HM Government

Review of the Balance of Competences between the United Kingdom and the European Union

Research and Development

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Executive Summary

This report examines the balance of competences between the European Union and the United Kingdom in the area of research and development, and is led by the Department for Business, Innovation and Skills. It is a reflection and analysis of the evidence submitted by experts, non-governmental organisations, businesspeople, Members of Parliament and other interested parties, either in writing or orally, as well as a literature review of relevant material. Where appropriate, the report sets out the current position agreed within the Coalition Government for handling this policy area in the EU. It does not predetermine or prejudge proposals that either Coalition party may make in the future for changes to the EU or about the appropriate balance of competences.

Chapter One sets out the historical development of EU activity in the field of research, development, innovation and space. It describes: an initial focus on coal, steel, nuclear and agricultural research; the addition of other areas aimed at making EU industry more competitive; and the eventual transition to the current wide range of research, including some without immediate commercial application. It also covers the Treaty objective of achieving a European research area in which researchers, scientific knowledge and technology circulate freely.

Chapter Two sets out the legal framework that currently underpins EU activities in the field of research, development, innovation and space. It explains: that the EU has supporting competence for innovation; the uncertainty surrounding competence for R&D, which is described as shared between the EU and Member States but where the exercise of EU competence shall not result in Member States being prevented from exercising theirs; and also explains the unusual competence for space, also described as shared, but where harmonisation of national laws is ruled out.

Chapter Three considers the impact on the UK's national interest of EU activity in the fields of research, development, innovation and space.

The EU's main role so far in research, development and innovation is in defining priorities and allocating funding through the research framework programme. The fact that the UK does well out of EU funding for research and has high levels of participation was reflected and given colour to by responses, particularly from the research community about their experiences with different projects. Although UK industry does less well in terms of funds received, responses from this group were also largely positive, particularly with regard to the forums and networks the EU provides for collaboration. In the area of space projects, the EU has responsibility for funding and delivering major programmes on satellite navigation (Galileo) and environmental monitoring (GMES, now known as Copernicus). UK industry has won major contracts from this EU space activity.

Respondents from all groups cited examples of useful and effective EU programmes and highlighted how these encouraged different projects and consortia from those targeted by national initiatives, afforded economies of scale and provided useful structures and links to facilitate international collaboration. However, there was also widespread criticism of their complexity at various stages, from understanding what is available, to putting together bids that tick all boxes and fulfilling reporting requirements. This was felt to act as a deterrent, particularly to potential small business participants.

There was a more mixed response to the EU's involvement in defining policy in these areas. There was little mention of the EU's Innovation Union as an overarching innovation strategy. Whilst there was wider recognition amongst research stakeholders of the Commission's objective of creating a European Research Area (ERA) and general support for its objectives, there were also a number of concerns raised about how far this might encroach on national initiatives and cause unnecessary reporting burdens. In the area of space, the EU's strategic priority-setting was generally seen as useful. UK space policy is closely interwoven with European and international initiatives taken forward in other forums such as the European Space Agency (ESA).

There was a sense amongst stakeholders that the EU did not have a coordinated approach across other policy areas to ensure that these encourage and do not hinder innovation. This resulted in a mixed picture where some legislation from other areas of competence acted as a spur to innovation and some hampered the activity of innovators and researchers. However, there was a sense that the European Commission does listen to stakeholder feedback and adapt legislation where necessary.

Chapter Four considers the future direction of EU research, development, innovation and space policy and its interaction with national UK policy.

The majority of respondents felt that a combination of local, national, EU, bilateral and international policies and collaborations was the most effective way of managing the complex needs of differing research fields. To this end, current arrangements, while not perfect, were broadly considered to provide a good foundation. There were improvements that could be made, notably to reduce the bureaucracy and raise the profile of EU programmes among UK industry, particularly Small and Medium-sized Enterprises (SMEs). Business stakeholders called for the Government to use its influence to ensure the priorities identified in the UK Government's industrial strategy are also reflected as EU research and innovation priorities. There were reservations about potential legislation to achieve the ERA. In terms of EU space policy, stakeholders were keen for ESA to remain a separate inter-governmental entity outside the EU in terms of research and specific programmes but saw benefits in a closer alignment with EU space policy.

Introduction

This is one of 32 reports being produced as part of the Balance of Competences Review, which the Foreign Secretary launched in Parliament on 12 July 2012, taking forward the Coalition commitment to examine the balance of competences between the UK and the EU. It provides an analysis of what the UK's membership of the EU means for the national interest. It aims to deepen public and Parliamentary understanding of the nature of our EU membership and provide a constructive and serious contribution to the national and wider European debate about modernising, reforming and improving the EU in the face of collective challenges. It has not been tasked with producing specific recommendations or looking at alternative models for Britain's overall relationship with the EU.

The Review is broken down into a series of reports on specific areas of EU competence, spread over four semesters between 2012 and 2014. More information about the Review, including a timetable of reports to be published over the next year, can be found at www.gov.uk/review-of-the-balance-of-competences.

The call for evidence for this report received over 80 responses and over 50 participants attended stakeholder events. Lists of these contributors are available at Annexes A and B. A non-exhaustive list of relevant literature is provided at Annex C.

For the sake of simplicity, the term 'EU' also refers to its predecessor communities.

Science and innovation are critical to assuring the UK's future prosperity and sustainable growth. Countries that aspire to be knowledge-based economies need: an excellent research base to create new knowledge; the right infrastructure to convert this into new products, processes and services; and skilled people to make effective use of innovations.

UK research is highly competitive across a wide range of fields. While the UK represents only 0.9% of the world population and 3.2% of research and development (R&D) expenditure, it accounts for: 6.4% of the world's academic publications; 11.6% of citations; and 15.9% of the world's most cited publications, higher than any other EU country.[1] This makes us the most productive as measured by the ratio of articles and citations to investment in R&D per capita) amongst comparator countries.[2] This scientific excellence also benefits the UK's innovation performance, with the UK consistently ranking in the top five countries globally for university-industry collaboration in R&D and in the top ten for innovation capacity.[3]

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1 Elsevier for BIS, *International Comparative Performance of the UK Research Base* (2013).

2 Idem.

3 World Economic Forum, *The Global Competitiveness Report 2013-2014* (2013).

The UK does exceptionally well from the EU's current seven-year research budget, Framework Programme 7 (FP7), receiving €6.1bn or 15.4% of the funds allocated to date, second only to Germany which has received 16.1%. This equates to a higher percentage of FP7 funding than either our share of EU Gross Domestic Product (GDP) or population; only the Netherlands does better on either of these measures.[4] However, these impressive headline figures mask a division between higher education institutions, which attract 70.3% of the UK's total, and businesses, which have been allocated just 18.6%. Small businesses receive 13.1% of UK funding, lower than the 14.6% allocated to SMEs across the Union as a whole.[5]

The EU is increasingly taking a role in strategic decisions about which research areas or technologies to prioritise. This is reflected in funding priorities but there are also overarching policies such as: the Innovation Union Flagship initiative; the aim of creating an ERA in which researchers and ideas can circulate freely; and successive space policies. These encapsulate a range of policy measures from funding, to coordination of Member States' activities, to some limited legislation.

In these fields of activity, international collaboration is vital to deliver projects of the scale of the Galileo satellite navigation programme and to deliver world class research. The EU provides many platforms and frameworks for joint working and knowledge exchange. Whether it is the most effective and efficient means of achieving it and whether the negatives of reduced control over priorities, constraints of other regulations and sheer bureaucracy outweigh the benefits is the subject of this report.

4 See chart 3.3 *Difference Between Share of FP7 and Share of GDP*, Chapter 3.

5 EC, FP7 Project and Participants database, version 15.0, released 1 November 2013.

Chapter 1:
Development of EU Competence

A Brief History of the EU Treaties

The Treaty on the European Economic Community (EEC) was signed in Rome on 25 March 1957 and entered into force on 1 January 1958. The EEC Treaty had a number of economic objectives, including establishing a European common market. Since 1957 a series of Treaties has extended the objectives of what is now the European Union beyond the economic sphere. The amending Treaties (with the dates on which they came into force) are: the Single European Act (1 July 1987), which provided for the completion of the Single Market by 1992; the Treaty on European Union – the Maastricht Treaty (1 November 1993), which covered matters such as justice and home affairs, foreign and security policy, and economic and monetary union; and the Treaty of Amsterdam (1 May 1999), the Treaty of Nice (1 February 2003) and the Treaty of Lisbon (1 December 2009), which made a number of changes to the institutional structure of the EU.

Following these changes, there are now two main Treaties, known as the Consolidated Treaties, which together set out the competences of the European Union:

- The Treaty on European Union (TEU);
- The Treaty on the Functioning of the European Union (TFEU).

1.1 Prior to the Treaty of Rome, the European Coal and Steel Community (ECSC) Treaty (1951) gave the Community competence to 'encourage technical and economic research' in these two sectors, including by funding it from levies on coal and steel production. Whilst the ECSC Treaty itself expired in 2002, the Research Fund for Coal and Steel remains under the control of the EU.

1.2 The 1957 Treaty of Rome and its EEC and Euratom Treaties expanded this competence. The EEC Treaty mentions research only in the context of agriculture and only then in terms of coordinating efforts of the Member States, which could include joint financing. The Euratom Treaty was initially created to coordinate the Member States' research programmes for the peaceful use of nuclear energy. It established a Joint Nuclear Research Centre, the precursor to the current Joint Research Centre (JRC), which now has a much wider scope of activity, and made provision for Community research and training programmes in the field of nuclear research.

1.3 During the 1970s, the JRC started to expand its research activities beyond nuclear into areas such as renewable energy, informatics, materials and environment (including remote sensing from space). From 1973, this was formalised into multi-annual research work programmes under Euratom adopted by the Council, including resource allocation. The JRC Board of Governors was also created.

1.4 In the 1980s, the economic down-turn led to calls for research activities to be more closely aligned with the aim of improving European industrial competitiveness and a number of industry-related programmes and collaborations with industry were initiated. In December 1982 the Council agreed to initiate ESPRIT, a Community research and development programme in the field of IT, which stipulated that there had to be an industrial participant, and in 1983 the first Framework Programme was established through a Council Resolution.[1] This referred to Article 7 of Euratom and Article 235 EEC, a catch-all article allowing the Council, by unanimity, to take any action necessary to the functioning of the Common Market. Accordingly, this first framework programme focussed on agricultural and industrial competitiveness, as well as nuclear, as there was no formal legal base for other activities.

Research Framework Programmes

Until FP7 (2007-2013), Framework Programmes had three to five year terms (FP1 1983-1986, FP2 1987-1991, FP3 1990-1994, FP4 1994-1998, FP5 1998-2002, FP6 2002-2006). When launched, FP7 was the world's largest research programme with a maximum budget of €50.5bn, to be allocated under four strands.

Cooperation: (largest part of FP7) funds research activities across different countries in ten areas: health; food, agriculture and fisheries, biotechnology; information and communication technologies; nanosciences, nanotechnologies, materials and new production technologies; energy; environment (including climate change); transport (including aeronautics); socio-economic sciences and the humanities; space; and security.

Ideas: investigator-driven research projects across all fields, carried out by individual teams in European competition and managed by a European Research Council (ERC). Projects are evaluated solely on the basis of excellence, as judged by peer review.

People: support through 'Marie Curie' actions aimed at the mobility of researchers, including transfers between industry and academia.

[1] Council Resolution of 25 July 1983, 1983 O.J.C 208 [Framework Programmes for Community Research, Development and Demonstration Activities and a First Framework Programme 1984 to 1987].

Capacities:

- *Infrastructures;* including support for new infrastructure based on the work of the European Strategy Forum on Research Infrastructures (ESFRI);
- *Science and society;* encourages pan-European reflection and debate on science and technology and their relationship with the whole spectrum of society and culture;
- *Regions of knowledge and research potential;* aimed at helping to involve 'regional research driven clusters' in FP7 and helping excellent researchers in convergence regions to achieve higher visibility by participation in collaborative projects;
- *International cooperation;* building the capacity of selected third countries and providing opportunities to take part in research not covered under the 'cooperation' specific programme;
- *Co-ordination of national programmes and international cooperation;* some support actions and measures with a focus other than a specific thematic or interdisciplinary area are implemented here.

Nuclear research, although grouped alongside other research funding, has a separate legal base in the Euratom Treaty, which limits it to a five-year term (a two-year supplementary programme was agreed to cover 2012-13). Under FP7 it funded three specific programmes: fusion energy research (including the International Thermonuclear Experimental Reactor (ITER), an international project to design and build an experimental fusion reactor); nuclear fission and radiation protection; and the activities of the JRC in the field of nuclear energy.

Horizon 2020 (2014-20) will be the EU's eighth framework programme, with a budget of around €79bn. It will be structured round three main priorities: excellent science; key enabling technologies to support industrial leadership; and a limited number of European and global societal challenges, for example energy security, food security and climate change.

Development of Research and Development

1.5 As with many other areas of policy, the 1987 Single European Act represented a significant expansion in powers in the field of research and development. Its addition of Title VI to the EEC treaty gave the EU for the first time an explicit, broadly defined remit for the promotion of research, albeit constrained by a requirement for industrial application: 'to strengthen the scientific and technological basis of European industry to encourage it to become more competitive at international level'.[2] It gave the EU competence to promote cooperation with third countries and international organisations. It also made *de jure* what already existed *de facto*, by giving legal provision for the EU to establish a multiannual Framework Programme and 'joint undertakings or any other structure necessary for the execution of Community research programmes' – both of these subject to unanimity in the Council.[3]

1.6 The 1992 Maastricht Treaty amended the articles relating to research to include the text below: The Community shall have the objective of strengthening the scientific and technological bases of Community industry and encouraging it to become more competitive at international level, while promoting all the research activities deemed necessary by virtue of other chapters of this Treaty. This signalled a big potential expansion of scope to promote research in areas beyond those with direct links to industrial

[2] Idem, Article 130f.

