

UK research and the European Union

The role of the EU in
funding UK research

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UK research and the European Union: the role of the EU in funding UK research

A referendum on the United Kingdom's membership of the European Union (EU) will take place before the end of 2017. This report sets out to show the role of the EU in funding UK research.

This is the first part of a phased project gathering evidence about the influence of the UK's relationship with the EU on research. It is intended to inform debate. Subsequent phases will look at researcher mobility and collaborations, and the role of EU regulation and policy.

Excellent research and innovation help us to live healthier, fuller and better lives. Europe is home to world-class research, and researchers come from all over the world to collaborate with researchers that are based here and to use European scientific infrastructure. Within this community, the UK has created a world-leading research base that interacts with the best and most ambitious in the rest of the world, keeping UK research at the cutting edge.

The European research landscape is complex. Both the EU and individual European countries fund research. Researchers collaborate with each other within Europe and internationally.

The UK contributes more overall to the EU budget than it receives. However, the UK is one of the largest recipients of research funding in the EU: it receives a greater amount of EU funding for research and development than the proportion of its contribution analyses suggests is earmarked for this.

There are two major routes by which the EU directly funds research in the UK – Framework Programme funding and structural funds. The UK is very successful in attracting Framework Programme funding, particularly that allocated for excellence. The UK receives relatively little structural funding, which is largely targeted

at building capacity in the least economically developed regions of the EU.

The UK was the second largest recipient in absolute terms after Germany in the most recent Framework Programme (FP7). If structural funds are taken into account, Poland is ranked second and the UK fourth. In the UK, universities are by far the most successful in attracting Framework Programme funding, taking 71% of the total funds awarded to the UK during Framework Programme 7¹. UK businesses attracted 18%². By contrast, if we consider the distribution of where research and development is conducted in the UK; 64% conducted by businesses and 26% in universities³.

The proportion of research income that EU funding represents for universities has been increasing. Since the 2010 UK spending review, universities have seen their total research income rise slightly, despite experiencing a drop in UK government funding for research through the Higher Education Funding Council and the Research Councils. This is due to increases in research income from other sources including the EU and the private sector.

The UK's relationship with the EU is complex and the EU's influence varies across different parts of the UK's research ecosystem. The evidence presented in this report focuses on the financial aspects of the UK's relationship with Europe and should not be considered in isolation. The monetary value of a funding stream is not the sole guide to its value for research. Small amounts of funding in areas where little funding is available, or that offer researchers mobility and encourage collaborations can have a bigger impact than their monetary values might suggest. This value is difficult to quantify and we have not sought to do so in this document.

Excellent research and innovation help us to live healthier, fuller and better lives.

How does the EU fund research?

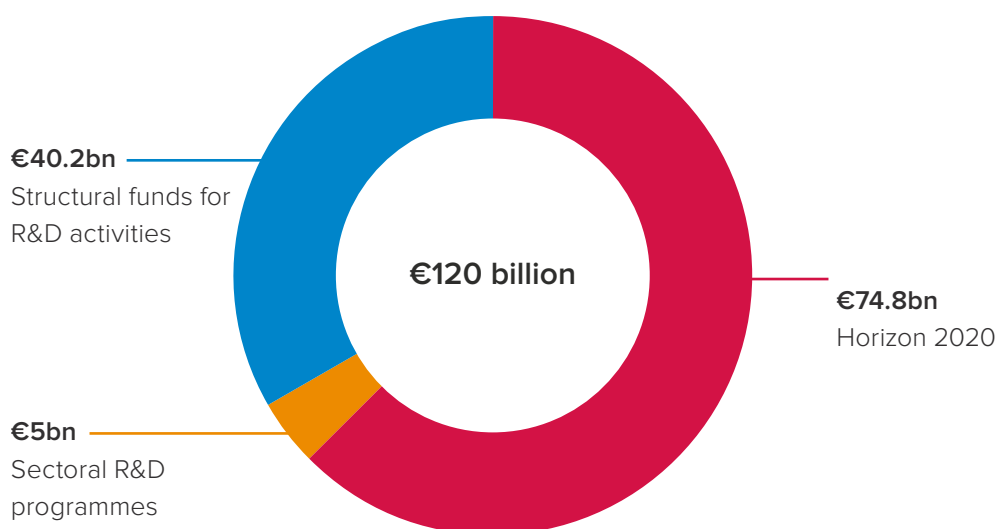
The EU supports research, development and innovation through several interlinked programmes. These are estimated to provide €120 billion⁵ to directly support research, development and innovation activities over the period 2014 – 2020.⁶

In addition the EU provides indirect support for research, development and innovation through specific programmes.

The EU has a total estimated budget of €120 billion to directly support research and innovation activities between 2014 and 2020.⁵

FIGURE 2

Estimated EU expenditure on research, development and innovation. 2014 – 2020.



Additional programmes indirectly supporting research and innovation activities:

- Competitiveness for Enterprises and Small and Medium Size Enterprises (COSME)
- Erasmus+
- The Health programme
- The Life programme
- The Connecting Europe Facility
- European Fund for Strategic Investment

Source: References 1, 8, 28 and 29.

Up to December 2014, almost half of the scientific publications resulting from completed Framework Programme 7 projects were in high impact peer reviewed journals.¹⁰

Framework Programmes

What are Framework Programmes?

Framework Programmes (FPs) are the main EU funding mechanism for research, development and innovation. The current Framework Programme is called Horizon 2020.

Who manages them?

Horizon 2020 is managed by the European Commission's Directorate-General for Research and Innovation (DG RTD). Eight other DGs with a research dimension (Energy, Communication, Agriculture, Education and Culture, Growth, Home Affairs and the Joint Research Centre (JRC)) share ownership and responsibility for the Programme with DG Research.

What is the budget?

Horizon 2020 has a budget of €74.8 billion⁹ for the period 2014 – 2020. The budget and remit of Framework Programmes has increased since their inception in 1984 (see timeline on page 9).

Who can receive funding?

Universities, research organisations, small and large businesses, charities and individual researchers from EU Member States are eligible for Framework Programme funding. Non-EU countries also participate in Framework Programmes.

What do Framework Programmes fund?

Framework Programmes fund a variety of different research, development and innovation activities across the private and public sectors, spanning from fundamental research to technological development. These funded activities aim to broaden understanding of the world, harness scientific progress for economic and technological development, and solve some of the 'grand challenges' Europe faces.

How is funding distributed?

Horizon 2020 funding is mostly allocated competitively through calls for proposals to which researchers and organisations can apply. Criteria for allocating funding vary and include scientific excellence, alignment with a number of strategic objectives (grand challenges), geographical and disciplinary diversity and potential for commercialisation. The calls for proposals are managed under a number of schemes and agencies, including the European Research Council (ERC), Marie Skłodowska-Curie Actions (MSCAs), the Small and Medium sized Enterprises (SME) instrument, the European Institute of Innovation and Technology (EIT), the European Investment Bank and partnerships with Member States and industries.

What has Framework Programme funding achieved?

Looking at the most recent Framework Programme, (FP7 running 2007 – 2013), 48% of projects were completed by December 2014 and had produced over 43,000 publications, 47% of which were published in high impact peer reviewed journals¹⁰ (defined as the top 10% of the SJR index¹¹ of all journals within a given scientific category). These projects also reported more than 1,500 patent applications.

The European Research Council (ERC)

What is the ERC? The ERC is the first pan-European funding body for frontier research¹², established in 2007. The ERC has rapidly established itself as a world leading funder of excellent research and its funding is highly prized by researchers for the status it confers and because it comes with relatively few restrictions attached.

What is the budget? The ERC budget for 2014 – 2020 is €13 billion, 17% of the total Horizon 2020 budget.¹³

What does the ERC fund? The ERC is unique among EU research funding schemes in funding individual researchers solely on the basis of their scientific excellence and their proposed projects. Unlike other forms of EU research funding, its grants have neither thematic priorities nor geographical quotas.

What has ERC-funded research led to?

As of September 2014, 48% of the scientific publications from completed ERC-funded projects were in the top 10% most highly cited publications in their scientific discipline and year of publication, and 11% were in the top 1% most highly cited publications worldwide.¹⁴

Marie Skłodowska-Curie Actions (MSCAs)

What are Marie Skłodowska-Curie Actions?

These enable researchers to work in different countries, sectors or disciplines. They are designed to encourage the development of early stage and more experienced researchers by enabling them to spend a period of time working abroad in an academic or non-academic setting in the EU and overseas. Prior to 2014 these were known as Marie-Curie Actions. We shall refer to them by their current name throughout.

What is the budget? The budget for Marie Skłodowska-Curie Actions for 2014 – 2020 is €6.2 billion, 8.2% of the total Horizon 2020 budget.¹⁵

What do Marie Skłodowska-Curie

Actions fund? MSCAs support international training networks for PhD and early career researchers, international mobility fellowships for experienced researchers, international exchanges of research staff and other programmes related to international and intersectoral research training and career development.¹⁶

The SME Instrument

What is the SME Instrument?

The Horizon 2020 SME Instrument is a mechanism for the EU to invest in, and support, small and medium enterprises looking to convert successful and innovative research into market-leading businesses. SMEs considered to have strong potential for growth on an international scale will receive funding as well as business support and mentoring.

