

“No-deal” is a bad deal for science

If we leave without a deal, it will impact on scientific research immediately and could take years to rebuild.

1 in 6 academic staff in UK Higher Education Institutions are from elsewhere in the EU. They can easily choose to build their careers elsewhere.

The UK could lose access to over £1 billion a year in EU research funding. Even with the UK government’s guarantees, UK-based researchers and SMEs will lose access to around half a billion a year in research funding, having an immediate impact on research underway in the UK. It could take years to develop alternatives, meaning that valuable research could be stopped in its tracks.

We lose access to new medicines and technologies and limit our ability to tackle global problems as regulatory and governance arrangements fall apart.

Science needs an outcome that:

Keeps highly-skilled scientists working in the UK and ensures that international talented people still choose to come here and contribute to our globally competitive science.

Keeps access to money and networks that support the UK to work with scientists around the world.

Maintains regulation that supports access to new medicines, technologies and constructive collaborations.

.....
“The UK is a global leader in science because top home-grown and international scientists want to work here. We must do everything we can to ensure that the UK maintains its role at the heart of European science, because that is in everyone’s best interests. If science loses, everyone loses.”

Venki Ramakrishnan, President of the Royal Society.
.....

UK science punches well above its weight

Scientific research and innovation are essential for UK jobs, healthcare and improving quality of life for us and people around the world.

Being part of the EU has played a huge role in the UK becoming a global scientific powerhouse and magnet for talent, as part of a strong European Research Area that can compete on the scale of other scientific superpowers, such as the USA and China. That success is now at risk.

If we leave without a deal, it will impact on scientific research immediately and it could take years to rebuild these relationships.

Despite having less than **1% of the world's population**, the UK produces **15% of the most highly cited scientific papers**¹.

33.5% of UK research papers are co-authored with other EU Member States and countries associated to Horizon 2020 – the EU Framework Programme for research and innovation – compared with 17.6% with the USA, which is the UK's largest individual country collaborator³.

In 2015, **over half of the UK's research output** was the result of international collaborations and these collaborations are increasing – both in absolute terms and as a proportion of the UK's research output². We must not put these collaborations at risk.

1. Elsevier. International comparative performance of the UK research base 2016. A report prepared by Elsevier for the UK's Department for Business, Energy and Industrial Strategy.

2. The Royal Society. 2016 UK research and the European Union: The role of the EU in international research collaboration and researcher mobility.

3. Clarivate Analytics data and analysis for the Royal Society (May 2019). The figures above refer to papers published between 2014 and 2018.

Skilled people

If we leave without a deal: EEA nationals working in the UK will have little clarity over their long-term future. UK-based researchers come from around the world and work with people across the globe. They can easily choose to build their careers elsewhere.

R&D intensive companies rely on a mobile scientific workforce to respond to day to day challenges which require specialist knowledge or skills. “Failures to mutually recognise this kind of highly flexible movement with the EU would present serious barriers to such operations⁶”.

Costs could become a deterrent to skilled individuals that the UK needs. If the UK decided to apply immigration charges to EU nationals, based on the current system, an EU academic with a partner and two children entering the UK on a 3 year Tier 2 visa would have to pay upfront costs, equivalent to **20% of their annual salary⁷**.

1 in 6 academic staff in UK Higher Education Institutions are from elsewhere in the EU. They can easily choose to build their careers elsewhere⁴.

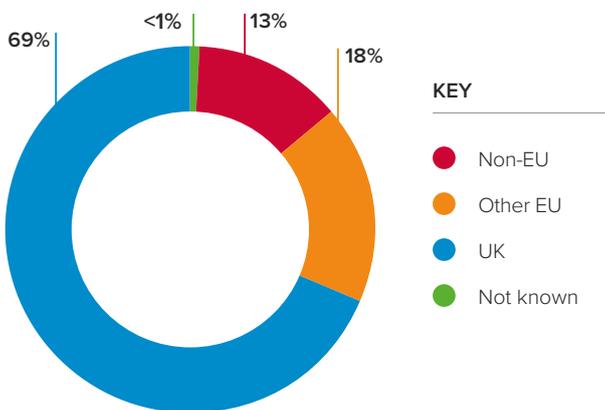
Many UK nationals work abroad, building their skills and networks and often bringing them back to the UK⁵. There is no clarity about what would happen to them if we leave the EU without a deal.

CASE STUDY



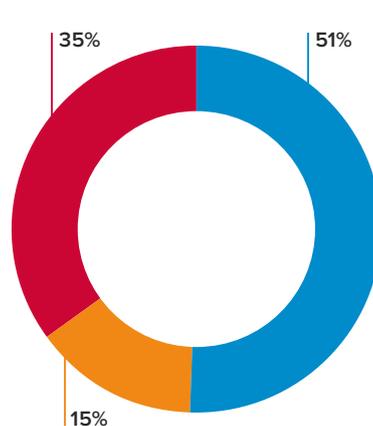
Dr Steven Spoel is a Dutch plant biologist, who has worked in the USA. He is now a Royal Society University Research Fellow and Head of Molecular Plant Sciences at the University of Edinburgh. His lab examines how plants respond to stresses encountered in their ever-changing environment. This research helps to design new stress-resilient food crops that increase agricultural yields in challenging environments and is vital to establishing future food security for a rapidly growing world population.