[3] Idem, Article 130.

competitiveness. In practice it did not result in a huge expansion into new research areas; the previous scope had been interpreted broadly and research in areas such as agriculture and the environment had long been backed by the EU. However, it did lay the foundations for a wider range of research to be brought under the aegis of future Research Framework Programmes.

1.7 The Maastricht Treaty was also the first to introduce innovation as a concept in the Treaties, as part of a newly inserted title on industry.[4] This text has remained virtually unchanged since then, stating that EU and Member State actions to improve competitiveness of industry should include fostering better exploitation of the industrial potential of policies of innovation, research and technological development.[5]

The ERA

1.8 Whilst the idea of an ERA dates back to the 1970s, it was not declared as a formal objective by the Commission until the 2000 Communication *Towards a European Research Area*.[6] This commitment was then strengthened by its inclusion in a legislative text as part of the title of the Sixth Framework Programme: 'concerning the sixth framework programme of the European Community for research, technological development and demonstration activities, contributing to the creation of the ERA and to innovation (2002 to 2006)'.[7]

1.9 The concept was incorporated into the European Treaties by the Lisbon Treaty in 2009, which conferred on the Union an 'objective of strengthening its scientific and technological bases by achieving a European research area in which researchers, scientific knowledge and technology circulate freely, and encouraging it to become more competitive, including in its industry'. The ramifications of this change are explored in subsequent chapters.

1.10 In the early 2000s, European Technology Platforms emerged in industrial sectors dependent on important research and technological progress in the medium to long term.[8] Initiated and led by industry players with support from the European Commission these bring together stakeholders to define and implement strategic research agendas. They contributed to the definition of the themes of the cooperation programme of FP7 and to the creation of Joint Technology Initiatives (JTIs), under what is now Article 187 of the TFEU. JTIs fund R&D into industry-oriented topics such as large-scale 'platform technologies' and combine private sector investment with European public funding, primarily grant funding. In some cases, JTIs also incorporate national public funding.

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4 Idem.

5 Idem, Article 103.

6 Commission Communication to the Council, the European Parliament and the Economic and the Economic and Social Committee and the Committee of the Regions, *Towards a European Research Area*, COM (2000) 6 final, 18 January 2000.

7 European Parliament and Council Decision of 29 August 2008 1513/2002/EC, *Concerning the Sixth Framework Programme of the European Community for Research, Technological Development and Demonstration Activities, Contributing to the Creation of the European Research Area and to Innovation* (2002 to 2006) 2002.

8 DG Research, *Technology Platforms from Definition to Implementation of a Common Research Agenda*: *Report Compiled by a Commission Inter-Service Group on Technology Platforms* (2004).

1.11 The ERC was created in 2006 as part of the European Parliament and Council Decision which established FP7 with the objective of promoting 'very high-level frontier research'.[9] The ERC consists of a Scientific Council (to plan scientific strategy, establish the work programme, quality control and information activities) and an implementing executive agency (dealing with administration, support for applicants, proposal eligibility, grant management and practical organisation). The Scientific Council consists of representatives of the European science community at the highest level, who act in their personal capacity, independent of political or other interests.

1.12 The European Institute of Innovation and Technology (EIT) was established in 2008 with the aim of promoting partnership between Higher Education Institutions, research organisations, companies and other stakeholders through Knowledge and Innovation Communities.[10]

1.13 In 2009 the EU passed a Council Regulation (732/2009) establishing a legal framework for European Research Infrastructure Consortiums (ERICs).[11] The legal base for this was Articles 171 and 172 TEC, now Articles 187 and 188 TFEU. The objective was to facilitate the establishment of large scale joint research infrastructures between EU countries, in response to growing demand for the economies of scale offered by such joint initiatives and the prior lack of an adequate framework.

Development of EU Competence for Space

1.14 The EU has long been actively promoting and undertaking space research under a range of treaty bases relevant to the outcomes of the research. As far back as the 1970s, the JRC had started to develop remote sensing from space, which could be used for studying pollution and monitoring agriculture, and in the late 1980s one strand of this developed into a formal programme called Monitoring Agriculture with Remote Sensing (MARS). The objective of MARS was to provide statistics on crops and yields, to reduce the need for field inspections and to combat fraud related to the Common Agricultural Policy (CAP).

1.15 Space has been a feature of successive recent Research Framework Programmes which have allocated significant sums to research in this area. A total of €1.43bn was spent on space research and development during the FP7 (2007-2014) and around €1.5bn (2011 prices) ear-marked for space research in *Horizon 2020*.[12]

1.16 Although the Lisbon Treaty was the first to mention explicitly space as a policy area for the EU to engage with, the Commission issued a Communication as early as 2007 on a 'European Space Policy' and obvious space projects were undertaken on the basis of other parts of the Treaties before then.[13] For example, the creation of the Galileo global navigation satellite system and the fully functional European Geostationary Navigatory Overlay Service (EGNOS) satellite navigation system both derive from Article 172 of

[9] European Parliament and Council Decision No 1982/2006/EC, *Concerning the Seventh Framework Programme of the European Community for Research, Technological Development and Demonstration Activities* (2007-2013).

[10] The EIT was established by regulation 294/2008/EC on the legal basis of article 157(3) TEC, focused on industrial competitiveness.

[11] Council Regulation 723/20089/EU, Community Legal Framework for a European Commission European Research European Research Infrastructure Consortium (ERIC), 2009.

[12] BIS analysis of figures provided by the European Commission.

[13] Commission Communication to the Council and the European Parliament, *European Space Policy*, COM (2007) 212 final, 26 April 2007.

the Treaty which deals with Trans-European Networks (TENs).[14] Galileo is a European navigation system akin to the US Global Positioning System (GPS) and EGNOS is the European Geostationary Navigation Overlay Service, a European satellite programme that augments the US GPS satellite navigation signals, making them suitable for safety critical applications such as flying and landing aircraft. It has been operational since 2009 for general users and for safety critical users since 2011. Galileo and EGNOS will have a budget of around €6.3bn (2011 prices) from 2014 to 2020.

1.17 Article 189 of the Lisbon Treaty provides that the EU shall draw up a European space policy. As part of this, it may promote joint initiatives, support research and technological development and coordinate the efforts needed for the exploration and exploitation of space but without going as far as harmonising the laws of the Member States or preventing the Member States from having their own space programmes.

1.18 Article 189 has been used as the legal base for the EU's earth monitoring initiative Copernicus (formerly GMES – Global Monitoring for Environment and Security), the second EU flagship space programme. Copernicus is an environmental monitoring programme using space remote sensing data to provide accurate and reliable information on environmental and civil security issues which will support broader areas of the EU's policies, particularly relating to the Single Market, transport, environment, energy, civil protection, humanitarian aid and cooperation with third countries. GMES began in 1998 when institutions involved in the development of space activities in Europe made a joint declaration which called for a long-term commitment to the development of space-based environmental monitoring services, through the use and development of European skills and technologies. In 2005, the Union made the strategic choice to develop this initiative which ultimately resulted in a Regulation on GMES and its initial operations (2010-2013).[15] [16] FP7 made a significant contribution to the development of both the GMES services and the space component in partnership with the European Space Agency (ESA). For the period 2014 to 2020, the proposed Copernicus Regulation foresees a total budget of €3.8bn (2011 prices).

EU Engagement with Non-EU Countries

1.19 The European Union's international scientific cooperation policy has three stated objectives:[17]

- To strengthen the Union's excellence and attractiveness in research and innovation as well as its industrial and economic competitiveness;
- To tackle global societal challenges; and
- To support the Union's external policies (such as trade, development, enlargement, and so on.

[14] TENs are borderless networks within the EU for transport (the basis for Galileo and EGNOS), telecommunications and energy.

[15] Commission Communication to the Council and the European Parliament, *Global Monitoring for Environment and Security (GMES) From Concept to Reality*, COM (2005) 565 final, November 2005.

[16] European Parliament and Council Regulation 1911/2010/EU/, The European Earth Monitoring Programme (GMES) and its Initial Operations (2011 to 2013), 2010.

[17] European Commission, *International Cooperation for Lasting Solutions* (2014). This is available at: http://ec.europa.eu/research/iscp/index.cfm, accessed on 15 January 2014.

1.20 From the outset, Research Framework Programmes have been open to the participation of non-EU countries, subject to bilateral agreements. There are currently 13 associated countries with agreements whereby they contribute to the FP budget and can participate in its activities.[18] Entities and individuals in other countries can also participate in Framework Programme activities on a 'pay to play' basis so long as their participation enhances the programme objectives.

1.21 In 1983 the European Commission launched a dedicated programme open to non-EU countries called the Science and Technology for Development Programme, running in parallel with the Framework Programmes. In 1992, it was integrated into the Fourth Research Framework Programme (1994-1998) as the International Cooperation Programme (INCO) and remained an integral part of subsequent Framework programmes. In addition to a specific programme under its 'capacities' theme, the Seventh Framework Programme (2007-2013) has sought to mainstream international cooperation across all its activities.

1.22 The EU has concluded international Science and Technology Agreements with around 20 countries.[19] They are legally binding as well as politically important and set out, for example, agreements on Intellectual Property (IP) rights, as well as commitments to cooperate in particular areas of research and conduct exchanges of best practice. They take as their legal base Article 186 TFEU. The Commission's 2012 International Strategy for Research and Innovation also proposes to target specific countries or regions for collaboration on particular topics.[20]

1.23 The Strategic Forum for International Science and Technology Cooperation (SFIC), comprising Member States and the Commission and chaired by a Member State, was created in 2009 to coordinate the EU's 'various scientific and technological cooperation activities with third countries, while setting priorities that are differentiated according to the level of scientific and economic development and sectoral characteristics of those countries'.[21]

1.24 The EU also engages with third countries on specific space programmes, such as Galileo, where cooperation with other states is beneficial for Europe. The US, China and Russia have their own independent satellite navigation systems, for example, and so it is important that Galileo can work alongside these. Cooperation with third states can also extend to hosting some space infrastructure, as Norway does for the Galileo programme's ground stations in the far north.

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[18] EU Candidate and potential candidate countries; EEA members; Switzerland; Israel; Moldova and the Faroe Islands.

[19] List of International RTD Association and Cooperation Agreements, available at: http://ec.europa.eu/research/iscp/pdf/st_agreement_ec_euratom_8_august_2013.pdf#view=fit&pagemode=none, accessed on 15 January 2014.

[20] Commission Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, *Enhancing and focusing EU International Cooperation in Research and Innovation: A Strategic Approach*, COM (2012) 497 final, 14 September 2012.

[21] Council of the European Union, Council Conclusions Concerning a European Partnership for International Scientific and Technological Cooperation, 16763/08 1-2 December, 2008.

Chapter 2:
Current State of Competence

2.1 For the purposes of this review, we have used a broad definition of competence. Put simply, competence in this context is about everything deriving from EU law that affects what happens in the UK. The EU's competences are set out in the EU Treaties. These provide the basis for any actions the EU institutions take. The EU can only act within the limits of the competences conferred on it by the Treaties. Where the Treaties do not confer competences on the EU, they remain with the Member States.

2.2 There are different types of competence, notably those known as exclusive, shared or supporting. Only the EU can act in areas where it has exclusive competence, such as the customs union and common commercial policy. In areas of shared competence, such as the Single Market, environment and energy, either the EU or Member States may act, but Member States may be prevented from acting once the EU has done so. In areas of supporting competence, such as culture, tourism and education, both the EU and the Member States may act, but action by the EU must be to support, coordinate or supplement Member State activities and does not prevent the Member States from taking action of their own.

2.3 The EU must also act in accordance with fundamental rights as set out in the Charter of Fundamental Rights (such as freedom of expression and non-discrimination) and the principles of subsidiarity and proportionality. Under the principle of subsidiarity, where the EU does not have exclusive competence, it can only act if it is better placed than the Member States to do so because of the scale or effects of the proposed action. Under the principle of proportionality, the content and form of EU action must not exceed what is necessary to achieve the objectives of the EU Treaties.

2.4 Competence in this area is a combination of supporting – for innovation and space – and a hybrid of shared and supporting – for research and technological development.

Current EU Competence for Research, Development and Innovation

2.5 The Lisbon Treaty in general sought to clarify the split of powers between the EU and its Member States by corralling areas of policy described in the Treaty into categories of supporting, shared, or exclusive competence as described above. Innovation is covered by the Industry title (Article 173) and as such the EU clearly only has supporting competence. However, in the areas of research, technological development and space, the transition from TEU to TFEU added, rather than removed, confusion around competence.

2.6 The previous language of supporting, coordinating and encouraging seemed to make clear that Union competence was in a supporting capacity only. By contrast, Article 4 TFEU states that the EU and Member States have shared competence in the field of research, technological development and space. However, contrary to 'standard' shared competence, paragraph 3 of Article 4 states that the exercise of the EU's competence in this area does not limit the competence of the Member States. This assurance that national governments may take action on their own account, regardless of whether the EU has acted in the same field, seems to make clear that the EU is not intended to have the same extent of powers as over other shared competence policy areas. However, it is unclear where the dividing line is drawn and this is an unusual arrangement. Only development cooperation and humanitarian aid are afforded a similar but slightly different, hybrid competence.

2.7 So far, the EU has not sought to take much action – and certainly very little legislative action – founded on this legal base. As a result, the extent of its competence is untested and unclear. Member States continue to pursue their own policies, but collaborating where possible. Such collaborations are often facilitated with EU funding or support.

2.8 The majority of EU competence exercised in the areas of research, development and innovation is for the Framework Programme. The Lisbon Treaty did not change the arrangements for agreeing the Framework Programme significantly. However it did mark a gear change from research and technological development simply being a means to the end of improving industrial competitiveness and achieving objectives of other chapters of the Treaty, to becoming an end in itself. The primary objective of Chapter XIX TFEU (the research legal base) is now the achievement of a competitive ERA, which ensures free movement of researchers and ideas.

2.9 The Treaty does not define what this means in practice but talks about encouraging businesses and research institutions to achieve high quality work, supporting their cooperation and ability to exploit the Single Market, 'in particular through the opening-up of national public contracts, the definition of common standards and the removal of legal and fiscal obstacles to that cooperation'. It also gives competence in Article 182 to the EU (the Council and the Parliament) to 'establish the measures necessary for the implementation of the European Research Area'.

