The Relationship between EU Membership and the Effectiveness of Science, Research and Innovation in the UK

A response from the Royal Society of Chemistry to the House of Lords Select Committee on Science and Technology. We have drawn upon information available from a range of external sources, as well as the experiences of researchers from across the chemical sciences community to inform our response. We have changed the order that we answer the questions in our submission, to aid its overall narrative.
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Executive Summary

EU membership has a strong influence on science, research and innovation in the UK. From the responses that we received, EU membership was regarded as having a mostly positive influence on the effectiveness of UK science, research and innovation, especially with respect to funding and collaboration. Negative effects that were highlighted focussed mainly on the formation of regulation and its unintended impacts.

There are a range of EU funding schemes that contribute to UK science, research and innovation. Data from previous schemes shows that the UK draws in a significant share of funding allocated for research. We heard from those in academia that EU funding is an important complement to UK research funding, especially given current levels of UK science spending, with the science ring-fence during the last parliament equating to a real-terms cut.

There were criticisms of the accessibility of funding schemes for small and medium enterprises (SMEs), though we also heard examples of successful participation from UK SMEs, who have been able to expand manufacturing or further develop technologies as a result of EU funding. Recent developments in EU funding have seen an emphasis on innovation, which the UK community is already capitalising on. The UK is an active participant in EU public-private partnerships and through mechanisms such as the European Regional Development Fund and European Structural and Investment Funds, the UK can use EU funding to improve UK competitiveness and innovation.

Collaboration opportunities that come as a consequence of EU membership were seen to be important in advancing UK research. There was a sense that EU mechanisms help to facilitate effective collaboration that can go on to outlast the initial project. Whilst it was acknowledged that collaboration can be achieved outside of the EU framework, researchers felt that the mechanisms provided were effective and drew added benefits, such as career development opportunities for early career researchers.

Respondents drew links between the mobility across the EU and the increasingly international nature of research careers. Free movement is seen to encourage the flow of talented scientists to and from the UK, creating opportunities for UK researchers to work elsewhere, as well as bringing the best researchers from overseas to the UK. This was also mentioned in relation to access to EU infrastructure; free movement facilitates easy access, which is often be funded by the EU.

In relation to regulation, a point made by industry respondents was the potential for divergent regulatory frameworks if the UK left the EU. The ability for the UK to set its own regulation was not viewed positively due to the perception that businesses would still need to comply with EU regulation, as well as any newly-developed UK regulation.

Some speculated on the possible effects that may occur in the event of a 'Brexit' across the four themes covered in this consultation. However, at this stage, it remains unclear what the exact effects of an EU exit would be on UK science, research and innovation.

Funding

Q1. What is the scale of the financial contribution from the EU to science and research in the UK? How does the financial contribution the UK receives compare with other member states in terms of, for instance, population, GDP, scientific strength or any other relevant indicators?

There are several streams of EU funding that can contribute to science and research in the UK. These include Horizon 2020, European Structural & Investment Funds and the European Fund for Regional Development.

As an indicator of the scale that these funds can contribute, the UK received £4.4bn from the Seventh Framework Programme (FP7 – the predecessor to Horizon 2020), which ran from 2007 to 2013. This is equivalent to 15.4% of the total fund and second only to Germany.[1] This level of funding alone is the equivalent of an additional research council, averaging higher than the annual investment by the Biotechnology and Biological Sciences Research Council (£509M in 2014-15), and equates to a higher percentage of FP7 funding than either our share of EU Gross Domestic Product (GDP) or population. [2] The proportion received from FP7 only represents one of the EU funding streams that has contributed to science and research.

In 2013, UK University chemistry departments received more than 21% (~£43m/€60m) of their funding from EU institutions (including businesses, charities and other national governments), compared to only 6% from non-EU overseas sources.[3]

Q2. What is the scale of the financial contribution from the UK to the EU that supports science and research activities?

