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The role of EU funding in UK research and innovation

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List of Abbreviations

AAL	Active and Assisted Living Research and Development Programme
ABPI	Association of the British Pharmaceutical Industry
ADS	Archaeology Data Service
AHSS	Arts, humanities and social sciences
AIG	European Research Council advanced grants
ALL	Acute lymphoblastic leukaemia
AMRC	Association of Medical Research Charities
ATI	Aerospace Technology Institute
BBI	Bio-Based Industries
BEIS	Department for Business, Energy and Industrial Strategy
BERD	Business Enterprise Research and Development
CEMAS	Centre of Excellence for Mobile Applications and Services
CERN	European organisation for Nuclear Research
CS	Clean Sky
COG	European Research Council consolidator grants
CORDA	COMmon Research DATA Warehouse
DG CONNECT	Directorate-General for Communications Networks, Content & Technology
DG DEVCO	Directorate-General for International cooperation and Development
DG EAC	Directorate General for Education and Culture
DG HOME	Directorate-General for Migration and Home Affairs
DG GROW	Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs
DG SANTE	Directorate-General for Health and Food Safety
EC	European Commission
ECSEL	Electronic Components and Systems for European Leadership
ECU	European Currency Unit
EDCTP	European and Developing Countries Clinical Trials Partnership
EIB	European Investment Bank
EFPIA	European Federation of Pharmaceutical Industries and Associations
Enpr-EMA	European Network of Paediatric Research at the European Medicines Agency
EMA	European Medicine Agency
EMPIR	European Metrology Programme for Innovation and Research
EMRP	European Metrology Research Programme
EPSRC	Engineering and Physical Sciences Research Council
ESRC	Economic and Social Research Council
ERA-NET	European Research Area Network
ERIC	European Research Infrastructure Consortium
ERDF	European Regional Development Fund
ERC	European Research Council
ESA	European Space Agency
ESF	European Social Fund
ESFRI	European Strategy Forum on Research Infrastructures
ESIF	European Structural and Investment Fund
ESS	European Social Survey
ESS HQ	European Social Survey headquarter
ESPRIT	European Strategic Program on Research in Information Technology
EU	European Union
EURAMET	European Association of National Metrology Institutes
FCH	Fuel Cells and Hydrogen
FP7	Seventh Framework Programme for Research and Technological Development
GERD	Gross domestic expenditure on research and development
GtR	Gateway to research

GVA	Gross Value Added
H2020	Horizon 2020
HE	Higher Education
HEFCE	Higher Education Funding Council for England
HEI	Higher Education Institutions
HES	Higher or Secondary Education Establishments
HESA	Higher Education Statistics Agency
ICT	Information and Communication Technology
IMI	Innovative Medicine Initiative
IT	Information technology
ITD	Integrated Technology Demonstrator
ITN	Innovative Training Network
JPI	Joint Program Initiative
JTI	Joint Technology Initiative
MSCA	Marie Skłodowska-Curie Actions
MRC	Medical Research Council
MS	Member State
NACE	Statistical classification of economic activities in the European Community
NC3Rs	National Centre for the Replacement, Refinement and Reduction of Animals in Research
NDPB	Non-Departmental Public Body
NIBEC	Nanotechnology and Integrated BioEngineering Centre
NPL	National Physical Laboratory
ONS	Office for National Statistics
OTH	Other
P2P	Public to public partnerships
PUB	Public bodies (excluding Research Organisations and Secondary or Higher Education Establishments)
PRC	Private for-profit entities (excluding Higher or Secondary Education Establishments)
QALY	Quality-Adjusted Life Year
R&D	Research and Development
REC	Research organisations
REF	Research Excellence Framework
RISE	Research and Innovation Staff Exchanges
RIA	Research and Innovation Actions
S2R	Shift2Rail
SAFE	Stroke Alliance for Europe
SI	International System of Units
SIG	European Research Council starter grants
SME	Small and medium-sized enterprise
TRL	Technology Readiness Level
UK	United Kingdom
UOA	Unit of Assessment
US	United States
WEFO	Welsh European Funding Office

Glossary of data sources

Short name	Full name	Description
CORDA ^[1]	Common Research Data Warehouse	Repository of the European Commission and portal for EU-funded research projects. The database contains data on applicants/proposals and signed grants/beneficiaries with regards to a specific EU Framework Programme for research and innovation. In this study, we use it to analyse data from the 7 th EU Framework Programme (FP7) (2007-2013) and the 8 th EU Framework Programme (Horizon 2020) (2014-2020).
HES	Higher or Secondary Education Establishments	A legal entity that is recognised by its national education system as a University or Higher or Secondary Education Establishment. It can be a public or a private body
PUB	Public bodies (excluding Research Organisations and Secondary or Higher Education Establishments)	Any legal entity established as a public body by national law or an international organisation. Excludes Research Organisations and Higher or Secondary Education Establishments*
PRC	Private for-profit entities (excluding Higher or Secondary Education Establishments)	Private, for-profit entities, including large, small or medium-sized enterprises and excluding Universities and Higher or Secondary Education Establishments
REC	Research organisations	A legal entity that is established as a non-profit organization and whose main objective is carrying out research or technological development
OTH	Other organisations	Any entity not falling into one of the other four categories
SME	Small or medium-Sized Enterprise	A micro, small or medium-sized enterprise within the meaning of Recommendation 2003/361/EC. Necessary (but not sufficient) conditions for being an SME are a number of employees smaller than 250 and an annual turnover not exceeding €50 million, and/or an annual balance sheet total not exceeding €43 million.
GtR	Gateway to Research	GtR is an open source database provided by Research Councils UK (RCUK) to enable users to search and analyse information about publicly funded research. It provides information about data from the main providers of publicly funded competitive grants, including each of the UK's seven grant-awarding research councils, Innovate UK and the National Centre for the Replacement, Refinement and Reduction of Animals in Research (NC3Rs). It provides information from 2006 onwards about publications, people, organisations and outcomes related to the funded research
HESA ^[2]	Higher Education Statistics Agency	HESA collects quantitative information from all public (and some private) higher education institutions in the UK. It publishes data about the institutions' finances, including a breakdown of the income of each higher education provider by source (e.g. from 'EU government bodies') and by 'cost centre' (i.e. academic departments/disciplines)
	Income from EU government bodies	Includes all research grants and contracts income from all government bodies operating in the EU, which includes the European Commission, but excludes bodies in the UK, see HESA definitions of research grants and contracts
	Income from UK government bodies	Includes income from (1) the UK Research Councils, the Royal Society, British Academy and (2) UK central government bodies, local authorities, health and hospital authorities, see HESA definitions of research grants and contracts

Sources:

[1] European Commission definitions of types of organisations, https://ec.europa.eu/programmes/horizon2020/sites/horizon2020/files/horizon_2020_first_results.pdf

[2] HESA definitions of research grants and contracts (<https://www.hesa.ac.uk/support/definitions/finances>)

Executive summary

This report

The United Kingdom's (UK) National Academies — the Academy of Medical Sciences, the British Academy, the Royal Academy of Engineering and the Royal Society — commissioned Technopolis to provide an in-depth understanding of the role of EU funding within the UK research and innovation landscape.

The UK's withdrawal from the European Union (EU) will have significant implications for UK research and innovation. The overall magnitude of funding flowing from EU programmes to UK research and innovation within universities and companies is well documented, but there is less understanding about the role of EU funding across different parts of the UK research and innovation landscape at a more granular level.

The evidence and analysis undertaken reflect the importance of EU funding across all academic disciplines, industrial sectors, organisation types, and across the whole innovation pipeline.

The report brings together available evidence from a combination of secondary data sources and primary research conducted through a programme of targeted interviews.

EU research and innovation funds

The EU provides funding for research and innovation through three main sources: (i) the EU Framework Programmes for research and innovation, (ii) the European Structural and Investment Funds (ESIF), specifically funding for research and innovation under the European Regional Development Fund (ERDF) and (iii) loans from the European Investment Bank (EIB).

Together, the EU Framework Programmes for research and innovation and ERDF have provided UK organisations with around €9bn in grants across the seven-year term of the previous programming period (2007-2013) (€7bn and €1.9bn respectively).

In the current programming period, these two sources of EU funds have provided UK organisations with income of circa €1.1bn a year, which is a substantial figure in absolute terms and a meaningful contribution to the total national research effort: it amounts to more than 10% of total government support for UK research and innovation and is around 5% of UK gross domestic expenditure on R&D (GERD) (which includes public and private funding).

Additionally, we estimate that the European Investment Bank (EIB) has provided loans for research and innovation-related activities to UK organisations for a value of €5.9bn in the period 2007-2016, including €2.8bn for UK universities and knowledge transfer services.

EU funding of UK academia

UK higher education institutions (HEIs), collectively report around £725m in research grant income from EU government bodies in 2014/15, according to data provided by the Higher Education Statistics Agency (HESA). HESA data 'Income from EU government bodies' incorporates all research grants and contracts income from all government bodies operating in the EU, including the European Commission as well as bodies outside EU Institutions. It is not possible to fully disentangle funding from the EU from other sources of funding within the geographic area that the EU covers (e.g. individual Member States). However, this data remains as the best proxy available to investigate the importance of EU funds to UK HEIs.

This is 12% of UK HEIs' £5.9bn total income from research grants and contracts, or around 25% of the £2.75bn in research grants provided by the UK government bodies (including Innovate UK and the

seven grant awarding research councils)¹. These figures relate to research grants and contracts only and exclude the £1.8bn in quality-related research (QR) income from the UK Funding Councils. Research grant income from EU government bodies still constitute more than 9% of total HEI income, even when QR funding is included.

Funding by academic disciplines

The HESA data shows that in 2014/15 UK HEIs reported research grant income from EU government bodies, in every one of the agency's 40 disciplinary categories or cost centres, from Clinical Medicine (£119m) to Sports Science (£0.4m). This shows the breadth of academic engagement in EU programmes.

When analysing HESA data we explore two different perspectives: first, we look at the absolute value of the research grant income from EU government bodies, and second, we look at relative value of research grant income from EU government bodies with respect to research grant income from all sources. This provides a different list of universities and disciplines that are important to consider: those who may find it more difficult to fully replace a potential reduction in EU funds (as defined above) given its sheer volume, and those for whom this volume (even if relative small) represents a high share of the total value of research grant income and consequently have a higher level of dependency.

The analysis of absolute values show that, across disciplines, research grant income from EU government bodies is concentrated, with the top 10 disciplines accounting for more than 70% of the £725m total, while the bottom 10 disciplines account for around £20m or 2%.

The natural and physical sciences dominate the figures, with HEIs reporting around £366m in EU research income (50%) for the top five subjects (by income) combined. These comprise Clinical medicine (£119m), Biosciences (£90m), Physics (£55m), Chemistry (£54m) and IT (£46m).

In terms of relative importance (i.e. research grant income from EU government bodies as a share of total research grant income from all sources) we find that there is a high degree of variability across disciplines, ranging from Archaeology, which received 38% of its research income from the EU, to sports science, which received only 4% from the EU.

The arts, humanities and social sciences (AHSS) feature prominently in the list of 10 most dependent subjects, even though they typically account for smaller volumes of EU research income in absolute terms. However, it is not exclusively so, with IT systems (30%) and Chemistry (23%) also featuring in the top 10. The analysis shows 15 of 40 subjects have dependency ratios of 20% or higher, of which 11 are AHSS subjects. The predominance of AHSS subjects partly reflects their greater reliance on institutional funding, as compared with the natural and physical sciences, and QR funding is outside the scope of these HESA statistics on research grant income. Nevertheless, the analysis suggests these subject areas may be amongst the most at risk from any change in the terms of access to EU funds going forward.

Funding to HEIs

In terms of absolute values, the distribution of research income from EU government bodies is heavily skewed across institutions, with the top 10 HEIs accounting for around £340m (47%) of the total £725m in research income from EU government bodies in 2014/15 and the top 20 accounting for around £476m or 66% of the total (according to HESA data). The top 10 HEIs each secured income of between £60m and £18M, and are dominated by the UK's larger, research-intensive universities. These funds are widely distributed across institutions, however, with more than 100 HEIs securing £0.5m or more in research income from EU government bodies in 2014/15.

¹ In our analysis, we have joined together two categories of research grant income provided by HESA data: 'Research Councils, Innovate UK and the national academies' and 'UK central government bodies, local authorities, health and hospital authorities'. We called those two categories research grant and contract income from 'UK government bodies'.

Looking at the top 10 HEIs based on the relative importance of research grants income, we find that the top 10 HEIs comprise universities from across England, Northern Ireland and Wales. All of which have dependency ratios that are 20% or higher.

From this perspective, the country's larger, research intensive universities enjoy high levels of research income from EU government bodies that would be difficult to replace given the sheer volume of those funds, however, they are less dependent on this flow of funds as compared with many of the country's mid-sized institutions, with more than 40 having dependency ratios above 20%.

EU funding and industry

EU Framework Programmes for research and innovation ('Framework Programmes') and ERDF both provide substantial volumes of direct funding to UK businesses, to support their in-house research and innovation activities. The levels of EU funding are broadly similar for both programmes, albeit the ERDF programmes are focusing on capital investments in support of SMEs and innovation, while Horizon 2020 places greater emphasis on pre-competitive research and a greater proportion of its support flows to larger firms (approximately 34%).

The current UK budget for ERDF 2014-2020 indicates that around €1bn will be invested with the private sector over the life of the programme, which is around two thirds of the total €1.5bn allocated to Priority Axis 1, on research and innovation. The planned budget anticipates that around €860m (60%) will be spent with SMEs. That will produce an average annual income of around €140m for firms of all sizes and around €120m for SMEs (85%).

Additionally, UK industry has secured around €500m in EU funding from Horizon 2020 (the 8th EU Framework Programmes), up to 2015, or around £190m a year, based on CORDA data. The equivalent industry figure for the whole of the 7th EU Framework Programmes (FP7) was around £1bn or around £140m a year (also based on CORDA data). As with the ERDF programme, the majority of funding from the Framework Programmes to UK industry flows to SMEs, which secured around £660m (€805m) in FP7, as compared with large firms, which secured around £350m (€435m).

Total income from the Framework Programmes for UK industry is a small fraction of UK Business Expenditure on R&D (BERD), equivalent to approximately 0.9% of total expenditure during the FP7 programming period (2007-2013). However, UK BERD – as in most countries – is overwhelmingly dominated by large enterprises, which account for almost 97% of the total Business expenditure on R&D. This figure masks the importance of the Framework Programmes to smaller firms. Indeed, EU industry research income is a significant contributor to UK SMEs' research capacity, equivalent to around 17% of UK BERD carried out by SMEs.

Moreover, the combined EU funding for industry compares favourably with the scale of investment of Innovate UK, the country's national innovation agency, which invested around £516m in 2015/16.

There are several hundred companies (including SMEs and large companies) that have participated in multiple projects and multiple EU Framework Programmes, and derive many non-monetary benefits from their involvement, through strategic collaboration, competitor monitoring, agenda setting and market appraisal.

More specifically, we considered the extent to which EU funding has enabled UK enterprises to access new markets in Europe and internationally. Various evaluations of the EU Framework Programmes for research and innovation have looked at this question and reached a strongly positive conclusion. Several of the Commission's external evaluations of FP7 conclude that a small majority of all business participants (50-60%), not just UK firms, report improved access to other European markets as a result of their participation in the programme.

EU funding across the UK regions

EU funds are supporting research and innovation activity across the UK. The EIB is providing long-term, low-interest loans to universities and research institutes across the country, in England, Northern

Ireland, Scotland and Wales, supporting capital projects ranging from the relocation of the University of Ulster to Belfast City Centre and the expansion of the new research facilities at Swansea University's new Bay Campus through to the development of UCL's Bloomsbury Campus in London.

European Structural Funds are only invested in eligible regions, so are spent in weaker regional economies to a greater extent than Horizon 2020 funds. The current ERDF 2014-2020 programme is expected to provide research and innovation income to regions in each of the UK's four nations. England accounts for the largest share of the €1.5bn pot, with around €816 million of the total (about 55%), with Wales expected to be awarded around €388m (26%), Scotland €158m (11%) and Northern Ireland accounting for around €113 million (8%).

The picture changes dramatically when one adjusts these figures in line with the countries' populations, with Wales expected to achieve €125 per capita. That is more than five times the UK average (€23 per capita), and almost 10 times the figure for England (€15 per capita). The figure for Northern Ireland (€60 per capita) is also markedly higher than the UK average. These data underline the importance of European Structural Funds for Wales in particular.

In the case of **Horizon 2020**, the geographical distribution shows England dominates the flow of funds in absolute terms, with more than €2.2 billion in income, or 85% of the UK total until 2016, based on CORDA data. Wales (€55m) and Northern Ireland (€43m) have achieved EU income levels two orders of magnitude lower than England and an order of magnitude lower than Scotland (€296m).

In proportionate terms, however, Scotland is achieving a higher level of income per capita (€55 per capita compared with a UK average of €40) than all of the other nations.

Dropping down a level, to the three nations and nine English regions, we find a further concentration of Horizon 2020 income around the south and east of England. Greater London dominates the flow of funds (€633m until 2016). Other UK regions that receive a large proportion of total funding are the South East England, the East of England, Scotland and the South West of England. In all regions, universities are the primary recipients of the total flow of Horizon 2020 income. Private companies are major beneficiaries too, especially in Greater London, the South East of England and the East of England.

Wales and Northern Ireland depend to a much greater extent on ERDF as compared with Horizon 2020, for the supply of funds for regional research and innovation activities, which reflects the logic of the Structural Funds to a large extent and underlines its complementarity with Horizon 2020, which follows established capacity to a greater extent.

We further explore the issue of EU funding across the UK regions and UK HEIs using HESA statistics. As discussed above, HESA data combine income from several sources within the EU, and cannot be split out to reveal the particular level of income attributable to Horizon 2020 or the European Structural Funds or any other source. From these aggregate figures, however, we can see that all regions are benefiting from substantial flows of research income from EU government bodies.

For 2014/15, we find that HEIs in Greater London secured the greatest volume of research income from EU government bodies (£168m) of any of the 12 UK regions, followed by the South East, Scotland, and the East of England.

When we consider research income from EU government bodies as a share of all HEI research income, we find a narrow spread across the regions, suggesting that much of the difference in absolute income is explained by differences in the number and scale of the HEIs located in each region: the individual regional dependency ratios range from 11% to 17%, and average around 13%. The regions with clusters of HEIs that are relatively more dependent on EU funding are Wales (17%), the West Midlands (16%), the South West (15%) and Yorkshire and the Humber (15%).

Research activities uniquely supported by the EU

The EU programmes described above support several important types of research activity in the UK that are not well-funded through national research and innovation programmes.

EIB and ERDF funding supports investments in research and innovation facilities and capacities, and offers opportunities that are not currently available through other channels. The majority of funded activities - with the exception of ERDF INTERREG - are implemented nationally and could, in principle, be funded through national programmes.

Horizon 2020 in turn is unique, and is the only international research and innovation programme of scale anywhere in the world. Other international research programmes are orders of magnitude smaller and often more narrowly based geographically and/or thematically. Major intergovernmental science programmes, like CERN or ESA, do have annual budgets running in to the billions, however, the very great majority of this expenditure is committed to the operation and maintenance of the facilities and programmes, and their calls for proposals are very much fewer and very much smaller than those run by Horizon 2020.

International cooperation is part of the programme's DNA, which is absolutely not the case for the very great majority of national research and innovation programmes.

In addition, the EU Framework Programmes for research and innovation – provides UK-based organisations with access to several types of research instrument that is not available nationally, including: (i) large collaborations and (ii) large-scale investigator awards.

EU Framework Programmes for research and innovation have provided substantial funding for a limited number of large-scale partnerships. The largest of these types of initiatives – Joint Technology Initiatives (JTIs) and so-called Article 185 actions – involve very large budget commitments from the EU, as well as other partners, which run into the billions collectively, and dwarf the very great majority of national collaborations here in the UK or elsewhere. As a case in point, the Innovative Medicines Initiative (IMI) is expected to invest more than €3.3 billion in the 10-years from 2014-2024. The Clean Sky public-private partnership is focusing on improving the environmental performance of aircraft, and is expected to mobilise a budget of around €5.6 billion in the 12-year period 2008-2020. The UK government has launched several large-scale collaborations in sectors such as Energy and Aerospace but these are predominantly national initiatives and do not have the international reach of Horizon 2020.