2.10 This codification of the objective into the Treaties has driven a stream of activity aimed at the idea of 'completing the ERA' by 2014. This terminology originated in the Commission's 2010 Innovation Union Flagship Communication, which set out as one of its ten objectives 'The European Research Area must be completed within four years'.[1] The European Council has subsequently also called in February 2011 and March 2012 for the ERA to be 'completed by 2014'.[2] [3] Stakeholders have commented that it is not clear what 'completion' would look like.

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1 Commission Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, *Europe 2020 Flagship Initiative Innovation Union*, COM (2010) 546 final, October 2010.

2 European Council, Conclusions, 2/1/11 REV, 4 February 2011.

3 General Secretariat of the Council to Delegations, European Council Conclusions, 4/3/12, REV 3, 1-2 March 2012.

2.11 A second ERA Communication in 2012 set out areas where the Commission believed improvements were needed.[4] These include: Joint Programming Initiatives (JPIs); research infrastructures, including ERICs; removal of barriers to researcher mobility; gender equality in the research field; and open access to scientific research. It has called for more effective national research systems with open national-level competition. That Communication set out a 'reinforced partnership approach' between Member States and the Commission to achieve the ERA. However, it also warned that this did 'not replace legislation, nor preclude the Commission's right to bring forward legislative proposals based on the new ERA-related provisions in the TFEU'.

2.12 The Lisbon Treaty also expanded Article 181(2) to explicitly state that the EU has competence for setting guidelines, monitoring and evaluation if useful to promote the coordination of Member State and Union research and technological development activities. This is a key part of the Commission's approach to judging whether the 'partnership approach' is working or whether legislation might be required.

2.13 The EU launched its ten year growth strategy, known as Europe 2020 in 2010. This aims to make structural reforms and create the conditions for a smarter, more sustainable and more inclusive growth. It is being implemented via seven flagship initiatives, of which four (innovation, digital economy, industrial policy and resource efficiency) have strong links to research and innovation. Innovation Union is the most relevant of these.[5] Most EU-level actions in support of innovation draw on this flagship initiative. The action lines in Innovation Union addressed the full range of policies affecting innovation, including proposing the establishment of European Innovation Partnerships (EIPs) to help co-ordinate the use of EU and national level policy instruments in key areas of the economy.

Current EU Competence for Space

2.14 The situation for space is clearer. Although also described by Article 4 as subject to shared competence, TFEU (Article 189(2)) explicitly rules out the harmonisation of national laws. It is therefore hard to identify any practical difference between the EU's competence for space and the generally defined 'supporting' competence.

2.15 Article 189 of the Lisbon Treaty requires that the Union draws up 'a European space policy to promote scientific and technical progress, industrial competiveness and the implementation of its policies' and also requires the Union to establish 'any appropriate relations' with the ESA. Member States can also pursue their own space programmes.

2.16 This legal base has been used to legislate for the European Earth monitoring programme, Copernicus, to provide for its initial operations between 2011 and 2013, and now for the proposed main Copernicus programme from 2014 onwards.

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[4] Commission Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, *A Reinforced European Research Area Partnership for Excellence and Growth*, COM (2012) 392 final, July 2012.

[5] Commission Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, *Europe 2020 Flagship Initiative Innovation Union*, COM (2010) 546 final, October 2010.

2.17 In terms of policy developed under this legal base, the Commission published a Communication *towards a European space strategy for the European Union that benefits its citizens* in 2011.[6] This focussed on the need to deliver the programmes underway (Galileo, Copernicus) and proposed action to protect European space assets developed under these EU programmes, such as one of the satellites providing data for Copernicus, from space debris. The Communication made the case for EU involvement in space exploration work and costed options for a mission to Mars and establishment of an EU astronaut corps, proposed actions for high-speed broadband for Europe by satellite and set out the need for greater international collaboration. Under the budget agreed for space until 2020, the focus is on delivering the current programmes.

2.18 ESA is an independent, intergovernmental organisation, focussed on space research and development and space missions. The UK was a founding member of ESA in 1975. There was cooperation between the EU and ESA, through the 2004 Framework Agreement, before the Lisbon Treaty came into force. This provides for a joint ESA and European Commission secretariat and meetings of Ministers at a joint ESA/EU Space Council. ESA's founding Convention and the Lisbon Treaty now charge both ESA and the EU individually with the development of a European space policy, and it is unclear how this will be aligned. In late 2012, the Commission issued a Communication which set out its initial views.[7] This proposed options for further study during 2013 which ranged from improving working arrangements between the EU and ESA, to ESA becoming a full part of the EU as an EU Agency. The differences between the EU and ESA do generate widely acknowledged difficulties where ESA acts as a delivery agent of the EU, for example in building the Galileo system. ESA's role is wider than supporting the delivery of EU programmes; it undertakes its own research for its Member States and has commercial arrangements for research in some sectors.

2.19 Although the 2009 change to the Treaty to explicitly provide that space was an EU policy competence was arguably unnecessary, it has emboldened the Commission's thinking, the range of activities it undertakes and has increased the amount of funding dedicated to space, which is up from around €5bn from 2007-13 to around €12bn from 2014-2020.

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[6] Commission Communication to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions, *Towards a European Space Strategy for the European Union that Benefits its Citizens*, COM (2011)152 final, April 2011.

[7] Commission Communication to the Council and the European Parliament, *Establishing Appropriate Relations between the EU and the European Space Agency*, COM (2012) 671 final, November 2012.

Chapter 3:
Impact on the National Interest

The Importance of Research and Innovation

3.1 Science and innovation are critical both in promoting prosperity and sustainable growth, and in tackling major global challenges. The Organisation for Economic Cooperation and Development (OECD) 2010 *Innovation Strategy* commented that 'innovation will increasingly be needed to drive growth and employment and improve living standards […] This economic challenge coincides with increasing political pressure to meet various social challenges, such as climate change, health, food security, or access to clean water […] innovation is crucial for solving such problems in an affordable and timely manner'.[1] Public opinion in the UK agrees that science and innovation plays an important role: in 2011 79% of respondents to a study of UK public attitudes to science agreed with the statement 'the UK needs to develop its science and technology sector in order to enhance its international competitiveness', with only 3% disagreeing.[2]

3.2 There are differences of opinion regarding the relative importance of economic and societal gains from science and innovation, although it is important to note that these two often go hand in hand. Particular interest groups, whether NGOs, businesses or researchers themselves may judge that the national interest is best served by furthering understanding in their particular field of interest. While researchers and innovators tend to favour greater freedom in how they further their work, NGOs might advocate greater restrictions to ensure protection of civil liberties or animal rights for example.[3] However, whilst individual researchers may value knowledge and discovery for its own sake, there appears to be a broad consensus that the advancement of knowledge across a range of disciplines, subject to appropriate controls, is welcome because of potential benefits. It can therefore be considered to be in the national interest for the UK to have an excellent research base and innovative companies.

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1 OECD, *The OECD Innovation Strategy: Getting a Head Start on Tomorrow* (2010).

2 Ipsos MORI for BIS, *Public Attitudes to Science* (2011).

3 Royal Society for the Prevention of Cruelty to Animals (RSPCA), *submission of evidence* commented 'good animal welfare is a pre-requisite for good science'.

3.3 The science and research sector is affected by a number of important market failures which justify government intervention, such as risk and uncertainty of research and development, knowledge spillovers or information failures. Literature reviews by Salter *et al.* (2000) and Salter *and Martin* (2001) found that most studies estimated the social rate of return to publicly funded R&D to be between 20% and 50%.[4] [5] The *Horizon 2020* Impact Assessment suggests the rate of return for publicly funded research usually exceeds 30%.[6] Well-targeted public sector investment can also leverage private sector funding. Universities UK (UUK) cite figures that 'a 10% increase in university research increases private R&D by 7%' and that the UK also has a better rate of return on investment in terms of numbers of spin-out companies formed than the US.[7]

3.4 The literature review undertaken for this report found no scholarly papers addressing the question of whether EU funds allocated to research could get a better return if invested differently, for example through national research budgets. Indeed the only arguments found against EU funding of research were from the very small minority of academics, such as Terence Kealey, Vice Principal of Buckingham University, who argue that any public investment in R&D is unnecessary.[8]

3.5 It might seem logical that the widespread frustrations expressed in stakeholder responses with the bureaucracy of EU programmes such as FP7 would lead to suggestions that equivalent sums of money could be more efficiently distributed through national systems. However, this case was not made by stakeholders who responded to the consultation. When prompted at stakeholder events, there were a number of explanations: firstly, they stressed that the two systems were not directly comparable – EU funding being targeted at projects which were for example larger, cross-border and which promoted researcher mobility; secondly, most seemed confident that the Commission was addressing inefficiencies and anticipated that *Horizon 2020* would represent an improvement; thirdly, it was felt that the UK did disproportionately well, getting more out than it put in; fourthly, there was a lack of confidence that even an amount equivalent to the UK input figure would make it to the national research budget, given overall budgetary pressures; and finally, stakeholders stressed that there was also bureaucracy associated with national research grants, so it was not a zero sum game. There was also recognition that a certain degree of bureaucracy was unavoidable and beneficial to minimising fraud.

4 Amon Salter et al., *Talent not Technology; Publicly Funded Research and Innovation in the UK* (2000).

5 Ammon Salter and Ben Martin, 'The Economic Benefits of Publicly Funded Basic Research: A Critical Review', *Public Policy 30 3* (2001).

6 European Commission, Commission Staff Working Paper*, Impact Assessment Accompanying the Communication from the Commission Horizon 2020 – The Framework Programme for Research and Innovation*, SEC (2011) 1427 final, 30 November 2011.

7 UUK and UK HE International's *submission of evidence,* p7 commented that AUTM and HESA data shows that the UK spends only £31m per spin-off, whereas the US requires £44.5m.

8 Terence Kealey, *The Economic Laws of Scientific Research* (1996).

UK's Performance in Research and Innovation

3.6 The UK is among the lowest funders in the OECD of research and development as a percentage of GDP and at 1.79% was below the EU average of 2% in 2011.[9] [10] However, the UK is one of the leading nations in science and research and performs particularly strongly for research productivity – measured as numbers of articles and citations compared with Gross Expenditure on R&D (GERD) – and for field-weighted citation impact (an indicator of research quality), where we rank first among comparator countries.[11] [12] The UK is also one of the top ten countries in the world for innovation capacity.[13]

3.7 This can be explained by a number of factors, including the UK's open and competitive system for allocating research funding. The European Commission has noted that 'the UK economy has several distinctive characteristics that represent actual or potential sources of competitive advantage in the innovation sphere: a world-leading science base and information infrastructure; a prominent financial sector (although this could be better incentivised to support the creation and growth of firms); a rich supply of high-level skills plus a proven attractiveness to globally mobile talents; strong performance by business in creating intangible assets; and a relatively large role of the service sector for industry and export performance'.[14]

3.8 However, British Influence noted that 'it would be unwise to assume that, with the current lower than average investment in R&D, and a flat cash outlook for the UK research base, the UK will necessarily continue to perform better than average over the long term'.[15] They noted that economic research indicates that 'over time there is a consistently positive correlation between a country's economic performance and its levels of R&D expenditure'.[16]

International Collaboration

3.9 International collaboration and researcher mobility have been found to be correlated with high research quality, and also appear to be key factors in explaining the UK's high research performance.[17] This was expressed consistently across responses from a range of stakeholders, with none suggesting the UK would be best served by focusing only on national programmes and British researchers. UUK commented that international collaborations 'encourage excellence by bringing together the most outstanding researchers in the field, provide opportunities to share best practice across partner institutions, provide access to international facilities and large international datasets and tend to result in high publication and citation rates'.[18]

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9 Office for National Statistics, *Gross Domestic Expenditure on Research and Development 2011* (2013).

10 European Commission, *Research and Innovation Performance in United Kingdom Country Profile* (2013).

11 Gross Expenditure on R&D (GERD) represents the total expenditure on R&D within a country, regardless of sector of performance or source of funding; it includes domestically-performed R&D financed from abroad (including from EU funding) but excludes R&D funding paid abroad, for example, to international agencies.

12 Elsevier, *International Comparative Performance of the UK Research Base: A Report Prepared for the Department of Business, Innovation and Skills* (2013).

13 World Economic Forum, *The Global Competitiveness Report* (2013-2014).

14 European Commission, *Research and Innovation Performance in United Kingdom* (2013).

15 British Influence, *submission of evidence*.

16 *Idem.*

17 Elsevier, *International Comparative Performance*.

18 UUK and UK HE International Unit, *submission of evidence*.

3.10 The UK collaborates with the rest of the world through a variety of different mechanisms aside from the EU including: individual researchers or businesses making their own connections with appropriate counterparts; bilateral agreements with foreign governments; investment in multilateral infrastructure projects such as the European Organisation for Nuclear Research (CERN); and joint initiatives to tackle common or global concerns such as the G8 Heads of Research Councils' funding of the Enabling Climate Simulation at Extreme Scale (ECS) programme launched in 2011.[19] Even at the European level there are a number of non-EU multilateral organisations such as the ESA and EUREKA – an intergovernmental network to coordinate national funding of innovation. This was praised by the Welsh Government in its submission.[20] However, the strong message from respondents across the board was that these different approaches address different needs and complement each other and activity facilitated by the EU. Research Councils UK (RCUK) commented 'where the UK chooses to engage it is usually positive and for the most part we consider the opportunities offered through EU engagement as complementary to those available at a national level. We choose to engage in European initiatives only when it represents a good opportunity for the UK'.[21] The high levels of UK participation in EU programmes suggest that on the whole they are considered useful and effective.

3.11 The UK has an excellent reputation and track record in research and innovation, and its collaboration with both EU and non-EU partners has been increasing.[22] The UK's considerably higher collaboration with EU research partners than with those from the rest of the world can be seen in Chart 3.1 below. It is hard to assess which cross-border collaborations are a direct result of EU membership and which would have happened regardless. On the one hand, ostensibly unrelated projects may have sprung from a coffee break conversation during an EU event. On the other hand, an EU project might have found alternative sources of funding, had European money not been available.