To our knowledge, the only available assessment of this has been carried by the Office of National Statistics. They calculated that the indicative UK contributions to the EU for science, engineering and technology (SET) research and development (R&D) expenditure in 2013 were £0.8bn/€1.1bn.[4] In 2013, the UK's net contribution (after rebates and public sector receipts) to the EU was £10.5bn/€14.7bn.[5]

Q3. What is the effectiveness and efficiency with which these funds are managed in the EU compared to the management of science funding in the UK? Particularly, when administrative overheads, quality of decision-making and advisory processes are considered?

Our members who have applied for EU funding generally found the process more involved than that for funding from Research Councils UK. There was a general appreciation that often this was due to the larger sums involved in many EU funding schemes but smaller schemes were also cited, such as ERC starter grants, which required lengthy paperwork. It

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[1] *Creating the future: a 2020 vision for science & research*, Department for Business Innovation and Skills, April 2014 (paragraph 87)
[2] *Review of the Balance of Competences between the United Kingdom and the European Union: Research and Development*, HM Government, February 2014 (page 10)
[3] Data provided by the Higher Education Statistics Agency and available at https://public.tableau.com/profile/rsc.ict#!/vizhome/Chemistryresearchfunding/Story1
[4] *Science Engineering and Technology Statistics*, Office for National Statistics, 2013
[5] *House of Commons Briefing Note 06091: UK-EU economic relations*, House of Commons Library, June 2015

was reported that many Universities have employed specialist staff familiar with specific scheme requirements to maximise the chance of gaining EU funding.

Some EU funding schemes (e.g. ERC grants) typically have a two-step process with applications being filtered based on a short proposal at the first stage and a longer full proposal being assessed by a scientific panel at a second stage. In many cases, both the first and second stage proposals must be submitted at the same time. The quality of refereeing at the first stage was particularly felt to be at a lower standard than comparative UK funding schemes. Members also stated that the EU processes led to unnecessary work as full proposals were required at the start of the process and so were still required for applications which would not pass the first stage. It was felt that this compared poorly to e.g. the EPSRC's process for programme grants, where applications only initially required a short document on initial application.

However, a member specifically involved in the assessment panel of a major EU funding scheme viewed the UK as only being marginally better in administering grants with reference to the quality of decision making. The close monitoring of large EU grants was seen as a positive feature as it enabled funding to be stopped where funds were not being used for their stated aims, curbing misuse.

The European Commission itself has committed to reduce bureaucratic load on participants of its programmes such as Horizon 2020, with explicit plans for the inclusion of better mapping and monitoring.[6]

Q6. How is private investment in UK science and research influenced by EU membership? Is international investment leveraged on the basis of this membership? How does EU membership affect the growth of research-intensive UK companies?

One mechanism that aims to encourage private investment in science and research alongside public funds provided by the EU is public-private partnerships (PPPs). These enable the formation of collaborative consortia between businesses and universities. In 2013, the European Commission launched eight contractual Public Private Partnerships (PPPs) of strategic importance for European industry. The partnerships were intended to leverage more than €6bn of public investments implemented through open calls under Horizon 2020.[7]

The Innovative Medicines Initiative (IMI) is Europe's largest PPP. IMI consists of a number of different projects that work towards an overall aim of speeding up the development of better and safer medicines for patients.[8] The first phase had a budget of €2bn, half of which came from the EU's Seventh Framework Programme (FP7) and half of which came from in-kind contributions from European Federation of Pharmaceutical Industries and Associations (EFPIA) companies. The next phase (IMI2) is expected to attract €1.6bn from Horizon 2020, €1.4bn from the EFPIA and €213m from other industries or organisations.

The UK-based Chem21[9] consortium is part of the IMI and has leveraged funds of over €26m from both public and private sources to develop the manufacture of sustainable pharmaceuticals The project brings together six pharmaceutical companies (2 UK based), 13 Universities (4 UK based) and four SMEs (2 UK based) from across Europe. The aim is to develop sustainable biological and chemical alternatives to finite materials, such as precious metals, which are currently used as catalysts in the manufacture of medicines. One of the

[6] *Horizon 2020 – Impact Assessment Report*, European Commission, 2011 (section 5.5)
[7] European Commission press release, December 2013
[8] http://www.imi.europa.eu/
[9] http://www.chem21.eu/

university researchers involved commented “This is a unique opportunity for academic groups to work alongside pharmaceutical companies and specialist SMEs to develop innovative catalytic processes for pharmaceutical synthesis. We believe that challenging problems of this nature are best solved on a pan-European basis by bringing together under one roof the combined expertise of many groups to establish a world-class research hub in catalysis and sustainable chemical synthesis.”