The Framework Programmes are also a unique source of personal grants and fellowships supporting mobility, career development and frontier research. The European Research Council (ERC), conceived during the course of FP6 and launched in FP7, has established itself as a pre-eminent funder of investigator-driven research and the UK has been singularly successful in attracting ERC grants, as well as awardees from throughout Europe and elsewhere in the world. During FP7, the UK won 22.4% of all grant funding from the ERC. Marie Skłodowska-Curie Actions (MSCA) similarly provides unique support for mobility between countries, sectors or disciplines. ERC grants and MSCAs account for about half of the combined value of fellowships and investigator awards given to UK researchers and –outside of the medical sciences– ERC investigator awards are unique in the scale and scope of support they provide.

There are various other instruments that are unusual and have proved particularly valuable to UK research interests, including the Commission's support for research infrastructure, which has systematised the process by which roadmaps are developed and facilities are prioritised and ranked. It has also provided additional funds for the development and modernisation of facilities in return for enhanced access rights for all EU researchers or the creation of more independent, sustainable institutions through the European Research Infrastructure Consortium (ERIC).

EU funding and leverage

Each of the three EU funding programmes provides a degree of financial leverage, by design.

Where the EIB provides loans to finance research and innovation schemes, its agreement is often an endorsement of the proposals and can be the key to attracting other investors. These loans can cover up to 50% of the total cost, however, on average the EIB share is about one-third of the total funding required. From this simple financial perspective, the EIB's provision of around €5bn in loans to various UK universities and companies over the past 10 years would have been matched by additional investments of around €10bn.

The ERDF rules require national co-financing of all supported projects, from either public or private sources. The EC co-financing rates are typically 75% or 85% of the total budget, depending upon the location of the project or the partners involved, with the higher level of support available to research and innovation actions based in the 'weakest' regions economically. Importantly, those funds must be additional to, and not replace, existing national funding.

In terms of the EU Framework Programmes for research and innovation, specifically FP7 and Horizon 2020, the UK has secured around €9.6bn in EC contributions and €2.3bn in contributions from the project partners themselves. In addition to the formal requirements for co-financing by project participants, the literature suggests that public R&D expenditure, such as the EU Framework Programmes, has a significant 'crowding-in' effect, encouraging further private investment in R&D outside the programme.

The European Commission has funded several large scale econometric studies working with FP7 projects, which have estimated this rate of additionality at 0.74, that is for every €1 spent on R&D by the European Commission, a further €0.74 will be invested by companies or other organisations in the wider EU economy. The rate was determined at the EU level; however, it is not unreasonable to assume that the effect would be as strong or possibly stronger, in an open and highly competitive economy like the UK. Applying this rate to the UK participation in FP7 and Horizon 2020 (to date), we arrive at an estimate of the total research and innovation expenditure of €16.6bn (174% of €9.6bn).

1 Introduction

1.1. This report

The United Kingdom's (UK) National Academies — the Academy of Medical Sciences, the British Academy, the Royal Academy of Engineering and the Royal Society — commissioned Technopolis to provide an in-depth understanding of the role of EU funding within the UK research and innovation landscape.

The UK's withdrawal from the European Union (EU) will have significant implications for UK research and innovation. The overall magnitude of funding flowing from EU programmes to UK research and innovation within universities and companies is well documented, but there is less understanding about the role of EU funding across different parts of the UK research and innovation landscape at a more granular level.

The evidence and analysis undertaken reflect the importance of EU funding across all academic disciplines, industrial sectors, organisation types, and across the whole innovation pipeline.

1.2. Aim of the report

This report brings together available evidence from literature and data sources at UK and EU levels to i) provide a better understanding of the role of EU funding in the UK research and innovation landscape, and ii) identify potential dependencies and risks for UK research and innovation related to the UK's departure from the EU. The study attempts to make the best possible use of available secondary data and any limitations, intrinsic to those sources of information, are documented in the report.

The report is structured as follows:

- Section 2 introduces the main EU sources of funding for UK research and innovation, including the EU Framework Programmes for research and innovation, relevant parts of the European Structural and Investment Funds (ESIF), and the European Investment Bank.

The following three sections detail where and to whom EU research and innovation funding is awarded in the UK:

- Section 3 addresses the role of EU funding for UK Higher Education Institutions, analysing the proportion of EU funding by academic disciplines and institutions and looks at evidence of impact of university research from EU-funded research.
- Section 4 analyses the role of EU funding for UK companies, looking at the distribution of funding according to sector, company size, Technology Readiness Level and thematic priorities, and explores the connection between EU funding and access to new markets.
- Section 5 analyses the geographical distribution of EU funding across nations and regions in the UK.

The concluding two sections look closer at how EU research and innovation funding is used:

- Section 6 identifies specific types of research and innovation activities in the UK that are uniquely or predominantly funded by the EU. These include large collaborations and partnerships, funding for specific career stages and personal awards.
- Section 7 looks beyond the individual grants and analyses how EU funding leverages funding from other sources.

1.3. Methodology

The study was carried out using a mixed methods approach employing both quantitative data analysis and qualitative methods and included consultation with key stakeholders. The study's main elements are described below.

1.3.1. Desk research

A review of relevant documents, evaluations and literature that contain evidence on the relevance and importance of EU R&D funding for the UK research and innovation system.

1.3.2. Interviews and stakeholder consultation

Key stakeholders from research organisations, funding bodies, charities and industry associations have been consulted for the study. They were invited to give their view on the main study questions and to provide advice on relevant sources of data and other evidence. A list of contributors is given in Appendix A. A stakeholder meeting took place on the 25th January 2017 and interviews were conducted by telephone during February and March 2017.

1.3.3. Quantitative and qualitative data analysis

A number of databases were analysed and secondary sources used as part of this study are listed below. With reference to EU databases, the analysis focuses on describing EU funding for research and innovation in the UK and covers the period of the EU's two latest Framework Programmes for research and innovation, FP7 and Horizon 2020, i.e. from 2007 until the present.

- **CORDA (Common Research Data Warehouse):** CORDA is a repository of the European Commission and portal for EU-funded research projects. The database contains data on applicants/proposals and signed grants/beneficiaries with regards to a specific EU Framework Programme for research and innovation. This data is provided in Euros and have not been converted to pounds—except in cases where direct comparisons are made to UK sources—to avoid generating discrepancies with publicly available information (such as the estimates of participation in the EU Framework Programme provided by the Department for Business, Energy and Industrial Strategy (BEIS)).
- **European Structural and Investment Funds data:** Data on European Structural and Investment Funds, including the European Regional Development Fund (ERDF), is published by the European Commission. UK regions publish operational programmes that provide more insight into each region's strategy and research and innovation budget.
- **European Investment Bank (EIB):** The European Commission publishes information on agreements signed by the EIB, including information on the project name and dates, sector and loan amount.²
- **Gateway to Research (GtR):** GtR is an open source database provided by Research Councils UK (RCUK) to enable users to search and analyse information about publicly funded research. It provides information about data from the main providers of publicly funded competitive grants, including each of the UK's seven grant-awarding research councils, Innovate UK and the National Centre for the Replacement, Refinement and Reduction of Animals in Research (NC3Rs). It provides information from 2006 onwards about publications, people, organisations and outcomes related to the funded research.
- **Research Excellence Framework (REF) impact case studies:** The REF impact case studies were submitted by UK Higher Education Institutions to the UK's last national research evaluation exercise, carried out in 2013 and 2014. About 7,000 impact case studies were submitted to the REF. The information provided in the case studies is used to identify examples of how EU funding has underpinned UK research and has led to economic and societal benefits.
- **Higher Education Statistics Agency (HESA) data:** HESA collects quantitative information from all public (and some private) higher education institutions in the UK. It publishes data about the institutions' finances, including a breakdown of the income of each higher education provider by source (e.g. from 'EU government bodies') and by 'cost centre' (i.e. academic departments/disciplines). Section 3 provides a description of the different categories of income included in the HESA data, including 'Income from EU government bodies'. This category

² <http://www.eib.org/projects/loan/list/index.htm>

incorporates all research grants and contracts income from all government bodies operating in the EU, including the European Commission as well as bodies outside EU Institutions.

As such, the category provides an approximation to the value of ‘EU funding’ for UK HEIs. However, it is not possible to fully disentangle funding from the EU from other sources of funding within the geographic area that the EU covers (e. g. individual Member States). In the absence of more accurate data, this study utilises the HESA classification of ‘income from EU government bodies’ to reflect as closely as is possible with the data available what funding flows from the EU could look like to UK HEIs where no other data is available to do so.

Other data sources used include data from the Wellcome Trust, which contains all projects funded in the UK since 2000, and publicly available data from the ONS on research and development expenditures.

1.3.4. Case studies

A series of short case studies were prepared to complement the statistics and better illustrate the role of EU funding in particular aspects of the UK research and innovation landscape. The case studies were based on interviews and desk research. The case studies provide a more in-depth consideration of dependencies in selected subjects, infrastructures, types of actor and nation.

Extracts of those case studies have been brought forward to the main body of this report to complement the overall, high-level exposition of arguments with some illustrative and concrete examples.

2 Sources of EU funding for UK research and innovation

2.1 Introduction

The EU provides funding for research and innovation through three main sources: (i) the EU Framework Programmes for research and innovation, (ii) the European Structural and Investment Funds (ESIF), and (iii) loans from the European Investment Bank (EIB).

Together, the EU Framework Programmes and ESIF have provided UK organisations with around €9bn in grants across the seven-year term of the previous programming period (2007-2013).

In the current programming period, these two sources of EU funds have provided UK organisations with income of circa €1.1bn a year, which is a substantial figure in absolute terms and a meaningful contribution to the total national research effort: it amounts to more than 10% of total government support for UK research and innovation and is around 5% of UK Gross Expenditure on R&D (GERD) (which includes public and private funding).

Additionally, we estimate that the European Investment Bank (EIB) has provided loans for research and innovation-related activities to UK organisations for a value of €5.9bn in the period 2007-2016.

Table 1 Overview of EU funding for UK research and innovation

	Total value (in EUR million)	Programming period	Annual (estimate)	Total value (in EUR million)	Programming period	Annual (estimate)
EU Framework Programme	€7.0bn	2007-2013 (FP7)	€1.0bn	€2.6bn	2014-2016* (Horizon 2020)	€0.9bn
European Structural and Investment Funds (ESIF) (Priority Area 1)	€ 1.9bn	2007-2013	€0.3bn	€1.5bn	2014-2020 (Commitments)	€0.2bn
European Investment Bank (EIB)	€5.9bn	2007-2016	€0.6	--	--	--

Source: *Horizon 2020 full programming period is 2014-2020, but this report presents data up until 2016.

2.2 The EU Framework Programmes for research and innovation

The EU Framework Programmes are the European Commission’s primary vehicle for supporting research and innovation. They provide funding support to promote the achievement of the following objectives:

- Strengthening Europe’s position in global science, through support for high quality research
- Reinforcing industrial leadership in innovation, including major investment in key technologies, greater access to capital and support for SMEs
- Helping to address major societal challenges such as climate change, developing sustainable transport and mobility, making renewable energy more affordable, ensuring food safety and security, or coping with the challenge of an ageing population

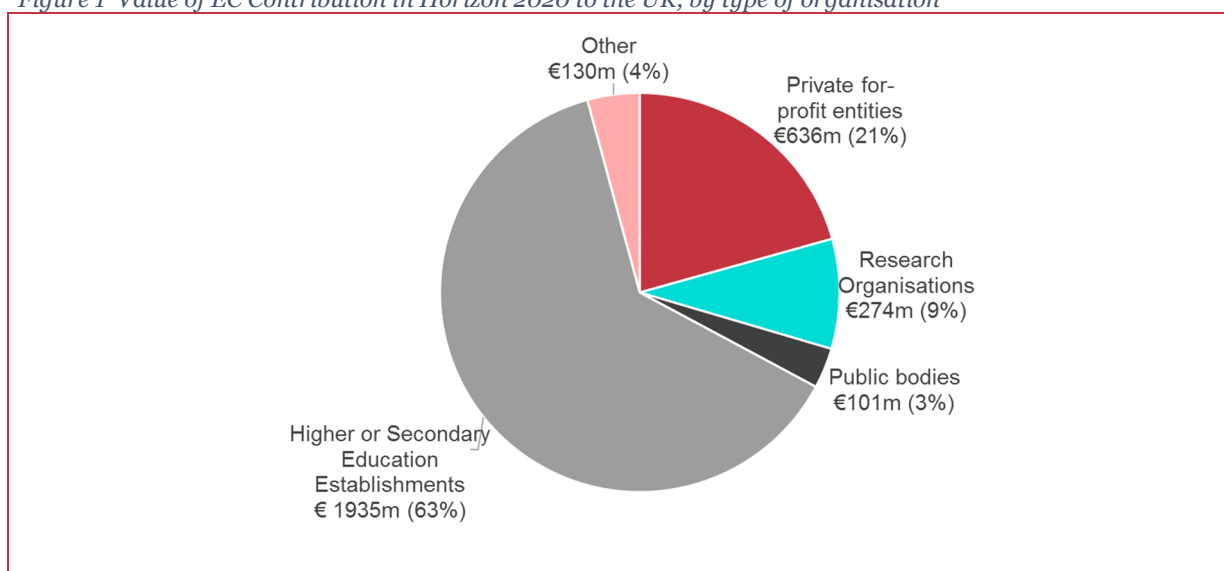
The Framework Programmes are composed of a number of pillars and specific programmes with more specific purposes. The two most recent EU Framework Programmes, FP7 and Horizon 2020 are described in more detail in Appendix C.

The amount of funding allocated annually through each successive EU Framework Programme has increased steadily over the years, from ECU³ 593m in 1984 to €11.1bn in 2013 (current prices),⁴ and is set to continue to increase every year until 2020. The Seventh Framework Programme, FP7 (2007-2013) had a budget of €50.5 billion, which represented a significant increase compared with the Sixth Framework Programme, FP6. With the Eighth and current Framework Programme, Horizon 2020 (2014-2020), the budget has further increased nearly 50% compared to FP7 at €74.8bn over the programming period.⁵

In the first three years of Horizon 2020, which will run from 2014-2020, UK organisations secured funds for a value of €2.6bn. There is a natural time lag in the bidding a contracting process, which may see that three-year figure rise substantially in the final accounts.

As shown in Figure 1 below, higher or secondary education establishments receive by far the largest share of EU funding in the UK whereas, in other countries, other types of research organisations normally receive a much higher share. This is an important starting point to note in the analysis of dependencies on EU funding within the UK research and innovation system.

Figure 1 Value of EC Contribution in Horizon 2020 to the UK, by type of organisation



Source: CORDA

2.3 European Structural and Investment Funds

The European Structural and Investment Funds (ESIF) support economic development in regions across the EU with the aims of reducing inequalities and increasing cohesion. The UK receives funding from two of the three main funds under ESIF: the European Social Fund (ESF) and the European Regional Development Fund (ERDF).⁶ In addition, the UK receives funding from several ‘territorial collaboration’ projects under ERDF, a.k.a. INTERREG, which includes some research and innovation activities.

The current UK budget for the research and innovation priority (priority axis 1) of the European Regional Development Fund (ERDF) is around €2.5bn. This budget anticipates €300m to €400m a year

³ The European Currency Unit (ECU) was replaced by the Euro in 1999.

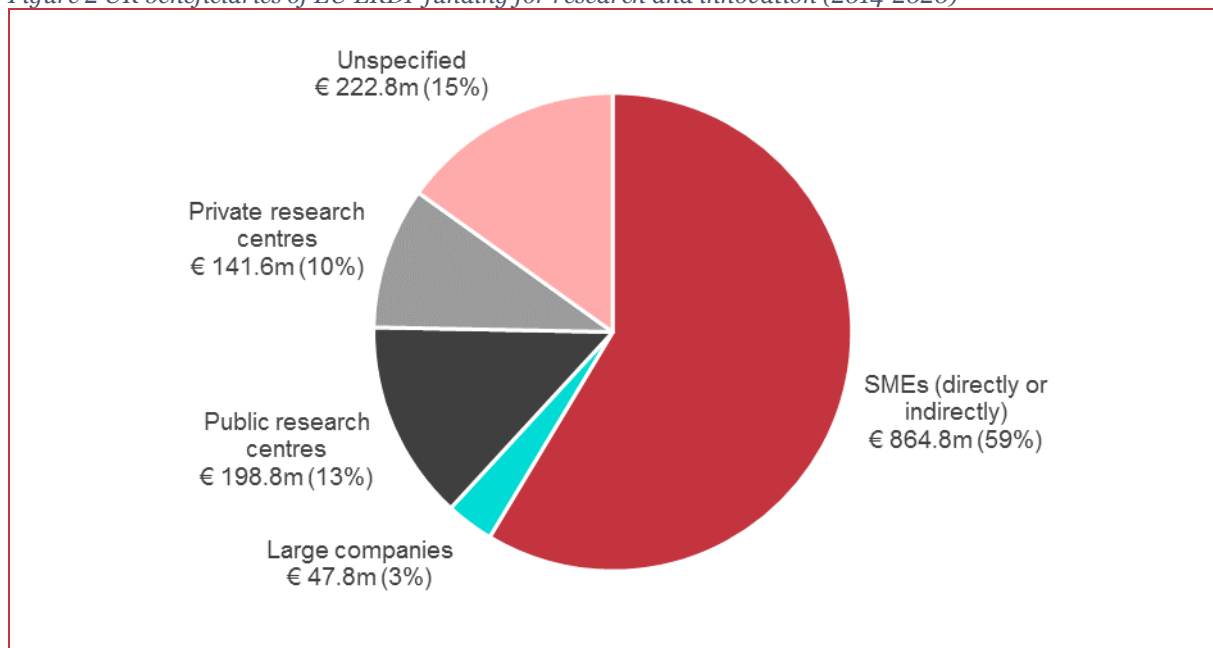
⁴ European Commission (2013), *Development of Community research – commitments 1984-2013* (available at: https://ec.europa.eu/research/fp7/pdf/fp-1984-2013_en.pdf#view=fit&pagemode=none)

⁵ The budget for Horizon 2020 was cut from € 77bn to € 74.8bn in 2015 in order to establish the European Fund for Strategic Investment (ESFI) (see <https://era.gv.at/object/news/1876>)

⁶ SPERI (2016), *UK regions and European structural and investment funds*, Sheffield Political Economy Research Institute British Political Economy Brief No. 24.

investment in research and innovation infrastructure in the UK’s developing regions. The planned EU budget contribution to UK projects under ERDF priority axis 1 amounts to €1.4bn (2014-2020), with the remaining amount expected from national matched funding. When other research and innovation activities from other parts of the programme, outside of Priority Axis 1 are included, the EU budgetary contribution is closer to €1.5bn. This equates to a planned EU contribution of approximately €200m a year. An analysis of the UK’s ERDF portfolio in the current programming period (2014-2020) shows that SMEs are the primary beneficiaries of ERDF research and innovation funding from the EU budget with more than 50% of planned funds to be spent on projects to benefit SMEs directly or indirectly (see Figure 2). Appendix D provides an overview of the funding from ESIF received by the UK and a more detailed breakdown of research and innovation activities funded.

Figure 2 UK beneficiaries of EU ERDF funding for research and innovation (2014-2020)



Source: Technopolis based on UK operational ERDF programmes.

2.4 European Investment Bank

The European Investment Bank’s main activity is to provide loans at low rates to support its four priorities: Innovation and Skills, SMEs, Infrastructure, and Environment and Climate. Between 2007 and 2016, the EIB has provided loans of a value of €54.4bn to the UK.

The majority of this loan book has enabled the UK to move forward with major transport infrastructure projects, like CrossRail or the Manchester Metro Link. The primary focus is not research and innovation. However, the EIB has provided multiple loans to support the renewal and expansion of university campuses and research centres. The loans have enabled research institutes to move forward earlier with more ambitious development plans.

The data do not allow to systematically distinguish those research and innovation-related funding, but our analysis of the portfolio suggests that a total of €5.9bn have been allocated to those activities over the period, 2007-2016. This includes €2.8bn for UK HEIs and knowledge transfer services and more than € 2.5bn to industry research and innovation.⁷ Appendix E provides an overview of EIB investments in the UK and of the research and innovation-related activities within the portfolio.