3.12 However, responses suggested that connections made through EU frameworks and programmes are key. Evidence gathered at stakeholder events, in written responses and from the literature review, stressed how much simpler EU structures made international collaboration. The Confederation of British Industry (CBI) commented 'those businesses which have successfully participated in Framework Programme activities frequently report that the non-financial benefits, through developing networks with European suppliers, customers, competitors and knowledge providers, tend to exceed the purely financial impact'.[23] Researchers mentioned 'the benefits of dealing with one organisation, the greater ease of making one application and getting one decision, and the success of the UK in bidding for European funding'. They also mentioned that 'it offers a substantial simplification: institutions do not need to negotiate and re-negotiate the terms of collaborations every single time, as they do with other funding types'.[24] [25] By contrast, other international collaborations were hampered by the reliance of researchers in different countries on different funding cycles.

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[19] Marc Snir et al., *Enabling Climate Change Simulation at Extreme Scales-ECS: Summary* (n.d.)

[20] Welsh Government, Minister for Economy, Science and Transport, *submission of evidence.*

[21] RCUK, *submission of evidence*.

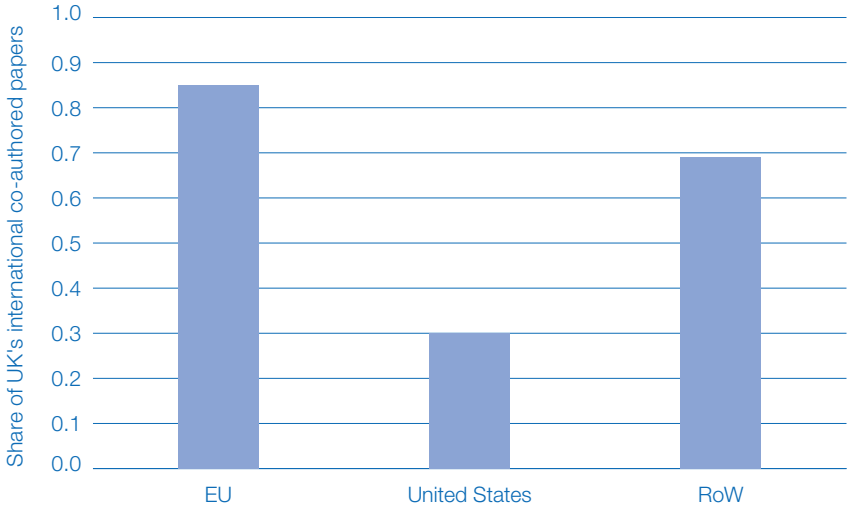
[22] Technopolis, *The Impact of the EU RTD Framework Programme on the UK (*2010).

[23] The CBI, *submission of evidence*.

[24] Elsevier*, International Comparative Performance*.

[25] UUK and UK HE International Unit, *submission of evidence*.

Chart 3.1 Global Shares of UK Research Base International Co-Authored Papers (2008-12)[26]



N.B. figures total more than 100% due to one paper by a UK, French and American author being included under the totals for both EU and US.

3.13 There was a strong message from the stakeholder events and responses that being part of the EU enhanced the UK's reputation with international partners both in business and research. There was felt to be little conflict or duplication with other bilateral relationships, indeed having the EU 'seal of approval' could attract greater interest both from inside and outside the EU. In its written submission, RCUK commented that the UK's existing strong links with India had enabled the UK to co-ordinate the EU-India platform in social sciences and humanities and leverage EU resources in a way that complements UK's bilateral engagements with India.[27] The CBI felt 'the European brand can also give an additional guarantee in dealings with parties in non-EU countries' and the Centre for Ecology and Hydrology that 'through EU funded research it has been possible to build [more] international partnerships outside the EU than would otherwise have been possible'.[28] [29]

UK Share of EU Research and Innovation Funding

3.14 Whilst the thematic priorities for EU research funding strongly reflect national funding priorities and are taken into account by UK research councils and the Technology Strategy Board (TSB) when developing their own programmes, there is no active coordination by Government.[30] In the case of research councils, this is an intentional result of the Government's adherence to the Haldane principle – the belief that decisions on individual research proposals are best taken by researchers themselves through peer review. This involves evaluating the quality, excellence and likely impact of science and research programmes. In practice, some projects do attract both national and EU funding but this is based purely on the merits of the proposal against the criteria and other applicants. The fact that a proposal has, or may secure, EU funding in itself should have no bearing on whether it secures national funding and vice versa. Nevertheless, EU priorities do align in many areas with UK priorities and, according to their responses to this consultation, with those of the devolved administrations.

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[26] Elsevier, *International Comparative Performance*, Figures *of the UK Research Base*, 2013.

[27] RCUK, *submission of evidence*.

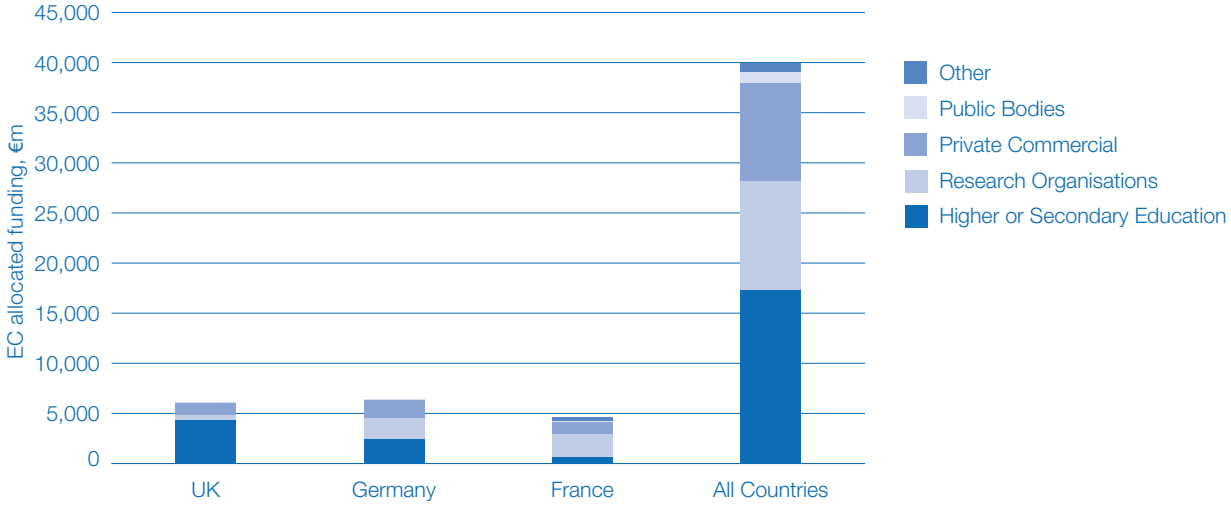
[28] CBI, *submission of evidence*.

[29] Centre for Ecology and Hydrology, *submission of evidence*.

[30] The Technology Strategy Board is the UK's Innovation Agency and aims to accelerate economic growth by stimulating and supporting business-led innovation.

3.15 The UK is a strong player in FP7, receiving €6.142m or 15.4%, second only to Germany, which receives 16.1% of the total FP7 funding allocated thus far; France receives 11.5%. The UK is also involved in more successful projects than any other country: 41.2% of all grant agreements in FP7 to date include at least one UK participant.[31]

Chart 3.2 Share of FP7 Funding[32]



3.16 EU research funding, like UK national funding, is allocated on the principle of excellence, which means that the best proposals are funded regardless of other factors. There is neither a link between the amounts countries contribute to the budget nor their need to develop in a particular area. The reputation of UK researchers means they are partners of choice for organisations elsewhere seeking to bid for EU funds and that many of those bids are subsequently won.

3.17 Commentators, stakeholders at our events, and respondents tended to agree that in the area of research, development and innovation, the UK gets more out of the EU budget than it puts in. A range of figures is cited: for example, £1.40 out for every £1 in, or a 1.25% uplift on investment.[33] [34] The difficulty of calculating a definitive answer is explained by a number of factors, including: the fact that the UK does not pay in to a separate 'EU research budget' but into the overall EU budget; over the course of a seven year budget period, annual receipts for different budget streams can vary widely; and rules surrounding the UK abatement mean that, depending on which other countries and which types of projects are funded by the EU, the UK may receive proportionately more or less money back. However, the CBI observes 'the UK now receives a proportion of funding which is greater than would be implied by the ratio of its GDP to the aggregate GDP of the EU as a whole'.[35] Indeed only the Netherlands receives a higher proportion relative to its GDP or population size. See chart 3.3 below.

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[31] EC, FP7 Project and Participants database, version 15.0, released 1 November 2013.

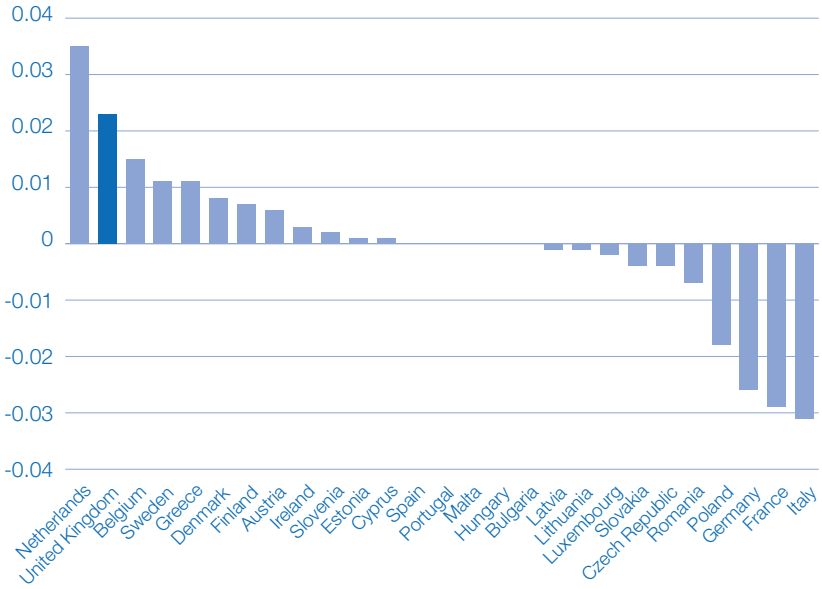
[32] EC, FP7 Project and Participants database, version 15.0, released 1 November 2013. This database includes the majority but not all programmes under the FP7 umbrella and the time-lag between calls for proposals and commitment of funds means that final figures for FP7 are not yet available.

[33] For example, John Butterworth, 'Scientific Research and the European Union', *The Guardian Newspaper*, 20 May 2013. Available at: http://www.theguardian.com/science/life-and-physics/2013/may/20/research-eu-ukip, accessed 15 January 2014.

[34] *Record of 3 and 8 July research and innovation stakeholder events.*

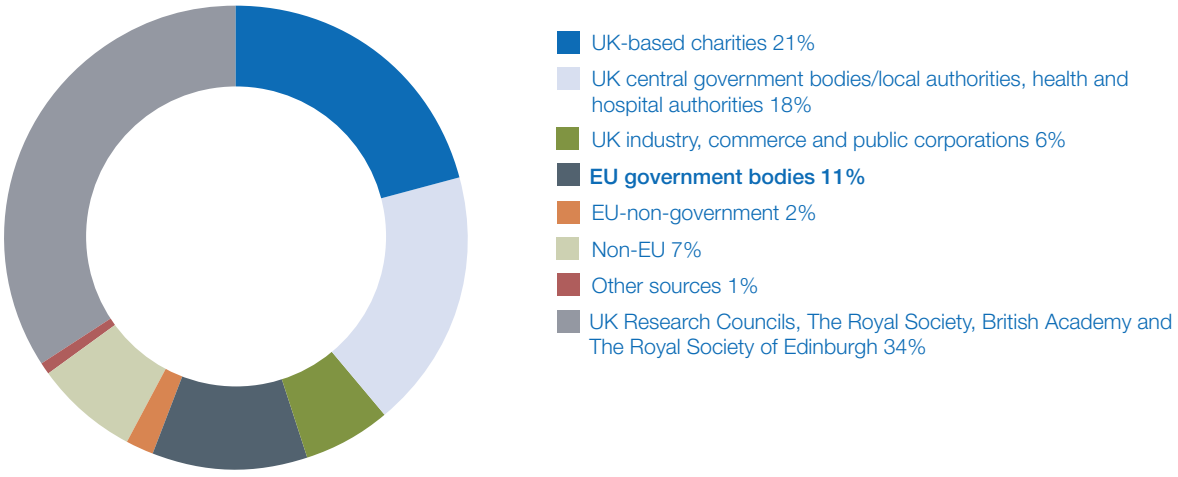
[35] The CBI, *submission of evidence.*

Chart 3.3 Difference Between Share of FP7 and Share of GDP[36]



3.18 A number of research-focused respondents make the point that, while the UK national research budget has remained frozen, EU funding has risen and as such 'the FP represents an increasingly important component of research funding in the UK'.[37] These stakeholders also pointed out that the UK is already behind competitors in levels of research funding as a percentage of GDP. There were some comments at the stakeholder events that UK funding was generally more short term and it was therefore useful to have the balance provided by EU funding which was generally five to seven years in duration. However a comment from one business, InnovaSec, suggested that both UK and EU projects lack short term (12-24 month), high risk funding.[38]

Chart 3.4 UK Higher Education Institutions' Income From Research Grants and Contracts 2011/12[39]



[36] BIS analysis of EC, FP7 Project and Participants database, version 15.0, released 1 November 2013 and GDP figures from Eurostat.