Another PPP relevant to UK industry is Sustainable Processing in Resource Efficiency (SPIRE)[10] which is concerned with the development of innovative technologies in ways that minimise consumption of raw materials and energy as well as maximising recycling and re-use of waste by-products and end use products, in line with the EU Circular Economy initiative. This has a budget of about €900M over the seven years of Horizon 2020 and covers eight industry sectors, many of which link directly to sectors within the UK economy (cements, ceramics, chemicals, engineering, non-ferrous metals, minerals, steel and water management), offering opportunities for UK involvement

Horizon 2020 encourages participation from universities, large companies and SMEs. Specifically, SMEs are being encouraged to participate as part of consortia or through a dedicated SME instrument. For example, MOF technologies, a spin-out from Queen’s University Belfast recently secured €1.2million to expand their UK manufacturing base to scale up production of clean technology to produce Metal Organic Frameworks, a nanoporous material. The funding was part of a European Horizon 2020 consortium project worth €7.6m which also includes partners Johnson Matthey and GDF Suez.[11]

More generally, a study conducted by Technopolis on behalf of BIS examining the impacts of the sixth and seventh Framework Programmes on the UK found that in many cases FP funding had helped to secure further follow-on funds for research projects.[12] Some UK SMEs surveyed for the study stated that the EU’s reputation for rigorously assessing applications has meant securing EU funding has been seen as a validation of their strategy, helping to secure further investment from other sources.

With the aim of extending this effect to “runner-up” projects submitted under Horizon2020, the EU Commission recently introduced the "Seal of Excellence" quality label.[13] This label is to be awarded to promising projects submitted under Horizon 2020 which did not secure funding due to budgetary constraints but received high assessment scores in the evaluation process. In its pilot phase, the "Seal of Excellence" will first be given to proposals by SMEs submitted under the SME instrument of Horizon 2020. If successful, the action could potentially be extended to cover more areas of Horizon 2020.

Q12. How is the innovation landscape affected by EU membership?

The EU provides a range of mechanisms that support and enhance the UK’s innovation landscape. These include, but are not limited to:

- Horizon 2020 and the Framework Programmes that preceded it support research and innovation. Within each of these programmes, there are or have been instruments dedicated to encouraging innovation. For example, the *Innovation in SMEs* stream under the Industrial Leadership pillar of H2020 and *Research for the Benefit of SMEs* under the Capacities programme under FP7.

[10] http://www.spire2030.eu/
[11] *Enterprise Plus newsletter*, Royal Society of Chemistry, October 2015
[12] *The impact of the EU RTD Framework Programme on the UK*, Technopolis Group carried out on behalf of the International Science and Innovation Unit within the Department for Business, Innovation and Skills (BIS), May 2010 (page 2)
[13] *New Seal of Excellence to increase the quality of regional research funding*, Lithuania 24, October 2015