⁷ <http://www.eib.org/projects/loan/list/index> (Accessed 14 March 2017)

2.5 Other funds

EU funding for research and innovation-related activities are available through various other routes, such as:

- The ERASMUS Plus programme: the Directorate-General for Education and Culture (DG EAC) provides substantial funding for Europe's universities to support high levels of student cross-border mobility, with some small spill-overs into research and innovation activities.
- The COSME programme: implemented by the EC Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) and the European Agency for SMEs (EASME), this programme provides Europe's small businesses with access to a wide range of business support measures, encompassing a number of business development functions, from access to finance, to support for internationalisation (exporting) and various aspects of entrepreneurship. The programme has a number of overlaps (complementarities) with the innovation components of both Horizon 2020 and the ESIF.
- Funding from other sectoral Directorate-Generals outside of the EU Framework Programme: For example, the Directorate-General for Health and Food Safety (DG SANTE) funds a health research programme, which does produce some research income for UK organisations involved with issues like Food Safety or public health. There are similar policy-related research funds in several other DGs, such as the Directorate-General for Migration and Home Affairs (DG HOME), e.g. security research, or the Directorate-General for International Cooperation and Development (DG DEVCO), e.g. research relating to international development issues. The UK is an active contributor within all of these programmes
- Funding from the European Investment Fund (EIF), for example venture capital for SMEs.

These programmes, although relevant, have not been considered for the purpose of this study as they are smaller in scale.

3 The role of EU funding across disciplines and institutions in UK academia

3.1 Introduction

This chapter presents evidence of funding from EU government bodies allocated to different disciplines and UK Higher Education Institutions (HEIs). The volume of funding from EU government bodies and the proportion of funding from EU government bodies over total funding allocated to academia is compared to that allocated by funding from UK government bodies.

The analysis is based on data from the Higher Education Statistics Agency (HESA), the UK agency responsible for the collection, analysis and dissemination of quantitative information about higher education in the UK, to which all UK HEIs report on their income in relation to academic cost centres. Academic cost centres correspond to different disciplines (see Appendix B for an overview of all academic cost centres)⁸. The HESA data uses the following classification of income for research grants and contracts⁹:

- ‘Income from EU government bodies’, which includes all research grants and contracts income from all government bodies operating in the EU, which includes the European Commission, but excludes bodies in the UK’.

As mentioned above, this category incorporates all income from research grants and contracts from all government bodies operating in the EU, including the European Commission as well as bodies outside EU Institutions. As such, the category provides an approximation of the value of ‘EU funding’ for UK HEIs. This is, to our knowledge, the best proxy available to analyse the dependency of UK HEIs (and individual disciplines to EU funding).

- ‘BEIS Research Councils, the Royal Society, British Academy and the Royal Society of Edinburgh’, which includes all research grants and contracts income from Research Councils sponsored by the Department for Business, Energy and Industrial Strategy (BEIS), the Royal Society, British Academy and the Royal Society of Edinburgh, returned to HESA under the following categories:
 - Biotechnology and Biological Sciences Research Council (BBSRC)
 - Medical Research Council (MRC)
 - Natural Environment Research Council (NERC)
 - Engineering and Physical Sciences Research Council (EPSRC)
 - Economic and Social Research Council (ESRC)
 - Arts and Humanities Research Council (AHRC)
 - Science and Technology Facilities Council (STFC)
 - Other (i.e. sponsored research grants and contracts income not included above).
Income from the other National Academies are likely reported under this heading, whether specifically mentioned or included under ‘other’
- ‘UK central government bodies, local authorities, health and hospital authorities’, which includes all research grants and contract income from UK central government bodies, UK local authorities and UK health and hospital authorities, except Research Councils and UK public corporations. This includes government departments and other organisations (including registered charities) financed from central government funds. Research grants and contracts from non-departmental public bodies (NDPBs) such as the British Council are also included in this source of income.

⁸ <https://www.hesa.ac.uk/support/documentation/cost-centres/2012-13-onwards>

⁹ <https://www.hesa.ac.uk/support/definitions/finances>

These data relate to research grants only and exclude the £1.8bn in quality-related research (QR) income from the UK Funding Councils.

Additionally, income is classified under UK-based charities, UK central government tax credits for research and development expenditure, UK industry, commerce and public corporations, other EU and international sources, and other sources.

In this study, we compare the category ‘income from EU government bodies’ with income from ‘UK government bodies’ (which is a combination of income from ‘the Research Councils, the Royal Society, British Academy’ and ‘UK central government bodies, local authorities, health and hospital authorities’, as described above).

3.2 Overview of total funding

The analysis of this data shows that a substantial share of funding from EU government bodies flows to UK HEIs, who collectively report around £725M in research income from EU government bodies in 2014/15, as shown in Table 2. This is 12% of UK HEIs’ £5.9bn in research income, or around 25% of the £2.75bn in research grants provided by the UK government (e.g. Innovate UK and the seven grant awarding research councils).

As mentioned above, these figures relate to research grants only and exclude the £1.8bn in quality-related research (QR) income from the UK Funding Councils. EU funds still constitute more than 9% of total HEI income, even when QR funding is included.

Funding from UK government bodies, in turn, amounts to roughly 47% of total funding to UK HEIs.

Table 2 UK Higher Education Institutions total research grants and contracts 2014/15, £ thousands

Income from research grants and contracts	Percentage	Volume
1. EU government bodies	12%	£724,996
2. UK government bodies income	47%	£2,754,044
- Research Councils, Innovate UK and the national academies	30%	£1,794,767
- UK central government bodies, local authorities, health and hospital authorities	16%	£959,277
3. UK central government tax credits for research and development expenditure	8%	£496,000
4. UK-based charities	17%	£1,034,473
5. UK industry, commerce and public corporations	6%	£336,528
6. Other EU and international sources	9%	£502,764
7. Other sources	1%	£63,211
Total income from research grants and contracts [Item 1 to 7]	100%	£5,912,016

Source: HESA

3.3 Disciplines

The HESA data show that in 2014/15 HEIs reported income from EU government bodies in every one of the agency’s 40 disciplinary categories or cost centres, from clinical medicine (£119m) to sports science (£0.4m). This shows the breadth of academic engagement in EU programmes.

Our analysis reveals that there are 15 disciplines for which income from ‘EU government bodies’ represent 20% of more of their total research income (based on using HESA data by cost centre from

2014/15¹⁰). These disciplines are listed in Table 3. Archaeology appears at the top of this list and 38% of the total research income allocated to this discipline corresponds to funding from EU government bodies. Other disciplines include area studies (125), politics & international studies (128), architecture, built environment & planning (123), art & design (143), sociology (132) and chemistry (113).

Of those 15 disciplines seven are in the social sciences (HESA cost centres 123, 126, 127, 128, 130, 132, and 133), six are in the arts and humanities (HESA cost centres 125, 137, 140, 141, 143, and 145) and two are part of the physical sciences, engineering and mathematics (HESA cost centres 113 and 121). The predominance of AHSS subjects partly reflects their greater reliance on institutional funding, as compared with the natural and physical sciences, and QR funding is outside the scope of these HESA statistics on research income. Nevertheless, the analysis suggests these subject areas may be amongst the most at risk from any change in the terms of access to EU funds going forward.

Table 3 The 15 HESA cost centres that received most income from EU government bodies as a proportion of total funding in 2014/15

HESA cost centre	EU government bodies income over total income in 2014/15
126 Archaeology	38%
140 Classics	33%
121 IT, systems sciences & computer software engineering	30%
145 Media studies	27%
130 Law	26%
141 Philosophy	25%
137 Modern languages	24%
127 Anthropology & development studies	23%
133 Business & management studies	23%
113 Chemistry	23%
125 Area studies	23%
128 Politics & international studies	21%
123 Architecture, built environment & planning	21%
143 Art & design	21%
132 Sociology	20%

Source: HESA

Table 4 presents an overview of the 15 disciplines that received most research income from EU government bodies in absolute terms. All of them received £10m or more in funding from EU government bodies in 2014/15.

The natural and physical sciences dominate the figures, with HEIs reporting around £366m in research income from EU government bodies (50%) for the top five subjects (by income) combined. These comprise clinical medicine (£120m), biosciences (£91m), physics (£55m), chemistry (£55m) and IT (£46m). Given this high absolute value, these disciplines may find it challenging to replace this income from other sources.

¹⁰ See Appendix B for an overview for all academic cost centres

Table 4 The 15 HESA cost centres that received most income from EU government bodies in 2014/15, in £ thousands

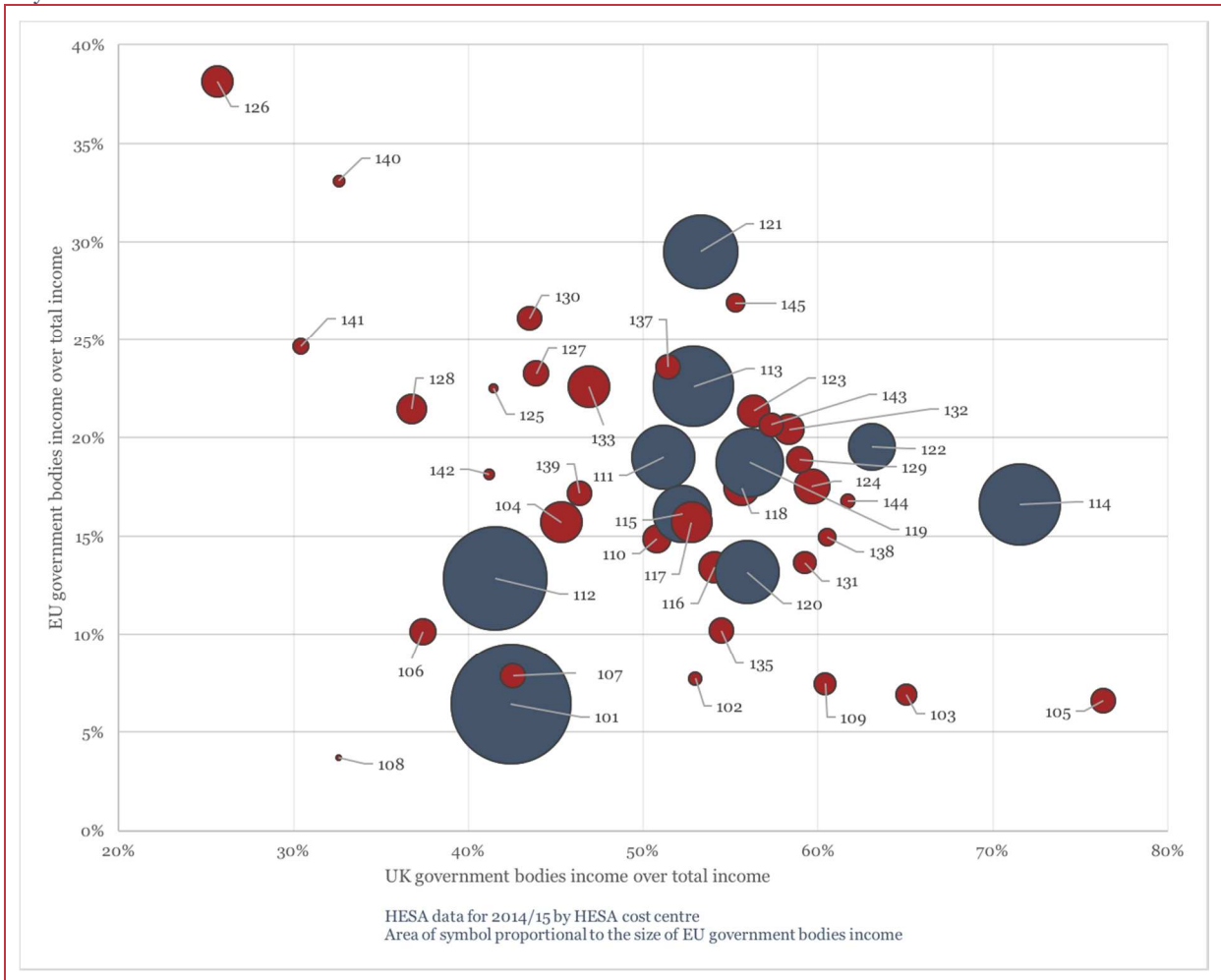
HESA cost centre	EU government bodies income in 2014/15
101 Clinical medicine	£119,913
112 Biosciences	£90,766
114 Physics	£55,403
113 Chemistry	£54,558
121 IT, systems sciences & computer software engineering	£46,208
119 Electrical, electronic & computer engineering	£39,290
120 Mechanical, aero & production engineering	£34,633
111 Earth, marine & environmental sciences	£34,538
115 General engineering	£28,116
122 Mathematics	£18,982
133 Business & management studies	£14,765
104 Psychology & behavioural sciences	£14,731
117 Mineral, metallurgy & materials engineering	£14,546
118 Civil engineering	£11,300
124 Geography & environmental studies	£10,857

Source: HESA

We further explore the HESA data to examine disciplines that are relatively more dependent on funding from ‘EU government bodies’ in comparison with funding from UK government bodies.

Figure 3 presents the relative dependency of disciplines in relation to i) income from EU government bodies as a proportion of total income (vertical axis) and ii) income from UK government bodies as a proportion of total income (horizontal axis). The area of symbols is proportional to total amount of EU government funding for each discipline. Symbols shaded in blue represent the ten disciplines that receive the most income from EU government bodies in absolute terms. The figure shows that there is a wide range in the distribution of income from EU and UK government bodies in relative terms, ranging from 4% to 38% for income from EU government bodies, to 26% to 76% for income from UK government bodies. Some disciplines receive more funding from alternative sources, e.g. a substantial proportion of funding for clinical medicine is provided by UK charities. A case study appended to this report details the role of EU funding in academic research in clinical medicine in the UK.

Figure 3 Distribution of EU government and UK government income as a proportion of total funding in 2014/15, by HESA cost centre



Source: HESA

3.4 Higher Education Institution types

The average volume of income from EU government bodies received by UK HEIs in 2014/15 was close to £4.9m and the median about £1.1m (based on data for 148 HEIs). 19 of these HEIs (13%) received no funding from EU government bodies in 2014/15, but did receive UK government funding in the range of £2k to £2.4m (all below the median HEI income from UK government sources of just under £2.7m).

Table 5 presents an overview of the ten UK HEIs that received most income from EU government bodies in 2014/15, which ranges from £60.3m for the University of Oxford to £18.2m for the University of Leeds. Table 6 presents the same for the ten UK HEIs that received most income from UK government bodies in 2014/15. Our analysis reveals that:

- The Top 10 HEIs (based on EU government bodies income) account for 47% of the total EU government bodies income in 2014/15, while the Top 20 account for 66%.
- This income from EU government bodies is less concentrated than research income from UK government sources. The Top 10 HEIs (based on UK government income) account for 50% of total research grants and contracts from the UK government, while the Top 20 accounted for 72%.

Table 5 The 10 HEIs that received most income from EU government bodies in 2014/15, in £ thousands

	Income from EU government bodies in 2014/15	EU government income, % of total income from EU government bodies for UK HEIs in 2014/15
The University of Oxford	£60,280	8%
The University of Cambridge	£59,495	8%
University College London	£45,710	6%
Imperial College of Science, Technology and Medicine	£41,929	6%
The University of Edinburgh	£25,680	4%
King's College London	£24,845	3%
The University of Manchester	£23,741	3%
The University of Sheffield	£20,414	3%
The University of Bristol	£18,623	3%
The University of Leeds	£18,191	3%
Total top 10 HEIs	£338,908	47%
Total top 20 HEIs	£476,953	66%
Total top 30 HEIs	£562,959	78%
Total all HEIs	£723,944	100%

Source: HESA

Table 6 The 10 HEIs that received most income from UK government bodies in 2014/15, in £ thousands

	Income from UK government bodies in 2014/15	Income from UK government, % of total UK government funding for UK HEIs in 2014/15
University College London	£209,524	8%
The University of Oxford	£197,379	7%
Imperial College of Science, Technology and Medicine	£174,723	6%
The University of Cambridge	£160,657	6%
The University of Manchester	£156,855	6%
The University of Edinburgh	£127,024	5%
The University of Bristol	£92,966	3%
The University of Sheffield	£89,314	3%
King's College London	£81,347	3%
The University of Glasgow	£80,760	3%
Total top 10 HEIs	£1,370,549	50%
Total top 20 HEIs	£1,958,133	72%
Total top 30 HEIs	£2,271,416	83%
Total all HEIs	£2,736,250	100%

Source: HESA

Additional analysis reveals that there is a set of universities that are relatively more dependent on EU funding. Table 7 lists the 10 HEIs that received the most income from EU government bodies as a proportion of total income and received more than £1m EU government bodies income. Whereas the country's larger, research intensive universities listed above enjoy high levels of research income from EU government bodies that would be difficult to replace given the sheer volume of those funds, they are less dependent on this flow of funds as compared with many of the country's mid-sized institutions, with more than 40 having dependency ratios above 20%.

Table 7 The 10 HEIs that received most income from EU government bodies as a proportion of total income and received more than £1m EU government bodies income, in £ thousands

	Income from EU government bodies in 2014/15	Income from EU government bodies over total income in 2014/15
Goldsmiths College	£3,371	61%
Middlesex University	£2,532	51%
University of South Wales	£2,271	41%
Birmingham City University	£1,033	40%
Anglia Ruskin University	£1,324	40%
Aston University	£5,589	39%
Bangor University	£8,306	38%
Sheffield Hallam University	£2,811	35%
The University of Wolverhampton	£1,040	35%
Coventry University	£3,271	33%

Source: HESA

4 The role of EU funding in industry

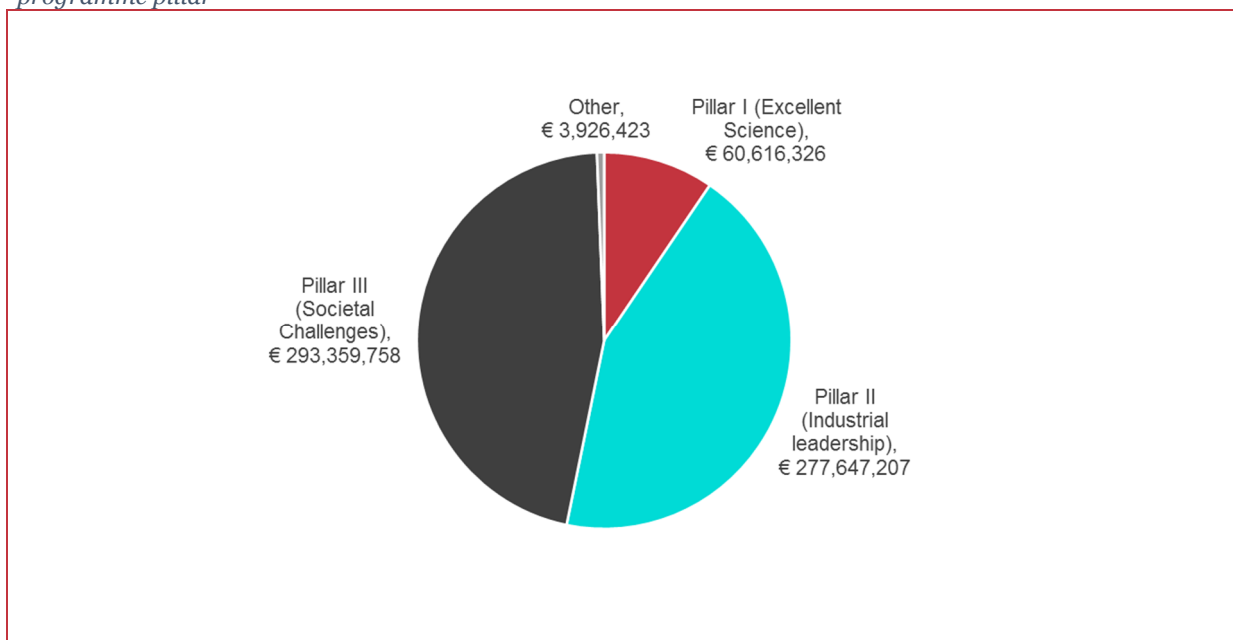
4.1 Industry participation in Horizon 2020

UK Industry – defined here as UK for-profit companies (PRC) as classified in CODA (see the Glossary) – takes active part in the EU Framework Programmes and receive substantial amounts of funding for research and innovation activities. In FP7, UK industry participants were particularly active in the thematically structured ‘Cooperation’ programme (see Table 10 below). Under Horizon 2020 so far, UK industry received significant amounts of funding through the new Pillar II, Industrial Leadership (which includes specific programmes supporting key enabling technologies, space, and ICT), and Pillar III, Societal Challenges which aims to look for innovative and research oriented solutions to common pan-European challenges, such as energy efficiency, ageing populations, environmentally friendly transport, and sustainable agriculture, among others (see Figure 4).