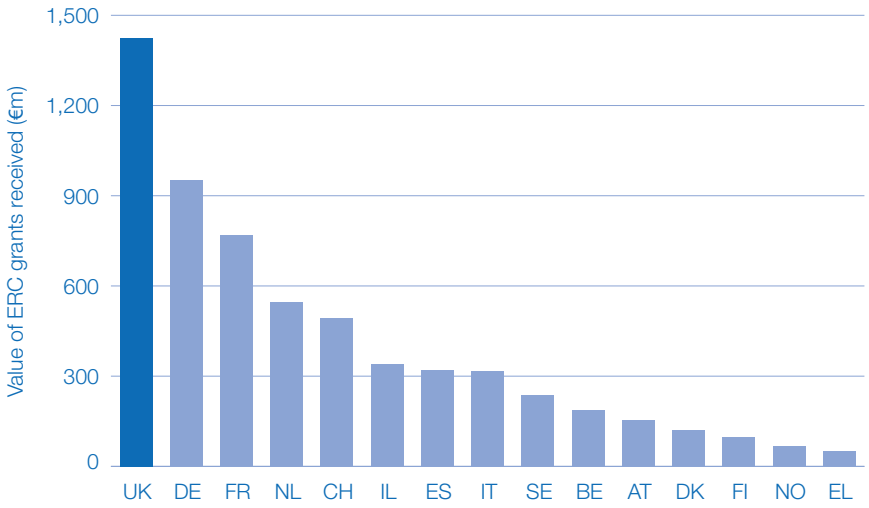
[37] UUK and UK HE International Unit, *submission of evidence*.

[38] InnovaSec, *submission of evidence.*

[39] Higher Education Statistics Agency (HESA), *Finances of UK HE Institutions* (2013).

3.19 Higher Education Institutions in the UK receive funding for teaching and research from a host of different sources and streams. Around a quarter of their total annual income is allocated to research, predominantly in two categories: 'recurrent (research)' grants, often referred to as block research grants, and 'research grants and contracts'. The latter category are those funds most directly comparable with EU research funding as they are allocated for specific defined research objectives, whereas 'block' research grants are allocated on broader criteria of research quality, volume and differing costs between disciplines. Chart 3.4 shows that 11% of funding in this category of income, which represents around 16% of total income, derives from EU institutions. This equates to around half a billion pounds per annum, primarily from the EU Research Framework Programme. This percentage has steadily increased from 7.6% in 2007 and anecdotal evidence suggests that for some institutions EU funding contributes as much as 20%. According to the University of Oxford, in the financial year 2011-12, EU funding at £32.2m was its third largest source of funds after the Wellcome Trust and the Medical Research Council.[40]

Chart 3.5 Top 15 Performing Countries in ERC to Date[41]



3.20 The ERC is a particularly valued institution where 'the UK does spectacularly well,' receiving around €1.425m while the next biggest beneficiary, Germany, receives €951m.[42] [43] The flexibility of its grant programmes, which do not require grant holders to collaborate with researchers in other Member States, is particularly welcome.

3.21 Marie Curie Actions, which provide funding for researchers to pursue training and career development in another country, including outside the EU, or for non-EU researchers to move into the EU, are also seen as particularly attractive schemes for the UK, both for developing the careers of UK researchers and for attracting excellent researchers from the rest of the world to the UK. The UK has been allocated over €945m to date, compared with Germany, as the next best performer, which has been allocated €526m.[44] Professor Cacialli, a Coordinator of a Marie Curie Initial Training Network, is quoted as saying 'Marie Curie actions provide an excellent means to recruit the very best Early Stage and Experienced researchers from the EU and outside […] and, crucially, provide

[40] University of Oxford, *submission of evidence*.

[41] EC, FP7 Project and Participants database, version 15.0, released 1 November 2013.

[42] RCUK, *submission of evidence*.

[43] EC, FP7 Project and Participants database, version 15.0, released 1 November 2013.

[44] Idem.

a fundamental contribution to high quality training of the future classes of industrial and academic researchers thanks to the well-monitored planning and implementation of training actions'.[45]

3.22 According to one respondent, 45% of all EU projects in the area of nanotechnology – identified in the UK Government's Industrial Strategy as one of 'eight great technologies' – included a UK participant.[46] This translated into UK participants receiving 10% of relevant funding or €355m.[47]

3.23 The UK has also done well in terms of research on space under the Framework Programmes. In the latest call for space projects under FP7, around 80% of successful bids include a UK partner and around 24% are led by a UK partner. The total investment secured by these partners is approximately €29m, or 23% of the available budget for the call. Inclusion of UK partners seems to make projects more likely to secure funding and UK partners include universities, companies and public bodies.[48]

3.24 EU funding for space programmes such as Galileo and Copernicus is used to place contracts with industry through competitive tender for the development, construction, launch and operation of the spacecraft and the ground infrastructure. UK companies have won contracts worth more than €600m since the Galileo and EGNOS programmes began.

Effectiveness of EU Programmes and Policies

3.25 EU-level spending on research and innovation is believed to be one of the most growth enhancing areas of EU spend, from earlier essays, from, for example, Sapir to more recent commentary from the Centre for European Reform.[49] [50] The European Commission's evaluation of FP6 in 2009 concluded that the programmes had: contributed to increased industrial competitiveness; generated extended networks; and strengthened the knowledge infrastructure in Europe.[51] In 2005, the European Commission estimated that the long-run impacts of FP7 would be 900,000 jobs and an extra 0.96% EU GDP.[52] An interim evaluation of FP7 by an expert group noted that, with a budget of around €50bn over seven years, the programme would account for around 10% of Member States' public spending on R&D at its end point, and noted that some leverage effects could already be seen.[53]

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[45] University College London (UCL), *submission of evidence*.

[46] Department for Business, Innovation and Skills, *Press Release:* £600 Million Investment in the Eight Great Technologies. Available at: https://www.gov.uk/government/news/600-million-investment-in-the-eight-great-technologies.

[47] Professor Wilkins, University of Leeds, *submission of evidence.*

[48] This is BIS analysis of figures provided by the European Commission.

[49] André Sapir et al., *An Agenda for a Growing Europe: The Sapir Report* (2004).

[50] Centre for European Policy Reform (CER), *The EU Budget 2014-20: More Boldness Needed* (2012).

[51] Ernst Th. Rietschel et al., *Evaluation of the Sixth Framework Programmes for Research and Technological Development 2002-2006: Report of the Expert Group* (2009).

[52] European Commission, Commission Staff Working Paper, *Annex to the Proposal for the Council and European Parliament Decisions on the 7th Framework Programme (EC and Euratom), Main Report Overall Summary, (2005).* Impact Assessment and Ex Ante Evaluation, SEC (2005) 430, 6 April 2005.

[53] Rolph Annerberg et al., *Interim Evaluation of the Seventh Framework Programme: Report of the Expert Group* (2010).

3.26 Whilst it might be argued that those who benefit directly from EU funding would be unlikely to criticise it, positive assessments also come from a 2013 House of Lords' European Union Committee report which found 'that EU R&I [research and innovation] programmes represent an excellent financial and networking opportunity for UK businesses as well as higher education institutions'.[54] Open Europe advocated a doubling of the EU R&D budget from FP7 levels in recognition of the 'economies of scale, and the pooling of expertise' available at the supranational level.[55] It also commented that 'unlike the structural funds, it is much easier to find examples of success stories in the field of R&D, which would not have happened without EU funding or which did not crowd out private funding or divert scarce resources. This is particularly true in medical research where, for example, a grant to a cluster of researchers from across Europe resulted in the identification of a gene that can act as a tumour suppressor in cases of lymphoblastic leukaemia'.[56]

3.27 Respondents to the call for evidence cited numerous further examples of valuable projects which they believed would have been less effective or simply not possible to fund at a national level. For example, the submission from the National Nuclear Laboratory detailed five examples of nuclear research which have increased the UK's capability in this area including through 'gaining access to and knowledge from major international nuclear fission research facilities and programmes'.[57] The Royal Society of Chemistry mentioned seven projects, including F^3 Factory which, among other benefits, has given the UK access to new facilities and led to efficiency gains in production.[58] BT described a project which was likely to overcome barriers to a competitive market in cognitive radio techniques in the TV Whitespace frequency bands, by bringing together competitive users of spectrum from across the EU and European Regulators.[59]

3.28 An example cited by both industry and academia of the effectiveness of EU funding is graphene. Professor Sir Konstantin Novoselov won the Nobel Prize in 2010 for his co-discovery of graphene, a one atom-thick crystal with unusual quantum conductive properties. Novoselov, a Russian-British professor at the University of Manchester, moved from the Netherlands to the UK with an ERC 'Starting Grant'.[60] The team were also awarded funding from the New and Emerging Science and Technology (NEST) cross-cutting activity of FP6 and the EU has continued to commit further funds, including under *Horizon 2020*, to explore more fully the potential applications of graphene.

3.29 Various stakeholders across the spectrum stressed the economies of scale available when operating at the EU level, for example access to major centres of excellence and large-scale infrastructure, such as the European Transonic Wind Tunnel, although BAE Systems and others commented that not many of these infrastructures were being sited in the UK.[61] Stakeholders also mentioned that a much wider range of topics and number of calls could be made available through the EU than through national funding mechanisms.

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[54] House of Lords European Union Committee, *The Effectiveness of EU Research and Innovation Proposals* (2013).

[55] Open Europe, *Seizing the moment: Aligning the EU Budget with Europe's Economic Needs* (2012).

[56] Idem.

[57] National Nuclear Laboratory, *submission of evidence*.

[58] Royal Society of Chemistry, *submission of evidence*.

[59] BT, *submission of evidence.*

[60] DG Research and Innovation, *Innovation: EU-funded Scientists Clinch Nobel Prize in Physics, Europe at Top of Research Game* (2010).

[61] BAE Systems Plc, *submission of evidence*.

UK Industry Participations

3.30 As can be seen in chart 3.2, the UK's businesses do less well than its research institutions in terms of attracting EU funding. UK academia has been allocated 70.3% of UK funding. Private commercial organisations, by comparison, receive just 18.6%.[62] This is partly explained by how well UK academia does, getting a large percentage of a relatively large total. However, UK businesses are also allocated less in absolute terms than their counterparts in France or Germany (€1.140m compared with €1.281m and €1.735m respectively) and because relatively large numbers of UK businesses participate, this smaller pot is also spread more thinly. SMEs receive 13.1% of UK funding.[63]

3.31 SCISYS – an IT services developer – offered an interesting interpretation of a possible reason for this, suggesting that the very strength and commercial awareness of UK academics compared with their EU counterparts means that non-UK players will 'tick the UK box' more readily with an academic than an industry partner and then look to other countries to complete their industry contingent.[64] However, it is worth noting that this is not unique to EU funding. UK Higher Education Institutions get a larger share, and UK businesses a smaller share, of all R&D funding in the UK. This is from all sources in the UK than their counterparts in France or Germany get of all funding in their countries.[65]

3.32 Nevertheless, it should be noted that the strength of the UK research base can also have a positive spillover effect into the private sector through collaborations and spin-outs, and that the UK has been ranked among the top five countries in the world on university-industry collaboration in R&D for the past four years.[66] Space industry stakeholders remarked that FP6 and 7 had enabled centres of excellence to be built up which had created spin-off businesses.[67]

3.33 Despite lower participation, respondents to our call for evidence identified a number of useful EU initiatives aimed at industry. Stakeholder event participants and others cited Eurostars, a programme to encourage R&D-focussed SMEs to lead international collaborations by helping them access support, as being effective.[68] The Welsh Government cautioned that, whilst making EU funding more accessible to SMEs was welcome, there should be a very clear rationale and the EU should not seek to displace successful Member State-led cooperation such as EUREKA.[69] Rolls Royce explained that nearly 40% of the completed research under the Clean Sky JTI in which it is involved goes to SMEs.[70] Similarly, Tata Steel commented that the Research Fund for Coal and Steel, which it finds particularly helpful, is effective at bringing together members of the coal and steel industry sectors, both large and small.[71]

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62 EC, FP7 Project and Participants database, version 15.0, released 1 November 2013.

63 EC, FP7 Project and Participants database, version 15.0, released 1 November 2013.

64 SCISYS, *submission of evidence.*

65 Elsevier, *International Comparative Performance*.

66 World Economic Forum, *The Global Competitiveness Report,* (2013-2014).

67 *Record of 8 July space stakeholder event.*

68 *Record of 3 and 8 July research and innovation stakeholder events.*

69 Welsh Government, Minister for Economy, Science and Transport, *submission of evidence*.

70 Rolls Royce Plc, *submission of evidence*.

71 Tata Steel UK Ltd, *submission of evidence*.

3.34 UUK mentioned EIT and the Knowledge and Innovation Communities (KICs) that it facilitates as positive examples of coordination across policy areas and the Climate Change KIC as particularly successful.[72] These views were echoed by other stakeholders, although some of those at the stakeholder event commented that the EIT was a little untested and that it was not clear how KICs operated.[73] UUK also thought it was positive that the requirement to form a legal entity to attract funding could provide impetus for research to enter the innovation chain.[74]

3.35 European Technology Platforms (ETPs) were thought by participants at the stakeholder event to be very effective at facilitating dialogue between industry players in the UK and their counterparts in the rest of the EU. The nuclear industry had particularly benefitted.[75] The CBI also commented that these were useful forums and Rolls Royce thought the aviation sector ETP had been 'effective in pulling together an integrated industry view'.[76] [77] By contrast, RCUK felt that European Innovation Partnerships, which seek to bring different initiatives and instruments onto a common platform, 'have the potential to increase rather than reduce complexity'.[78]

Space

3.36 Major European space programmes require international collaboration due to the scale and cost of the undertaking. European Member States have traditionally chosen to do this through membership of the ESA but increasingly, as demonstrated through the Galileo, EGNOS and Copernicus programmes, this is being done through the EU. ADS Group considered that the UK's space industry benefitted 'significantly' from strong relationships with both the EU and ESA.[79]

3.37 Stakeholders from the space industry attending the consultation event thought that the EU's political ownership of Galileo and Copernicus had played an important role in maintaining progress on these programmes through difficult periods when the programmes were vulnerable to cancellation.[80] The Commission had played a crucial role in galvanising action for their delivery. Some stakeholders also considered that EU research complemented ESA's work. SCISYS noted that ESA, in contrast to the EU, is reluctant to address 'research driven' technologies due to the long timescales before their use in missions.[81] Stakeholders thought that FP6 and FP7 had enabled centres of excellence to be built which had created spin-offs that had gone on to become self-standing businesses. Application of the EU rules on open, competitive tenders to the space programmes was seen as having had the effect of allowing smaller, newer space companies to compete against established companies, in some cases beating expectations to secure contracts to the advantage of the UK.[82]

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72 UUK and UK HE International Unit, *submission of evidence*.