What is the budget? The SME Instrument budget for 2014 – 2020 is €3 billion, 4% of the total Horizon 2020 budget.¹⁷

What does the SME Instrument?

SMEs from a wide variety of different sectors¹⁸ can access funding and support through this scheme. These include: low carbon technologies and energy efficiency; transport; medicine and medical devices; biotechnology; nanotechnology; space; food production; and eco innovation and production of raw materials. There are currently 155 listed SMEs in the UK that are receiving SME Instrument funding.

Sectoral research and innovation programmes¹⁹

What are the EU sectoral research and innovation programmes?

Sectoral programmes fund research and innovation activities in specific sectors:

- Nuclear energy: Euratom Research and Training Programme (ERTP) and International Thermonuclear Experimental Reactor (ITER)
- Space: Copernicus and Galileo satellites programmes, complementing space research under Horizon 2020
- Coal and steel production

What is the budget?

The total research budget for these programmes is about €5 billion over the period 2014 – 2020, of which the majority (€4.5 billion) is for research into nuclear energy. These numbers are not exact because these programmes do not all run within the same timeframe.

Structural funds

What are the structural funds?

European Structural and Investment Funds (ESIF) are a set of funds targeted especially (though not exclusively) at building capacity in the least economically developed regions of the EU. In the UK, these include Cornwall, parts of Wales and the Scottish Highlands.

Although a large proportion of these funds are spent on projects such as building infrastructure, support for research and innovation activities is also one of their priorities. Structural funds and Framework Programmes have different objectives and awarding criteria, and support different activities, but funding from the two programmes is increasingly coordinated and synergies are encouraged.

What is the budget?

An estimated €40.2 billion of structural funds will be allocated to research and innovation activities over the period 2014 – 2020.²⁰

What activities are funded?

Research and innovation activities funded by the European Structural and Investment Funds include the construction of research infrastructure, support for technology transfer and research intensive businesses, and skills programmes.

Programmes connected to research and innovation activities

Five other EU programmes indirectly support research, development and innovation activities, although they do not fund these directly:

- COSME (supports Small and Medium Enterprises (SMEs), including to develop Research & Development capabilities).
- Erasmus+ (student mobility).
- The Health Programme (supports healthcare frameworks including research hospitals).
- The Life Programme (supports policy uptake of environmental research).
- The Connecting Europe Facility (includes €1.14 billion for trans-European telecoms infrastructures).

European Fund for Strategic Investment (EFSI)²¹

What is EFSI?

The European Fund for Strategic Investment (EFSI, also known as the 'Junker Plan') is one pillar of the European Commission's Investment Plan for Europe. It aims to mobilise investment to stimulate jobs and growth in Europe across a range of infrastructure and innovation projects.

What is the budget?

EFSI has a seed fund of €16 billion of EU public funds that are intended to leverage external investment of €315 billion. €2.2 billion have been redeployed from Horizon 2020 to form part of the seed money.

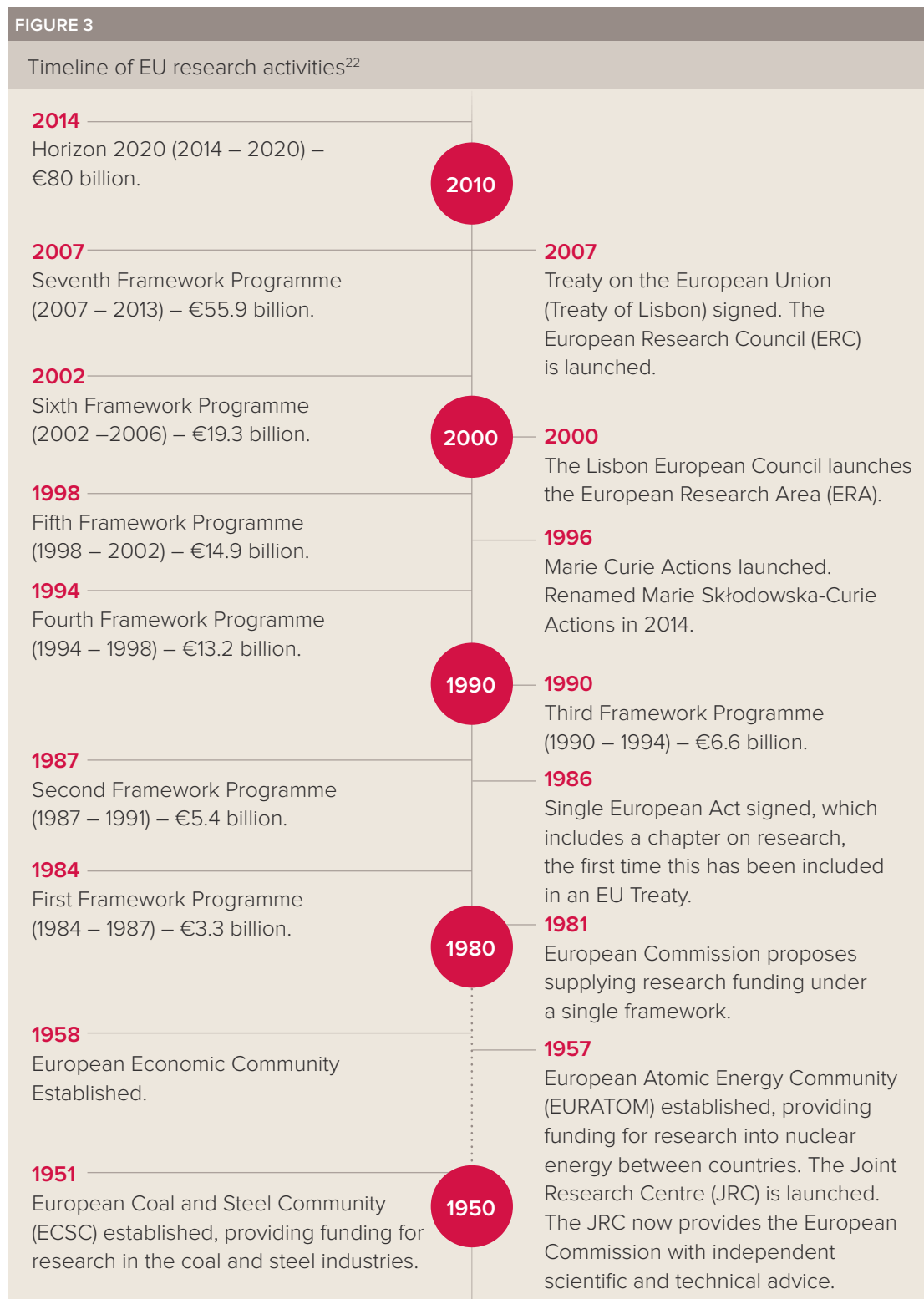
What does EFSI fund?

The Commission has guaranteed that research and innovation projects will be among the activities for which EFSI will leverage investment. However, precise details are yet to be determined.

Who decides the EU's priorities for its research funding?

Decisions about the budget and strategic priorities of EU research funding are agreed by the European Parliament, Commission and Council. Countries that are not Members States of the EU do not have a role in the

negotiations that shape EU research funding. However, they can participate in Framework Programmes, contributing funds and accessing funding under specific conditions.



Which countries can access EU research funding?

All European Union (EU) Member States can access EU research funding.

In addition, a number of mechanisms exist to enable scientific institutions and researchers in non-EU countries to participate in, and receive funding from, EU Framework Programmes.²³

Associated Countries²⁴

Thirteen countries (including Norway, Israel and Switzerland) have 'Associated Country' status and contribute to Framework Programme budgets proportionally to their GDP. This enables their researchers and organisations to apply for Horizon 2020 projects with the same status as those from EU Member States. Associated Country status is open to countries that are members of the European Free Trade Association (EFTA) and current EU candidate nations. The terms of their association differ slightly by country. They do not have a role in the negotiations that shape EU research funding.

Non-associated third countries

Institutions and researchers from other countries can also apply and participate in EU Framework Programmes, under the 'openness' strategy, and in some circumstances receive direct funding. Depending on the exact scheme, third countries might have to provide matching funds.

Scientific and technological cooperation

The EU has international agreements for scientific and technological cooperation with 20 countries. These create a framework for participation in joint projects, sharing of facilities, staff exchanges or the organisation of specific events.

Case study Switzerland

Switzerland is not an EU member state but is partially associated to the EU Framework Programme until the end of 2016. During this time, researchers based in Switzerland can access some parts of Horizon 2020 funding on the same basis as those in an EU Member State. Extension of this access through to 2020 is dependent on Switzerland's ratification of an agreement on free movement of people related to Croatia joining the EU.

Case study Norway

Norway is not an EU member state but is an official 'Associated Country' meaning it participates in Framework Programmes under the same conditions as EU Member States. The nature of the agreement signed between Norway and the EU means that terms do not need to be renegotiated with each new Framework Programme.

As an 'Associated Country' Norway is not represented on the European Council or in the European Parliament so has limited ability to influence the direction of European research funding. However, it does engage extensively in EU-funded research, contributing to, and receiving funding from, EU Framework Programmes.