UK participation in projects under Pillar II and other parts of Horizon 2020 with strong industrial resonances, is not limited to for-profit companies. UK higher or secondary education establishments and other organisations also receive funding through these actions. As noted in the case study on the role of EU funding in the UK ICT sector (See Box 1 below), Horizon 2020 offers unique opportunities for universities and other organisations to work with for-profit companies on industrially relevant research. Thus, EU funding for universities feed into broader ‘eco-systems’ and not only fund academic research but also helps underpins a variety of innovation activities throughout the system. This is, however, outside of the scope of this section, which focusses on EU funding granted directly to UK for-profit companies.

The sub-sections below explore industry participation in the EU Framework Programmes across sectors of the economy, company size, and benefits in terms of access to new markets.

Figure 4 EU Framework Programme funding granted to UK for-profit companies under Horizon 2020, by programme pillar



Source: CODA

Thus, the EU contributes a substantial amount of funding to UK industry for research and innovation, complementing what is available from UK sources. During two years, 2014/15 and 2015/16, UK’s national innovation agency, Innovate UK, provided grants of a value of £516m per year to UK businesses. In comparison, UK for-profit companies were awarded just under €500m during the first two years of

Horizon 2020 – an average of €250m or £189m per year – (calls issued in 2014 and 2015). This is equivalent to 37% of the funding from Innovate UK.

4.2 SME participation¹¹

UK SMEs have been successful at drawing down resources from FP7 and Horizon 2020 and funding from these sources represents a high proportion of SMEs R&D expenditure.

Domestically, UK SMEs account for less than 5% of UK Business Enterprise R&D (BERD), but they account for 65% of FP7 funding granted to UK companies. Consequently, EU funding constitutes a much higher proportion of total R&D spend for SMEs than for the business sector as a whole, as shown in Table 8. Furthermore, UK SMEs have drawn down more funding from FP7 and Horizon 2020 than SMEs in any other country and account for the majority of the UK’s business participation.

Although less dependent on EU funding by volume, large companies also have a strong participation in the EU Framework Programmes. They consequently also report significant benefits from the EU funding they receive. These benefits are often indirect in nature: Participation in EU-funded actions facilitates strategic collaboration across Europe and helps underpin the innovation ecosystem by supporting the ‘pipeline’ of ideas and talent from universities (e.g. see Box 3 on the Innovative Medicines Initiative).

Table 8 FP7 funding as proportion of total R&D expenditure by UK SMEs and large businesses

	FP7 funding (2007-2013)^[1]	Business Enterprise R&D (2007-2013)	FP7 funding as proportion of Business Enterprise R&D expenditure (2007-2013)
UK SMEs	£ 658m	£ 3,885m	16.9%
UK large businesses	£ 354m	£ 112,660m	0.3%
All UK businesses	£ 1,012m	£ 116,545m	0.9%

Sources: CORDA and UK Office of National Statistics (ONS)¹²

^[1] Average exchange for the period 2007 to 2013: 1.225 EUR/GBP

The role of EU funding for UK SMEs is described in more detail in the separate case study (see appendix to this report).

4.3 Sectors of economic activity

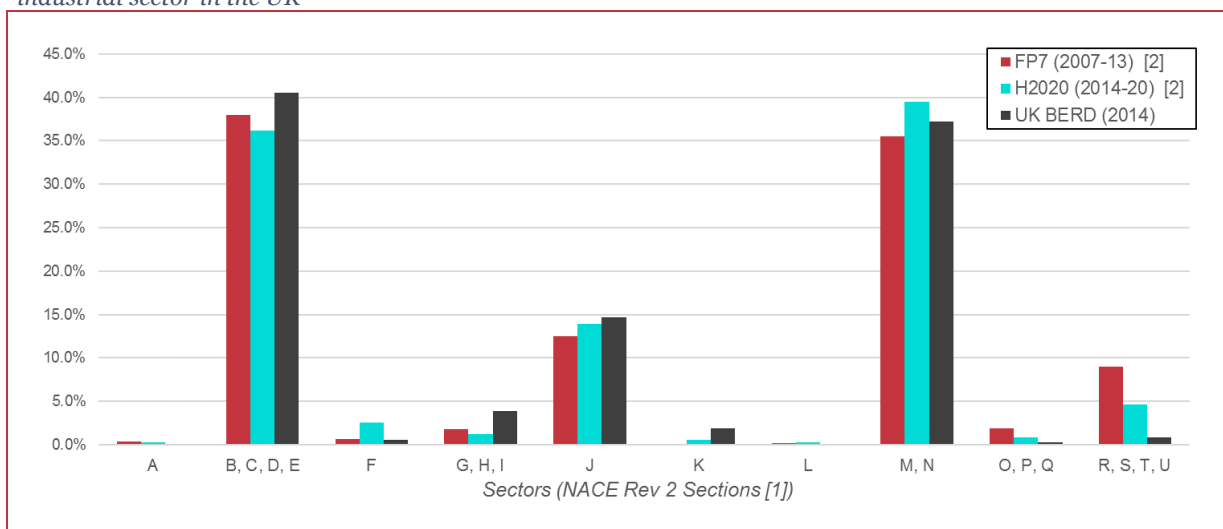
Companies in a range of industry sectors receive EU funding for research and innovation activities. Using the statistical classification of economic activities in the European Community (NACE)¹³ from EU CORDA data, Figure 5 and Table 9 below provide a breakdown of FP7 funding for UK companies by economic sector. UK companies within the sectors ‘Manufacturing, mining and quarrying and other industry’ and ‘Professional, scientific and technical activities’ receive the highest total value of funding from EU Framework Programmes. As the figures make clear, UK industry participating in FP7 largely come from research-intensive sectors and the proportions of EU funding awarded to companies in different sectors largely match the relative research intensity of those sectors in the UK.

¹¹ This section is primarily based on data from FP7. At the time of writing, the available version of CORDA data for Horizon 2020 does not contain reliable data on company size. This problem might be addressed in an upcoming data release from the European Commission.

¹² Office of National Statistics (2016), *Business enterprise research and development, UK: 2015*, Statistical Bulletin, November 2016, table 26.

¹³ The statistical classification of economic activities in the European Community (NACE) is used in EUROSTAT and CORDA data. NACE Revision 2 (Rev. 2) was agreed in December 2006 and implemented from 2007. See: [http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Statistical_classification_of_economic_activities_in_the_European_Community_\(NACE\)](http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Statistical_classification_of_economic_activities_in_the_European_Community_(NACE))

Figure 5 Distribution of EU Framework Programme funding and UK Business Enterprise R&D (BERD) by industrial sector in the UK



Source: Technopolis based on data from Eurostat and CORDA.

[1] NACE Rev 2, Aggregated structure: high-level SNA/ISIC aggregation A*10/11¹⁴, [2] CORDA data contained meaningful NACE description for projects representing 73% of EC contribution in FP7 and 69% in Horizon 2020.

Table 9 Distribution of EU framework programme funding and UK Business Enterprise R&D (BERD) by sector

NACE Section [1]	Description	FP7 [2] (2007-13)	H2020 [2] (2014-20)	UK BERD (2014)
A	Agriculture, forestry and fishing	0.4%	0.3%	0.1%
B, C, D, E	Manufacturing, mining and quarrying and other industry	38.0%	36.2%	40.5%
F	Construction	0.7%	2.6%	0.5%
G, H, I	Whole and retail trade, transportation and storage, accommodation and food service activities	1.8%	1.2%	3.9%
J	Information and communication	12.5%	14.0%	14.7%
K	Financial and insurance activities	0.1%	0.6%	1.9%
L	Real estate activities	0.2%	0.2%	0.1%
M, N	Professional, scientific, technical administration and support service activities	35.5%	39.5%	37.2%
O, P, Q	Public Administration, defence, education, human health and social work activities	1.8%	0.9%	0.3%
R, S, T, U	Other services	9.0%	4.6%	0.8%
	Total	100.0%	100.0%	100.0%

Source: Technopolis based on data from Eurostat and CORDA.

[1] NACE Rev 2, Aggregated structure: high-level SNA/ISIC aggregation A*10/11¹⁵, [2] CORDA data contained meaningful NACE description for projects representing 73% of EC contribution in FP7 and 69% in Horizon 2020.

¹⁴ Eurostat (2008), *NACE Rev. 2 Statistical classification of economic activities in the European Community*, European Communities, p. 43.

¹⁵ Idem

4.4 Thematic priorities

In FP7, both large enterprises and SMEs extensively participated in the ‘Cooperation’ specific programme. In addition, SMEs also received a significant share of their funding from the ‘Capacities’ specific programme including from the “research for the benefit of SMEs” scheme and for research infrastructures.¹⁶

Table 10 Participation of UK for-profit companies (PRC) in FP7 by company size and programme

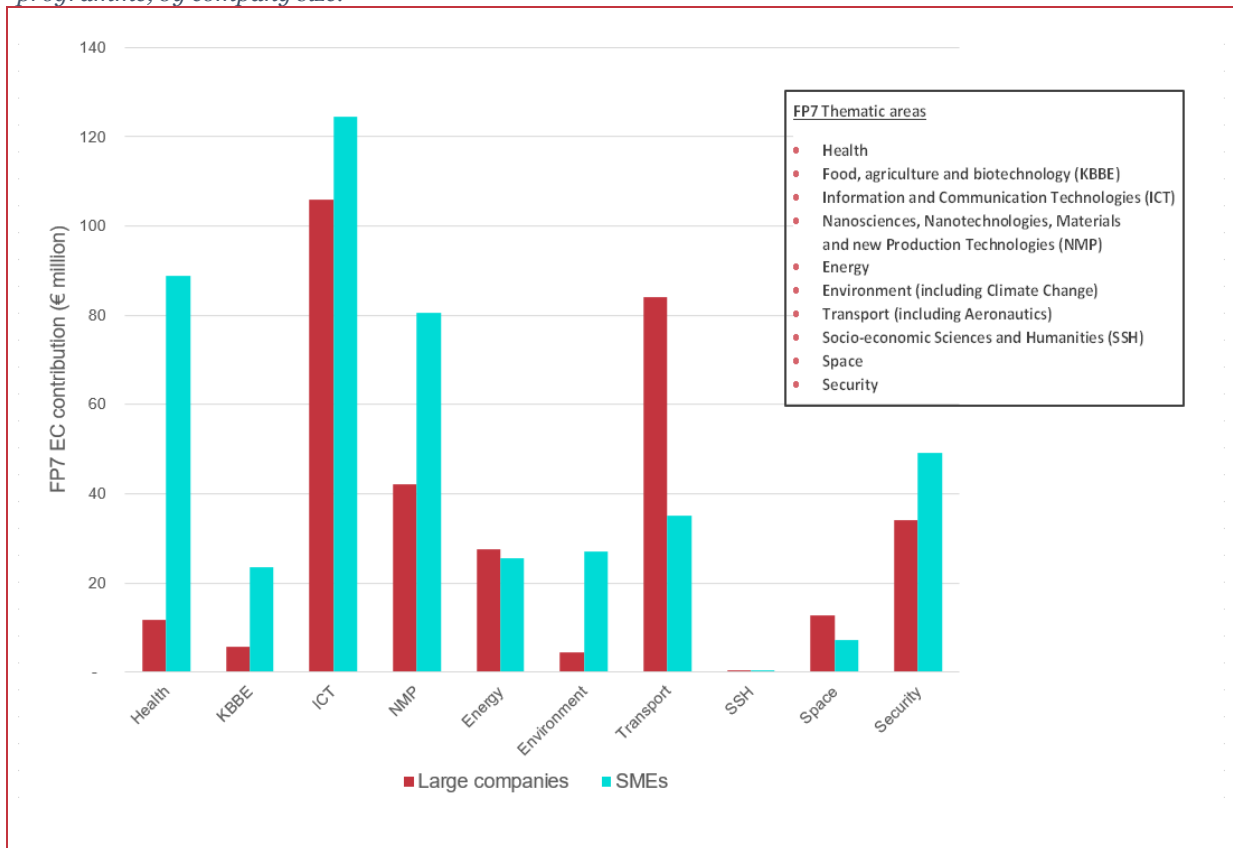
FP7 Specific programme	Large enterprises (PRC)	SMEs (PRC)	All UK companies (PRC)
Capacities	€ 14.0m	€ 249.8m	€ 263.9m
- Of which Research for the benefit of SMEs	€ 9.7m	€ 156.2m	€ 165.8m
- Of which Infrastructures	€ 2.3m	€ 88.9m	€ 91.2m
Cooperation	€ 374.7m	€ 517.1m	€ 891.8m
Ideas (ERC)	€ 8.9m	€ 1.5m	€ 10.4m
People	€ 2.5m	-	€ 2.5m
EURATOM	€ 34.0m	€ 37.0m	€ 70.9m
Total FP7	€ 434.1m	€ 805.4m	€ 1,239.5m

Source: CORDA

Under the ‘Cooperation’ specific programme in FP7, the ICT thematic programme provided the highest amount of funding for both SMEs and large companies. As shown in Figure, SMEs received a much higher share of funding from the thematic programmes on Health and ‘Nanosciences, Nanotechnologies, Materials and new Production Technologies’, whereas large companies received most funding from the Transport programmes (which also includes Aeronautics).

¹⁶ More than 90% of the funding for UK SMEs under infrastructures was awarded to Geant Limited, see the Case study on the role of EU funding for UK SMEs for details.

Figure 6 EU Funding for UK for-profit companies (PRC) in thematic areas under the FP7 'Cooperation' specific programme, by company size.



Source: CORDA

Box 1: The role of EU funding for the UK ICT sector

In the UK, the digital sector is a key part of the UK economy, characterised by fast growth and high R&D intensity. In 2014, the sector accounted for 7.3% of UK Gross Value Added (GVA), 17% of UK Business R&D (BERD) and provided 4.4% of jobs in the UK. As part of the new UK Digital Strategy, published on the 1st March 2017, the government has confirmed its commitment to supporting research and innovation in ICT through Innovate UK and the Engineering and Physical Sciences Research Council (EPSRC).

The UK digital sector is heavily involved in EU research and innovation programmes and UK universities and businesses have been very successful in attracting EU funding for ICT research. Since 2007, UK universities have received more than €700m from the specific ICT programmes under FP7 and Horizon 2020, and income from EU government bodies has increased to approximately 30% of research income from grants and contracts, compared to 22% in 2007. UK companies have received more than €300m over the same period. Some companies depend directly on EU funding but non-monetary benefits from participation in large collaborations and accessing networks are equally important. EU funding feeds into broader 'eco-systems' in cities like Edinburgh and London and underpins a variety of innovation activities across academia and business.

The UK's decision to leave the EU presents potential risks to the UK ICT sector. In addition to the risk of losing access to funding, talent and networks, stakeholders point to the strategic importance of participating in EU initiatives – such as the development of 5G technology – and the risk of losing influence on future European policy and programming.

Source: Case study on the role of EU funding in the UK ICT sector

4.5 Access to new markets

Participating in EU funding programmes often has benefits for companies beyond the immediate financial award. There is a presumption in the innovation literature that international research cooperation can provide participating businesses with a platform for entering new markets, and especially so where the project work extends into technology demonstration and other near-market commercialisation activities.¹⁷ The question of market access and exports is considered to be especially important for SMEs, whereby smaller businesses typically face a larger number of market failures than their larger counterparts, particularly around risk and uncertainty. It might also be a stepping stone for expanding further afield. Horizon 2020 has a clear commitment to improving Europe's competitiveness globally, including innovation-led GDP growth and exports, and the EU Framework Programmes have had an increased focus over successive programmes on 'international' collaboration, i.e. collaboration with countries outside of the EU, for example to access advanced technology developed in the US, Japan and Korea, or to collaborate with low and middle-income countries.¹⁸

Anecdotal evidence appears to support the supposition of a connection between EU funding and access to markets. Stakeholders consulted for this study described, for example, how companies might be able to establish relationships with future clients through EU projects. It was generally felt that companies in receipt of EU funding were more likely to expand into new markets, but from available evidence it is difficult to establish the direction of causality, i.e. whether companies, which already have plans to expand, are more likely to seek EU funding.

While a full-scale econometric analysis is beyond the scope of this study, a systematic review of the evaluation record has revealed evidence concerning the European Investment Bank (EIB) and the EU Framework Programmes, although not specifically about UK firms.

Whereas market access is not covered in the standard evaluations of European Structural Funds programmes an evaluation of EIB Group's Support to the European Knowledge Economy reports access to new markets among the observed positive impacts, especially for SMEs:

*Beyond innovative products, processes and services, a majority of projects (31) contributed to the strengthening or safeguarding of the promoters' competitive position in the market. In some cases, it helped them penetrate new markets as well.*¹⁹

The number of data observations is small however, and does not allow for any further analysis at the level of particular Member States or economic sectors.

The question of market access has been included in various EU Framework Programme evaluations, albeit not in all cases and not always consistently. As noted above, these findings are from EU-wide studies and do not provide evidence specifically about UK companies. The ex post evaluation of FP7²⁰ provides the best available evidence, particularly Programme evaluations with industry participation such as ICT, NMP, Security, SMEs and Space. The overarching sentiment regarding access to markets is one of improved access upon involvement within FP7 Programmes. This was marked not only within companies' motivation for participation, but is also reflected in the objectives achieved as reported by beneficiaries.

¹⁷ https://ec.europa.eu/research/innovation-union/pdf/internationalisation_business-rd_final-report.pdf

¹⁸

https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/ftags/international_cooperation.html#c.topic=flags/s/IntlCoop/1/1&+callStatus/asc

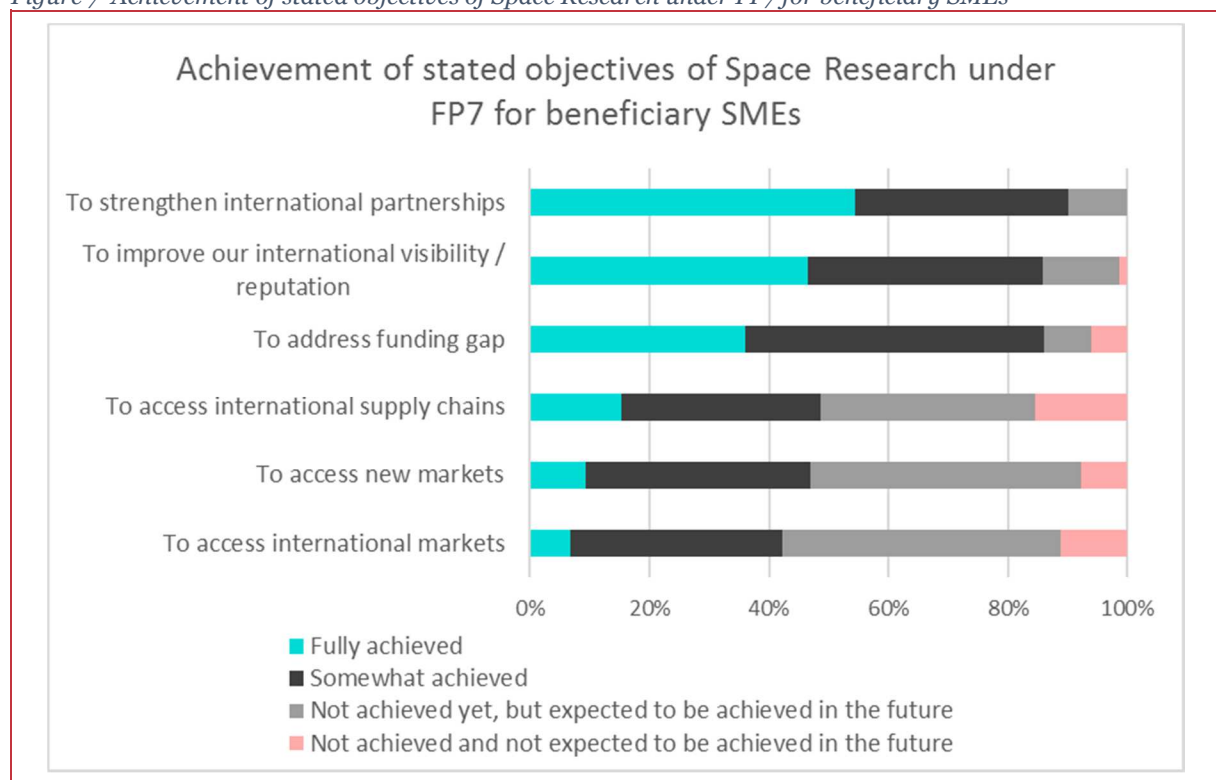
¹⁹ R-L Ballaguy et al. (2015), *EIB Group's Support to the European Knowledge Economy 2007-2013 – Synthesis report*, European Investment Bank, p. 23.