73 *Record of 3 and 8 July research and innovation stakeholder events.*

74 Universities UK and UK HE International Unit, *submission of evidence*.

75 *Record of 3 and 8 July research and innovation stakeholder events.*

76 The CBI, *submission of evidence*.

77 Rolls Royce Plc, *submission of evidence*.

78 RCUK, *submission of evidence*.

79 ADS Group, *submission of evidence*.

80 *Record of 8 July space stakeholder event.*

81 SCISYS, *submission of evidence.*

82 *Record of 8 July space stakeholder event.*

3.38 SCISYS commented that Galileo was a successful example of 'fostering EU industries to compete on a global scale'.[83] Similarly, the Royal Astronomical Society noted that 'astronomy and space science have benefitted enormously from both EU funding streams and international EU-fostered collaboration', and that there is general agreement in these communities that the UK would not be as effective in these 'big sciences', where team building is important, if there was not access to the EU's research programmes.[84] The Society noted that the EU's funding mechanisms seemed poorly equipped to support long term programmes with a development period of 10-20 years as is necessary for the largest observatories or deep space missions.

Bureaucracy and Complexity

3.39 The Scottish Government – while commenting that European activities in research and development 'have greatly benefited Scotland' – was among the majority of respondents from all groups in commenting that EU programmes are, and, importantly, are perceived to be, highly complex and bureaucratic.[85] They also noted that 'the proliferation of programmes and the overlaps can be confusing'. This goes a long way to explain the comparatively low participations among the business, and particularly small business, community. The CBI made the point that for smaller businesses 'the complexity of the diverse schemes can have a bewildering or even deterrent effect' and C-Tech Innovation commented that 'high burden of administration is off-putting to many SME and industry partners. Excessive time from project concept to launch – often 18-24 months as a result. Nonetheless result is positive vs. not having the instruments'.[86] [87] The University of Leeds highlighted JTIs and ERA-Nets specifically as having detrimentally complex funding mechanisms.[88] [89]

3.40 Some stakeholders expressed frustration at the seemingly arbitrary requirement for proposals to have participants from a range of different countries and from industry as well as academia in order to attract funding. They believed this sometimes meant that the pursuit of excellence was compromised. For example, an academic commented 'a significant amount of time and money is spent producing deliverable reports and having meetings (in multiple countries) to organise the production of said reports' which are subsequently 'only subject to cursory assessment'.[90] The University of Warwick commented that when looking beyond EU borders, 'identification of the best partners for projects is often undertaken on the basis of who can receive EU funding, rather than because they provide the best scientific quality research or intellectual compatibility with the project' although they go on to say that 'nevertheless, EU programmes have positively supported the development of partnerships beyond the EU's borders'.[91] The University of Oxford suggest that there should not be such an emphasis on the participation of SMEs in every project.[92]

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[83] SCISYS *submission of evidence*.

[84] Royal Astronomical Society, *submission of evidence*.

[85] Scottish Government, *submission of evidence*.

[86] The CBI, *submission of evidence*.

[87] C-Tech Innovation Ltd, *submission of evidence.*

[88] The ERA-NET scheme aims to develop and strengthen the coordination of national and regional research programmes.

[89] University of Leeds, *submission of evidence*.

[90] Dr Daniel Sykes, *submission of evidence*.

[91] University of Warwick, *submission of evidence*.

[92] University of Oxford, *submission of evidence*.

3.41 A few respondents felt that there was also sometimes a sense of research funding being used for regional policy. The Centre for Ecology and Hydrology, for example, said that in some cases the 'pressure to include partners from less favoured regions of the EU' has compromised the quality of research.[93] Whatever the motivation, BAE Systems felt that the 'inevitable dilution of expertise and diffusion of centres of excellence makes it difficult to tap into the real experts'.[94]

3.42 However, UUK pointed out that 'citation rates tend to be significantly higher for papers published with multiple international authors compared to those with only domestic authors' and that 'researchers who have spent a significant time abroad tend to be significantly more productive in terms of articles published than those who have remained in the UK'.[95]

3.43 A number of stakeholders compared the speed of grant approvals and other decision-making unfavourably with national procedures. BAE Systems found this particularly problematic in fast-moving markets, such as cyber security. Waiting for EU standards in this area would therefore add little value. However, it found EU involvement was beneficial in setting standards in civil aerospace both in terms of consistency in the Single Market and greater EU weight because of consistency in international fora.[96]

3.44 Euclid comment that 'in some cases expectations of delivery may be unrealistic' and that concerns about proving immediate delivery 'hinders developing capacity to deliver'.[97] Many stakeholders acknowledged that the Commission had made significant efforts to simplify processes for *Horizon 2020* but that it remained to be seen how effective they would be. British Influence agreed that the Commission should continue their simplification efforts, but also pointed out that 'it must be accepted that an application for EU research funding will necessarily be fuller than a comparable application at the simpler, national level' in part because of the importance of preventing fraud against the EU budget.[98]

EU Policy Direction

3.45 The EU's overarching policy strategies were in general seen as helpful in defining appropriate priorities and ensuring Member State and other entities' activities were coordinated. Space stakeholders who attended the event on 8 July 2013 felt particularly that the EU's role in setting policy had complemented ESA's R&D delivery and enabled a consensus to be built as to what technologies were required.[99] This had in turn driven activity at national level and enhanced the global reach and benefits of satellite-enabled services. They valued the more strategic policy direction that EU involvement in the sector had brought and thought that the recent space industrial policy had the potential to be of significant benefit to UK companies.

93 Centre for Ecology and Hydrology, *submission of evidence*.

94 BAE Systems Plc, *submission of evidence*.

95 UUK and UK HE International Unit, *submission of evidence*.

96 BAE Systems Plc, *submission of evidence*.

97 Euclid Network, *submission of evidence*.

98 British Influence, *submission of evidence*.

99 *Record of 8 July Space stakeholder event.*

3.46 There was consensus at the stakeholder events that there was a clear UK hand in setting agendas at the EU level. Professor David Price, Vice Provost for Research, UCL commented, 'long-term negotiation and cooperation has seen European mechanisms evolve to forms well suited to supporting UK universities in delivering their research missions'.[100] An example cited by RCUK was that of open access to research, where the UK has led the way and the EU is now promoting it across the EU through *Horizon 2020*.[101] This was seen as beneficial to the UK interest, potentially hugely increasing the publications and data available. The Russell Group was also supportive of this initiative and pleased that the Commission had offered a simple, cost-effective 'green route'.[102] This is an example of a more general point made by UUK, amongst others, of the advantages of having access to significantly larger datasets in comparable formats, particularly in fields such as climate change and health.

3.47 There was also generally a sense that the EU took into account views of researchers and industry in setting its agendas, particularly when it came to more specific programmes. The University of Oxford said 'the EU has gone to considerable lengths to consult on policy instruments and specific programmes, hold open calls for researchers to serve on advisory bodies and to peer review proposals and to publicly evaluate particular initiatives'.[103] MIRA, a vehicle engineering consultancy, commented that in road transport there is 'a coherent and dynamic strategic framework for advancing research and development, driving deployment, informing and guiding policy and raising awareness' and close coordination and consultation of industry has led to better focussed EU funding and 'greater amounts of industry funding leveraged by the EU funding'.[104]

3.48 However, a smaller company, Sigma-Aldrich Corporation, felt that 'the balance of programmes has not in the past been sufficiently validated by the relevant interests' and C-Tech Innovation Ltd also commented that the topics were 'often not relevant to national interests'.[105] [106] BAE Systems was another dissenting voice which identified 'a challenge for the EU to better exploit the product of national investments, rather than to encourage other nations via framework programme funding to build up alternative and competing expertise in slower time'.[107]

Impact of Legislation from Other Areas of EU Competence

3.49 EU action in a wide range of other policy areas has an impact on research, innovation and space stakeholders. Whilst these have been, or will be, handled more fully by other strands of the Balance of Competences Review, the extent to which they constrain or enable UK actors in these fields merits some consideration by this report. Stakeholders did not have a sense that the EU had a coherent plan for ensuring its activities across all its policy areas create an enabling environment for researchers and innovators. For example, Professor Mark McCarthy from UCL commented that there was a strong need for better coordination between DG SANCO and DG RTD on public health research, which would place the EU in a more competitive position compared for example with the

[100] UCL, *submission of evidence*.

[101] RCUK, *submission of evidence*.

[102] Russell Group of Universities, *submission of evidence*.

[103] University of Oxford, *submission of evidence*.

[104] MIRA Ltd, *submission of evidence.*

[105] Sigma-Aldrich Corporation, *submission of evidence.*

[106] C-Tech Innovation Ltd, *submission of evidence.*

[107] BAE Systems Plc, *submission of evidence*.

US.[108] The Brussels and Europe Liberal Democrats were an exception here, citing a 1994 White paper as well as the JRC, the Bureau for European Policy Advisers (BEPA) and the European Chief Scientific Adviser's work on foresight and coordination.[109] The Science Council commented that 'regulation across Europe can act as a spur as well as a barrier to innovation' and respondents provided examples of both of these.[110]

3.50 Amongst those areas described as barriers by the National Farmers' Union were: rules on Genetically Modified Organisms (GMOs) and plant protection products, highlighting for example restrictions imposed on use of neonicotinoidal pesticides due to unproven concerns regarding their impact on bees: 'the commissioning of a GM feeding study to repeat research already discredited by the European Food Safety Agency (Seralini 2012) and related increases in data requirements for GMO dossiers; and the extremely lengthy GMO approvals process, including no-votes with no basis in science, completely out of step with that in third countries'.[111] Their view was that 'ultimately this means that companies are discouraged from investing in the EU, exemplified by BASF Plant Science moving its headquarters to the US in January 2012 and Monsanto ceasing to seek approvals for new biotech crops in Europe in 2013'.[112] In relation to food and feed, this issue was touched upon in the Animal Health and Welfare and Food Safety report, but is covered in greater detail in the Environment and Climate Change report.[113]

3.51 EU restrictions on data sharing were another commonly cited concern, with various research-focussed stakeholders stressing the advantages to scientific progress that the EU offered in facilitating the sharing of large databases across borders. Stakeholders who raised this agreed with the Wellcome Trust that the proposed 'data Protection Regulation is particularly important in supporting health research that strikes a balance between protecting the individual's interests and allowing research for public good'.[114] These stakeholders also agreed with RCUK's concerns that amendments proposed by the European Parliament 'could have potentially serious implications for the use of patient data for health research purposes' and with the University of Surrey which explained that such concerns relate, for example, to proposed requirements to obtain patient consent even for anonymous data.[115] [116] However, the Ethical Medicines Interest Group cautioned, in relation to clinical trials data release, that 'data-sharing needs to be carried out in a controlled way, with well-constructed, prospective requests made by an "applicant" to a future "gatekeeper" authority. Data should not be simply released on public websites'.[117]

[108] Professor Mark McCarthy, UCL, *submission of evidence*.

[109] Brussels and Europe Liberal Democrats, *submission of evidence*.

[110] Science Council, *submission of evidence*.

[111] National Farmers' Union, *submission of evidence*.

[112] Idem.

[113] HMG, *The Balance of Competences Between the UK and the EU: Animal Health and Welfare and Food Safety Report* (2013).

[114] Wellcome Trust, *submission of evidence*.

[115] Research Councils UK, *submission of evidence*.

[116] University of Surrey, *submission of evidence.*

[117] Ethical Medicines Interest Group, *submission of evidence*.

3.52 The Wellcome Trust were amongst those to mention the implications of the European Court decision on Brüstle v Greenpeace which 'has called into question the ability to patent embryonic stem cell derived products' and which raises significant concerns about the future of UK stem cell research because of the potential loss of private sector investment.[118] [119] The University of Sheffield acknowledged, however, that ethical arguments justified this and the consequent approach of the EU 'in part'.[120]

3.53 EU State aid rules were mentioned by a significant proportion of respondents as being a deterrent to innovation. State aid will be covered in more detail by the Competition and Consumer Protection report. It is worth noting the CBI view that other Member States were, at least in theory, similarly constrained.[121] However, the CBI also reflect its members' perceptions that the UK was overzealous in our application of the rules and should be more active in highlighting breaches in other Member States.

3.54 Other issues raised by individual stakeholders include the Biofuels Directive which C-Tech Innovation Ltd cited as an example of backing an unproven technology rather than defining the desired outcomes and letting the R&D community generate answers.[122] It had led to 'blind alley R&D and technical development'. Similarly, space industry stakeholders at the consultation event on 8 July 2013 commented that EU involvement in universal broadband had been predicated on a particular technology (in this case fibre optics) rather than being outcome-focussed, which might have meant satellites would have been an alternative.[123]

3.55 RCUK were amongst those to highlight the Physical Agents Directive as a proposal which could have seriously restricted the use of MRI scanners.[124] However, as the Wellcome Trust acknowledged, 'the EC responded to these concerns when they were raised by a group of radiologists, research organisations and funders' and an improved proposal was made.[125] The Institute of Physics agreed but pointed out that this was 'an area where the involvement of a European Chief Scientific Advisor (CSA) role at an early stage may have been advantageous'.[126]

3.56 The Clinical Trials Directive was mentioned by many respondents as having acted as a disincentive to conducting such trials because of bureaucracy, inconsistent application and an inflexible regulation. However, most stakeholders agreed with the Association of Medical Research Charities (AMRC) that the Commission's revised draft 'showed they listened to the concerns and viewpoints that were raised'.[127] The responses to the Health report indicated that there was acceptance that legislation at EU level was helpful in this case, especially in facilitating multi-national trials and that measures to ensure access to clinical trials data to all those with a legitimate interest were beneficial.[128]

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[118] Wellcome Trust, *submission of evidence*.