- An example of a research and innovation project funded under FP7 is the SHYMAN project. In this project Promethian Particles, a spinout from Nottingham University, leads a €10 million research project to investigate the sustainable manufacturing of nanomaterials. It involves 5 academic institutions and 12 companies from across Europe. The eventual aim of the project is a 1000 ton per year nanomaterial manufacturing plant in the UK, alongside the development of commercial products that can be manufactured at the site.[14]
- Under the H2020 *Innovation in SMEs* stream, the dedicated SME instrument has €3.0bn, and is aimed at supporting innovation with the potential to grow and internationalise all the way from feasibility assessment (phase 1) to commercialisation (phase 3). One successful UK company that has secured funding this way is Cambridge based Abcodia who received funding to advance its pancreatic cancer early diagnosis test.[15]
- The European Regional Development Fund (ERDF), will provide funds of €5.8bn to support local growth across the UK between 2014 and 2020.[16] €1.4bn of this is earmarked to support 'research and innovation, with a further €1.3bn for 'low carbon economy' and €2.0bn for 'SME competitiveness'.
- The European Structural and Investment Funds will be used to build a smart specialisation hub in England. The aim of this hub is to 'share best practice in innovation' by bringing together universities, businesses, investors and the Catapult centres.[17] In a speech at Innovate UK's annual conference earlier this month, Business Secretary Sajid Javid announced this as one of a number of measures that would 'help make Britain the best place in Europe to innovate'.
- This summer, Santander UK has signed an agreement with European Investment Fund (EIF) to increase lending at favourable rates to UK SMEs to support research, development and innovation activities. The agreement will provide €140M (£100M) over the next 2 years and the loans will be guaranteed by the EIF, enabled by financial backing from the Horizon 2020 programme.[18]
- The European Investment Bank may be less well-known for providing innovation support, but does act in this capacity, for example, by providing £50m to the company *Imperial Innovations* to allow them to increase the rate and scale with which they support new companies and technologies in the biotech and medtech sectors.[19] This follows on from an earlier £30m loan provided to the company by the EIB in 2013.[20]
- Managed by the EIB, the recently established European Fund for Strategic Investments (EFSI) includes 'education, research, development and innovation' as one of its focus areas.[21] The announcement to establish the fund, shortly after the Commission President Jean-Claude Juncker took office, was criticised by many in the scientific community, due to proposals that it would divert money from H2020 to EFSI. This has been countered by claims from the Commission, including the Commissioner for Research, Science and Innovation, Carlos Moedas, that EFSI will provide more money for research and innovation, not less.[22] To date, many European academics remain critical of the fund, in particular the idea that the fund will be distributed as loans and not grants.[23] This has been perceived by some in the European science and research

[14] http://www.prometheanparticles.co.uk/eu-projects/
[15] *Abcodia press release*, September 2014,http://www.abcodia.com/news_180914.php
[16] EU Cohesion Funding information https://cohesiondata.ec.europa.eu/country?country=United%20Kingdom
[17] - *Department for Business, Innovation & Skills press release*, November 2015
[18] - *Santander press release*, July 2015
[19] *European Investment Bank press release*, July 2015
[20] *Imperial innovations press release, July 2013*
[21] http://www.eib.org/about/invest-eu/index.htm?media=shortlink
[22] - *Speech at the Royal Society of London - Science without Borders*, Carlos Moedas - Commissioner for Research, Science and Innovation, March 2015
[23] *Academics not convinced, despite Commission pledges*, Research Fortnight, November 2015

community as shifting money away from research that can be carried out in universities and towards research and technology organisations and businesses.

Collaboration

Q4. What are the benefits to UK science and research of participation in EU collaborations and funding programmes such as Horizon 2020 and the European Research Council?

From responses' gathered from our community, there was a general consensus that the key benefits to the UK were:

- Access to sources of funding
- Opportunities for collaboration and knowledge exchange
- Career development opportunities for early career researchers
- Access to EU research infrastructure

a) Access to sources of funding

Many of those who responded from our community attested that EU funding *via* the Framework Programmes has proved to be an important source of funding for research. The UK's ability to access such funds contributes to overall national research outputs. Some researchers mentioned that the magnitude and timescale of some EU funding programmes (e.g. ERC starting, consolidator and advanced grants can last up to 5 years) provides an important mechanism for securing long-term funding for specific research projects. European funding programmes provide what is seen as an important complement to UK funding programmes; this was seen as especially important by some respondents in light of the current research funding environment in the UK. Many are acutely aware that the science ring fence provided by the last government has still equated to a real-terms cut in science spending in recent years.[24]

Several members gave examples of where collaborations were formed through access to EU funding. UK universities also benefit from access to the funding schemes of other European countries, enabling them to create beneficial collaborations. For example, one member has hosted students from Spain in his academic group through funding from the Spanish Government. The collaboration has lasted beyond the initial funding and has led to the publication of 3 research papers since 2013. A member from industry also stated that access to EU funding benefited UK companies as it facilitated access to the best research networks in the EU.