²⁰ The Commission has published reports of the individual FP7 components too: Evaluation report of the FP7 Cooperation Specific Programme, which is the part of FP7 most concerned with supporting European competitiveness. There is also the evaluation of the 'Capacities Specific programme, which included the €1.3 bn Research for the Benefit of SMEs and two place-based innovation funds, regions of knowledge (€130M) and research potential in outermost regions (€340M).

For companies, objectives corresponding to commercialisation were understandably deemed to be important, covering not only the opening up of new markets, but additionally the improvement of existing market position and the establishment of new business areas. For industry participants in the NMP Programme, opening-up new markets or new groups of customers was thought to be important for 54% of respondents (of 822 industry partners) and is reflected in their motivation for participation. While SMEs reported access to new markets as motivation for participation in the Research for SME Programme and the Cooperation Programme at 63% and 55% respectively.

In terms of actualised impact, interviews with FP7 beneficiary SMEs found that increased sales to new customers/markets was the most notable economic impact as a result of their participation. Of the interviewees, 45% reported increased sales to new customers in other EU Member States, and 37% reported increased sales to new markets as a product of their involvement in the programme. This sentiment was also reported by beneficiary SMEs involved in the FP7 Space Programme, who reported access to markets had been fully or somewhat achieved for 47% of respondents while an additional 45% of respondents reported that while the objective had not been achieved at the point of survey response, it is expected to be achieved in the future.

Figure 7 Achievement of stated objectives of Space Research under FP7 for beneficiary SMEs



Source: Final Evaluation of Space Research under FP7 2015 (beneficiary survey, 2014), N = 65

This sentiment is similarly reflected in the interim evaluation of the ICT research in FP7, whereby around approximately 60% of respondents thought that the involvement in the project achieved enhancing their ability to enter new markets.²¹ This is particularly significant in light of the fact the FP7 ICT Programme was thought by DG CONNECT officials, experts and project officers to have limited market impact in supporting new market entries.²²

²¹ Bravo et al. (2010), *Interim evaluation of the ICT research in the 7th Framework Programme: Catalysing European Competitiveness in a Globalising World*, European Commission, p. 36

²² DG CONNECT (2015), *Ex-post evaluation of ICT research in the Seventh Framework Programme*, Final Report prepared by DG CONNECT, January 2014, p. 24

5 The role of EU funding across regions in the UK

5.1 Introduction

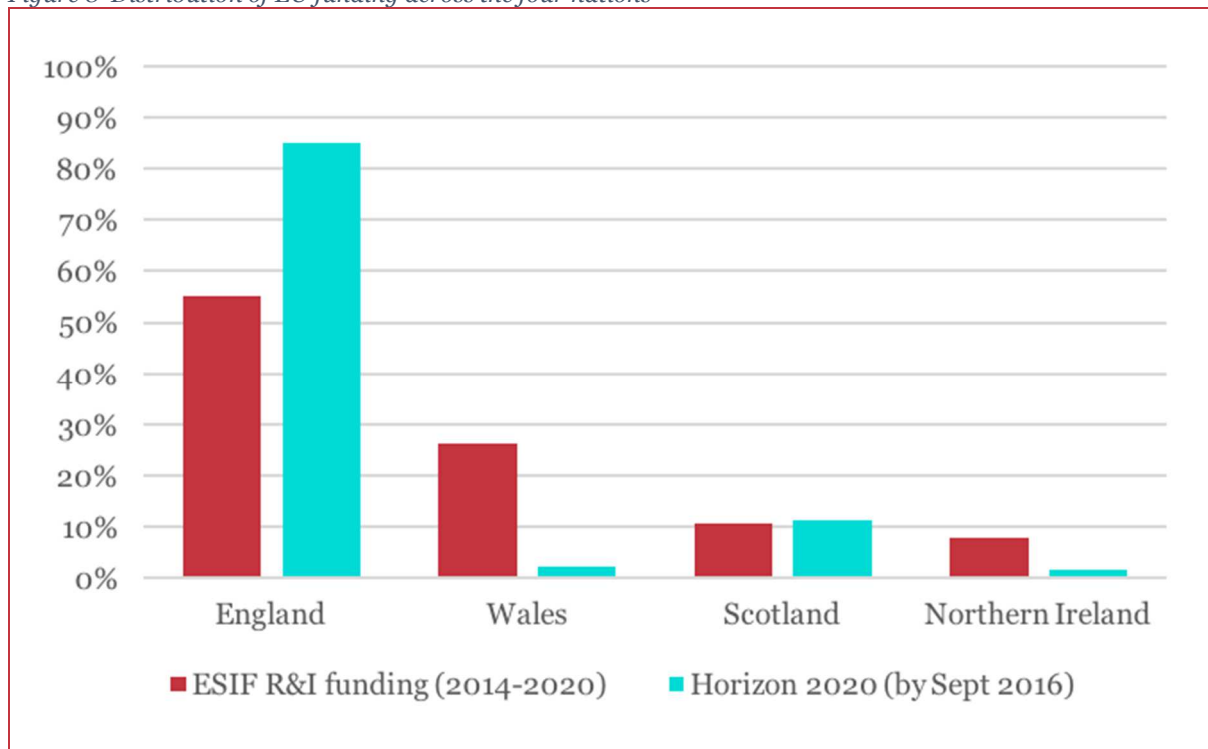
This section explores the extent to which EU funding is supporting research and innovation activity across the UK, and the degree to which different regions receive more or less funding from Horizon 2020 and the European Structural and Investment funds (ESIF), i.e. funding for research and innovation under the European Regional Development Fund (ERDF).

Figure 8 presents the distribution of EU funding across the four nations in the UK, for both ESIF and Horizon 2020. The chart shows that England has benefitted from the largest proportion of both types of EU funds among the four nations, receiving around 55% of ERDF research and innovation funding and about 85% of Horizon 2020 funding in the UK.²³

The chart also shows that while the absolute amounts are smaller, ERDF research and innovation funding is relatively more important than Framework Programme funding in Northern Ireland and Wales. These two nations both receive a greater proportion of ERDF research and innovation funding than Horizon 2020 funding. In relative terms, Wales is particularly reliant on ERDF research and innovation funding, and relies much less on EU Framework Programme funding. Despite being awarded a smaller amount of funding in absolute terms than England, Wales receives the most *per capita* ERDF research and innovation funding. Northern Ireland and Scotland also receive relatively more *per capita* ERDF research and innovation funding than England, as shown in Table 11.

Across all nations, the largest volume of ERDF research and innovation funding is allocated to SMEs, e.g. in relation to investment in infrastructure, capacities and equipment, cluster support, voucher schemes, etc.

Figure 8 Distribution of EU funding across the four nations



²³ Estimations are based on the ERDF funding to be allocated for 2014-2020, by nation and the Horizon 2020 funding allocated by 2016 to each nation. Data is presented in the appendix.

Source: CORDA; analysis by BEIS

5.2 European Structural and Investment funds (ESIF)

Table 11 presents the government’s estimated distribution of the EU’s contribution to ERDF research and innovation projects, for the UK and its four nations. The table also provides a breakdown of these figures by type of actor. The table shows the clear focus on support for small businesses (SMEs), which the ERDF programme has prioritised for support to encourage increased investment in research and innovation through cooperation with research groups in universities and research institutes.

England accounts for the largest share of the pot, with around €816 million of the total (approximately 55%), with Northern Ireland accounting for around €113 million (8%). The table also includes an estimate of income per capita, which uses population size to adjust for the marked differences in the size of the four nations. On this basis, in proportionate terms, England is expected to secure around €15 per person, while Wales, at the other end of the scale, is expected to achieve closer to €125 per person. That is more than five times more than the UK average, which reflects Wales differential access to Structural Funds support.

Table 11 Distribution of the EU’s contribution to ERDF research and innovation projects in the UK (2014-2020) by Region and organisation type

	England	Wales	Scotland	Northern Ireland	UK	%
SMEs (directly or indirectly)	€ 508m	€165m	€112m	€81m	€865m	59%
Large companies	€0	€15m	€0	€33m	€48m	3%
Public research centres	€ 111m	€ 88m	€ 0	€ 0	€ 199m	13%
Private research centres	€ 109m	€ 33m	€ 0	€ 0	€ 142m	10%
Unassigned	€ 89m	€ 88m	€ 46m	€ 0	€ 223m	15%
Total	€ 816m	€ 388m	€ 158m	€ 113m	€ 1,476m	100%
Per capita	€ 15	€ 125	€ 29	€ 60	€ 23	

Source: Technopolis based on UK ERDF operational programmes.

The box below shows two examples of how ERDF funds have been used in Wales to support research and innovation (the full Case Study on the role of EU funding in Wales is presented in an appendix to this report).

Box 2: Roles of EU funding in Wales

The Centre of Excellence for Mobile Applications and Services (CEMAS)

The University of South Wales received a £5.96m ERDF Convergence Funding grant in 2010-2015 for the establishment of the Centre of Excellence for Mobile Applications and Services (CEMAS). CEMAS support Welsh SMEs to develop, test and find a route to market for their mobile application product on a number of platforms including iOS, Android, Blackberry and Windows Phone. A REF case study submitted by the university specifies that “by July 2013, the Centre has aided in forms of research and development services to 66 companies, developed 28 products.”

The Sêr Cymru ('Stars Wales') programme

In Wales, funding from the Horizon 2020 and ERDF have been combined with national funding to fund the effort to strengthen research capacity. A €9.6m Horizon 2020 grant awarded to the Welsh Assembly part-funds the second phase of the Sêr Cymru ('Stars Wales') programme, which aims to strengthen the capacity of Wales' leading research groups via talent attraction and training,²⁴ and particularly in Wales' three Grand Challenge science activities (advanced materials and manufacturing, life sciences, and energy and environment).²⁵ The second phase of the programme is also supported through ERDF and regional and institutional funding. As of 2016, the four Sêr Cymru Research Chairs attracted to Wales, and the three National Research Networks had secured €36.4m²⁶ of competitive research funding for Wales and had also been successful at winning Welsh research funding.²⁷

Phase	Support for	Budget and funding source	Duration
I	Establishment of three National Research Networks, with dedicated directors Appointment of Four Sêr Cymru Research Chairs	€58.6m 70% from Welsh Government 30% from the Higher Education Funding Council for Wales	5 years
II	90x 3-year COFUND Research Fellows 30x 3-year Research Fellows 12x 3-year 'Recapturing Research Talent' Fellowships 26x 5-year 'Rising Star' fellowships Strategic Awards for Capital Equipment Staff to support rising stars Delivery team	€67.3m 11% from Marie-Sklodowska-Curie Co-Funds 41% from ERDF 12% Welsh Government 6% Higher Education Funding Council for Wales 30% HEI match contribution	5 years

Source: Case study on the role of EU funding in the UK ICT sector and Case study on the role of EU funding in Wales.

5.3 Horizon 2020

Our analysis of the European Commission's database shows the UK has secured more than €2.6 billion (£2.2 billion) in Horizon 2020 grants, in the period up 2016.

Table 12 presents the distribution of Horizon 2020 funding for the nations of the UK in absolute terms, as a percentage of the UK total and on a per capita basis. It shows England dominates the flow of funds in absolute terms, with more than €2.2 billion in income, or 85% of the UK total. In proportionate terms, however Scotland has achieved the highest level of income per capita. UK Horizon 2020 income per capita is about £34 (€40) and this is substantially higher than the UK ESIF income per capita, which is €23.

Table 12 Distribution of Horizon 2020 funding, by UK nation

	England	Wales	Scotland	Northern Ireland	UK
Total	€ 2,241m	€ 55m	€ 296m	€ 43m	€ 2,635m
% UK Total	85%	2%	11%	2%	100%
Per capita	€41	€18	€55	€23	€40

²⁴ Welsh Government (2015) New Frontiers: Cutting-edge Science in Wales. <http://gov.wales/docs/det/publications/150807-new-frontiers-en.pdf>

²⁵ The three areas are: advanced materials and manufacturing, life sciences, and energy and environment, as per <http://gov.wales/topics/science-and-technology/science/growing-research-in-wales/national-research-networks/?lang=en>

²⁶ Converted from GBP at current rates via InforEuro: http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/index_en.cfm

²⁷ See: <http://gov.wales/docs/det/report/160331-science-for-wales-report-2016-en.pdf>

Source: CORDA

Table 13 present these same data on Horizon 2020 across the three nations and nine English regions. The chart and table also include data on income by type of organisation, for all grants contracted in the period up to 2016.

Greater London dominates the flow of funds (€633m). Over 60% of this funding is allocated to HEIs. Other UK regions that receive a large proportion of total funding are the South-East England, the East of England, Scotland and the South West of England. In all regions, HEIs are the primary recipients of the total flow of EU income. Private companies are major beneficiaries too, especially in London, the South and East of England.

Table 13 Distribution of Horizon 2020 funding by UK region and type of organisation, in € million

Region (NUTS 1)	Private for profit organisation		Public body (excluding research and education)		Higher or secondary education		Research organisations		Other		Total	
	€ million	%	€ million	%	€ million	%	€ million	%	€ million	%	€ million	%
Greater London	€ 135m	24%	€ 36m	41%	€ 406m	24%	€ 45m	19%	€ 12m	29%	€ 634m	24%
South East	€ 111m	20%	€ 1m	1%	€ 258m	15%	€ 48m	20%	€ 8m	20%	€ 427m	16%
East of England	€ 74m	13%	€ 1m	1%	€ 198m	12%	€ 41m	17%	€ 2m	4%	€ 316m	12%
Scotland	€ 50m	9%	€ 7m	8%	€ 218m	13%	€ 18m	7%	€ 3m	6%	€ 296m	11%
South West	€ 28m	5%	€ 18m	20%	€ 124m	7%	€ 68m	28%	€ 3m	8%	€ 241m	9%
Yorkshire and The Humber	€ 34m	6%	€ 2m	3%	€ 111m	7%	€ 9m	4%	€ 3m	8%	€ 160m	6%
West Midlands	€ 29m	5%	€ 2m	2%	€ 115m	7%	€ 5m	2%	€ 4m	9%	€ 155m	6%
North West	€ 38m	7%	€ 2m	2%	€ 104m	6%	€ 1m	0%	€ 3m	6%	€ 147m	6%
East Midlands	€ 28m	5%	€ 5m	6%	€ 57m	3%	€ 0	0%	€ 2m	5%	€ 92m	3%
North East	€ 14m	3%	€ 0	0%	€ 49m	3%	€ 5m	2%	€ 0	1%	€ 69m	3%
Wales	€ 10m	2%	€ 10m	11%	€ 35m	2%	€ 0	0%	€ 1m	2%	€ 55m	2%
Northern Ireland	€ 12m	2%	€ 4m	5%	€ 26m	2%	€ 1m	0%	€ 0	1%	€ 43m	2%
Total	€ 564m	100%	€ 88m	100%	€ 1,700m	100%	€ 242m	100%	€ 40m	100%	€ 2,635m	100%

Source: CORDA

6 Research activities uniquely supported by the EU

6.1 Introduction

The preceding sections have shown how EU funding has been distributed across the UK research and innovation landscape, among organisations, academic disciplines and geographical areas. This section explores the particular types of activities supported by EU programmes with a focus on the types of activities that are uniquely funded by the EU or that cannot easily be organised domestically.

As explained above, the EIB has provided loans to support various UK capital investment projects, mostly for the expansion and modernisation of campus buildings and related research infrastructure. For the purpose of this chapter however, the EIB is largely supporting capital projects that could have been funded, in principle at least, through existing national programmes (e.g. the Regional Growth Fund or the Research Capital Investment Fund). Similarly, the UK's five ERDF Operational Programmes²⁸ list several types of standard activities used to support research and innovation in the regions, and particularly for the benefit of SMEs. The added value of ERDF compared to what already exists in the UK is in the volume and focus of funding it makes available for research and innovation infrastructure in the UK's more peripheral and economically less well-developed regions.

Horizon 2020 by contrast is unique, and is the only international research and innovation programme of this scale anywhere in the world. Other international scientific programmes are orders of magnitude smaller. Major intergovernmental science programmes, like CERN or ESA, do have annual budgets running in to the billions, however, the very great majority of this expenditure is committed to the operation and maintenance of the in-house facilities and programmes, and their calls for proposals are very much fewer and very much smaller than those run by Horizon 2020. International cooperation is part of the programme's DNA too, which is absolutely not the case for the very great majority of national research and innovation programmes. In general, governments around the world require national research funds to be expended with people and organisations based in the same jurisdiction as their taxpayers. While all science may be said to be global in outlook, successive EU Framework Programmes for research and innovation have propelled our international engagement to new levels.

Putting aside the level of commitment to international cooperation, Horizon 2020 – and FP7 before it – provides UK-based organisations with access to several types of instrument or programme that has not been available nationally. In the following sub-sections, we explore two particular perspectives: (i) large collaborations and partnerships and (ii) individual fellowships and investigator awards.

6.2 Large collaborations

6.2.1 Collaborative projects

The ability to collaborate with peers or potential customers is an important motivation for participating in EU projects. Many parts of Horizon 2020 are specifically set up to support cross-border collaboration and a large proportion of the programme's funding is awarded as grants for collaborative projects. In line with its predecessor programmes, two of the most commonly used funding instruments in Horizon 2020, Research and Innovation Actions (RIA) and Innovation Actions (IA), require at least three participants from three different Member States (see Appendix C2). As shown in Table 14 below, it is also striking that Horizon 2020 projects generally involve more partners, not least in Pillar III (Societal Challenges) where an average project has more than 10 partners, and grants are typically larger than is the case for national schemes.

²⁸ Five UK ERDF Operational programmes include research and innovation actions: East Wales, West Wales and the Valleys, Northern Ireland, Scotland and England.

Table 14 Size of project consortia and awards from Horizon 2020 and UK funders.

		Average number of project partners	Average grant size per project (£) ^[3] (2014-2016)
Horizon 2020 ^[1]	Pillar I (Excellent Science)	2.3	£ 971,306
	Pillar II (Industrial Leadership)	4.6	£ 1,295,880
	Pillar III (Societal Challenges)	10.2	£ 2,876,242
	Horizon 2020 (total)	4.4	£ 1,832,487
UK funding bodies ^[2]	AHRC	2.1	£ 142,310
	BBSRC	1.8	£ 333,547
	EPSRC	3.1	£ 622,914
	ESRC	2.0	£ 356,501
	MRC	4.3	£ 790,934
	NERC	2.2	£ 301,571
	STFC	2.5	£ 364,880
	Innovate UK	2.8	£ 340,178
	NC3Rs	1.2	£ 166,621
	UK funders (total)	2.7	£ 459,849

Sources: [1] EU open CORDA data (updated 22 December 2016), [2] Gateway to Research, [3] EU grant size converted from Euros to GBP using average exchange rate for 2014-2016, 1.28 Euro/GBP.

6.2.2 Large partnerships

In addition to collaborative projects funded on the basis of calls for proposals issued by the European Commission and carried out by the grant beneficiaries (so-called ‘indirect actions’), FP7 and Horizon 2020 also provide funding for a limited number of large scale partnerships to complement other actions.²⁹ The largest of these types of initiatives – Joint Technology Initiatives (JTIs) and so-called Article 185 actions – are distinct from other activities funded in the EU Framework Programmes in terms of their legal status and institutional setup and the scale. They involve very large budget commitments from the EU as well as other partners, which run into the billions and dwarf the very great majority of national collaborations here in the UK or elsewhere. As a case in point, the £700m Crick Institute will be one of the largest inter-disciplinary biomedical centres in Europe, with 1,200 scientists and an annual budget in excess of £100m. By comparison, the Innovative Medicines Initiative (IMI), described in Box 3 below, is expected to invest more than €3.3 billion in the 10-year term from 2014-2024.

The UK government has launched several large-scale collaborations with planned budgets running into the hundreds of millions (e.g. the Energy Technology Institute) and even billions in some of the more recent initiatives (the Aerospace Technology Institute, ATI). However, these are predominantly national initiatives and do not have the international reach of Horizon 2020. The example of the Clean Sky JTI, introduced in Box 4 below, illustrates the importance of being able to coordinate large-scale national initiatives across borders in an industry where supply chains are very internationalised.

²⁹ REGULATION (EU) No 1291/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2013 establishing Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020) and repealing Decision No 1982/2006/EC, Article 23.

Box 3: The Innovative Medicine Initiative Joint Technology Initiative was founded with the view of increasing the efficiency and efficacy of the drug development process through collaborative efforts between organisation and institutions across the pharmaceutical sector. As a JTI, half of the funding is contributed by the EC, while the remainder is contributed in kind by the European Federation of Pharmaceutical Industries and Associations (EFPIA) and its constituent members, and other associated partners. While EFPIA members are not eligible for funding from the EC, other organisations such as SMEs may obtain funding through calls for proposals. Under the second iteration of the IMI, IMI2, 25.6% EFPIA members and 15.4% of SMEs involved in IMI2 projects are based in the UK.