[119] *Oliver Brüstle v Greenpeace eV*, Case C-34/10 [2011] E.C.R. I-09821.

[120] University of Sheffield, *submission of evidence.*

[121] The CBI, *submission of evidence*.

[122] C-Tech Innovation Ltd, *submission of evidence.*

[123] *Record of 8 July space stakeholder event.*

[124] RCUK, *submission of evidence*.

[125] Wellcome Trust, *submission of evidence*.

[126] Institute of Physics, *submission of evidence*.

[127] Association of Medical Research Charities, *submission of evidence*.

[128] HMG, *The Balance of Competences Between the UK and the EU: Health Report* (2013).

3.57 AMRC and the Royal Society for the Prevention of Cruelty to Animals (RSPCA) also commented that the UK is widely recognised as a world leader in animal protection. This meant that harmonisation at EU level, for example through Directive 2010/63/EU on the protection of animals used for scientific purposes, had the win-win effect of ensuring the UK was not at a competitive disadvantage, whilst also spreading best practice in animal welfare.[129]

3.58 A number of industry stakeholders thought some EU regulations in other fields had promoted innovation. According to MIRA, 'the need to innovate in order to meet such demanding legal frameworks [European Emissions standards since 1993]' has led to closer cooperation between industry players and to EU funding for pre-competitive strategic research.[130] These requirements were also mentioned by C-Tech Innovation Ltd.[131]

3.59 The CBI was among those to stress the value of Single Market legislation on the free movement of people and goods.[132] Standard-setting was cited as a pro-innovation initiative by a few respondents, including a nanotechnology academic from the University of Leeds and BAE Systems, particularly because of the leading role the UK often plays in the EU process and the fact that EU standards often go on to be adopted as global standards.[133] [134] The Joint National Academies cited examples of the Digital Audio Broadcasting (DAB) standard for digital radio and mobile telephone standards for 2G and 3G which had emerged variously from EUREKA, Framework Programme projects and collaboration between standardisation experts across the EU.[135] However, the CBI also considered that, in some cases, conflicts between EU and international standards could become barriers to innovation.[136]

3.60 IP is covered fully by the Free Movement of Goods report, however it is worth noting that it was an issue raised by a number of business stakeholders in the context of this report. Johnson Matthey, for example, stressed that a strong pan-European IP regime would be beneficial 'enabling businesses to fully invest in R&D with the correct prospects of receiving a return'.[137] The Association for Independent Research and Technology Organisations (AIRTO) also thought more assurance was needed on IP rights and cost recovery before they would engage.[138] Rolls Royce had concerns that the EU IP regime should not be opened up excessively as it felt had been done in the US through the Bayh-Dole Act.[139] Such a move they thought would deter industry investment in R&D in Europe.

[129] Association of Medical Research Charities and RSPCA *submissions of evidence.*

[130] MIRA Ltd, *submission of evidence.*

[131] C-Tech Innovation Ltd, *submission of evidence.*

[132] The CBI, *submission of evidence*.

[133] Professor Terence Wilkins, Nanomanufacturing Institute, University of Leeds, *submission of evidence*.

[134] BAE Systems Plc, *submission of evidence*.

[135] Joint National Academies, *submission of evidence*.

[136] The CBI, *submission of evidence*.

[137] Johnson Matthey Plc, *submission of evidence*.

[138] AIRTO, *submission of evidence*.

[139] Rolls Royce Plc, *submission of evidence*.

Summary

3.61 Research and innovation are vital contributors to both the UK's economic growth and societal advances, such as the improvement of the environment, public health and quality of life. International cooperation in these fields is fundamental to making, and being able to capitalise on, new discoveries. The UK is a strong performer and collaborates effectively with a wide range of partners across a range of disciplines and sectors through bilateral, multilateral and international interactions. UK stakeholders across the board value the European Union's programmes, networks and structures in this area. This is not only because they receive significant proportions of the funding available but also because of the nature of the projects which it funds and the connections which they feel are facilitated. However, they also find the bureaucracy of EU programmes frustrating, although they recognise that the EU is taking steps to tackle this. UK businesses do less well than universities, receiving less funding than their counterparts in other Member States. However, they participate in EU programmes in relatively large numbers and despite some frustrations, for example about the speed of decision-making, seem to think it is worth their while. Stakeholders felt that the impact of legislation from other areas of EU competence did not always fully consider the impact on research and innovation, although there was a sense that the EU did in general listen to feedback and make improvements where necessary.

Chapter 4:
Future Options and Challenges

4.1 As described in Chapter 2, the extent of the EU's current competence in the field of research and technological development remains uncertain.

4.2 The articles which provide the legal basis for action in these areas (articles 179-188 TFEU) do not explicitly rule out the harmonisation of national laws, which is a key distinction between supporting and shared competence. However, it is clear that the EU's exercise of its competence 'shall not result in Member States not being able to exercise theirs'. It is hard to imagine a proposal which would go so far as to impose certain binding obligations upon Member States (harmonisation) without limiting the Member State's own regulatory powers. It is therefore hard to judge what legislative action the Commission might propose and in what area of research activity. There is potential for EU action to diminish the potential returns of national action.

4.3 However the general consensus from stakeholder consultation was that there was added value to EU level action in these policy areas because of the economies of scale, benefits of, for example, international collaboration, and range of different programmes which were explored in the previous chapter. Nevertheless, stakeholders did feel there could be some improvements in the exercise of the current competence by both the EU and the UK Government and the interaction between the two.

EU Funding Priorities

4.4 As well as the strong message about simplification of EU funding programmes, other changes to funding priorities were proposed. For example, British Influence made the point that commercial benefits of research are often unforeseen and long term, so the EU should maintain capacity to support blue sky research, as it had done through an increase in ERC funding under *Horizon 2020*.[1] The University of Oxford cautioned against an overly rigid focus on 'grand challenges', as inevitably some important research would not fit these categories.[2] Along similar lines, BT commented that there was 'a tendency to focus on very visible challenges that can be easily expressed' at the cost of infrastructure technologies and that, without this, there was a risk that 'Europe may not be able to deliver suitable solutions to the societal challenges'.[3]

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1 British Influence, *submission of evidence*.

2 University of Oxford, *submission of Evidence*.

3 BT, *submission of evidence.*

4.5 There was also support, for example from BAE Systems, for the Commission's nascent plans to launch an initiative on pre-commercial public procurement as an area where the EU might add value in future by 'pulling through upstream technology that may otherwise not reach market'.[4] The Northern Ireland Executive was among a large proportion of stakeholders who welcomed measures planned under *Horizon 2020* to streamline and simplify, and stressed the importance of the stated objective of engaging more SMEs in the programme.[5]

4.6 While many recognised the advantages of increased competition and diversity, some reservations were expressed about the potential future enlargement of the EU. These generally stressed that it would be vital to retain the focus on 'excellence' as the primary criterion for awarding funds. This reflects concerns that research funding should not be used to redress regional imbalances. RCUK noted that a recent addition to *Horizon 2020* 'aimed at "widening participation and spreading excellence"[…] neatly allows new Member States to climb the stairway to excellence without excellence being undermined' and the University of Oxford thought that 'teaming' and 'twinning' could help to direct Structural Funds towards capacity-building in newer Member States without compromising 'excellence' in research.[6] [7] UUK also noted the effect that more Member States could have on the process for laying down rules surrounding the Framework Programmes.[8]

Better Coordination of EU and UK Policy

4.7 A majority of stakeholders felt that it would remain important to have a mix of local, national, EU and international policies and programmes. The Russell Group commented that, 'as well as boosting key areas of research and allowing activity at a larger scale than might be supported in the UK alone, EU funding can also help to sustain areas of research when funding is not available at a national level', citing the examples of heritage science and energy management in buildings.[9] In a similar vein, the University of Leeds suggested that plant research often lost out to other disciplines in competing for national funding and so felt the EU 'provides a very valuable additional source of funding for plant researchers in the UK'.[10] RCUK noted however that 'transnational co-operation can, when properly implemented, help make the most efficient and effective use of national and regional resources but is not always the most appropriate way of working'.[11] It pointed out that different degrees of EU involvement are appropriate depending, for example, on how well networked researchers in the area are. The current arrangements, whilst sometimes administratively heavy, allowed for this differentiated approach.

4.8 A number of stakeholders also suggested that it would be in the national interest for national research policy to be more aligned and coordinated with EU policy and funding. MIRA was one of those who saw it as particularly important to improve signposting and guidance for SMEs about where to find support.[12] The CBI was among a few who thought the UK should seek to emulate the German Fraunhofer institutes – application-oriented

4 BAE Systems Plc, *submission of evidence*.

5 Northern Ireland Executive, Minister for Enterprise, Trade and Investment, *submission of evidence.*

6 RCUK, *submission of evidence*.

7 University of Oxford, *submission of evidence*.

8 UUK and UK HE International Unit, *submission of evidence.*

9 Russell Group of Universities, *submission of evidence*.

10 University of Leeds, *submission of evidence*.

11 RCUK, *submission of evidence*.

12 MIRA Ltd, *submission of evidence.*

research organisations – as it considered that their structure incentivises them to secure funding from the EU.[13] It considered that the new UK Catapult Centres could form the basis for this.

4.9 A large number of stakeholders also commented that there should be better coordination between structural funds and innovation funding, both at the policy level and at the Member State implementation level. The University of Oxford, CBI and Euclid were amongst those who felt that since the closure of Regional Development Agencies, there has been a lack of clarity about the coordination of European Regional Development Funds (ERDF) which could be a missed opportunity to leverage further innovation-focussed funding.[14] [15] [16] The Cohesion report will consider ERDF funding in more detail.

4.10 There were a few calls for the UK Government to do even more to push national policy priorities at the EU level, with the aim of moulding EU research and innovation priorities along similar lines. The CBI suggested that UK industrial strategy and the 'eight great technologies' should be the basis for this.[17]

Better Support for UK Applicants

4.11 The CBI also commented that the network of National Contact Points and Enterprise Europe Networks, which should provide guidance on accessing Framework Programme funds, was variable across the UK and should be improved if we were not to put UK innovators at a disadvantage compared with their counterparts in other Member States.[18] It is believed there is a role for the UK Government to provide more guidance to innovators in the manner that the UK Research Office (UKRO) does for researchers.

4.12 The Government is developing a more proactive support service to potential new applicants to *Horizon 2020*, especially to businesses. As part of its European Strategy, the Technology Strategy Board will create two new posts in Brussels to offer broad based advice and support to stakeholders about EU opportunities. It will also run a dedicated website. This is in addition to the existing network of National Contact Points, which is being reorganised to create a model of more full-time, in-house staff.

Better Coordination of Research and Innovation with Other Policy Areas

4.13 Euclid commented that there is still work to be done to realise the Commissioner's ambition to bring coherence to innovation across the Directorates of the Commission. It believed that this 'might make it easier to create imaginative funding models, such as prizes co-funded by commerce'.[19] The Brussels and Europe Liberal Democrats suggested that EU policy-making would be improved if the work of the JRC were 'brought more effectively to the attention of the policy departments of the Commission and also, particularly, to the attention of the European Parliament which needs better sources of scientific information'.[20] Similarly, they also believed that EU institutions should not exclude information from industry experts for fear of bias, because in areas of advanced technology this was often the only reliable information.

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13 The CBI, *submission of evidence*.

14 University of Oxford, *submission of evidence.*

15 The CBI, *submission of evidence*.

16 Euclid Network, *submission of evidence*.

17 The CBI, *submission of evidence*.

18 Idem.

19 Euclid Network, *submission of evidence*.

20 Brussels and Europe Liberal Democrats, *submission of evidence*.

ERA

4.14 There are some indications that the EU may seek to exercise further competence in future, for example if the Commission does not feel that sufficient progress is being made on the ERA. There was general support from stakeholders for the concept of an ERA, in which researchers, scientific knowledge and technology could circulate freely, although a view from the stakeholder events that it was a 'nebulous' concept was reinforced by written submissions.[21] There appeared to be a lack of understanding amongst stakeholders about what the tangible objectives were. There was some nervousness from research coordination bodies about making significant changes to the current 'partnership approach'. UUK stated 'a legislative solution would run the risk of restricting the autonomy of HEIs and/or funders and ultimately be counterproductive through constraining high performing HEIs and Member States such as the UK'.[22] The University of Oxford also cautioned against legislation on the ERA.[23] RCUK thought it would be 'a sledgehammer to crack a nut and implementation of the legislation virtually impossible on a practical level'.[24]

4.15 The CBI summed up the majority view in stating that it 'has served a useful function in stimulating thinking about the need to facilitate mobility of researchers across Europe and the need for critical mass in some scientific infrastructure. The concept would benefit from greater clarity, particularly in terms of concrete objectives, the obstacles to achieving them, and how these obstacles are to be overcome'.[25] British Influence thought that the parallels with the Single Market were 'inspiring' but that 'the practical steps to achieve that level of openness and flexibility in a complex field like R&D are not always clear'.[26] Its view that 'in many respects, the ERA concept actually reflects other countries' need to adopt best practices that are already in place in the UK' was echoed by many stakeholders. However, this did not mean that legislating for it would have no impact in the UK. There were concerns expressed at the stakeholder events that it would entail significant administrative burdens in terms of reporting requirements without bringing any measurable improvements for the research community.[27] RCUK were particularly concerned that legislation on open recruitment and professional status on researchers would cut across and undermine the sector-led Concordat.[28]

Space

4.16 It is not clear yet what the outcome will be from the processes started in response to the Commission's Communication of 2012 on the relationship between the EU and the ESA. The explicit reference to space as a competence of the EU in the Lisbon Treaty preceded a significantly increased level of EU funding for space and potential new legislative proposals from the European Commission. The acknowledged practical difficulties that have arisen in the area of EU/ESA cooperation on specific space projects such as Galileo will need to be addressed. Among the issues which need to be clarified is whether the EU, ESA or a joint undertaking, as envisaged by the 2004 Framework Agreement, should lead on the development of Europe's space policy.

