have committed to long-term investment in research and development (R&D) to drive innovation and national prosperity.[3]



Source: OECD (2017 gross domestic spending on R&D and G20 GDP Growth – Fourth quarter of 2018)

The UK today is impactful across most major research fields, exhibits strong cross-sector knowledge exchange, and is a focal point for global research collaboration.[4] This success stems from a long history of publically supported R&D. However, with comparatively low levels of investment, the UK risks losing its competitive advantage to other innovation leaders. This risk is already becoming apparent: the European Innovation Scoreboard 2019[5] shows the UK losing its status as an innovation leader.

*UK's investment in R&D has been **below the EU and OECD averages** since 1985, and despite a continuous increase in R&D investment since 2012,[6] is only **fifth in the G7** for R&D spending.[7]*

Public sector investment will be crucial to boost private sector investment and reach the 2.4% target.

There is a complementary relationship between public and private sector investment in R&D: public investment crowds in private investment, attracts overseas investment and raises productivity.[8] In our *Open for Business* report, we found a wealth of examples where funding from public streams is being leveraged to support businesses to grow within regional economies, such as the Sheffield Science Gateway.[9] The 2018 EU Survey of Industrial Investment Trends found the top three factors that attract private R&D investment are quality of researchers, availability of researchers and access to specialised R&D knowledge.[10]

The Campaign for Science and Engineering project that it ***will not be possible to reach the 2.4% target with increased private sector investment alone.***[11]

1.2 Plan for stability and prosperity, creating trust through transparency

The UK government should set out a long-term cross-sectoral roadmap for public sector investment in R&D to 2027 and beyond to provide the stability needed to attract talent and R&D investment to the UK.

Ambition will not be enough to reach the 2.4% target and needs to go hand in hand with real commitment and the right mechanisms to get there. A transparent, long-term roadmap will be essential to give confidence to the private sector, including international investors, for long-term R&D investment decisions. Defining R&D funding allocations for the length of a single spending review cycle will not be enough: a long-term cross-sectoral roadmap for public sector investment to 2027 and beyond is needed.

The UK government should create a 'digital shop window' for UK R&D investment that guides domestic and international researchers, innovators and investors to the UK's research and innovation offering.

International talent and investment are an integral part of the UK's R&D landscape.[12] UK government should create a 'digital shop window' for R&D investment that showcases information on the full range of available funding streams and grants, their purpose and source budgets. This is vital to attract the international researchers, innovators and investors crucial to reaching the UK government's target of spending 2.4% of GDP on R&D by 2027.[13] [14]

In 2017 ***over half*** *of all UK business expenditure on R&D was by foreign-owned businesses.*[15]

2. Safeguard the UK's diverse R&D funding landscape

The UK government should safeguard the UK's diverse funding landscape to attract talent and R&D investment to the UK:

- → Reverse the long-term erosion of core research budgets to protect our national research capacity and capability, including
- → Support regional R&D growth by ensuring the proposed Shared Prosperity Fund flexibly supports the growth of R&D at a scale at least equivalent to that of the European Structural Investment Funds.
- → Ensure the balance of funding recognises the importance of curiosity-driven, discovery research as a vital element of a diverse R&D funding landscape.
- → Secure association to Horizon Europe, as well as allocating additional funding for other international collaborations.

2.1 Safeguard the UK's national research capacity and capability

The UK Government must reverse the long-term erosion of core research budgets to protect our national research capacity and capability.

Core research budgets are at the heart of the UK's national research capacity, supporting postgraduate training, infrastructure, early-stage research and core research activities.[16] [17] While the overall R&D budgets have been increasing since 2012, quality-related (QR) funding has seen a real-terms fall in its value of 13% in the same timeframe.[18] [19] The recently announced 2019-20 uplift in QR funding is welcome,[20] but it doesn't go far enough. The longer-term erosion of core budgets poses serious risks for the ability of the UK's research base to build capacity and train the next generation of scientists.

*Funding for postgraduate training only covered **47% of the full economic cost** (FEC) in 2017/18.*[21]

*Research Council funding covers 72% of the FEC of research, leaving universities with an **estimated annual funding gap of £3.9bn**.*[21]

The UK Government must balance any reduction in undergraduate tuition fees recommended by the Augar Review[22] with increased public sector investment in university teaching.