The benefits of being involved in the IMI are not limited to financial contributions, but also include fostering cross-sector collaboration, networking and knowledge sharing, as well as access to new tools and methods. The knowledge sharing and networking activities enable companies greater access to new and progressive research being conducted, and to the patient and regulatory bodies representing the market place applications for such technological developments. A tangible manifestation of such knowledge sharing are the database generation projects of the IMI such as Open PHACTS, PROTECT and the European Lead Factory, collating data concerning drug development, disease and patient responses to support the future development and production of drugs.

Source: Case study on Innovative Medicines Initiative (IMI)

Public-Private Partnerships (PPP) can be implemented under Horizon 2020 to support pre-competitive research and innovation activities in areas of strategic importance and can take one of two main forms: Contractual Public-Private Partnerships (cPPP) work on the basis of roadmaps developed through open consultation and are implemented through open calls using normal Horizon 2020 rules and regulations. There are currently nine cPPPs including ‘Factories of the Future’ and ‘Advanced 5G Networks for the Future Internet’.³⁰ Joint Technology Initiatives (JTIs) are larger scale initiatives, implemented by Joint Undertakings on the basis of Article 187 of the Treaty on the Functioning of the EU (TFEU). These initiatives are implemented where “the scope and objectives pursued and the scale of the resources required justify it [...]”.³¹ Table 15 shows the Joint Technology Initiatives currently running under Horizon 2020.

Table 15 Joint Technology Initiatives in Horizon 2020

Name	Horizon 2020 EU contribution	Industry / Member State contribution	Total budget
Innovative Medicines Initiative (IMI2)	€ 1,638m	€ 1,725m	€ 3,276m
Clean Sky 2 (Aeronautics and Air Transport)	€ 1,755m	€ 2,250m	€ 4,000m
Fuel Cells and Hydrogen (FCH2)	€ 665m	€ 665m	€ 1,300m
Electronic Components and Systems (ECSEL)	€ 1,185m	€ 3,600m	€ 4,785m
Bio-Based Industries (BBI)	€ 975m	€ 1,800m	€ 2,775m
Shift2Rail (S2R)	€ 450m	€ 470m	€ 920m

Source: European Commission³²

Note: The Innovative Medicines Initiative and Clean Sky (both shaded) are described in separate case studies.

³⁰ See: http://ec.europa.eu/research/industrial_technologies/ppp-in-research_en.html

³¹ REGULATION (EU) No 1291/2013, Op Cit., Article 24

³² See: <http://ec.europa.eu/programmes/horizon2020/en/area/partnerships-industry-and-member-states>

The Innovative Medicine Initiative (Box 3 above) and the Clean Sky Joint Technology Initiative (box 4 below) are two of such unique PPPs in key areas of strength for UK research and innovation (the full case studies are presented in an appendix to this report)

Box 4: The Clean Sky Joint Technology Initiative main objectives are to support the development of technologies that reduce CO₂ and NO emissions and noise outputs from aircraft across the air transport system. In order to achieve this, the programme includes a range of Integrated Technology Demonstrators that test and demonstrate the feasibility of burgeoning technologies within aircraft. As such, the programme supports collaborative efforts from large industry players, SMEs, research institutions and other national institutions. The Clean Sky JTI involves 12 industry leaders, 65 associate organisations and institutions, and over 500 partner organisations from across Europe. Its second iteration, the Clean Sky 2 programme, has a total budget exceeding €4bn, 50% of which is contributed under H2020 and the remainder contributed in kind from industry partners.

The value of the programme is such that it provides a platform for the development of technologies that often require large scale and costly testing to push them through to higher TRLs. These technology demonstrators are unique due to their size and progressive focus, and difficult to achieve without large scale collaboration. To facilitate this process, the programme is capable of mobilising expertise, skills and capabilities from a larger pool, and in doing so is able to draw upon outputs of the other national programmes in Europe. The scale and scope of the programme extends not only across countries and institutions, but additionally into the future, providing strategic and coordinated direction for the EU aerospace sector, which is particularly valuable given the long lead times for technology development and deployment.

Source: Case study on the Clean Sky Joint Technology Initiative

Public-Public Partnerships (P2P) allow public sector bodies from the Member States (national or regional) and the EU to align national programmes and strategies, and to implement joint research programmes. Horizon 2020 contain a number of instruments and processes to further this aim, including: the JPIs, which provides a structured process to define joint Strategic Research Agendas; the ERA-NET scheme, which supports networking and joint activities through top-up funding, and; the new European Joint Programme (EJP) Cofund, which helps the implementation of JPIs. Article 185 initiatives are the most integrated of these coordination mechanisms in which the EU participates in programmes undertaken jointly by several Member States.³³ Table 16 provides an overview of Articles 185 initiatives funded under Horizon 2020.

Table 16 Joint Programmes (Article 185 Actions) in Horizon 2020

Name	Horizon 2020 EU contribution	Member State contribution	Total budget
European and Developing Countries Clinical Trials Partnership 2 (EDCTP2)	€ 683m	€ 1,700m	€ 2,383m
European Metrology Programme for Innovation and Research (EMPIR)	€ 300m	€ 300m	€ 600m
Eurostars 2: support for high-tech SMEs	€ 287m	€ 861m	€ 1,148m
Active and Assisted Living Research and Development Programme (ALL)	€ 175m	€ 175m	€ 350m

Source: European Commission³⁴

Note: The European Metrology Programme for Innovation and Research (shaded) is described in a separate case study.

³³ Regulation ... establishing Horizon 2020 (Ibid). See also: <https://www.era-learn.eu/public-to-public-partnerships>

³⁴ <http://ec.europa.eu/programmes/horizon2020/en/area/partnerships-industry-and-member-states>

The European Metrology Programme for Innovation and Research (EMPIR) is a prime example of how the EU's P2P instruments have been used to develop gradually closer coordination between national programmes with UK National Physical Laboratory (NPL) in a leading position (the full Case Study on EMPIR is presented in an appendix to this report).

Box 5: The European Metrology Programme for Innovation and Research (EMPIR) is a Public-Public Partnership, implemented as a so-called Article 185 action, with a budget of €600m jointly funded by the European Commission and Member States. EMPIR is the culmination of more than 15 years of collaboration with EU support from a series of EU grants, including an ERA-NET preparatory grant (MERA), a full ERA-NET grant (iMERA), an ERA-NET Plus bridging grant (iMERA-Plus) leading the way for the European Metrology Research Programme (EMRP), a €400m programme, and EMPIR. The first EMPIR annual call was issued in 2014 and these will continue until 2020 with work continuing until 2024.

Much of the drive and thinking to develop the European Metrology Research programmes came from the National Physical Laboratory (NPL), and the UK is the second largest participant in the programmes, close behind Germany. Over the last few years NPL has seen a rapid increase in revenue from the EU, such that in 2014 it equated to 17% of its turnover.

Source: Case study on the European Metrology Programme for Innovation and Research (EMPIR)

6.2.3 Research Infrastructures

Research infrastructures funded by the EU are a clear example of where collaboration can help achieve scale and reduce costs for individual countries. So far, UK participants have been granted €86m for infrastructure projects in Horizon 2020 in addition to the €272m granted during FP7.³⁵

European Research Infrastructure Consortia (ERICs) is a new legal structure created under EU law. They are designed to facilitate the shared operation of research infrastructures and provide benefits such as exemption from VAT.³⁶ At the time of writing, 14 ERICs have been approved by the European Commission. The European Social Survey (ESS) gained ERIC status in 2013 and is currently the only ERIC to be hosted by the UK.

Box 6: The European Social Survey (ESS) is a biennial cross-national survey measuring attitudes, beliefs and behavioural patterns of diverse populations across Europe. Since its establishment in 2001, the survey has been conducted every two years using face-to-face interviews, each round having participation from between 22 and 31 countries, including EU Member States and other European countries.

ESS activities are financed by a combination of EU grants and funding from national and other sources, including initial support from the European Science Foundation. Eleven grants from successive EU Framework Programmes have been awarded to ESS with a total value of €26.5 million, which is very significant in the context of the social sciences. In 2013, the ESS was awarded status as a European Research Infrastructure Consortium (ERIC) by the European Commission and in 2016 was listed as a 'Landmark' Research Infrastructure in the European Strategy Forum on Research Infrastructures (ESFRI) Roadmap.

Source: Case study on the European Social Survey

6.3 Individual fellowships and investigator awards

Individual fellowships and investigator awards are another area where EU Framework Programmes for research and innovation have played an increasingly prominent role in recent years. Successive EU Framework Programmes have provided support to individual researchers working at different stages of their career, with a view to improving the capacity and quality of the European research community

³⁵ <https://www.gov.uk/government/statistics/uks-participation-in-horizon-2020-february-2017>

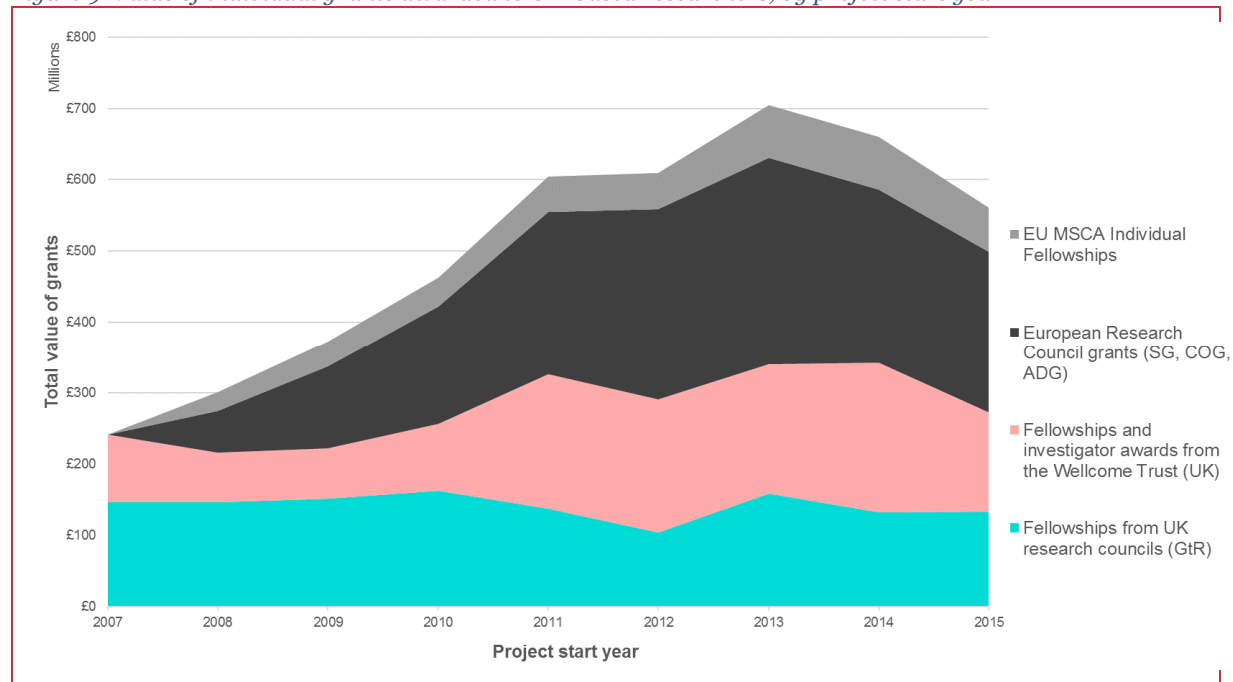
³⁶ https://ec.europa.eu/research/infrastructures/index_en.cfm?pg=eric (accessed 7 March 2017).

overall and to help individual researchers stay in the sector and progress more quickly in their careers. The European Research Council (ERC), first formed during the course of FP6 and launched in FP7, and has established itself as a pre-eminent funder of investigator-driven frontier research.³⁷ The UK has been singularly successful in attracting ERC grants. During FP7, the UK won 22.4% of all grant funding from the ERC.

Marie Skłodowska-Curie Actions (MSCA) are particularly relevant for early career researchers. As part of Horizon 2020, MSCA provides funding for research training and career development focused on innovation skills, thereby supporting PhD candidates as well as highly experienced researchers.³⁸ MSCA grants are generally recognised as generous and prestigious grants and may have a positive influence on young researchers’ career development. Under FP7 (2017-2014), 1,297 UK-based academic staff received a Marie Curie Fellowship and 2,175 staff participated in an exchange. The total budget awarded to UK-based organisations under FP7 was €1,1bn, which involved 4,053 UK based organisations.³⁹

As shown in Figure 9, ERC research grants and Marie Skłodowska-Curie Individual Fellowships now make up a substantial proportion of the value of personal awards given to research based in the UK. This success has meant that researchers in some academic disciplines have come to rely heavily on ERC funding, as described in the case of Archaeology below (Box 7).

Figure 9 Value of individual grants awarded to UK-based researchers, by project start year⁴⁰



Sources: CORDA, Gateway to Research and Wellcome Trust grant database.

Note: The value of EU grants converted from Euros to GBP using average exchange rate for each year (2007-2015)

³⁷ In addition to the investigator grants (96% of UK ERC funding in FP7), the ERC also offer Proof of Concept (PoC) and Synergy Grants (SyG) to ERC grantees to explore the commercial or societal potential and synergies of their work. These grants are not included in the analysis of fellowships and investigator grants presented here.

³⁸ https://ec.europa.eu/research/mariecurieactions/about_en

³⁹ http://ec.europa.eu/research/mariecurieactions/statistics_en

⁴⁰ Funding figures for ERC decrease slightly in 2015 but increased again in 2016 (not included in this figure as data for other funding streams are unavailable). This temporary decrease in 2015 is probably explained by the transition from FP7 to Horizon 2020.

Box 7: The Role of EU funding for UK Archaeology Research

The latest financial data available show that 38% (£8.7m) of research grants and contracts for Archaeology research at UK HEIs are derived from EU government funding sources. This proportion of funding represents a more than tenfold increase in the volume of funding received since 2006/07, which was just £658k, 4% of total funding. This increasing dependency on EU funding can be in part explained by the availability of and success of UK-based archaeologists in winning competitive ERC funding, which was launched in 2007 under FP7. ERC grants are unique to the discipline because of the size of the grants (enabling sufficient funding for the salary of academics working at different career stages), the length of the grants, and the collaborative nature of the funding. The ERC grants enable collaboration and teamwork that helps advance research. For Archaeology, there are no other sources of multiannual funding of this magnitude available. Similarly, Marie Skłodowska-Curie funding has helped advance the careers and research of grant recipients working in the discipline and the absence of this type of funding implies fewer resources available for early career researchers.

Source: Case study on the role of EU funding in the discipline of Archaeology

Compared to typical grants provided by UK funding bodies, ERC grants tend to be larger in terms of the amounts and the time afforded to the recipient to pursue independent research. In the UK, only the Wellcome Trust provides ‘investigator awards’ similar in size and scope to the ERC grants, and they are concentrated in the medical sciences, although the Wellcome Trust also provides smaller grants for research in the Humanities and Social Sciences that addresses health-related issues.⁴¹

Table 17 Size of personal grants from EU and UK funding bodies to UK researchers

	Average grant size to UK-based researchers (2007-2013) ^[2]	Average grant size to UK-based researchers (2014-2016) ^{[1] [2]}
ERC Starting Grant	£1,082,333	£1,164,891
ERC Consolidator Grant	£1,462,334	£1,475,543
ERC Advanced Grant	£1,792,833	£1,900,549
EU MSCA Individual Fellowships	£170,665	£148,028
UK Research Council Fellowships	£315,269	£440,954
Wellcome Trust Investigator Awards (science)	-	£1,704,487
Wellcome Trust Investigator Awards (H&SS)	-	£442,280

Source: CORDA, Gateway to Research, Wellcome Trust

[1] Wellcome Trust Investigator Awards have been awarded since 2011. Data available for the period 2011-2015.

[2] ERC grant size converted using average exchange rate: 2007-2013 1.225 Euros/GBP, 2014-2016: 1.281 Euros/GBP.

Note: Shaded rows are EU Framework Programme grant schemes.

⁴¹ <https://wellcome.ac.uk/what-we-do/our-work/research-humanities-and-social-sciences>

7 Leverage effect of EU funding

7.1 Introduction

Up until now, we have largely discussed each funding stream in isolation, but in practice, different streams of funding are interdependent in various ways. In this section, we will look at ‘leverage’, that is, the extent to which one stream of EU funding leads to additional resources from other sources.

7.2 Contribution required by project participants

Each of the three EU funding programmes discussed in this report provides a degree of financial leverage, by design.

Where the EIB provides loans to finance research and innovation schemes, its agreement is often an endorsement of the proposals and can be the key to attracting other investors. These loans can cover up to 50% of the total cost, however, on average the EIB share is about one-third of the total funding required. From this simple financial perspective, the EIB’s provision of around €5bn in loans to various UK universities and companies over the past 10 years would have been matched by additional investments of around €10bn.

The ERDF rules require national co-financing of all supported projects, from either public or private sources. The EC co-financing rates are typically 75% or 85% of the total budget, depending upon the location of the project or the partners involved, with the higher level of support available to research and innovation actions based in the ‘weakest’ regions economically. Importantly, those funds must be additional to, and not replace, existing national funding.

From the EU Framework Programmes, UK participants have been awarded a total of €9.6bn during the period considered in this study, including €7bn during FP7 and a further €2.6bn during the first 30 months of Horizon 2020. Depending on the funding instrument and types of organisation participating, however, the EU contribution might not cover all project costs, and so project participants often have to make monetary and in-kind contributions.

Again, the rate of funding, or the extent of the requirement to contribute to the project total costs, differs across funding instruments and type of organisations involved. For example, whereas Research and Innovation Actions (RIAs) and ERC grants are funded at a rate of up to 100%, Innovation Actions are funded up to 70%, and support for Public Procurement of Innovative Solutions can fund no more than 20% of the costs (see Appendix C for details about H2020 funding schemes and funding rates).

Table 18, below, shows the contribution made by different types of organisations to the total project costs. It shows that EU funding of €9.6bn (in FP7 and Horizon 2020) has leveraged €2.3bn from UK-based participant organisations. This ratio is higher among companies (private for profit organisations) where €1 million led to additional €633K, due to the rules of engagement for private organisations and the instruments in which they usually take part (or are eligible for).

Table 18 EU contribution and other contributions to total project costs from UK participants in FP7 and Horizon 2020

	EC contribution	Own contribution	Total project cost	Own contribution as a % of total project cost
Higher and secondary education institutes (HES)	€ 6,665m	€ 818m	€ 7,483m	11%
Private for profit (excluding education) (PRC)	€ 1,804m	€ 1,142m	€ 2,946m	39%
Research organisations (REC)	€ 831m	€ 218m	€ 1,050m	21%
Public body (excluding research and education) (PUB)	€ 232m	€ 126m	€ 358m	35%
Other (OTH)	€ 99m	€19m	€ 118m	16%
Total	€ 9,631m	€ 2,323m	€ 11,955m	19%

Source: CORDA

7.3 ‘Crowding-in’ of R&D investment

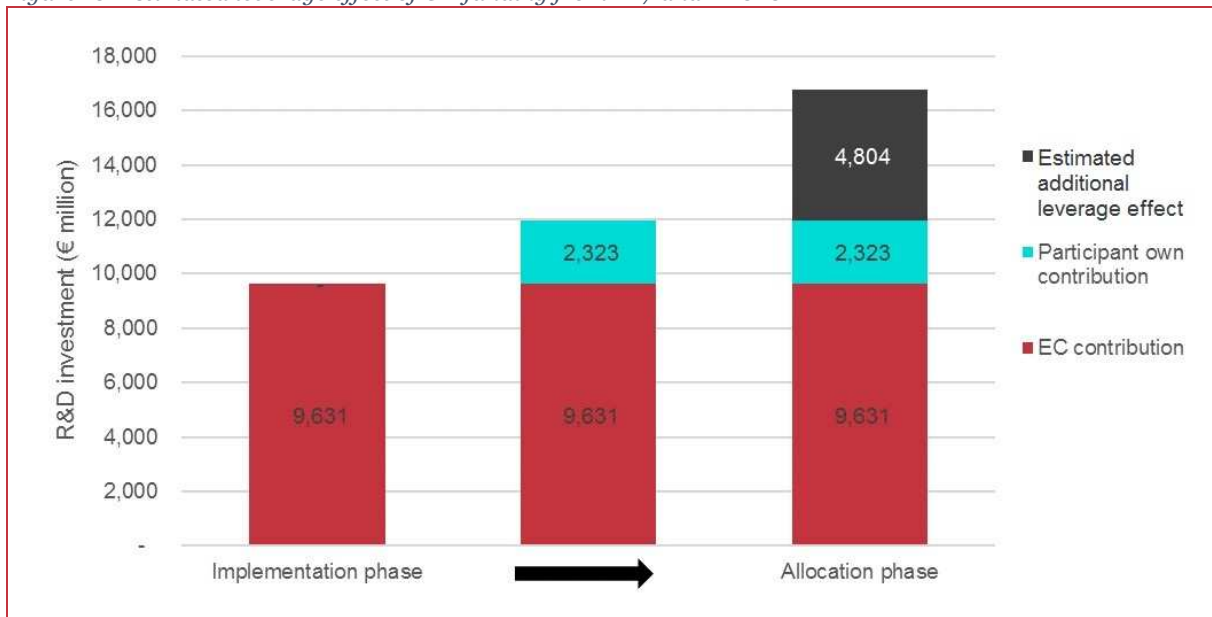
Beyond the required contribution by project participants, the literature suggests that public R&D expenditure, such as EU funding for research and innovation, has a significant ‘crowding-in’ effect or ‘additionality’ leveraging further private investment in R&D.⁴² Econometric studies based on FP7 projects set the rate of additionality at 0.74, that is, for every €1 spent to support R&D by the European Commission, a further €0.74 will be invested by universities, companies or other stakeholders.⁴³ This effect goes beyond the formal requirement for participants to contribute to project costs described above, and includes additional investments made by organisations to expand the resources available for a given project, or for follow-up research activities.