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21 *Record of 3 and 8 July research and innovation stakeholder events.*

22 UUK and UK HE International Unit, *submissions of evidence*.

23 University of Oxford, *submission of evidence*.

24 RCUK, *submission of evidence*.

25 The CBI, *submission of evidence*.

26 British Influence, *submission of evidence*.

27 *Record of 3 and 8 July research and innovation stakeholder events.*

28 RCUK, *submission of evidence*.

4.17 The Commission published an associated industrial policy for the European space sector in 2013.[29] This policy contains nearly 40 actions to support the development of the European space sector, some of which are likely to result in further legislative proposals by the Commission. For example, the Commission sees merit in harmonising laws at a European level on the transfer and sale of high resolution data generated by satellites (remote sensing). The legal base under which this would be taken forward is unclear because, as described above, the space legal base precludes such harmonisation. The Commission is also exploring whether standardised rules should be introduced, covering, for example insurance requirements and environmental protection for the launch of spacecraft to implement the provisions of current UN Treaties at the European level. It would also open the possibility of the EU going further and gold-plating UN requirements.

4.18 The Commission is also exploring whether a new regulatory framework should be established in the EU to permit the operation of space planes such as Virgin Galactic in European airspace. At present, there is no regulatory framework in place to permit such activity and so Europe is in effect excluded from this new and developing market.

4.19 Given the unusual nature of the competence set out in Article 189 of the Treaty, it is also important to consider the role of the national space agencies. The UK Space Agency supports the development of technology and research, science missions and the use of space to stimulate growth in the economy. If any of the responsibilities and roles is clarified at the EU and ESA level, it will be important to ensure coherence at the national level for the UK's domestic space activities.

4.20 Space stakeholders who submitted evidence tended to feel that there were important but distinct roles for both the EU and ESA and that they should continue as separate space actors but coordinate closely, particularly to align *Horizon 2020* and ESA technology road-mapping. Stakeholders did not see benefit in ESA becoming an EU body.

4.21 BAE Systems and space industry attendees at the stakeholder event were amongst those concerned that enlargement could mean dilution of aims and reduction of funds because newer Member States were unlikely to have capacity or interest in such high-tech sectors.[30] [31] Those more recent accession states which had entered the space sector tended to be involved in cheaper aspects, like software development. This was seen as a potential threat to UK expertise in the area.[32]

4.22 The Commission has also indicated that it will explore in more detail the role of space programmes and initiatives in supporting Europe's defence policy objectives. Programmes such as Galileo and Copernicus are explicitly civil in nature but it is clear that the Commission sees scope for space also to play a role in defence. It outlined possible initiatives in this area in a Communication in July 2013.[33] The elaboration of these proposals will need to be carefully monitored.

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[29] Commission Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, *EU Space Industrial Policy: Releasing the Potential for Growth in the Space Sector*, COM (2013) 108 final, February 2013.

[30] BAE Systems Plc, *submission of evidence*.

[31] *Record of 8 July space stakeholder event*.

[32] Idem.

[33] European Commission, *Towards a More Efficient and Effective Defence and Security Sector, A New Deal for European Defence* (2013).

International Representation

4.23 In its Communications on space, the Commission has also raised the issue of whether the EU should join international organisations such as the International Telecommunications Union (ITU) which controls how the radio-spectrum is licensed to ensure that satellite communications do not interfere with each other. Despite the EU having its own global satellite navigation system, Galileo, the Commission relies on Member States to represent the Union in the ITU.

4.24 More broadly, the Commission has sought to build alliances and relations with a range of third countries by signing Memoranda of Understanding on a range of issues, including space, innovation and research. Whilst within the policy areas covered by this report, these have so far been broadly in line with UK interests. However, the UK Government is keen to ensure that a precedent is not set by which the Commission can agree texts without prior approval by the Council given that the Commission does not have competence to do so.

Summary

4.25 The EU's ambitions of simplifying and rationalising programmes under the Horizon 2020 programme were welcomed and seen as necessary by many stakeholders, as was a continuing focus on excellence as the criterion for funding. There was also a clear message that UK and EU funding priorities should be better aligned, which might be achieved both by the UK seeking greater influence over the design of EU programmes and by adapting national programmes where appropriate. Respondents also felt that there should be more support for potential participants, particularly businesses, to ensure they had the necessary information to put in a good proposal. The research community is broadly supportive of the ambitions of the ERA, for example its objective of improving researcher mobility, but expressed caution about going beyond the current collaborative approach. Space stakeholders felt that EU-level coordination was helpful but that ESA should remain separate from the EU.

Appendix:
Legal Appendix

Competence in Research and Development

The area of innovation is one where the EU has supporting competence, as it falls under the 'Industry' section of the Treaty (Title XVII). Article 2(5) TFEU provides:

> In certain areas and under the conditions laid down in the Treaties, the Union shall have competence to carry out actions to support, coordinate or supplement the actions of the Member States, without thereby superseding their competence in these areas.
>
> Legally binding acts of the Union adopted on the basis of the provisions of the Treaties relating to these areas shall not entail harmonisation of Member States' laws or regulations.

The areas of research, technological development and space are areas where a hybrid version of shared competences exist.

Article 2(2) TFEU provides:

> When the Treaties confer on the Union a competence shared with the Member States in a specific area, the Union and the Member States may legislate and adopt legally binding acts in that area. The Member States shall exercise their competence to the extent that the Union has not exercised its competence. The Member States shall again exercise their competence to the extent that the Union has decided to cease exercising its competence.

However Article 4(3) provides:

> In the areas of research, technological development and space, the Union shall have competence to carry out activities, in particular to define and implement programmes; however, the exercise of that competence shall not result in Member States being prevented from exercising theirs.

Article 182 (5) provides:

> […]the European Parliament and the Council, acting in accordance with the ordinary legislative procedure and after consulting the Economic and Social Committee, shall establish the measures necessary for the implementation of the European research area.

Article 189 (2) provides:

> […]the European Parliament and the Council, acting in accordance with the ordinary legislative procedure, shall establish the necessary measures, which may take the form of a European space programme, excluding any harmonisation of the laws and regulations of the Member States.

Also of relevance is Declaration 34 on Article 179 TFEU associated with and attached to the Lisbon Treaty which provides:

> The Conference agrees that the Union's action in the area of research and technological development will pay due respect to the fundamental orientations and choices of the research policies of the Member States.

The forerunners of the provisions of Title XVI TFEU (Trans-European Networks, Articles 170-172) which relate to European Networks for telecommunications, energy and transport have been used to adopt legislative instruments in relation to the Galileo global navigation satellite system (see for example Regulation no 683/2008). There is shared competence for this area.

Title XVII TFEU (Industry), which consists of a single Article (Article 173), provides that the Union and Member States are to ensure that conditions necessary for the competitiveness of the Union's Industry exist. This includes fostering better exploitation of the industrial potential of policies of for innovation, research and technological development (See Article 173(1)). Article 173(2) provides for co-ordinated action by Member States and for the Commission to take initiatives to promote such co-ordination. Article 173(3) makes it clear that the objectives in Article 173(1) can be achieved through policies and activities under other provisions of the TFEU. In addition the European Parliament and Council acting in accordance with the ordinary legislative procedure and after consulting the Economic and Social Committee may decide on specific measures to support action taken by Member States, excluding any harmonisation of the laws and regulations of Member States.

Article 179 of the Treaty confers on the Community the objective of creating a European research area in which researchers, scientific knowledge and technology can circulate freely. Article 180 provides that the Union is to carry out the following activities:

> (a) implementation of research, technological development and demonstration programmes, by promoting cooperation with and between undertakings, research centres and universities;
>
> (b) promotion of cooperation in the field of Union research, technological development and demonstration with third countries and international organisations;
>
> (c) dissemination and optimisation of the results of activities in Union research, technological development and demonstration;
>
> (d) stimulation of the training and mobility of researchers in the Union.

Article 181 requires the Union and Member States to coordinate research and technological development activities. The Commission is empowered to take initiatives to promote this.

Article 182 makes provision for:

The adoption, after consulting the Economic and Social Committee, by the Parliament and Council by the ordinary legislative procedure of multiannual framework programmes to set scientific objectives and to provide for a budget for these activities (for example the Seventh Framework Programme FP7 – see Decision No 1982/2006/EC of the European Parliament and of the Council of 18th December 2006 concerning the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007-2013)) .

The framework programme to be implemented through specific programmes adopted under the special legislative procedure by the Council after consultations with the Parliament and Economic and Social Committee.

The European Parliament and the Council after consulting the Economic and Social Committee using the ordinary legislative procedure to establish measures to implement the European research area.

Articles 183 to 186 make provision as to the content of the multiannual framework programme and related matters.

Articles 187 and 188 enable adoption of legislation to set up joint undertakings and any other structures necessary for the efficient execution of Union research, technological development and demonstration programmes. Council Regulation (EC) No 723/2009 of 25 June 2009 on the Community Legal Framework for a European Infrastructure Consortium (ERIC) was adopted under the forerunners of Articles 187 and 188.

Article 189 makes provision for the adoption of a Union space policy. The European Parliament and the Council, acting in accordance with the ordinary legislative procedure, may give effect to the Space Policy by the adoption of measures including a European space programme. Measures cannot include any harmonisation of the laws and regulations of the Member States. The Union is required to establish any appropriate relations with the European Space Agency.

Article 190 makes provision for an annual report by the Commission to the Council and the Parliament.

Annex A:
Contributors to the Call for Evidence

Aberystwyth University

Academy of Social Sciences

ADS Group (trade organisation for UK Aerospace, Defence, Security and Space industries)

AIRTO (Association of Independent Research and Technology Organisations)

Association of Medical Research Charities

BAE Systems Plc

Bangor University

BITECIC Ltd

British Influence

British Standards Institution

Brussels and Europe Liberal Democrats

BT

CEFAS (Centre for Environment, Fisheries and Aquaculture Science)

Centre for Ecology and Hydrology

Centre for Enterprise, Manchester Metropolitan University Business School

Centre for Process Innovation Ltd

Civitas: The Institute for the Study of Civil Society

COGEN Europe

Confederation of British Industry (CBI)

C-Tech Innovation Ltd

Davenport, Professor James – University of Bath

Design Council

Engineering Professors' Council

Ethical Medicines Industry Group

EU Commission

Euclid Network

Food and Environment Research Agency (FERA)

Freedom Association

Geological Society of London

Hakl, Mag. Karin – Austrian MP, Vice-Chair Research and Innovation Committee, Chair of Austrian-British Parliamentary Friendship Group

Hall, Fiona – MEP

High Value Manufacturing Catapult

Imperial College London

Individual, University of Manchester

Individual, University of York

InnovaSec Ltd

In Silico Genesis Ltd

Institute of Physics

Janmaat , Dr Jan Germen – Institute of Education, University of London

Johnson Matthey Plc

McCaldin, Simon – TWI Ltd

McCarthy, Mark, Professor Emeritus – University College London

Met Office

MIRA Ltd

Morrison, Dr James

National Academies – joint (British Academy, Royal Society, Royal Academy Engineering, Academy of Medical Sciences)

National Farmers' Union

National Nuclear Laboratory

National Physical Laboratory

NATS

NewRail, Newcastle University

Nicholson, Dr. Rekha Rao – School of Management, University of Bath

NMI (trade association for Electronics Systems, Microelectronics and Semiconductors in the UK)

Nokia Research Centre

Northern Ireland Executive- Minister for Enterprise, Trade and Investment

Open University

Public Health England

Queen's University, Belfast

Research Councils UK (RCUK) – on behalf of seven Research councils

Rolls Royce Plc

Royal Astronomical Society

Royal Society for the Prevention of Cruelty to Animals (RSPCA)

Royal Society of Chemistry

Russell Group of Universities

Sanofi

Science Council

SCISYS

Scottish Government

Sheffield Hallam University

Sigma-Aldrich Corporation

Society of Motor Manufacturers and Traders (SMMT)

Sweet Environmental Consultants

Sykes, Dr Daniel

Tata Steel UK Ltd

Thomas, Neale

Universities UK (UUK) and UK HE International Unit

University College London

University of Leeds

University of Oxford

University of Sheffield

University of Surrey

University of Warwick

Wellcome Trust

Welsh Government – Minister for Economy, Science and Transport

Wilkins, Professor Terence – Nanomanufacturing Institute, University of Leeds

Annex B: Attendees at Engagement Events

Aberystwyth University

Academy of Social Sciences

ADS Aerospace, Aviation and Defence Knowledge Transfer Network

ADS Group

Aston University

Astrium (a subsidiary of the European Aeronautic Defence and Space Company-EADS)

Avanti Consulting

BETA Technology Ltd

BP Plc

British Academy

British Geological Survey

British Influence

CGI Group Inc

COGEN Europe

Confederation of British Industry (CBI)

Coventry University and Coventry University Enterprises Ltd Limited

E-synergy Ltd

Euclid Network

Faraday Institute for Science and Religion

Food and Environment Research Agency (FERA)

Geological Society of London

Hanover Communications

Imperial College London

Inmarsat Plc

Institute of Civil Engineers

Institute of Mathematics and its Applications

Institute of Physics

Institution of Environmental Sciences

Keele University

Kent & Essex Police, Directorate of Support Services

London School of Hygiene and Tropical Medicine

National Nuclear Laboratory

National Physical Laboratory

NewRail, Newcastle University

Public Health England

Research Councils UK (RCUK)

Royal Academy of Engineering

Royal Society

Russell Group of Universities

Science Council

Science and Technology Facilities Council (STFC)

Teesside University

Universities UK (UUK) and UK HE International Unit

UK Space

University College London

University of Brighton

University of Surrey

University of Warwick

University of Wolverhampton

Telespazio VEGA UK Ltd

Wellcome Trust

Annex C: Other Sources

The following list is not exhaustive but sets out some of the main sources drawn upon in preparing the analysis:

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European Research Council website, http://erc.europa.eu/

UK Research Office website, http://www.ukro.ac.uk/