Some respondents specifically referenced access to the European Research Council (ERC) funding being beneficial to the UK community. As ERC grants are awarded on the basis of excellence alone, there is no requirement for even distribution across member states or associated countries. In 2014 the UK received nearly 24% of the European Research Council (ERC) grants[25] and in 2013, seven of the top twenty European institutions hosting at least 30 ERC grantees were in the UK, more than in any other EU nation.[26] Some respondents suggested that UK universities' international reputation for excellence made them favoured host institutions for both UK and non-UK nationals who hold ERC grants.

[24] *Parliamentary briefing: Science & innovation in the UK*, Royal Society of Chemistry, September 2015
[25] *European Research Council Grants: projects and results*, 2007-2015
[26] *Annual report on the ERC activities and achievements in 2013*, prepared under the authority of the ERC Scientific Council, 2013

b) Opportunities for collaboration and knowledge exchange
Collaboration was seen as an integral part of scientific research, particularly in relation to devleoping solutions to global challenges in areas such as health, food and energy. Many EU funding programmes provide inherent opportunities for collaboration as a condition of award.

Another motivation for participating in EU collaborations is the opportunity for knowledge exchange. Access to EU networks helps UK researchers broaden their own knowledge which can then be applied to UK research and is reflected in UK research outputs, for example, collaborative research papers.

c) Career development opportunities for early career researchers
Linked to this are the opportunities that EU collaborative programmes offer for the development of early career researchers. Innovative training networks (ITNs) offer the opportunity for PhD students to work in cohorts that span several EU countries and institutions. These allow the students to establish links with other researchers across the EU early in their training, allowing them to be exposed to a greater breadth of knowledge and research practice. This can be particularly useful to help establish networks and develop expertise in newer, interdisciplinary sciences. An example of this is the LASSIE initiative,[27] which trained early career researchers in the field of astrochemistry capable of assimilating techniques, ideas and practices from a wide range of scientific disciplines.

Funding provided by European Cooperation in Science and Technology (COST) actions is specifically dedicated to building networks and collaborations; it cannot be used for research itself. Part for the funding allocated to COST networks is used for what are known as 'short scientific missions'. These exchanges, which vary in duration from a few weeks up to 6 months, often involve early-career researchers, including PhD or Masters' students. Whilst the visit will have a scientific aim, there is often a developmental aspect to the mission also, allowing the visitor to gain insights into how other research groups work or even specific technical skills, such as learning a new practical technique that could potentially be applied back in their home institution. Opportunities like this are seen to help to develop the future UK scientific workforce.

d) Access to EU research infrastructure
See our response to question 7 below.

A more general point about the UK's EU membership related to the influence that the UK has on the direction of EU funding programmes. Currently, UK priorities for research can be fed into negotiations around the shape and scope of EU funding programmes as they are developed, helping to develop synergies between the two. It is unclear whether the UK would retain this level of input over future EU research funding if it were to leave.

[27] The Laboratory Astrochemical Surface Science in Europe (LASSIE) initiative is one of the largest interdisciplinary training networks (ITNs) under FP7 in the field of solid state astrochemistry and was established from a UK-focussed network (AstroSurf) to address issues of relevance to the chemical evolution of the Universe. From 2010-14 the consortium of 13 experimental and theoretical groups with 5 industrial and 1 outreach partners supplied training and research opportunities for 28 Early Stage Researchers and 4 Experienced Researchers. Researchers involved in LASSIE have gone on to apply for further Horizon2020 funds based on the collaborations formed through this ITN and are currently awaiting the results of those bids. Those involved in founding the LASSIE programme believe its creation also influenced the European Commission's decision to have laboratory astrophysics recognised as a potential area for a research infrastructure in H2020.