The European Research Area (ERA)

Work is underway to create a European Research Area (ERA). This is intended to be:

“a unified research area open to the world based on the Internal Market, in which researchers, scientific knowledge and technology circulate freely and through which the Union and its Member States strengthen their scientific and technological bases, their competitiveness and their capacity to collectively address grand challenges.”²⁵

The aim of the ERA is to maximise the return on research investment for both the EU and its individual Member States; avoid unnecessary duplication of research and infrastructure investment at national level; and improve the effectiveness and efficiency of the European research community.

Its key priorities are:

- More effective national research systems
- Optimal transnational co-operation and competition
- An open labour market for researchers
- Gender equality and gender mainstreaming in research
- Optimal circulation, access to and transfer of scientific knowledge

An ERA Board advises the European Commission on the realisation of the ERA and helps develop, promote and evaluate policy initiatives and actions. The board consists of 22 high-level experts from academia, business and industry appointed in their personal capacity²⁶ by the European Commission. The current chair is Professor John Wood CBE FREng.

The European Research Area and Innovation Committee (ERAC) advises the EU and Member States on research and innovation issues that are relevant to the development of the ERA. The ERAC is chaired by the Commission and includes representatives of all Member States. A number of non-EU countries that are associated to EU research and innovation programmes, including Norway, Israel and Switzerland, participate as observers.²⁷

The UK and EU research funding

The analysis in the following section is based on the most recent completed EU financial framework, that operated during 2007 – 2013.

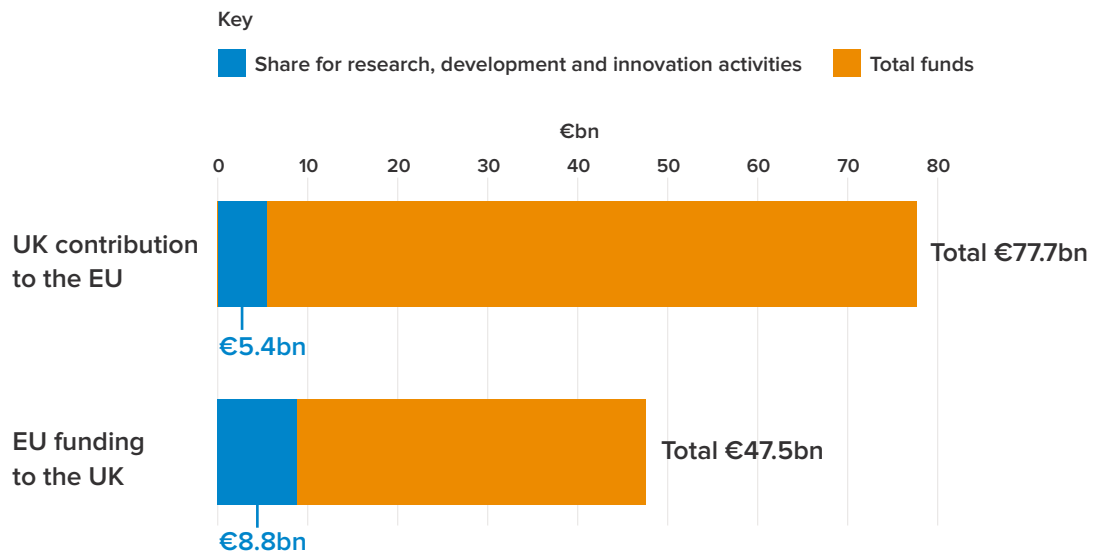
How much does the UK contribute to EU research and how much does it receive?

Overall the UK is a net contributor to the EU budget. Over the period 2007 – 2013, the UK contributed €77.7 billion to the EU (10.5% of the total EU income from Member States), and received €47.5 billion in EU funding (6% of the total EU expenditure to Member States).²⁸

The UK is one of the largest recipients of research funding in the EU and, although national contributions to the EU budget are not itemised, analyses suggest that the UK receives a greater amount of EU research funding than it contributes. The UK Office of National Statistics (ONS) report an indicative figure for the UK's contribution to EU research and development of €5.4 billion over the period 2007 – 2013.²⁹ During this time, the UK received €8.8 billion in direct EU funding for research, development and innovation activities.³⁰

FIGURE 4

Flow of funds between the UK and EU 2007 – 2013 (€ billion).*



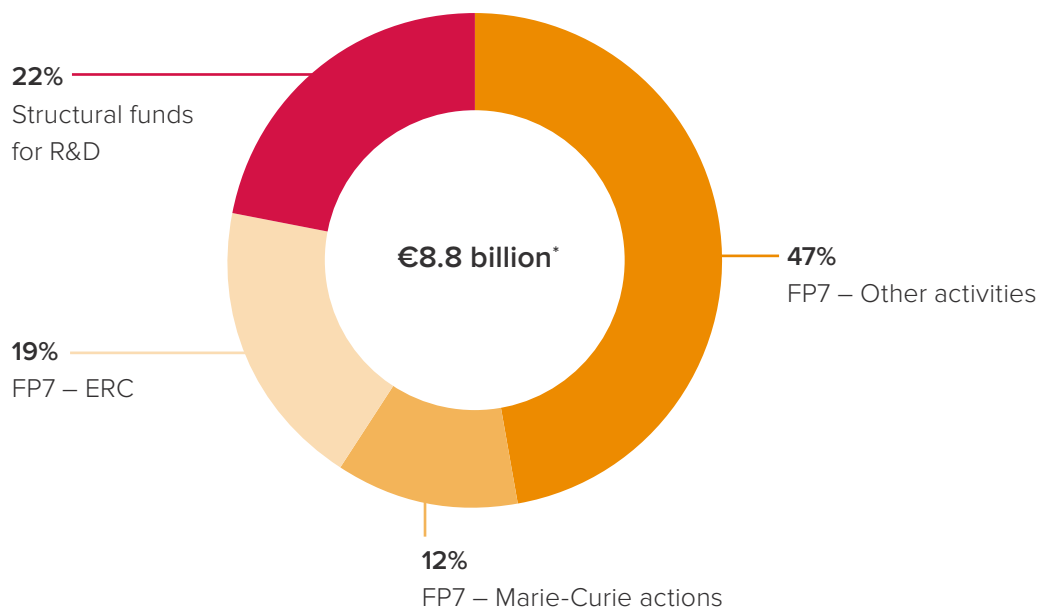
Source: References 1, 8, 28 and 29.

What types of research funding does the UK receive from the EU?

The UK receives most of its EU research funding through Framework Programmes and structural funds. Over the period 2007 – 2013, the UK received €6.9 billion of Framework Programme 7 (FP7) funding³¹, of which €1.7 billion were in European Research Council grants³² (19%) and €1.1 billion for Marie Skłodowska-Curie Actions³³ (12%). The UK was allocated €1.9 billion of structural funds for research and innovation activities over the same period.³⁴

FIGURE 5

Sources of EU funding to UK research, development and innovation. 2007 – 2013.



Source: References 1 and 8.

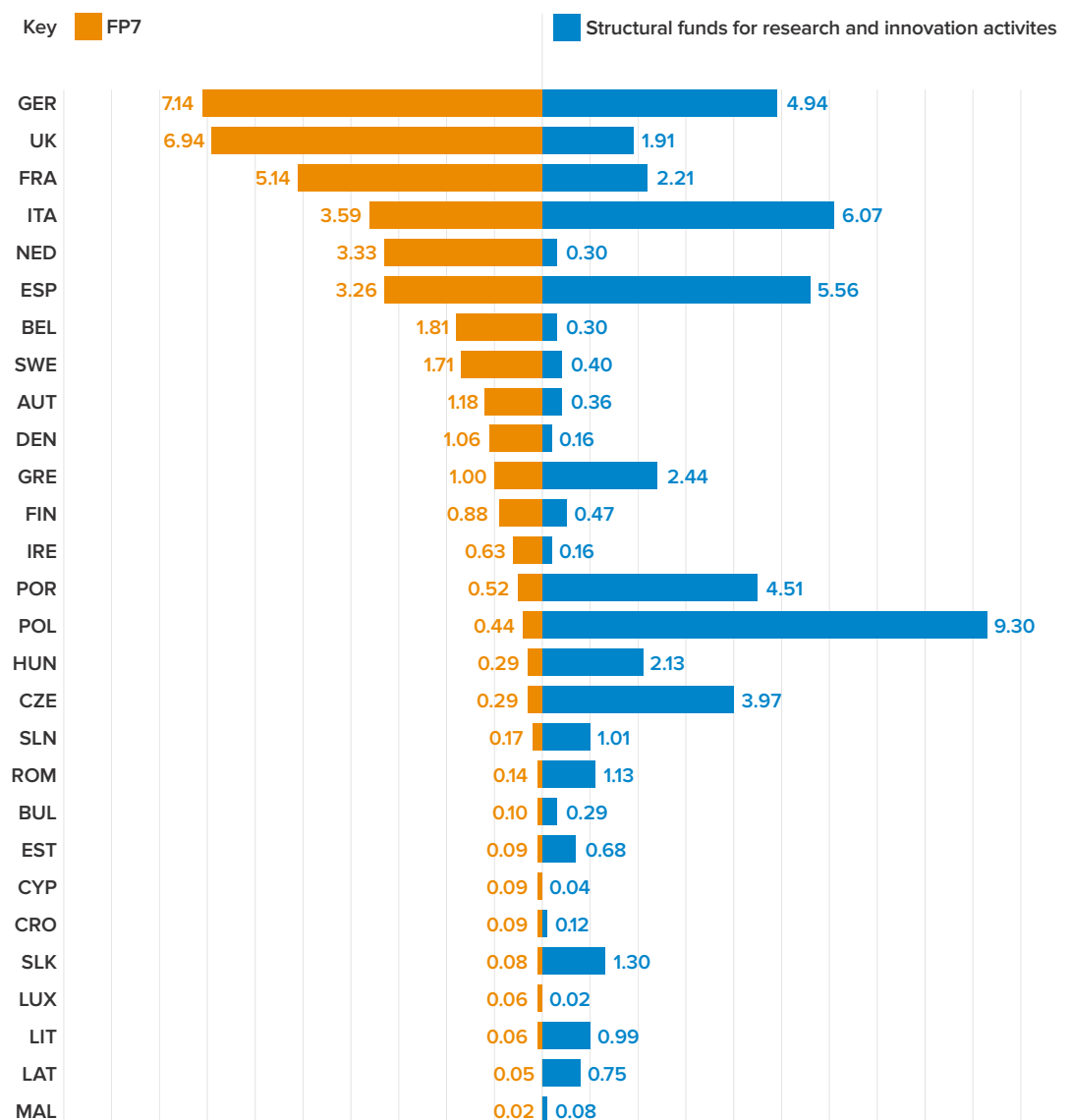
How much research funding does the UK get from the EU and how does this compare with other countries?