Applying this rate to the funding received by UK organisations in FP7 and Horizon 2020 (to date), we arrive at an estimate of the effect of the participation on R&D expenditure (and derived benefits for employment and economic growth) which is substantially higher than the €9.6bn received directly from the European Commission. Already, contributions by UK participants in EU projects add €2.3bn of R&D investment, as shown above. With the further estimated leverage effect, the outcome of UK participation in FP7 and Horizon 2020 (so far) is estimated to be a total increase in research and innovation expenditure of €16.6bn. Figure 10 illustrates the process from the initial ‘implementation’ phase where EU Framework Programme funding is granted through to the ‘allocation phase’ when the leverage has taken effect.

⁴² E.g. Economic Insight (2015), *What is the relationship between public and private investment in science, research and innovation*, April 2015.

⁴³ See Zagamé, Paul, Arnaud, Fougeyrollas and Pierre le Mouël (2012) *Consequences of the 2013 FP7 call for proposals for the economy and employment in the European Union*. ERASME, 2012., and Fougeyrollas, Arnaud, Pierre le Mouël and Paul, Zagamé (2012) *Consequences of the 2012 FP7 call for proposals for the economy and employment in the European Union*. ERASME, 2013.

Figure 10 Estimated leverage effect of UK funding from FP7 and H2020



Source: Analysis by Technopolis, based on CORDA.

8 Conclusion

Since the first EU Framework Programmes for research and innovation in the 1980s, the UK has played a central part in EU research and innovation actions. EU funding is an integral part of the UK research and innovation landscape and many UK organisations are central actors in EU-funded projects and research and innovation networks in Europe. The UK's decision to withdraw from the EU entails uncertainty and potential risks for many areas of UK research and innovation concerning future access to EU programmes and funding. In this report, we have made use of existing data and evidence to describe the role of EU funding for research and innovation in the UK and parts of the UK research and innovation landscape that may be exposed in the event of a withdrawal from EU programmes.

The UK has been very successful in winning research and innovation grants from the EU Framework Programmes. UK participants received a total of €7bn of research and innovation funding from FP7 (2007-2013) and have been awarded a further €2.6bn so far under Horizon 2020 (in the period 2014-2016). Research and innovation is supported through the European Regional Development Fund (ERDF), receiving €1.9bn during the previous programming period (2007-2013) and nearly €1.5bn in the current period (2014-2020). Finally, our analysis shows that the European Investment Bank (EIB) has signed loans for research and innovation-related activities in the UK of a value of some €5.9bn (2007-2016), in large part for the development of university facilities.

UK Higher Education Institutions (HEIs) receive by far the largest share of EU funding for research and innovation in the UK, including nearly two thirds of EU Framework Programme grants so far under Horizon 2020 (based on CORDA data), and significant support from ERDF funds and EIB loans as well.

As a consequence, EU funding now accounts for a substantial proportion of research income in many HEIs and academic disciplines. Some disciplines receive very large amounts of income from research grants and contracts from EU government bodies every year, more than €100m in the case of Clinical Medicine. Other disciplines, often with smaller research budgets, rely on funding from EU government bodies for a much larger *proportion* of research income. Archaeology is a case in point, as 38% of income from research grants and contracts within this discipline is derived from EU government bodies. A number of other academic disciplines, many in the social sciences and humanities, are similarly exposed with figures above 20% too.

UK industry also receives substantial amounts of EU funding for research and innovation. UK SMEs are among the most successful in attracting EU funding and the amounts of funding awarded to UK SMEs during FP7 is equivalent to more than 15% of R&D expenditure by SMEs in the UK. For larger companies, the grant money is often not the primary motivation for participating in EU initiatives. For industry stakeholders consulted for this study, access to networks and strategic initiatives were among recurring concerns and several also emphasised the role of EU funding in supporting broader 'eco-systems' within which they operate.

The UK Research Councils and other national funding bodies account for a much larger share of research funding made available to UK researchers than EU programmes. Yet, there are certain types of activities and projects which tend only to be funded by EU sources, and which may be difficult to replicate at the UK level. Very large collaborative initiatives, such as Joint Technology Initiatives (JTIs) and Public-Public Partnerships (P2P), have budgets running into the billions and, as illustrated in our case studies, offer opportunities for large-scale collaboration and coordination not available in UK national programmes. The European Research Council (ERC) has established itself as a major new source of funding for investigator-driven frontier research and offers grants of a size usually not available to UK researchers outside of the medical sciences. Grants from the ERC and Marie Skłodowska-Curie Actions now account for some 50% of the value of personal awards to UK researchers, and offer new opportunities in disciplines where no other such grants exist.

Finally, the report considered the leverage effect of EU funding. Public support for research and innovation tend to 'crowd in' funding from other sources. According to our conservative estimate, the UK's participation in EU Framework Programmes – the €9.6bn awarded to UK participants from FP7

and Horizon 2020 (so far) – will lead to a total increase in research and innovation expenditure of €16.6bn. This goes beyond the contributions made by participants given the rules of engagement set up for the different instrument in the programmes.

This report provides an overview of the role of EU funding in UK research and innovation, primarily based on existing sources of data on funding from EU and UK sources. This approach helps map volumes and proportions of EU funding across disciplines, sectors, institutions and regions in the UK, but necessarily provides a partial view of the role that EU funding plays. Some of the wider effects of participating in EU-funded research and innovation projects are described in the short case studies appended to this report, and these include issues such as access to networks and influence on policy priorities.

This report focuses primarily on the current role of EU funding, and thereby provides the basis for considering the implications of the UK's decision to leave the EU. The UK government has guaranteed funding for projects selected under the current EU Framework Programme, Horizon 2020, and for ESIF projects already signed.⁴⁴ Beyond this, there are different scenarios and policy options for the UK's future association with the EU research and innovation programmes, for example as a member of the European Economic Area (EEA) or through bilateral agreements as an 'associated' or a 'third country'.⁴⁵ The terms of association will have implications for funding arrangements, regulatory requirements, and the ability of the UK to influence EU programming priorities.

⁴⁴ See: <https://www.gov.uk/government/news/chancellor-philip-hammond-guarantees-eu-funding-beyond-date-uk-leaves-the-eu>

⁴⁵ Boekholt et al. (2012), *Norway's affiliation with the European Research Programmes: Options for the future*, Technopolis Group for the Norwegian Ministry for Education and Research.

Appendix A Stakeholders consulted

- The Academy of Medical Sciences
- Association of Medical Research Charities (AMRC)
- Association of the British Pharmaceutical Industry (ABPI).
- The British Academy
- Cardiff University
- CBI (Confederation of British Industry)
- Centre for Research in the Arts, Social Sciences and Humanities (CRASSH), Cambridge University
- City, University of London
- Department for Business, Energy and Industrial Strategy (BEIS)
- Department for Skills and Higher Education, Welsh Government
- The Higher Education Funding Council for England (HEFCE)
- Innovate UK
- IoD Scotland
- Learned Society of Wales
- McDonald Institute for Archaeological Research, University of Cambridge
- National Physical Laboratory (NPL)
- Research Councils UK (RCUK)
- Rolls-Royce
- The Royal Academy of Engineering
- The Royal Society
- The Royal Society of Edinburgh
- The Royal Irish Academy
- Scottish Enterprise
- Scottish Funding Council (SFC)
- Shadow Robot Company
- TechUK
- UK Digital Catapult
- University of Southampton
- University of Ulster
- The Wellcome Trust

Appendix B REF2014 Units of Assessment and HESA cost centres

Table 19 REF2014 Units of Assessment (UOAs) and corresponding HESA cost centres

Main Panel	Unit of Assessment	Unit of Assessment Name	HESA cost centre(s)	HESA cost centre(s) Name
A	1	Clinical Medicine	101	Clinical medicine
A	2	Public Health, Health Services and Primary Care	102 and 105	Clinical dentistry and Health & community studies
A	3	Allied Health Professions, Dentistry, Nursing and Pharmacy	102 and 103 and 107	Clinical dentistry and Nursing & allied health professions and Pharmacy & pharmacology
A	4	Psychology, Psychiatry and Neuroscience	104	Psychology & behavioural sciences
A	5	Biological Sciences	106 and 112 and 127	Anatomy & physiology and Biosciences and Anthropology & development studies
A	6	Agriculture, Veterinary and Food Science	109 and 110	Veterinary science and Agriculture, forestry & food science
B	7	Earth Systems and Environmental Sciences	111	Earth, marine & environmental sciences
B	8	Chemistry	113	Chemistry
B	9	Physics	114	Physics
B	10	Mathematical Sciences	122	Mathematics
B	11	Computer Science and Informatics	121	IT, systems sciences & computer software engineering
B	12	Aeronautical, Mechanical, Chemical and Manufacturing Engineering	116 and 120	Chemical engineering and Mechanical, aero & production engineering
B	13	Electrical and Electronic Engineering, Metallurgy and Materials	117 and 119	Mineral, metallurgy & materials engineering and Electrical, electronic & computer engineering
B	14	Civil and Construction Engineering	118	Civil engineering
B	15	General Engineering	115	General engineering
C	16	Architecture, Built Environment and Planning	123	Architecture, built environment & planning
C	17	Geography, Environmental Studies and Archaeology	111 and 124 and 126	Earth, marine & environmental sciences and Geography & environmental studies and Archaeology
C	18	Economics and Econometrics	129	Economics & econometrics
C	19	Business and Management Studies	133	Business & management studies
C	20	Law	130	Law
C	21	Politics and International Studies	128	Politics & international studies
C	22	Social Work and Social Policy	131	Social work & social policy

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Main Panel	Unit of Assessment	Unit of Assessment Name	HESA cost centre(s)	HESA cost centre(s) Name
C	23	Sociology	132	Sociology
C	24	Anthropology and Development Studies	127	Anthropology & development studies
C	25	Education	135 and 136*	Education and Continuing education
C	26	Sport and Exercise Sciences, Leisure and Tourism	108 and 134*	Sports science & leisure studies and Catering & hospitality management
D	27	Area Studies	125	Area studies
D	28	Modern Languages and Linguistics	137	Modern languages
D	29	English Language and Literature	138	English language & literature
D	30	History	139	History
D	31	Classics	140	Classics
D	32	Philosophy	141	Philosophy
D	33	Theology and Religious Studies	142	Theology & religious studies
D	34	Art and Design: History, Practice and Theory	143	Art & design
D	35	Music, Drama, Dance and Performing Arts	144	Music, dance, drama & performing arts
D	36	Communication, Cultural and Media Studies, Library and Information Management	145	Media studies

*Costs centres excluded from the analysis by discipline

Appendix C Overview EU Framework Programmes

C.1 The structure of FP7 and Horizon 2020

The EU's multi-annual Framework Programmes for research and innovation represent the main instrument for funding and supporting research and innovation at a European level. They provide funding support to promote the achievement of the following objectives (now at the core of the Eighth Framework Programme, Horizon 2020):

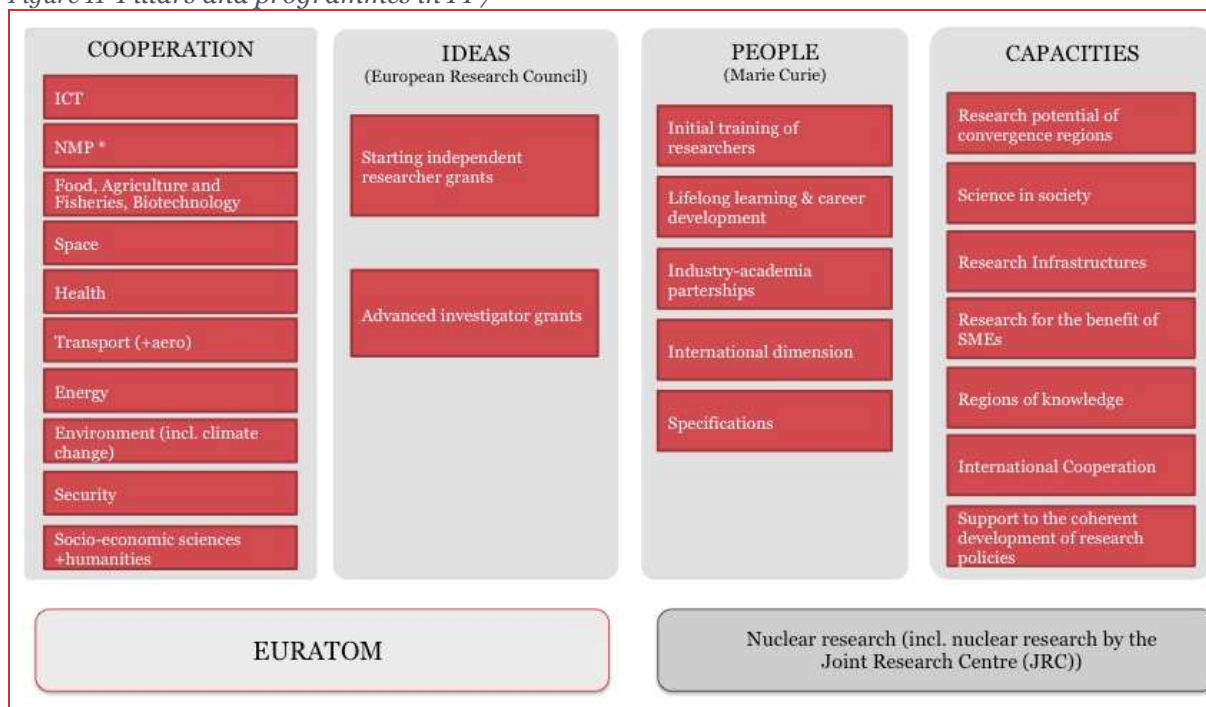
- Strengthening Europe's position in global science, through support for top level research
- Reinforcing industrial leadership in innovation, including major investment in key technologies, greater access to capital and support for SMEs
- Helping to address major societal challenges such as climate change, developing sustainable transport and mobility, making renewable energy more affordable, ensuring food safety and security, or coping with the challenge of an ageing population

C.1.1 FP7

The Seventh Framework Programme, FP7 (2007-2013), was organised around four pillars as shown Figure 11. Additionally, in 2007 the European Commission introduced the Joint Technology Initiatives (JTIs). This marked the first time that Public-Private Partnerships, involving industry, the research community and public authorities, were proposed at European level to pursue ambitious common research objectives. Six JTIs were funded under FP7 in the areas of innovative medicines (IMI), aeronautics (Clean Sky), embedded computing systems (ARTEMIS), nanoelectronics (ENIAC), hydrogen fuel cells (FCH) and space (GMES).⁴⁶ FP7 was also 'adopted' by the Europe 2020 strategy (2010) as a key instrument in the pursuit of a smart, sustainable and inclusive economy.

⁴⁶ Note, GMES was not implemented as a JTI in a strict sense, but rather through a delegated agreement with ESA, which co-financed 60% of the GMES space component, with the Commission delegating c. €750M of FP7 funds to ESA for the design, development and implementation of the Sentinels earth observation satellites.

Figure 11 Pillars and programmes in FP7

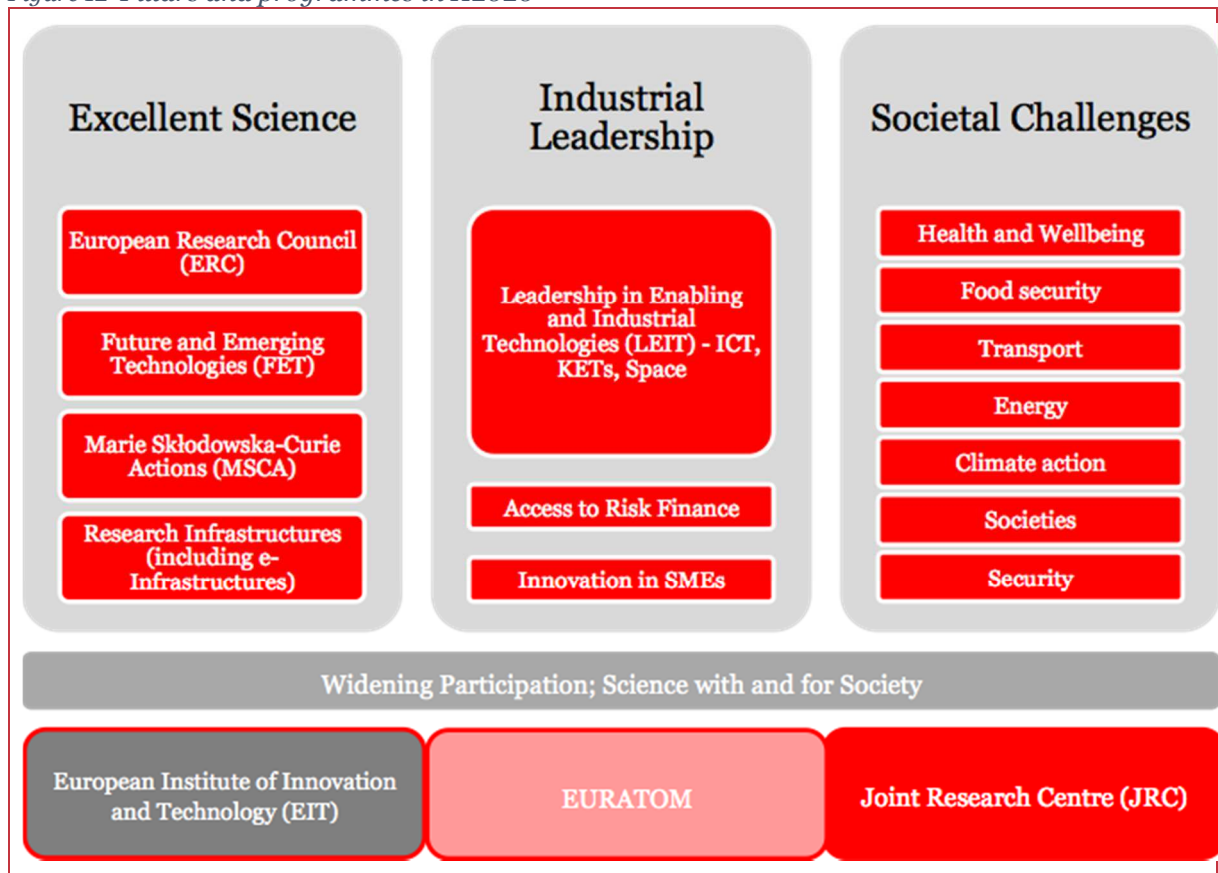


C.1.2 Horizon 2020

The Eighth Framework Programme, Horizon 2020 (2014-2020), marks a further development of EU Framework Programmes. The rationale for research and innovation policy intervention at the EU level is driven by European added value, i.e. in support of the Europe 2020 agenda and the completion of the single market. The Framework Programme for research and innovation intervenes above all in *transnational activities*, promoting competition among top researchers, enhancing cross-border cooperation in order to address common societal challenges and the competitiveness of the European economy. The Horizon 2020 programme is structured around three main pillars (figure below). As in FP7, it includes the European Research Council (ERC) and a programme on nuclear research, but also incorporates what was previously the separate Innovation Programme and European Institute of Innovation and Technology.