Failing to do so will leave universities' core budgets stretched even further. This could be particularly damaging for strategically important subjects like chemistry that are more expensive to teach.[23]

The UK government must deliver long-term and sustained investment in the different types and scales of infrastructure critical to advancing scientific endeavour.

This must also include running costs and the skilled workforce needed to operate it. Investment is needed at a range of levels of infrastructure from capital investment in world-class UK university labs[i] to world-leading cutting-edge national facilities like the Diamond Light Source, regional hubs like the Daresbury Laboratory, and e-infrastructure that enables advances in digital technologies such as artificial intelligence, machine learning, robotics and automation.

*Science researchers globally believe advances in **measurement, sensing and modelling techniques** will be essential in propelling the chemical and other sciences forward over the next 5-10 years.*[24]

[i] World-class labs means instruments like Nuclear Magnetic Resonance (NMR), Mass Spectrometry, X-ray Diffraction and Atomic Level microscopy which are housed in universities, often in shared facilities within the university or even regionally.

The Shared Prosperity Fund (UKSPF) must flexibly support the growth of R&D across the UK at a scale at least equivalent to that of the European Structural Investment (ESI) Funds.

Funding to support regional growth is vital. When the UK leaves the EU it will no-longer be able to access ESI Funds such as the European Regional Development Fund (ERDF), which has a track record of supporting businesses to grow, invest and create jobs in regions across the UK. Domestic replacements, such as the UKSPF and the Strength in Places (SIP) Fund must flexibly support R&D to secure sustainable regional growth.

*The UK has been allocated €17.2bn in ESI Funds for 2014-2020, of which **€5.8bn is via the ERDF**.*[25]

*The SIP Fund will invest **£236m for 2018/19-2021/22**.*[26]

2.2 Support all stages of the innovation pipeline, including discovery research

The UK government and UKRI must ensure the balance of investment recognises the importance of curiosity-driven, discovery research as a vital element of a diverse R&D funding landscape.

Diverse UK funding streams to support each stage of the innovation pipeline, from discovery to application, are vital to ensuring the strength of the UK research base and allowing the UK to compete on the international stage. Discovery research underpins current and future research and innovation activities. Whilst its impacts can often be long term, they can lead to ground-breaking discoveries that deliver new technologies or open up completely new avenues of research.[27] [28] The UK derives much of its funding for discovery research from EU framework programmes, for example through the European Research Council (ERC).[29]

*Chemical scientists identify **funding for discovery research** as one of the most important aspects of public R&D funding.* [30]

*The UK has **received €1.84bn in ERC grants** through Horizon 2020 so far, more than any other country.*[31]

Broader concerns about the changing balance between discovery and applied research, and the risk of drying out the innovation pipeline, have been expressed by the global science community.[32] These concerns were also reflected in recent RSC research, where 66% of chemical sciences researchers agreed that funding bodies put too much emphasis on the applications of research.[24]

2.3 Invest in international collaborations and partnerships

The UK government must secure association to Horizon Europe, as well as seeking collaboration in excellent science with the rest of the world.

Participation in EU framework programmes enables access to global networks, facilities and collaborations that are proven to bring benefits to UK science, economy and society. The collaborations these programmes enable are vital in tackling global challenges and advancing discovery research, where we can only achieve progress by bringing together the best people, equipment and facilities in the world.[33] For example, the PharmaSea project is developing potential new drugs for Alzheimer's and epilepsy. It owes its success to being able to access EU and global collaborative networks, bringing together people with specialist skills not available in any one country.[34] Access to Horizon Europe also means that the UK will continue to be seen as a hub for global collaboration, making it more attractive for researchers and investors from outside of Europe.

*Chemical scientists identify **access to international collaborative networks, knowledge and expertise** as some of the most important factors of public R&D funding.*[30]

*In publications across our portfolio of journals, EU framework programmes facilitate collaborations that are associated with **higher impact science** for the UK.*[35]

There is not a binary choice between collaborating with the EU and collaborating with the rest of the world. When it comes to maintaining the UK's status as a global research leader, it must embrace links with the whole world.

2.4 Attract overseas investment in R&D to enhance national prosperity

Overseas investment is an important source of support for research in the UK,[36] and continuing to attract foreign investment will be crucial to reach the 2.4% target and drive national prosperity.