The UK is one of the largest recipients of research funding in the EU. Over the period 2007 – 2013 the UK received €8.8 billion out of a total of €107 billion expenditure on research, development and innovation in EU Member States, associated and third countries. This represents the fourth largest share in the EU.³⁵

In terms of funding awarded on a competitive basis in the period 2007 – 2013 (Framework Programme 7), the UK was the second largest recipient after Germany, securing €6.9 billion out of a total of €55.4 billion.³⁶

FIGURE 6

Distribution of EU expenditure on research, development and innovation (Framework Programme 7 and structural funds) in EU-28 countries. 2007 – 2013 (€ billion).



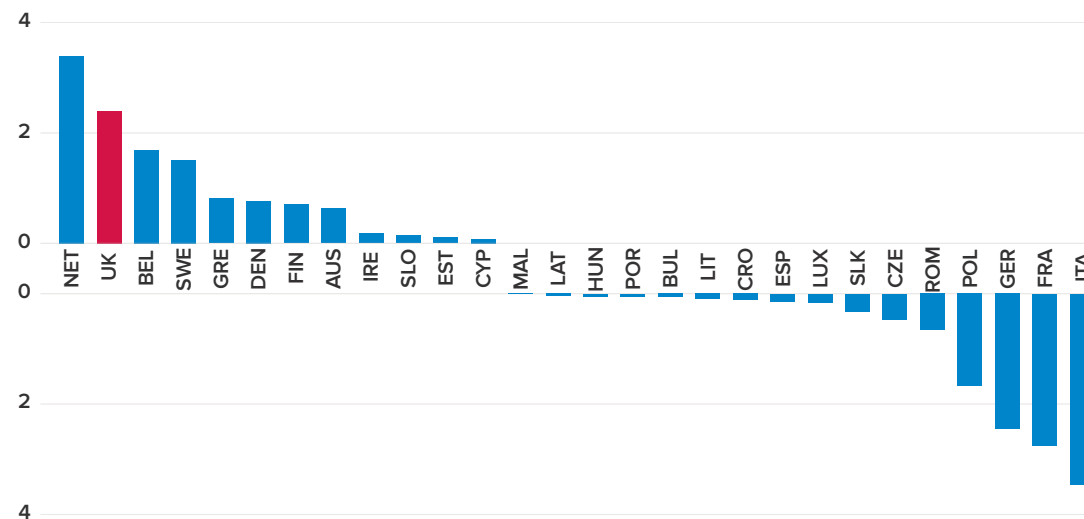
Source: References 1 and 8.

However these figures do not take into account the relative size of each country's economy. Adjusting these figures for GDP shows that the UK performs well for the size of its economy,

second only to the Netherlands. In contrast, Germany, France and Italy perform less well (see figure 7).

FIGURE 7

Difference between the percentage proportion of Framework Programme 7 funding received and the percentage proportion of EU GDP for each EU Member State. 2007 – 2013.



Source: Reference 1.

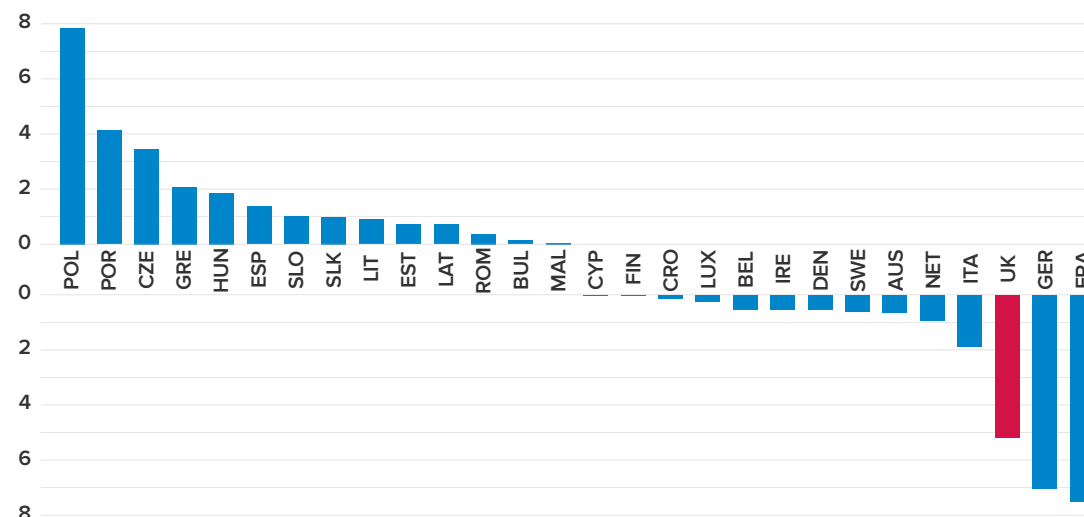
GDP values from ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tec00001&plugin=1

Structural funds are allocated to build capacity in the least economically developed regions of the EU. Countries with lower GDPs therefore tend to receive a greater proportion of these. This is demonstrated by figure 8 that adjusts

total EU research and development funding (FP7 and structural funds) for GDP. The UK, Germany and France are shown to receive proportionally less overall funding when their GDP is taken into account.

FIGURE 8

Difference between the percentage proportion of EU funding on for research, development and innovation (Framework Programme 7 and structural funds) received and the percentage proportion of EU GDP for each EU Member State. 2007 – 2013.



Source: References 1 and 8.

GDP values from ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tec00001&plugin=1

Between 2007 – 2013, 3,454 UK-based researchers received funding from Marie Skłodowska-Curie Actions to work overseas and 8,120 overseas researchers came to work in UK organisations with Marie Skłodowska-Curie Actions support.³⁸

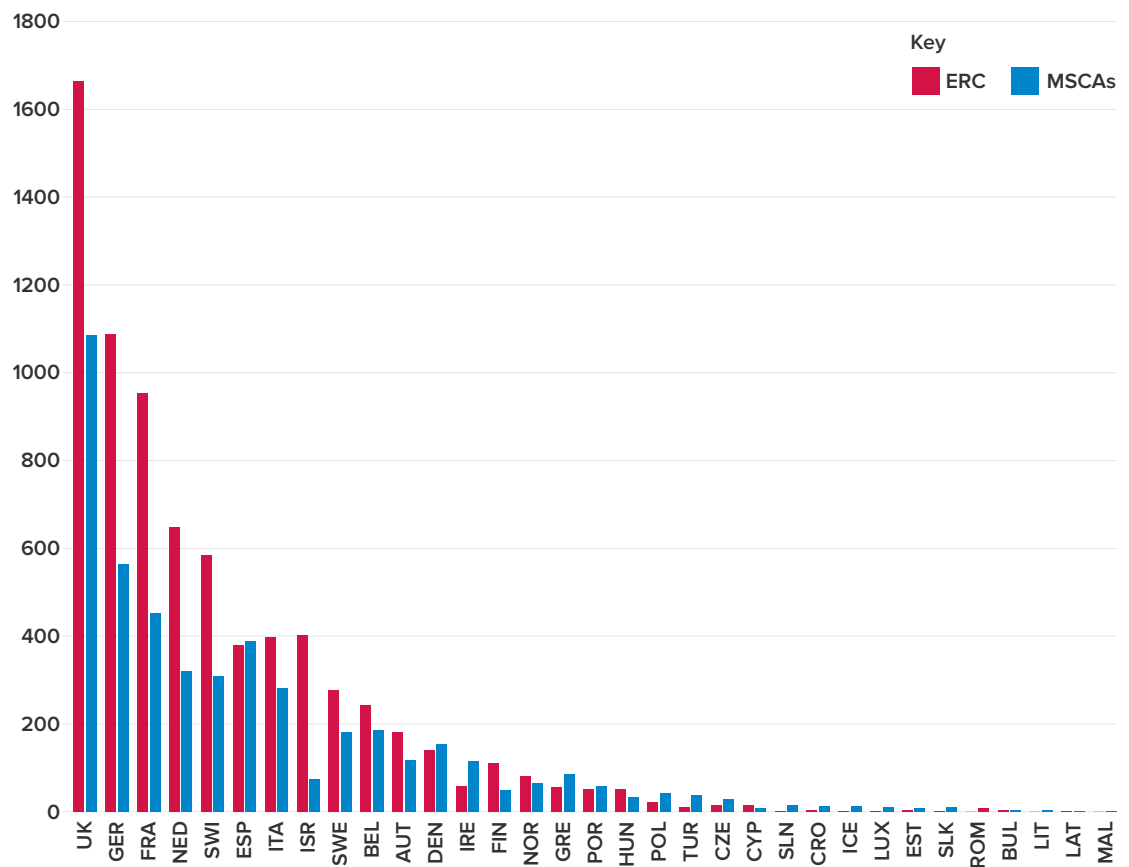
Looking at Framework Programme 7 funding more closely, in terms of funding from the European Research Council (ERC) and Marie Skłodowska-Curie Actions (MSCA), which are awarded solely on the basis of scientific excellence, the UK was the top performer among participating countries.