Where do academic researchers working in the UK come from?



Source: Higher Education Statistics Agency 2017 – 18 Staff numbers and characteristics.⁸

Where do postgraduate researchers in the UK come from?



Source: Higher Education Statistics Agency 2017 – 18 Full-time PGR student enrolment figures by domicile 2016/17 and 2017/18.⁹

- There are 211,980 academic staff working in the UK. 18% (37,255) of Academic staff working in the UK HEIs are non-UK EEA nationals.
- RAND Europe (2017) International researcher mobility International mobility of researchers: a review of the literature <https://royalsociety.org/topics-policy/projects/international-researcher-mobility/international-mobility-researchers-review-literature/>
- techUK submission to the Science and Technology Committee inquiry: An immigration system which works for Science and Innovation.
- Consultation response: Home Office approach to charging for services <https://royalsociety.org/topics-policy/publications/2018/consultation-response-home-office-approach-to-charging-for-services/> Family in this scenario is a partner and two children with an average salary of £37500. Please note, that since this submission, the immigration health surcharge has been doubled to £400 per year. This has been factored into the calculations. See <https://royalsociety.org/~media/policy/projects/brexit-uk-science/references-and-workings-for-brexit-no-deal-factsheet.xlsx> for the calculations on which this is based.
- Higher Education Staff Statistics: UK, 2017/18. <https://www.hesa.ac.uk/news/24-01-2019/sb253-higher-education-staff-statistics> (Figure 2) accessed 5 June 2019. Numbers are rounded.
- Higher Education Student Statistics: UK, 2017/18. <https://www.hesa.ac.uk/news/17-01-2019/sb252-higher-education-student-statistics/location> (Figure 8) accessed 5 June 2019. Postgraduate researchers include students undertaking research masters' and PhDs full-time. Part-time students are not included. Numbers are rounded.

Funding and networks

If we leave without a deal: We will lose access to funding and networks that support work with brilliant scientists around the world and undermine our relationship with some of our strongest scientific collaborators.

Without a deal, the UK would immediately become a third country with limited access to Horizon 2020, the current EU research and innovation funding programme which supports research in the UK, and collaborations with scientists around the world.

This funding has been decades in development and creates easy ways for European researchers to work together. Global collaborations like these are increasingly important for cutting-edge research, enabling researchers in the UK to work with the best teams around the world. It would take a long time to rebuild similar relationships. We need to be growing mechanisms that help us to build these relationships, not cutting ourselves out of them.

Without a deal, UK-based researchers will not be able to access highly prized funding from the European Research Council or some Marie Skłodowska-Curie Actions. But successful applicants could leave the UK and take the grant up in an EU country¹⁰.

The UK could lose access to over £1 billion a year in EU research funding. Even with the UK government's guarantees, UK-based researchers and SMEs will lose access to around half a billion a year in research funding, having an immediate impact on research underway in the UK. It could take years to develop alternatives, meaning that valuable research could be stopped in its tracks¹².

Our growing digital economy could be damaged by a no-deal scenario. IT systems science and computer software engineering are highly dependent on EU funding (30% of their funding comes from the EU). This is a significant amount of money (£46 million in 2014 – 15). If the UK were to be cut off from EU research funding in the event of no deal, this could have serious consequences for our future digital workforce if replacement funding were not quickly found¹¹.

7

EU countries and Switzerland are among the UK's top ten strongest scientific collaborators, forging relationships that are valuable in both countries¹³.

17%

of the R&D undertaken by UK SMEs comes from the EU. Without a deal, UK SMEs will not be able to access EU SME Instrument funding¹⁴.

UK research collaboration with European researchers is rapidly growing.

The rate of UK scientific collaboration with other EU Member States and countries associated to Horizon 2020 – the EU Framework Programme for research and innovation – as a bloc, is increasing faster than with our largest individual country collaborator, the USA¹⁵.