A stable economic climate, and one that ensures access to talent, are often named among the key factors for private companies to decide where to invest, and where to increase spending on R&D, respectively. A key factor in making the UK attractive for R&D investment is its diversity of funding streams, which ensures support at each stage of the innovation pipeline, from discovery research to technology demonstration and operational product.[37] This diversity of streams includes access to EU framework programmes, which demonstrate UK competitiveness on the global stage. Access to future framework programmes means that the UK will continue to be seen as a hub for global collaboration, making it more attractive for investors from outside of Europe.

*In 2017, overseas R&D investment in UK-based organisations **fell for the third consecutive year**,[38] and overseas funding acquired by university chemistry departments dropped for the first time in 10 years.[39]*

3. Increase access to talent alongside increased R&D investment

The UK government should develop a cross-departmental strategy to deliver the skilled workforce the UK needs to support future economic growth and attract R&D investment to the UK:

- → Improve recruitment and retention of chemistry teachers, increase high-quality apprenticeships and technical skills development, and ensure sustainable long-term funding for further education.
- → Improve the retention and progression of women in chemistry and science.
- → Deliver a UK immigration system that ensures easy movement of researchers, enabling them and their families to live and work in the UK.

> "Skilled and talented researchers are the most precious resource a country can have. For this you have to stay attractive as a science place and don't just rely on historic achievements."
>
> *Researcher in RSC's February 2019 survey*[30]

As competition for attracting the best research talent increases globally, uplifting research intensity will require access to skills and knowledge from across STEM in addition to increased R&D investment.

Access to a skilled and talented workforce, particularly the availability and quality of researchers, is among the top three factors in attractiveness for private investment.[40] It is also a key determinant for UK-based companies to decide whether to invest in the UK or elsewhere and a key barrier to growth for UK scale-up businesses.[41] The National Audit Office estimated employers in England experienced around 2.7m STEM recruitment shortages in 2015 and expected around 1.5m in 2018.[42] We have previously recommended that improvements to science education, diversity in STEM and mobility of researchers will all be important to tackle these shortages and deliver the skilled workforce the UK needs.[43 44 45]

"[…] if we need to increase R&D spending by more than double our current investment levels by 2027, then ***we are also going to have to substantially increase the numbers of people we have working in R&D*** *in the same period – perhaps by as much as 50%." Chris Skidmore MP, May 2019*

3.1 Strengthen STEM education and the development of technical skills

The UK government must improve recruitment and retention of STEM teachers, increase high-quality apprenticeships and support for technical skills development, and ensure sustainable long-term investment in further education.

Creating a skilled and talented R&D workforce will require excellent foundations in UK STEM education. For chemistry, this requires increasing the number of high-quality chemistry teachers by improving retention and progression[46] and improving the quality of and access to technical and further education routes, for example by investing in more high-quality apprenticeships and providing sustained, long-term funding for further education, as recommended in the Augar Review of post-18 education.[16 47]

Gatsby Charitable Foundation estimates an additional ***700,000 STEM technicians*** *will be needed in the decade to 2024.*[48]

3.2 Increase retention and progression of women in the STEM workforce

The UK government must improve the retention and progression of women in chemistry and science.

Increasing retention and progression of women in STEM will increase workforce participation, improve the return on investment from the education budget and increase innovation and productivity.[49] There is an overall STEM participation gap in terms of gender. However, our recent *Breaking the Barriers* report shows that female chemists in academia experience considerable barriers for progression and are often lost from the STEM workforce.[46 50]

***99% of female chemists** in UK academia can evidence the lack of retention and progression of women.[46]*

3.3 Create a UK immigration system to attract scientists and innovators

The UK government must deliver an immigration system that ensures easy movement of researchers, enabling them and their families to live and work in the UK.

There is a crucial interdependence between attracting talent and R&D investment to the UK and immigration policy. The UK immigration system needs to do more to attract scientists and innovators – this means both welcoming messaging and streamlined rules. Doing so will help deliver maximum impact from investments in international collaboration on research and innovation.[44]

***84% of UK chemical scientists** think that freedom of movement has had a positive impact on UK science and innovation[30]*

Contact

The Royal Society of Chemistry would be happy to discuss any of the issues raised in our statement in more detail. Any questions should be directed to Kathy Page or Mindy Dulai at policy@rsc.org.

About us

With about 50,000 members in 120 countries and a knowledge business that spans the globe, the Royal Society of Chemistry is the UK's professional body for chemical scientists, supporting and representing our members and bringing together chemical scientists from all over the world. Our members include those working in large multinational companies and small to medium enterprises, researchers and students in universities, teachers and regulators.

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