UK based researchers received €1,665

million in ERC grants over FP7 2007 – 2013, which was 22.4% of the total budget for the programmes.³⁷ Over the same period, through Marie Skłodowska-Curie Actions, UK-based researchers received €1,086 million, which was 25.5% of the programme’s total budget.³⁸

FIGURE 9

Distribution of European Research Council (ERC) and Marie Skłodowska-Curie Actions (MSCAs) funding among participating countries. 2007 – 2013 (€ million).



Source: References 32 and 33.

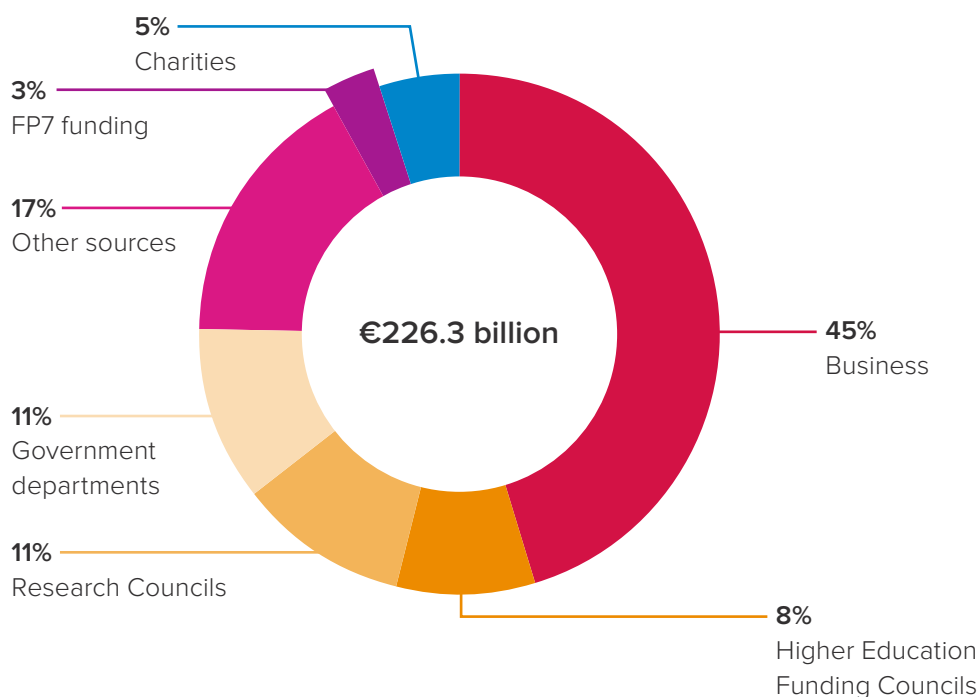
How does EU research funding compare with UK domestic research funding?

EU research funding through Framework Programme 7 represented 3% of UK expenditure on research and development between 2007 and 2013.³⁹ EU research and innovation funding through structural funds

is not captured in this as only some of these activities fall under the ONS definition of research and development used to calculate the domestic data below. The real figure is therefore likely to be higher than 3%.

FIGURE 10

UK expenditure on research and development by source of funding. 2007 – 2013.*



Source: References 1 and 3.

Which UK sectors receive EU research funding?

Considering just Framework Programme funding (as breakdown by sector is not available for structural funds), UK universities were among the most successful in securing EU research funding, receiving 71% of total Framework Programme (FP7) funding awarded to the UK.⁴⁰

A total of 13 UK universities are ranked in the top 25 European universities, rated in terms of the number of participations in Framework Programme 7. Oxford, Cambridge, Imperial College and UCL occupied the top four spots.⁴¹ However no UK organisation was ranked in the top 25 research organisations participating in FP7, and only 4 were ranked in the top 50.

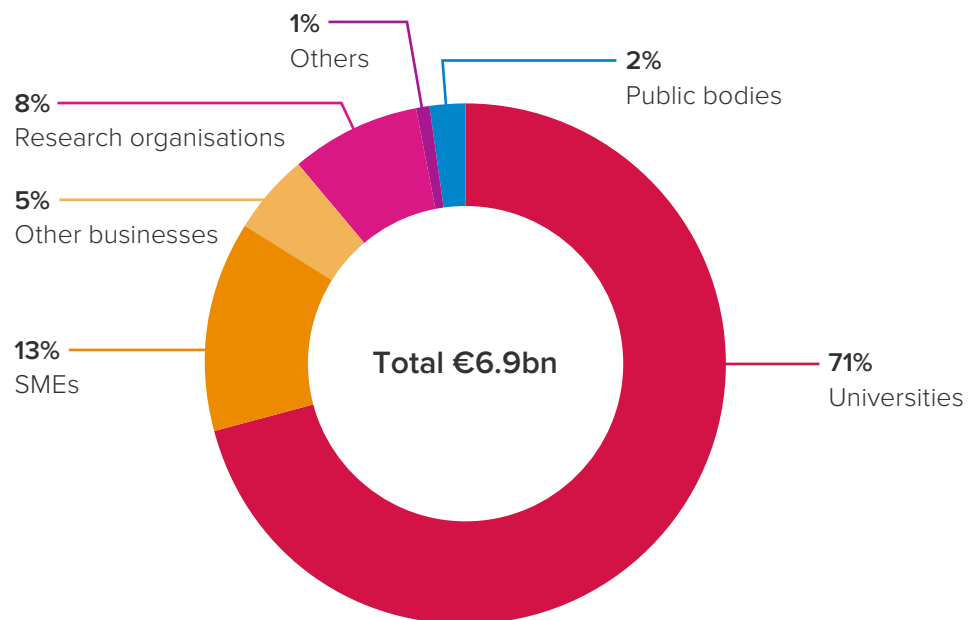
This reflects that research architecture varies across participating countries, with research strength in some countries concentrated in research organisations (such as the Max Planck Institutes in Germany) rather than universities.

UK businesses attracted 18% of the total funds awarded to the UK through FP7. This is below the EU average of 26.7% and much lower than countries such as Germany and France where businesses secured 33% and 27% respectively of the FP7 funding received by the country.⁴²

This distribution contrasts with where research and development is conducted in the UK. 64% is conducted by businesses and 26% in universities.⁴³ This reflects a low rate of private sector participation in EU research funding in the UK. In the rankings of private-for-profit organisations, only 2 UK companies (NEC Europe Ltd and Rolls Royce) were ranked in the top 50 European companies in terms of FP7 participations.⁴⁴

FIGURE 11

Breakdown of sectors receiving Framework Programme 7 funding in the UK. 2007 – 2013.



Source: Reference 1.

Data are not available about the breakdown by sector of structural funds received by the UK.

What impact does EU research funding have on UK universities?

Over the period 2007 – 2013, universities received €4.9bn out of a total of €6.9bn awarded to the UK through FP7 Framework Programme.⁴⁵