Q5. What is the influence of EU membership on bilateral collaboration between the UK and other EU member states? Are collaborations with member states stronger than with non-EU countries as a result of EU membership?

Most EU funding programmes are multilateral with some requiring bids to include several EU countries as partners, but bilateral collaboration is also supported by mechanisms like the European Industrial Doctorates (EID), European Cooperation in Science and Technology actions (COST), and the Marie Skłodowska-Curie (MSC) Actions.

Our members have highlighted in general that bilateral collaborations with colleagues within the EU are more straightforward than with countries outside it, even if they are similarly accessible geographically and have associate state status (e.g. Turkey). The reasons cited for this include easier access to funds for students and researchers and reduced administrative burdens in terms of visa restrictions for students and researchers to travel for conferences, short and medium term research visits, sabbaticals and placements.

Q7. How does the UK participate in the creation and operation of international facilities that are available as a consequence of our EU membership? Are there any restrictions in the creation and operation of international facilities outside the EU as a consequence of our EU membership?

Access to both excellent national and international large scale facilities is essential for chemical sciences research.[28] The chemical sciences community benefits from access to a variety of large scale European facilities. Several members expressed the view that no single country can operate every type of large facility needed for scientific research; international cooperation is vital. Access to equipment in Europe such as the European Synchrotron Radiation Facility (ESRF) in Grenoble, France enabled members to undertake experiments that would not be possible in the UK. Similar arguments apply to, for example, central neutron and X-ray facilities in Europe (for example the Institut Laue-Langevin (ILL), the Laboratoire Léon Brillouin (LLB), Elettra Sincrotrone Trieste and the Swiss Spallation Neutron Source (SINQ).

Access to such facilities is often dependent on EU membership or association. Funds for travel and accommodation to enable researchers to use these facilities are also only available for EU member states. The value of EU infrastructure was seen to be linked with that of free movement across the EU; access to such facilities was seen as straightforward and so now formed a significant component of some researchers' work.

One UK institution highlighted their provision of equipment to the European XFEL. The European XFEL is currently under construction in Hamburg, Germany and due to be completed in 2017.[29] It will generate ultra-short X-ray flashes to enable scientists to map the atomic details of viruses, decipher the molecular composition of cells, film chemical reactions, and study processes such as those occurring deep inside planets. Early involvement of the UK research community in the setting up of this facility will mean that the UK research community can help shape its future running.

None of the responses we received highlighted restrictions in the creation and operation of international facilities outside of the EU.

[28] *Response to the House of Lords Select Committee on Science and Technology consultation on Scientific Infrastructure*, Royal Society of Chemistry, June 2013

[29] http://www.xfel.eu/overview/in_brief/

Q8. What contribution does EU membership make to the quality of UK science and research through the free movement of people? How does this compare with flows of people between the UK and non-EU countries such as the USA, India, China and Singapore?

Attracting world-class researchers to the UK is essential to maintaining the UK's reputation as the best place to do science. The UK must be seen as "open for business" and welcoming to scientists and researchers.

Our members cited many positive benefits which arise from the free movement of people within the EU. Free movement of top researchers between EU member states allows UK universities and businesses to recruit the best researchers for their field with ease.

Researchers who are willing to move across borders both to and from the UK were seen as being highly motivated. One member stated that this created a healthy competitive atmosphere within research groups, with the result being raised standards of work across the whole team. Through long-term recruitment, sabbaticals, short-term research visits and attendance at conferences across the EU, UK workplaces benefit from a greater diversity of knowledge and expertise that enhance their research culture, increasing creativity, productivity and innovation. Free movement also means that UK researchers can easily travel to specialised equipment throughout Europe to undertake experiments (see response to question 7).

As EU members, the UK benefits from access to the EU-wide MSC actions designed to support researchers at all stages of their careers. These actions include prestigious individual research fellowships, Innovative Training Networks (ITNs) and Research and Innovation Staff Exchanges (RISE), European Researchers' Night (NIGHT) and co-funding of regional, national and international programmes (COFUND).[30] These actions were cited by members responding to this inquiry as essential for supporting post-doctoral researchers in addition to meeting the actions' aims of boosting scientific excellence and business innovation and enhancing researchers' career prospects through developing their skills in entrepreneurship, creativity and innovation.