10. European Commission, Participant Portal H2020 Online Manual, http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/international-cooperation_en.htm
11. Technopolis. 2017 The role of EU funding in UK research and innovation – an analysis commissioned by the UK's National Academies – The Royal Society, British Academy, Academy of Medical Sciences and Royal Academy of Engineering.
12. Annual UK research funding from the EU calculated using the average Horizon 2020 funding received by the UK per year between 2015 – 2017 plus the average amount received by the UK through ESIF to support research and innovation activities calculated by Technopolis (2017) The role of EU funding in UK research and innovation. This gives an average of Euro 1.5 billion per year. The UK Government's guarantee announced on 24 July 2018 will cover the cost of UK participation in Horizon 2020 as a third country in the event of leaving the EU with no deal. As a third country, UK-based academics will not be able to access funding from the European Research Council or some Marie Skłodowska-Curie Actions and UK-based SMEs will not be able to access SME Instrument funding. Over the period 2015-17, the UK received an annual average of Euro 523 million from these three funding streams. See <https://royalsociety.org/media/policy/projects/brexit-uk-science/references-and-workings-for-brexit-no-deal-factsheet.xlsx> for the calculations on which this is based.
13. Clarivate Analytics data and analysis for the Royal Society (May 2019). Strength of collaboration has been normalised for total research output, using Salton's cosine.
14. Technopolis (2017) The role of EU funding in UK research and innovation.
15. Clarivate Analytics data and analysis for the Royal Society (May 2019). The percentage of UK papers co-authored with the USA increased more rapidly between 2004-2008 and 2014-2018 than rates of co-authorship with any other individual country, from 12.8% in 2004-08 to 17.6% in 2014-18 – a 4.8 percentage point increase. However, the percentage of UK papers with a the Horizon 2020 bloc has increased even more rapidly, from 23.6% in 2004-08 to 33.5% in 2014-18 – a 9.9 percentage point increase.

Regulation and governance that helps us work together

If we leave without a deal: We lose access to new medicines and technologies and limit our ability to tackle global problems.

The diseases that affect people in the UK affect people across the EU and around the world. Similarly, the same technologies can improve all of our lives, from smart phones to electric cars. Agreements, shared regulatory standards and governance help us work together, enabling us to pool expertise and resources to develop cures faster, innovate more rapidly to bring new products to market and tackle global challenges such as climate change that will affect us all. Without the clarity and certainty provided by a deal, these relationships will fall apart.

Without regulatory alignment with the EU the UK could be excluded from many clinical trials of new treatments. Taking part in these trials ensures that NHS patients have access to the most cutting edge treatments.

Doctors have warned that leaving Euratom without a deal would see critical supplies of medical isotopes imported for cancer patients held up at the border¹⁷. Euratom establishes a single market for the trade in nuclear materials and technology.

Without clarity, the UK will fall out of the EU emissions trading scheme, a key tool for reducing global greenhouse gas emissions.

Research-intensive manufacturers based in the UK may move abroad. Jaguar Land Rover employs 40,000 people in the UK and exports £18bn of goods a year. They have warned that a hard Brexit would cost £1.2bn a year in trade tariffs and make it unprofitable to remain in the UK¹⁶.

Every month, 45 million packs of medicine move from the UK to the EU, with 37 million moving the other way¹⁸. This relies on agreements and shared regulation. AstraZeneca, the UK's second largest pharma company who employ 7,000 people in the UK, plans to increase its drugs stockpiles by about 20% in preparation for a no-deal Brexit¹⁹.

16. FT (2018) Jaguar Land Rover says hard Brexit will cost it £1.2bn a year <https://www.ft.com/content/d077afaa-7f8a-11e8-bc55-50daf11b720d>

17. News article reporting comments from Dr Jeanette Dickson, vice president of clinical oncology at the Royal College of Radiologists and Dr John Buscombe, a consultant at Addenbrooke's Hospital in Cambridge Daily Mail (2018) Doctors warn border delays could ruin medicines amid fears No-deal Brexit 'will put cancer patients at risk' <http://www.dailymail.co.uk/news/article-6003209/Doctors-warn-no-deal-Brexit-cancer-patients-risk.html>

18. ABPI (2018) Life Sciences sector responds to BEIS Committee report on the impact of Brexit on the pharmaceutical sector <https://www.abpi.org.uk/media-centre/news/2018/may/life-sciences-sector-responds-to-beis-committee-report-on-the-impact-of-brexit-on-the-pharmaceutical-sector/>

19. BBC (2018) AstraZeneca to stockpile drugs for Brexit <https://www.bbc.co.uk/news/business-44847914>

Science needs an outcome that:

Keeps highly-skilled scientists working in the UK and ensures that international talented people still choose to come here and contribute to our globally competitive science

Ensure that UK and EU scientists can continue to work in each others' countries with minimal friction, bureaucracy and cost.

Demonstrate that the UK is a great place to do great science, and a welcoming place for people around the world to choose to bring their specialist skills and come and work.

Keeps access to money and networks which support the UK to work with scientists around the world

Ensure that the UK remains a part of Horizon 2020 (the EU's research and innovation funding programme) to its end.

Work to ensure that the UK has full association with the next EU research and innovation funding programme, Horizon Europe.

Maintains regulation that supports access to new medicines, technologies and constructive collaborations

Ensure that the UK can continue to take part in EU-wide clinical trials and European Reference Networks, which help us to do cutting edge research into new medical treatments and diagnostics, and give patients access to these.

Agree regulation and governance that will ensure that scientists can continue to work together across borders and we can all benefit from the new medicines and technologies that they create.

For more information visit royalsociety.org/topics-policy/projects/brexit-uk-science

The text of this work is licensed under the terms of the Creative Commons Attribution License which permits unrestricted use, provided the original author and source are credited. The license is available at: creativecommons.org/licenses/by/4.0. Photography is not covered by this license.

© The Royal Society. Issued: November 2019 DES6691