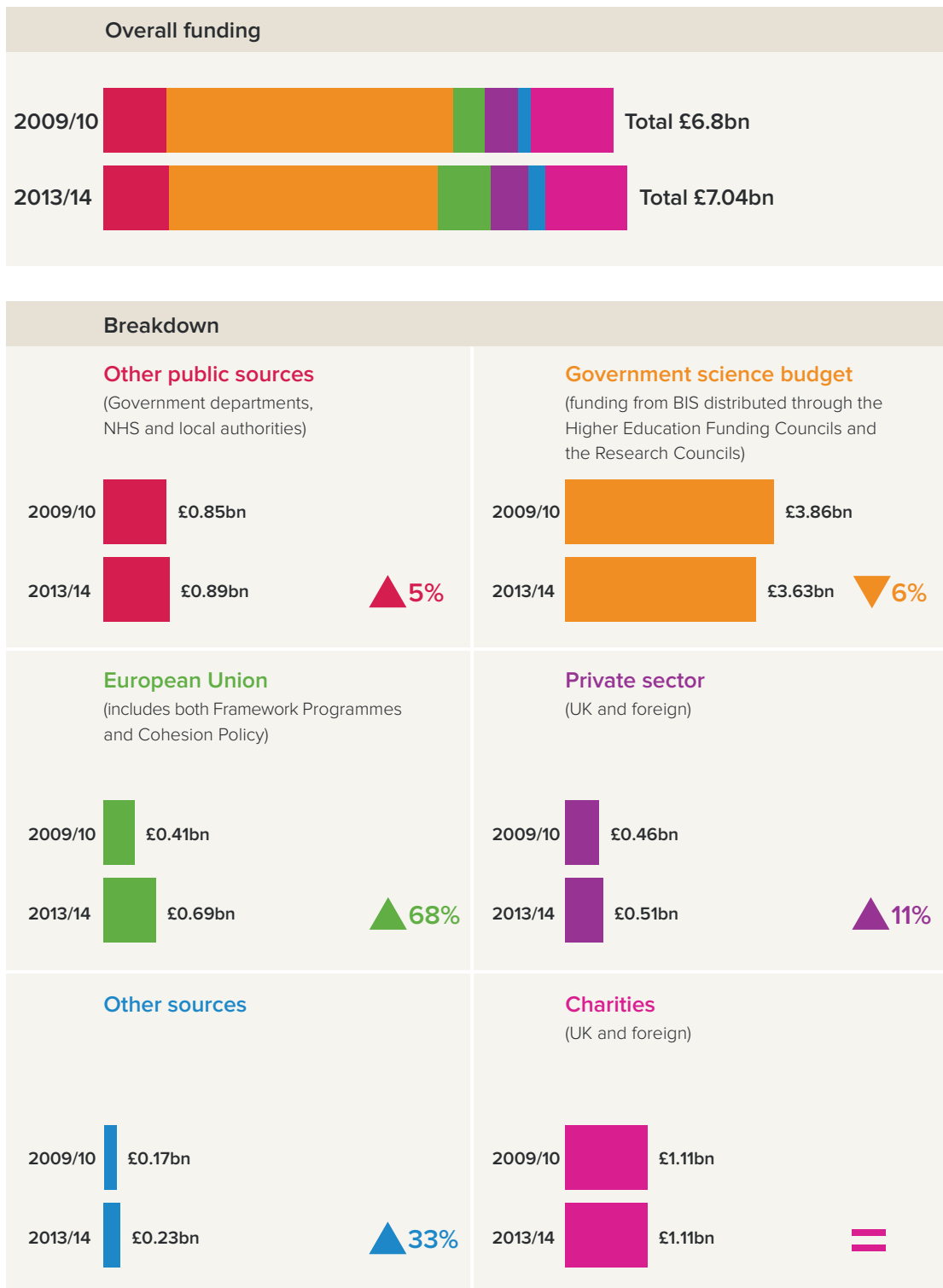
Considering the years since the UK spending review in 2010, the overall research income of universities⁴⁶ has increased by 2.7% in real terms (between 2009/10 and 2013/14).⁴⁷*

In 2009/10 UK universities received £409 million of research income from EU government bodies.* By 2013/14, this had risen to £687 million.⁴⁸* This is equivalent to the combined total research income of Kings College London and Imperial College (£679 million), two leading research-intensive universities.

It is important to note that EU funding does not always cover the full cost of research overheads, meaning that recipients need to meet such costs from other sources of research income, such as Quality-related Research (QR) funding or endowments.

FIGURE 12

Research income of UK Universities in 2009/10 and 2013/14*.



Source: Reference 47.

In 2013/14, EU funding represented 9.7% of total research income for Higher Education Institutions in the UK. This was a real terms increase of 68.2% from 2009/10^{48,*}

Over the same period, income from the Department for Business, Innovation and Skills (BIS)⁴⁹ as a proportion of total research income for UK Higher Education Institutions has declined by 4.5 percentage points, from 56% to 51.5%. This is a real terms decline of 6.2%.*

How does the EU fund research facilities and major equipment?

Framework Programme 7 earmarked €1.85 billion for research facilities, and the Framework Programme for 2014 – 2020 (Horizon 2020) will support them with about €2.4 billion.⁵⁰

The EU has supported 3,539 UK based researchers to access 1,055 European research facilities between 2007 and 2013.⁵¹

Research often needs specialised infrastructure, including equipment and buildings, or less tangible infrastructure such as databases, archives, collections and computing systems.

These can be of great scientific value but are sometimes expensive, and as a result are often shared and used by scientists from many different countries. Access to and networking between different pieces of research infrastructure represent an important part of the European and international research landscape. Different countries, including the UK, play host to the headquarters of international research facilities.

Most of the cost of shared research facilities is borne by participating countries, but the EU often provides funding for activities such as planning, strategic coordination, networking and transnational access. The Framework Programme for 2007 – 2013 (FP7) earmarked €1.85 billion for research facilities, and the Framework Programme for 2014 – 2020 (Horizon 2020) will support them with about €2.4 billion.⁵⁰

National research facilities

Most research facilities are built, funded and managed at the national level. Although national research facilities will serve mostly their own national research community, their research value can be greatly increased by creating international networks and granting reciprocal access to researchers based elsewhere.

The EU supports transnational and virtual access, networking, and joint research activities. These create opportunities for new and existing groups of researchers and scientists to collaborate across disciplines and countries, as well as platforms where science and industry can come together. Users can be researchers from academia, business, industry and the public sector from countries participating in the programmes. The EU has supported 3,539 UK based researchers to access 1,055 European research facilities between 2007 and 2013.⁵¹

In addition, 107 UK national research facilities received support from the EU to grant access to international researchers, fostering collaborations and exchange of ideas.⁵²

EU funding is also available to create and coordinate Europe-wide networks of research facilities in the same research area.⁵³

Pan-European research facilities

A number of pan-European research facilities exist. They are often distributed across multiple sites within the EU and beyond, with headquarters in one of the participating countries. They are funded by participating countries.

The EU does not directly fund the construction of these research facilities but can support the associated planning and coordination. It does this through the European Strategic Forum on Research Infrastructures (ESFRI).

The European Strategy Forum on Research Infrastructures (ESFRI)⁵⁴

The European Strategy Forum on Research Infrastructures (ESFRI) is a multi-disciplinary forum to support coherent and strategic decisions regarding the planning and implementation of new or improved research infrastructures in Europe, and to facilitate multilateral initiatives to best support this approach.

The ESFRI membership consist of two delegates from all EU Member States as well as a number of additional Associate Nations and a representative of the European Commission. The current ESFRI Chair is Prof John Womersley, the Chief Executive of the UK's Science and Technology Facilities Council. The Forum is a self-regulated body, operating in an open method of coordination, mainly on the basis of consensus.

It does not allocate funding nor does it give “direct recommendations” for funding. However the ESFRI plays a major role in the decision-making processes regarding the strategy and implementation of new research infrastructure development and improvements.

Under the Framework Programme for 2007 – 2013 (FP7), the EU granted such projects about €300 million and further support is planned under the research programme Horizon 2020. Support is also provided for conceptual design studies for new research facilities that demonstrate a clear European dimension and interest. Sixteen design study projects are funded by the EU under the Framework Programme for 2007 – 2013.⁵⁵ Structural funds can sometimes be used to fund the construction phase.

Pan-European research facilities in the UK

The UK hosts the headquarters of 6 pan-European research facilities, with facilities distributed across multiple participating countries.⁵⁶ These are:

- High Power Laser Energy research Facility (HiPER) – Harwell, Oxfordshire (Central Laser Facility)⁵⁷
- ELIXIR (European Life-science Infrastructure for Biological Information) – Hinxton
- Integrated Structural Biology Infrastructure (INSTRUCT) – Oxford
- Infrastructure for Systems Biology-Europe (ISBE) – London (Imperial College)
- Square Kilometre Array (SKA) – Manchester (Jodrell Bank)
- European Social Survey (ESS ERIC) – London (City University)

The UK also hosts 10 facilities⁵⁸ that are part of pan-European research facilities headquartered in other European countries and is a member of pan-European research facilities entirely based beyond its borders, such as the European Hard X-Ray Free Electron Laser (European XFEL) based in Germany.

The EU's role in the UK's engagement with intergovernmental research efforts

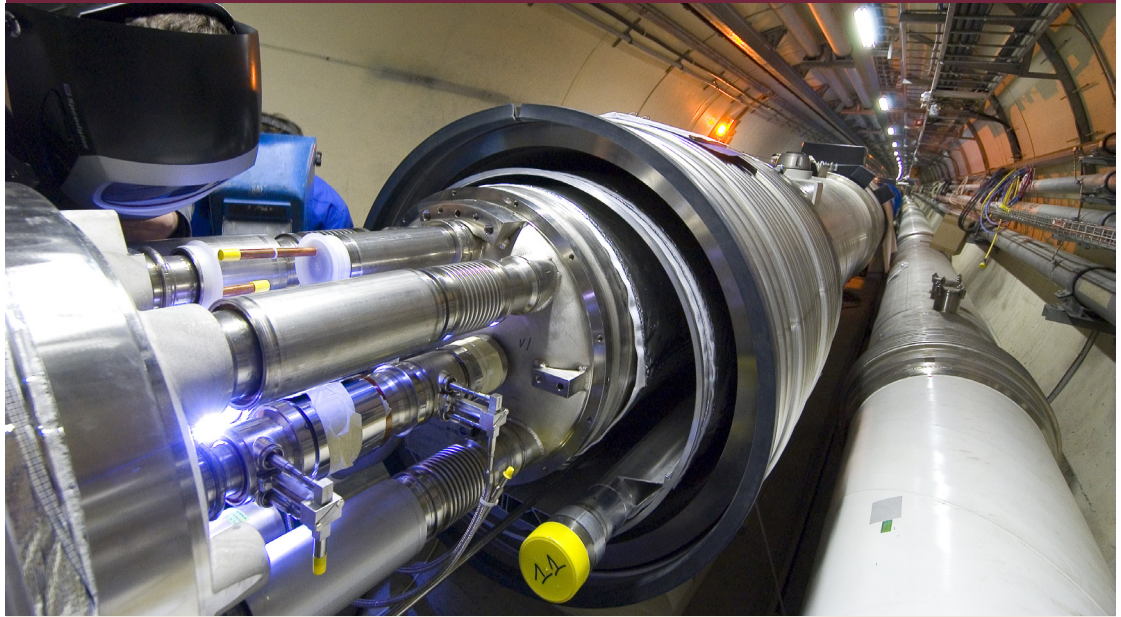
Intergovernmental organisations are part of the European research landscape providing valuable facilities and infrastructures. Each of these organisations has its own institutional arrangements and membership rules, and the EU plays a different role in each. Some, such as the ITER fusion experiment, are directly managed by the EU. Others predate the EU itself and receive only a marginal part of their budget from the EU, such as CERN.