A further point was made by one respondent regarding MSC fellowships. These fellowships are highly competitive and the respondent felt that they help to mobilise the best scientists across Europe. In some cases, these fellows go on to win permanent appointments in the institute that hosted their MSC fellowship. This benefits both the researcher who could continue their work and the institute, who have been able to secure excellent scientists early in their career who go on to produce high-quality research at the host institution. The emphasis on mobility of excellent researchers reflects the increasingly international nature of research careers – there are opportunities for UK nationals to work elsewhere, as well as for overseas nationals to work in the UK.

Being able to recruit from outside the EU was perceived as more difficult, due to a combination of work permit issues and fewer funding opportunities.[31] One respondent in industry suggested that being able to recruit from a pool of newly-qualified EU scientists was important to businesses, given the difficulties in recruiting non-EU students who had qualified in the UK. In some science subjects, the proportion of non-EU students is increasing, but many companies feel it is difficult to recruit them on graduation due to immigration law.

[30] http://ec.europa.eu/research/mariecurieactions/about-msca/quick-guide/index_en.htm
[31] *UK Immigration law and its impact on chemistry research and education*, Royal Society of Chemistry, September 2014

Q9. Does EU membership inhibit collaborations with countries outside the EU, for example by requiring the UK to adopt EU wide immigration policies rather than bespoke ones for the UK?

This was not a specific issue raised by our members. Many cited membership of the EU as a positive facilitator of international collaboration, with collaborations outside the EU being more challenging (see our response to Question 5).

Regulation

Q10. What are the key EU regulatory frameworks/mechanisms that directly affect the science and research community in the UK?

There are several regulatory frameworks that apply to chemical sciences research. These frameworks cover: chemical substances manufactured or imported into the EU in quantities of 1 tonne or more per year; human and veterinary medicines; food and foodstuff additives; plant protection products and biocides; radioactive substances; and waste. Of these frameworks the first mentioned, the Registration, Evaluation, Authorisation of Chemicals (REACH), is likely to have the greatest impact, not only on the chemical sciences research community and its connected industry but also to all businesses which use chemicals and materials further down a value chain.

REACH entered into force on 1 June 2007 and aims to improve the protection of human health and the environment from the risks that can be posed by chemicals, while enhancing the competitiveness of the EU chemicals industry.

REACH requires that manufacturers and importers of chemicals supplied in the EU above 1 tonne per year (over 30 000 substances) must be registered with the European Chemicals Agency (ECHA) by June 2018. Substances that have not been registered may not be placed on the EU market. A fee is charged for substance registration. Substances used in scientific research and development in amounts of less than one tonne a year are exempted from authorisation and restriction.

While this exemption exists for scientific research and development, there are concerns that future innovation may be impacted by a reduction in the availability of some chemicals because of compliance with REACH. If manufacturers and importers find the financial cost of registering some chemicals outweighs the potential economic returns, manufacturers and importers may decide not to register some chemicals and potentially cease production or import. Despite the exemptions for use in scientific research and development, this could lead to barriers in obtaining the chemicals for research in the first place, if they are no longer available on the EU market.

Although REACH mostly directly affects businesses, any reduction in chemical diversity at a larger scale could potentially impact upon collaborative research undertaken between universities and businesses. There is potential to affect further development of research carried out within academia, by businesses, if specific chemicals are no longer available at a larger scale.

However, some members in our community representing large, multinational companies highlighted the value of a common language in terms of regulatory affairs. Some actually felt that it facilitated a faster procurement of chemicals for research within the EU as there are no regulatory barriers to importing chemicals from other EU nations if the substances are registered under REACH, suggesting that at this stage the potential reduction in chemical availability outlined above is not actively impacting research.