The six boxes below outline some of the most prominent European intergovernmental research organisations, providing details about their function, location, membership and funding, and the role of the EU in their operation.

Image

The Large Hadron Collider.
CERN ©2014 CERN.

European Organisation of Nuclear Research (CERN)



The ALICE project, investigating the basic constituents of matter, is a collaboration between more than 1000 scientists from 30 countries.⁶⁰

What is CERN? The European Organisation of Nuclear Research (CERN) is an intergovernmental research organisation, operating the largest particle physics laboratory in the world. It provides particle physicists with state of the art equipment like particle accelerators and detectors, such as The Large Hadron Collider (LHC)⁵⁹ to carry out ground breaking research. CERN organises and sponsors international research collaborations, promoting contacts between scientists and interchange with other laboratories and institutes. The experiments conducted at CERN are the result of large-scale international collaborations. For example, the ALICE project⁶⁰, investigating the basic constituents of matter, is a collaboration between more than 1,000 scientists from 30 countries.

Where is it located? CERN is situated astride the Franco-Swiss border near Geneva.

Which countries are involved in it? The UK is one of 22 member nations of CERN, which includes 19 EU Member States as well as Switzerland, Norway and Israel. Many

nations from outside of Europe have non-member status to CERN, meaning they do not participate in organisational decision making but have co-operation agreements to participate in specific projects.

Who funds it? In 2014 CERN received €1.2 billion in funding, 90% of which came from its member nations.⁶¹ The UK contribution to CERN funding in 2014 was roughly €126 million (the third highest contributing member nation behind Germany and France). In 2014, the EU provided 1.6% of CERN's funding.⁶²

What's the role of the EU in it? The EU is not directly involved in the organisation of CERN activities and policy but has held 'Observer Status' at CERN since 1985. While the direct investment from the EU at CERN is relatively low, EU-funded research projects conduct work at CERN and collaborate with researchers who conduct work at CERN.⁶³ During the seven years of EU Research Framework Programme 7 (2007 – 2013), CERN participated in successful proposals for 87 new EU projects, 36 of which are coordinated by CERN.⁶⁴

European Synchrotron Radiation Facility (ESRF)

What is the European Synchrotron Radiation Facility? The European Synchrotron Radiation Facility (ESRF) operates one of the most powerful X-ray sources in the world, producing X-rays 100 billion times brighter than the X-rays used in hospitals.⁶⁵ This allows research scientists visiting the facility to investigate the inner molecular structure of materials and living matter, carrying out innovative research in a very wide variety of scientific fields including: chemistry, material physics, archaeology and cultural heritage, structural biology and medical applications, environmental sciences, polymer science, information science and nanotechnologies. It is estimated that around 6,500 academics visit the ESRF each year.

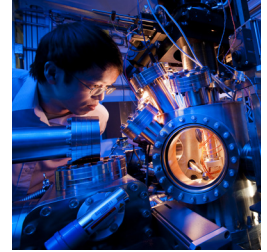
Where is it located? The facility is located in Grenoble, France.

Which countries are involved in it?

The ESRF has 21 partner nations, including mostly EU Member States as well as a number of non-EU countries from Europe and abroad, such as Russia, Norway, Switzerland, Israel and South Africa.

Who funds it? Since it was formed in 1994, it is estimated that the ESRF has received around €2 billion of total investment, the majority of which comes from its individual member nations. The UK provides funding to the ESRF through the Science and Technology Facilities Council. The investment from the UK in 2014 was €6.3 million, the fourth highest individual member contribution behind Germany, France and Italy.⁶⁶

What's the role of the EU in it? While the ESRF does not receive direct funding from the EU, much of the research conducted at the ESRF forms part of EU-funded projects or as part of collaborations involving EU-funded researchers.⁶⁷



Image

The Canadian Light Source, ESRF
©lightsources.org
Courtesy: National Synchrotron Radiation Research Center.



Image
Scientist examining culture sample.

European Molecular Biology Organisation (EMBO) and European Molecular Biology Laboratory (EMBL)

What are the EMBO and EMBL? EMBO is an organisation of more than 1700 leading researchers that promotes excellence in the life sciences. Its major goals are to support talented researchers at all stages of their careers, stimulate the exchange of scientific information, and help build a European research environment where scientists can achieve their best work.⁶⁸

The European Molecular Biology Laboratory (EMBL) was created in 1974 following plans elaborated by EMBO. Now an independent organisation, the EMBL conducts basic research in molecular biology, engages in technology development and provides infrastructure, facilities, training and services for researchers.

Where are they located? EMBO and EMBL's headquarters are located in Heidelberg, Germany. In addition, EMBL operates outstations in 4 European countries, including the European Bioinformatics Institute in Hinxton, UK.

Which countries are involved in their funding and governance? Funding and support for EMBO programmes of activities is provided by the European Molecular Biology Conference (EMBC), an inter-governmental organisation with 27 member nations, including mostly EU Member States as well as Norway, Switzerland, Israel and Turkey. In 2014, the UK provided 14.6% of total member nation contributions to the EMBC.⁶⁹

EMBL is funded by 21 European member nations, including most EU Member States, and by Australia and Argentina as associate member states. EMBL funding comes predominantly from its individual member nations, of which the UK was the third highest individual contributor in 2014 after Germany and France. Roughly one third of EMBL's budget of € 210 million in 2014 was contributed by third party funding.⁷⁰

What's the role of the EU? EMBO and EMBL both act independently from the EU, but work closely together and synergise their activities with the European Commission. EMBL's collaboration with the EC began with a cooperation agreement first signed in 1995. Today cooperation is based on a Memorandum of Understanding implemented through biannual work plans. The agreement grants the EC 'observer status' in EMBL. While EMBL does not receive direct funding from the EU, the EU funding programmes for research remain the biggest external funding source of EMBL and with €13.5 million accounted for 30% of external funding awarded to EMBL in 2014. 30% of EMBL's research faculty hold ERC grants and in the years 2012-2014 EMBL coordinated 20 and participated in 88 collaborative projects funded by the European Commission Framework Programmes.

European Southern Observatory (ESO)

What is the European Southern Observatory? The European Southern Observatory (ESO) (more formally known as the European Organisation for Astronomical Research in the Southern Hemisphere) is an intergovernmental organisation, focussed on the design, construction and operation of powerful ground-based observation facilities for astronomy. This enables European researchers to conduct ground-breaking astronomical research that would not be possible in their home nations. ESO work has paved the way to pioneering observations and discoveries such as identifying extra-solar planets and black holes in the Milky Way. ESO is the most productive astronomical observatory in the world. In 2013, over 840 refereed papers were published based on data from ESO-based studies.⁷¹ The ESO also promotes the mobility and co-operation of European scientists, for example by hosting externally-funded (e.g. Marie Skłodowska-Curie Actions) researchers and maintaining a programme of international conferences.

Where is it located? Based in Garching, near Munich, Germany, the ESO operates three observing sites in the Atacama Desert region of northern Chile.

Which countries are involved in it? There are 16 ESO member nations, along with the host state of Chile, including EU Member States, non-EU countries (Switzerland) and non-European countries (Brazil is in the process of ratifying its membership).

Who funds it? In 2014, ESO received €140.6 million in funding from its member nations, of which the UK provides 15.7% (third highest contributor after Germany and France).⁷²

What role does the EU play in it?

The ESO operates independently from the EU and is controlled by its own directorates and governing council. The ESO plays a central role in a number of EU-funded research networks. For example, the OPTICON (The Optical Infrared Co-ordination Network) project has received €10 million in EU funding and involves several UK universities.⁷³ The project aims to bring together members of national and international agencies and organisations to help improve the quality of facilities and the standard of training and development for astronomy research.

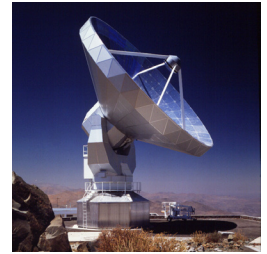


Image
ESO telescope at La Silla Observatory, Chile. ©Iztok Bončina/ALMA (ESO/NAOJ/NRAO).

The ITER Organisation

What is ITER? ITER is an international-scale research and engineering project intended to demonstrate the scientific and technological feasibility of nuclear fusion as an energy source and pave the way for a functioning fusion power plant.

Where is it located? In 2010, construction began of the world's largest experimental tokamak nuclear fusion reactor at a location adjacent to CEA-Cadarache nuclear research centre in the south of France.

Which countries are involved in it? The parties developing ITER are China, the EU, India, Japan, the Russian Federation, South Korea and the USA, with the partners signing the ITER Agreement in 2007.⁷⁴ This scale of global scientific collaboration is comparable only with the International Space Station.

Who funds it? What's the role of the EU in it? The EU's commitments to the ITER Agreement were agreed through the European Atomic Energy Community (EURATOM) Treaty. The EU is contributing 45% of the construction phase (buildings, machine components and assembly) cost and 34% of the cost of operation, deactivation and decommissioning of the facility for the ITER project, with the other six parties contributing approximately 9% each. The current cost estimates for the European contribution to ITER construction phase (2007-2020) amount to €6.6 billion.⁷⁵ UK industry has so far been awarded over €170 million worth of contracts as part of the ITER project (ranked third behind France and Italy).⁷⁶



Image
The ITER Facility, St Paul-Les-Durance, France
©MatthieuCOLIN.com



Image

Launch of Flight VA224 of the Ariane 5 mission. ©ESA/CNES/ARIANESPACE-Optique Video du CSG, S. Martin

European Space Agency (ESA)

What is the European Space Agency?

The European Space Agency (ESA) is an independent intergovernmental organisation devoted to conducting aero-space research and exploration. ESA's activities have included human spaceflight missions (such as experiments conducted on the International Space Station) and unmanned space exploration (such as the Rosetta spacecraft for studying comets), as well as the design, testing and operation of satellites for commercial and scientific purposes such as earth observation and telecommunication projects.

Where is it located? ESA headquarters are based in Paris but it also has research facilities in a number of locations around Europe including the European Centre for Space Applications and Telecommunications (ECSAT) at Harwell in Oxfordshire, UK.

Which countries are involved in it?

ESA comprises 22 member nations, mostly EU Member States as well as Norway and Switzerland. Canada is an Associate Member of ESA.

Who funds it? In 2015 ESA received total funding of €4.4 billion, 73% of which was contributed by individual member nations.⁷⁷

The UK provided €322 million towards this current ESA budget, the fourth highest individual contributor behind Germany, France and Italy.

What's the role of the EU in it? ESA is not an agency or body of the EU. However, ESA maintains close ties with the EU and the two organisations have jointly developed a European Space Policy.⁷⁸ Roughly 23% of ESA's funding in 2015 was provided by the EU, which is more than any individual member nation.

ESA's relationship with the International Space Station (ISS) The ISS is an international collaborative project involving the United States, Russia, Canada, Japan and 10 of the 21 ESA member nations (Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden and Switzerland). These ESA members contribute approximately 8% of the total estimated costs for the development, construction and maintenance of the ISS.⁷⁹ The UK is not involved in the construction of the ISS but takes part in some of the research projects carried out on board, such as the ESA Programme for Life and Physical Sciences in Space (ELIPS).⁸⁰

Other intergovernmental research facilities

The UK takes part in other intergovernmental organisations. These provide research infrastructures to European researchers and include:

- European Incoherent Scatter (EISCAT)
- Copernicus (formerly Global Monitoring for Environment and Security or GMES)
- Institut Laue-Langevin (ILL)
- European Centre for Medium-Range Weather Forecasts (ECMWF)
- European Organisation for the Exploitation of Meteorological Satellites (EUMESAT)

What role does the EU play in supporting researchers to collaborate and partner with other countries?

Collaborations are vital for science, and scientists want to work with the best in their field irrespective of their geographical location and institutional affiliation.

Researchers often seek to collaborate. Institutional frameworks can enable, facilitate and promote these. For example, researchers in different countries might operate on different funding cycles, which makes collaborations difficult. By pooling resources together and distributing them centrally, EU funding can overcome these challenges, lowering the cost of collaborations and simplifying them.⁸¹ Most EU funded research is intrinsically collaborative, bringing together expertise from different sectors and countries to share knowledge and expand networks.

A number of specific EU initiatives seek to promote and support such collaborations:

Joint Programming Initiatives

Joint Programming Initiatives (JPIs) aim to pool national research efforts to make better use of Europe's limited public research and development resources and tackle common European challenges more effectively in a few key areas.

JPIs are public-public research partnerships between participating countries within the European Research Area (ERA). Participating countries agree, on a voluntary basis and in a partnership approach, on common strategic research agendas, to be implemented jointly. The ERA-NET Cofund financially supports the preparation, establishment, design and implementation of these partnerships but the operating costs of the partnership come from participating member states.

Currently, ten JPIs are operational and the UK takes part in all of them.⁸² These are:

- Neurodegenerative Disease Research (JPND)
- Agriculture, Food Security and Climate Change (FACCE)
- A Healthy Diet for a Healthy Life
- Cultural Heritage and Global Change: A Challenge for Europe
- Urban Europe
- Connecting Climate Knowledge for Europe (CliK'EU)
- More Years, Better Lives – The Potential and Challenges of Demographic Change
- Antimicrobial Resistance (AMR)
- Water Challenges for a Changing World
- Healthy and Productive Seas and Oceans (OCEANS)

Four joint programmes have been initially proposed under Horizon 2020:⁸³

- European and Developing Countries Clinical Trials Partnership 2 (EDCTP2)
- The European Metrology Programme for Research and Innovation (EMPIR)
- Eurostars 2 (support for high-tech SMEs)
- Active and Assisted Living Research and Development Programme

Joint Technology Initiatives⁸⁴

The European Commission promotes research collaborations between public and private partners across Europe through its Joint Technology Initiatives (JTIs).

JTIs support large-scale multinational research activities in areas of major interest to European industrial competitiveness and issues of high societal relevance. They are run as Joint Undertakings that organise their own research agenda and award funding for projects on the basis of open calls.

Current JTIs operate in a number of areas of strategic importance for the EU:

- Innovative Medicines 2 (IMI2): to develop next generation vaccines, medicines and treatments, such as new antibiotics.
- Fuel Cells and Hydrogen 2 (FCH2): to accelerate market introduction of clean and efficient technologies in energy and transport.
- Clean Sky 2 (CS2): to develop cleaner, quieter aircraft with significantly less CO₂ emissions.
- Bio-based Industries (BBI): to use renewable natural resources and innovative technologies for greener everyday products.

- Electronic Components and Systems for European Leadership (ECSEL): to boost Europe's electronics manufacturing capabilities.
- Shift2Rail: to develop better trains and railway infrastructure that will drastically reduce costs and improve capacity, reliability and punctuality.
- Single European Sky ATM Research (SESAR) 2020: to develop the new generation of European Air Traffic Management system that will enhance the performance of air transport

Intergovernmental frameworks for research collaborations

A number of European intergovernmental agreements and frameworks exist to foster research collaborations. These are not EU initiatives but the EU and its Member States play an important role in them. These include:

- European Cooperation in the field of Scientific and Technical Research (COST)
- European Energy Research Alliance (EERA)
- Pan-European network for market-oriented, industrial R&D (EUREKA)

The Innovative Medicines Initiative (IMI)

What is the IMI? The Innovative Medicines Initiative (IMI) is a public-private partnership between the EU and the European Federation for Pharmaceutical Industries and Associations (EFPIA) that aims to speed up the development of, and patient access to, innovative medicines. The IMI supports collaborative research projects and networks of different stakeholders (e.g. researchers, the pharmaceutical industry, SMEs, public bodies, patient organisations etc) to encourage pharmaceutical innovation in Europe.

What is the budget? The current second phase (IMI 2) of the programme has a budget of €3.3 billion for the period 2014 – 2024. Of this: €1.6 billion comes from Horizon 2020; €1.4 billion comes from EFPIA companies; and up to €213 million comes from other life science industries or organisations.⁸⁵

What does the IMI Instrument Fund?

The IMI currently lists over 50 currently ongoing Europe-wide projects⁸⁶, focussed on specific aspects of pharmaceutical development. For example, the CHEM 21 Project⁸⁷ is focussed on finding ways to make the chemical processes involved in drug synthesis more environmentally sound. This involves the participation of EFPIA companies (e.g. GlaxoSmithKline and Pfizer); UK-based Universities (e.g. Manchester, Durham, York and Leeds) and UK-based SMEs.

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The Royal Society is a self-governing Fellowship of many of the world's most distinguished scientists drawn from all areas of science, engineering, and medicine. The Society's fundamental purpose, as it has been since its foundation in 1660, is to recognise, promote, and support excellence in science and to encourage the development and use of science for the benefit of humanity.

The Society's strategic priorities emphasise its commitment to the highest quality science, to curiosity-driven research, and to the development and use of science for the benefit of society.

These priorities are:

- Promoting science and its benefits
- Recognising excellence in science
- Supporting outstanding science
- Providing scientific advice for policy
- Fostering international and global cooperation
- Education and public engagement

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