Q11. If the UK were not a member of the EU, could regulations be reformed to give greater benefit to UK science and research? For example, in areas such as data regulation, VAT on shared facilities, and the use of the precautionary principle?

Many of those we consulted highlighted concerns about the risks of divergent regulatory practices emerging between the UK and the EU and the impact this would have on their research or businesses. A key issue for some that we consulted in industry seems to be the uncertainty around how regulation would be affected, and the potential (resource or financial) consequences this could eventually have on research within the sector.

For the pharmaceutical industry, the European Medicines Agency (EMA), a decentralised agency of the European Union, located in London, is a key stakeholder in the assessment and approval of new medicines and maintenance of product licences. One of our members working in pharmaceutical research speculated that if the UK were not a member of the EU, then regulatory submissions may well proceed *via* national regulatory procedures through the Medicines and Healthcare Regulatory Authority (MHRA). However, it is unclear whether or not there would need to be a re-evaluation of product licenses previously approved under EMA centralised procedures. It is unclear whether this would affect the availability of medicines to patients and what other consequences (e.g. resourcing or financial) it may have for the companies involved.

Regulation of chemicals is not only a European issue, but a global one, with trading blocs each devleoping their own rules in an ever-changing global environment. An example is the current Transatlantic Trade and Investment Partnership (TTIP) negotiations between the USA and the EU, aimed at creating a free trade area covering both current trading blocs. Part of the negotiation is concerned with regulatory legislation such as REACH within the EU and regulations set by the Environmental Protection Agency within the USA. Whilst it has been reported that harmonisation between the two blocs is not feasible, steps towards regulatory cooperation between the two bloc are being examined during the negotiations. Though it is foreseen that the TTIP negotiations will have been concluded by the end of next year, it is unclear how UK would be affected by the agreement if it left the EU, both with respect to regulation and more broadly.

From the responses that we received, there was a perception that even if the UK did leave the EU, UK businesses would still have to comply with EU regulations if they wished to sell their products in the EU. Even if UK regulation could be reformed, it was felt that this would simply lead to more regulation that would need to be complied with.

Scientific advice

Q13. How does the quality and effectiveness of scientific advice on matters of public policy compare between the EU and the UK? What are the effects, if any, of differences in the provision of scientific advice between the EU and the UK?

The Royal Society of Chemistry believes that scientific evidence has an important role in the formulation of evidence-informed policy. This evidence will be further balanced against wider social, economic and political factors, which are more complex at EU level, given the scale and range of stakeholders involved.

Q14. To what extent does EU membership enable UK scientists to inform and influence public policy at EU or international levels? To what extent does EU membership inhibit UK scientists from influencing public policy at EU or international levels?

There are many opportunities for UK scientists to inform and influence public policy at EU or international levels. These include responding to consultations, representation on advisory panels and expert stakeholder groups.

A member who has been involved in both UK and EU level committees that provided scientifc advice found that the EU-level committee was more labour-intensive for the scientists involved. They suggested that this is partially a reflection of the more complex stakeholder landscape that the EU represents. They felt that UK researchers were both well represented and respected for their advice and input by their EU colleagues.

Some in our community have indicated that research pertinent to regulatory matters is being rejected from the European regulatory decision making process on the basis that it has been generated by industry researchers or academics in receipt of industry funding. In some cases this has been reported to have occurred where prior links to industry are not relevant to the regulatory matter being investigated. An alternative approach would be to take account of all evidence available but in doing so, declare all conflicts of interest openly and transparently – this includes research that has links to industry, non-governmental organisations, charities and/or national governments, as well as research with links to industry.

Contact

The Royal Society of Chemistry would be happy to discuss any of the issues raised in our response in more detail. Any questions should be directed to Dr Mindy Dulai, dulaim@rsc.org, 01223 432674.

About us

With over 51,000 members 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.

A not-for-profit organisation with a heritage that spans 170 years, we invest in educating future generations of scientists, we raise and maintain standards and work with industry and academia to promote collaboration and innovation. We advise governments on policy and we promote the talent, information and ideas that lead to great advances in science.