Horizon 2020 has also introduced a series of new or improved funding instruments, including the SME Instrument, access to finance and novel public procurement methodologies. The programme has enhanced the use of the co-funding system (used in FP7), which allows EU funds to be granted to national funders to strengthen the international engagement of what are essentially national schemes

Figure 12 Pillars and programmes in H2020



Additionally, beyond regular EU-funded projects, which may in some cases involve networking, we witness an increasing number of the types of network and partnering initiatives at the European level. It is critically important to understand and engage with these, both from the point of view of influencing agendas (setting priorities) and securing major contracts. These can be grouped into two categories: i) *innovation-related initiatives* such as the European Technology Platforms (industry-led networks that help to set the strategic agenda and define roadmaps) or the European Innovation Partnerships (Public-Private Partnerships that work across the research and innovation spectrum and address / work on major societal challenges), and ii) the *Public-Public Partnerships*, i.e. initiatives coordinating national policy makers such as the Joint Programming Initiatives. Finally, the seven Flagship Initiatives identified in Europe 2020 remain active, and provide opportunities for collaboration and funding.

C.2 Types of actions and grant characteristics under Horizon 2020

Table 20 Horizon 2020 – Types of Action

Type of Action ⁴⁷	Code	Minimum Conditions ⁴⁸	Funding Rate	Typical Duration	Average EC Contribution	Aim
Research & Innovation Action	RIA	≥ 3 legal entities from 3 MS/AC	100%	36-48 months	€ 2.0 - 5.0M	collaborative research projects
Innovation Action	IA	≥ 3 legal entities from 3 MS/AC	70% ⁴⁹	30-36 months	€ 2.0 - 5.0M	produce plans & arrangements or designs for new, altered or improved products, processes or services
Coordination & Support Action	CSA	1 legal entity	100%	12-30 months	€ 0.5 - 2.0M	accompanying measures (standardisation, dissemination, policy dialogues etc.) no research
MSCA ⁵⁰ (except Cofund)	MSCA					facilitate mobility of researchers for training & career development
ERC Grants	ERC	1 legal entity in MS/AC	100%	60 months	Starting: ≤ €2.00M Consolidator: ≤ €2.75M Advanced: ≤ €3.50M	support excellent investigators and their research teams to pursue ground-breaking, high-gain/high-risk research
Prizes	PRI	1 legal entity	n/a	n/a	variable	<ul style="list-style-type: none"> recognise past achievements induce future activities
SME Instrument	SME	1 SME in MS/AC	3 phases: <ul style="list-style-type: none"> Phase 1: lump sum of € 50K / project Phase 2: € 1 – 2.5M / project (1-2 years) (70% of eligible costs reimbursed) Phase 3: no funding 			combination of demonstration activities (testing, prototyping, ...), market replication
Fast Track to Innovation	FTI	≤ 5 legal entities from 5 MS/AC	70% ³	tbd	≤ €3.0M	produce plans & arrangements or designs for new, altered or improved products, processes or services
MSCA Cofund	MSCA Cofund	1 legal entity	50%	36-60 months	≤ €10.0 M	Co-funding of regional, national & international doctoral & fellowship programmes

⁴⁷ Defined in the Work Programme.

⁴⁸ Additional conditions may be listed in the respective Work Programmes.

⁴⁹ 100% for non-profit organisation (= any legal entity except companies)

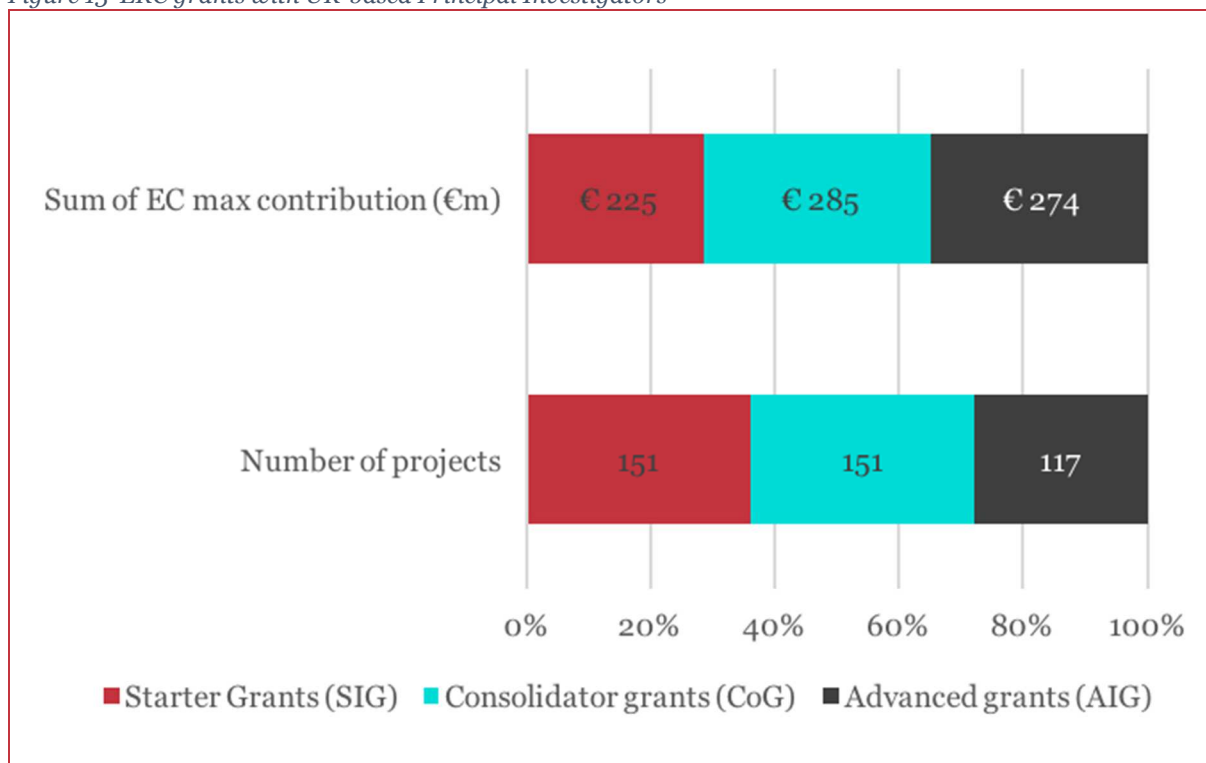
⁵⁰ MSCA = Marie Skłodowska Curie Actions

Type of Action⁴⁷	Code	Minimum Conditions⁴⁸	Funding Rate	Typical Duration	Average EC Contribution	Aim
ERA-NETs	ERA-NET	≥ 2 legal entities in MS/AC	33%	60 months	variable, see respective topic	coordinate research efforts of participating MS/AC in the field described & implement joint transnational call for proposals with EU co-funding
Pre-Commercial Procurement	PCP	≥ 3 public procurers from MS/AC	70%	18-48 months for 2 Phases: A) Preparation B) Execution	variable, see respective topic	enable the public sector as a technologically demanding buyer to encourage research, development and validation of breakthrough solutions in areas of public interest
Public Procurement of Innovative Solutions	PPI	≥ 3 public procurers from MS/AC	20%	18-48 months for 2 Phases: A) Preparation B) Execution	variable, see respective topic	enable trans-national buyer groups of procurers to share the risks of acting as early adopters of innovative goods or services which are not yet available on a large-scale commercial basis

Source: Euresearch

C.3 UK participation in Horizon 2020 European Research Council and Marie Skłodowska-Curie Actions

Figure 13 ERC grants with UK-based Principal Investigators



Source: CORDA

Table 21 Horizon 2020 MSCA grants with UK-based Principal Investigator

	Number of projects	Sum of maximum EU contribution
Innovative Training Networks	85	€ 281m
Individual Fellowships	875	€ 167m
Research and Innovation Staff Exchange	44	€ 32m
Co-funding of regional, national and international programmes	7	€ 23m
European Researchers' Night (NIGHT) / Trans-national cooperation among Marie Skłodowska-Curie National Contact Points (NCP)	10	€ 2m
Total	1,021	€ 504m

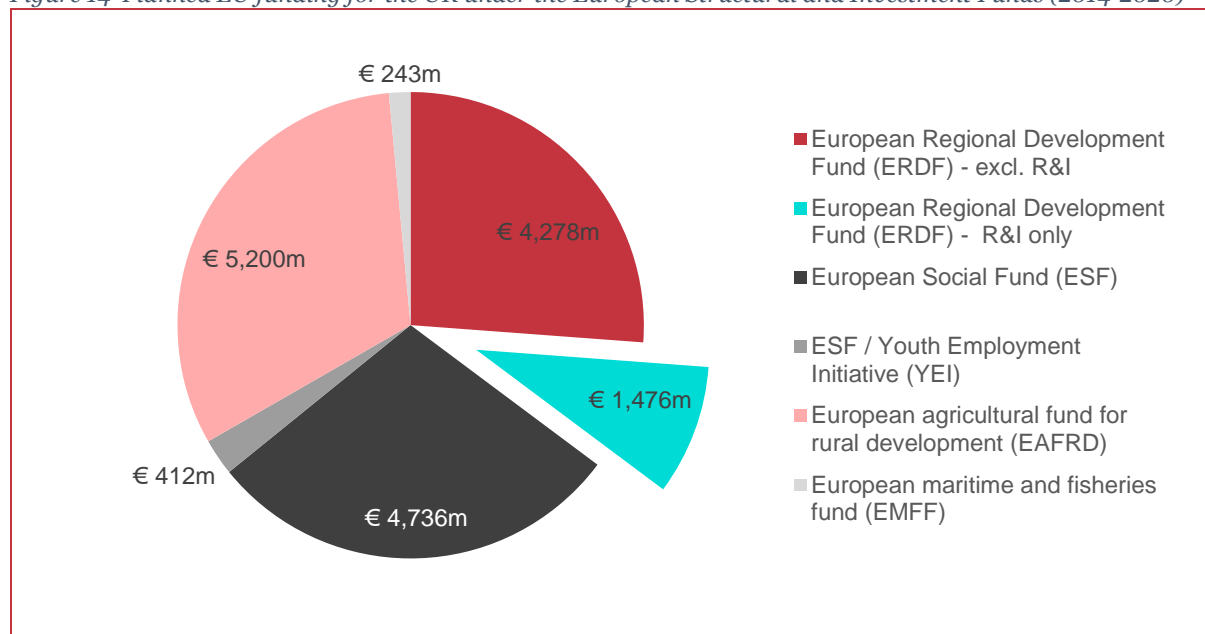
Source: CORDA

Appendix D Overview of support from the European Structural and Investment Funds to research and innovation projects in the UK

D.1 Overview of European Structural and Investment Funds (ESIF)

The five European Structural and Investment Funds (ESIF) are: the European Regional Development Fund, the European Social Fund (ESF), the Cohesion Fund, the European Agricultural Fund for Rural Development (EAFRD), and the European Maritime and Fisheries Fund (EMFF). EU funding for UK research and innovation comes primarily through the ERDF, as shown in Figure 14.

Figure 14 Planned EU funding for the UK under the European Structural and Investment Funds (2014-2020)



Source: EU Cohesion data and UK ERDF operational programmes

D.2 EU funding for UK research and innovation under ERDF

Priorities for ERDF funding are determined in a multilevel process: The Common Strategic Framework is set at the EU level and a Partnership Agreement is agreed between the European Commission and the Member States, translating the programme objectives into the national or regional context. Finally, national or regional bodies develop Operational Programmes detailing how the funds will be implemented during the programming period.⁵¹

Table 22 details the planned expenditure on research and innovations contained in the five UK operational programmes for ERDF (2014-2020). Most but not all actions are contained with ERDF 'Priority Axis 1', research and innovation.

⁵¹ See, for example, *Briefing: How the budget is spent - The European Structural and Investment Funds*, European Parliament, July 2015.

Table 22 Planned EU funding for research and innovation projects in the UK under ERDF (2014-2020)

ERDF intervention field	England	Wales ^[1]	Scotland	Northern Ireland	UK total
001. Generic productive investment in small and medium –sized enterprises ('SMEs')	€ 0	€ 0	€ 16.5m	€ 0	€ 16.5 m
02 Research and innovation processes in large enterprises	€ 0	€ 9.2m	€ 0	€ 0	€ 9.2m
056 – investment in infrastructure, capacities and equipment in SMEs directly linked to research and innovation activities	€ 102.8m	€ 17.8m	€ 0	€ 76.1m	€ 196.8m
57 Investment in infrastructure, capacities and equipment in large companies directly linked to research and innovation activities	€ 0	€ 5.9m	€ 0	€ 32.6m	€ 38.6m
058 – research and innovation infrastructure (public)	€ 55.3m	€ 69.7m	€ 0	€ 0	€ 125.0m
059 - research and innovation infrastructure (private, including science parks)	€ 55.3m	€ 23.7m	€ 0	€ 0	€ 79.1m
060 – research and innovation activities in public research centres and centres of competence including networking	€ 55.3m	€ 18.4m	€ 0	€ 0	€ 73.7 m
061 - research and innovation activities in private research centres including networking	€ 53.3m	€ 9.2m	€ 0	€ 0	€ 62.5m
062 – technology transfer and university-enterprise cooperation primarily benefiting SMEs	€ 100.8m	€ 55.2m	€ 47.0m	€ 0	€ 203.0m
063 – cluster support and business networks primarily benefiting SMEs	€ 100.8m	€ 27.6m	€ 0	€ 0	€ 128.4m
064 – Research and innovation processes in SMEs (including voucher schemes, process, design, service and social innovation)	€ 100.8m	€ 63.9m	€ 48.0m	€ 4.7m	€ 217.4m
065 – Research and innovation infrastructure, processes, technology transfer and cooperation in enterprises focusing on the low carbon economy and on resilience to climate change	€ 88.9m	€ 86.2m	€ 46.1m	€ 0	€ 221.3m
067 – SME business development, support to entrepreneurship and incubation (including support to spin offs and spin outs)	€ 102.8m	€ 0	€ 0	€ 0	€ 102.8m
101 Cross-financing under the ERDF (support to ESF-type actions necessary for the satisfactory implementation of the ERDF part of the operation and directly linked to it)	€ 0	€ 1.5m	€ 0	€ 0	€ 1.5m
TOTAL Research and Innovation funding	€ 816.1m	€ 388.4	€ 157.6m	€ 113.5m	€ 1,475.6m

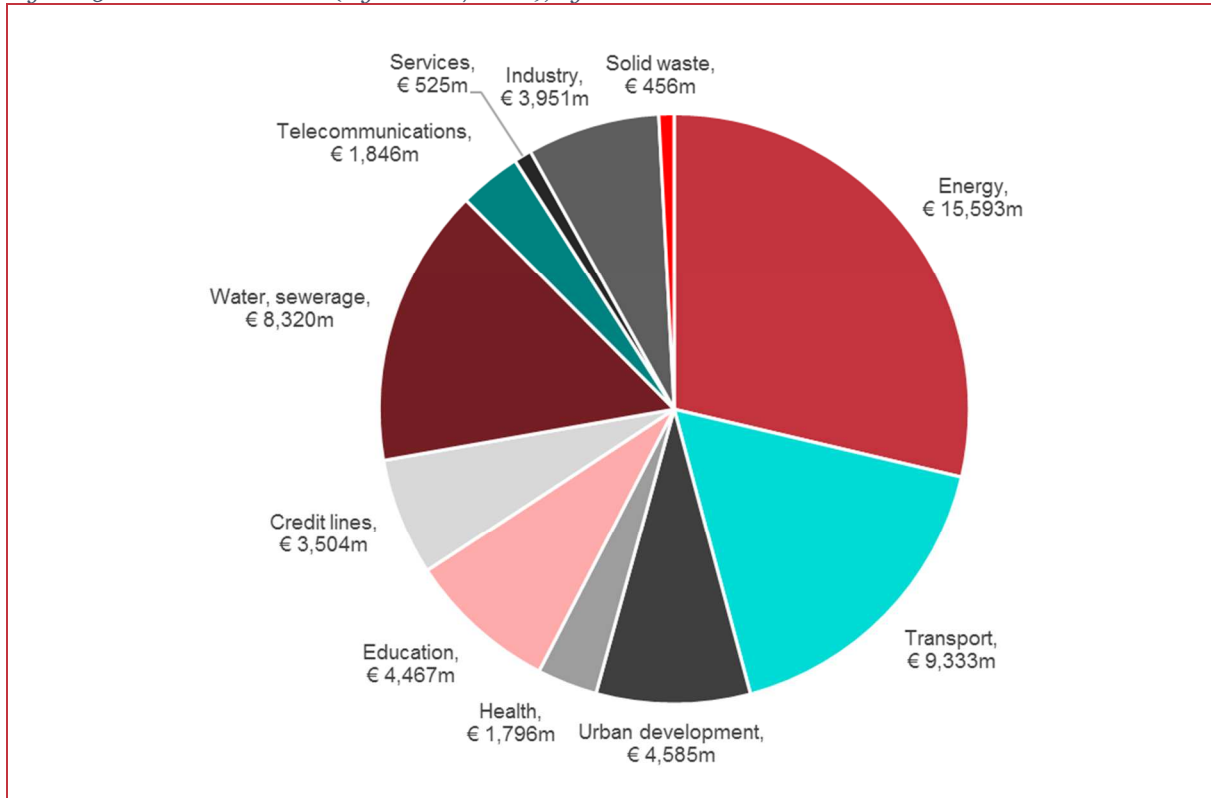
Source: Operational programmes for ERDF 2014-2020 (England, East Wales, West Wales and the Valleys, Northern Ireland, Scotland).

Note [1]: The 'Wales' column adds figures from the two Welsh operational programmes

Appendix E European Investment Bank (EIB) support for research and innovation in the UK

E.1 Overview of EIB loans to the UK

Figure 15 EIB loans to the UK (signed 2007-2016), by sector.



Source: EIB loans list (<http://www.eib.org/projects/loan/list/index.htm>)

E.2 EIB loans to research and innovation-related projects in the UK

Table 23 Loans from the European Investment Bank (EIB) to research and innovation-related projects in the UK, contracts signed between 2007 and 2016.

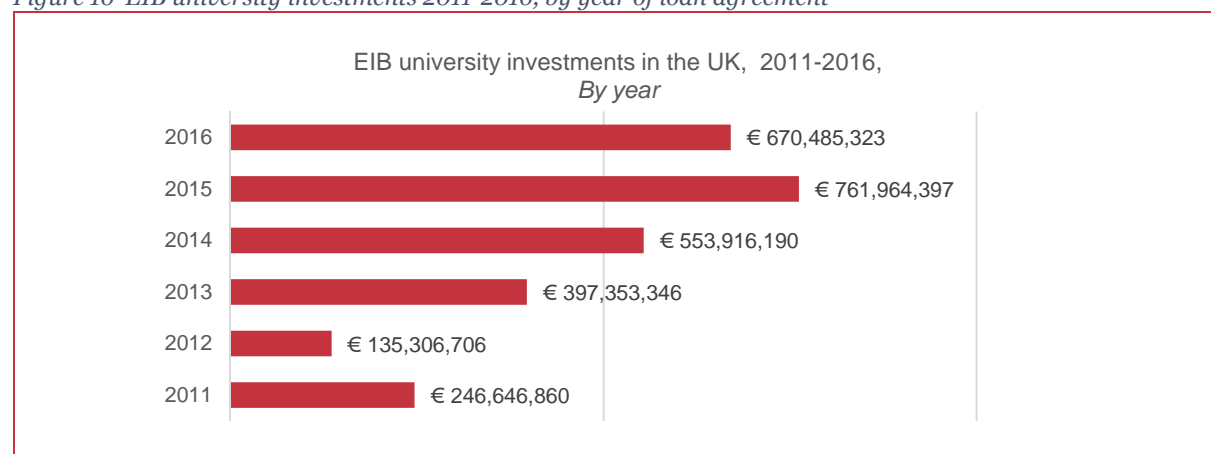
EIB Sector	Value of loans to UK Universities and Knowledge Transfer services	Value of loans to UK Businesses for R&D activities	Value of loans for the UK “Knowledge Economy programme”
Energy	-	€ 141.1m	-
Transport	-	-	-
Urban development	-	-	-
Health	-	-	-
Education	€ 2,624.5m	-	€ 500.6m
Credit lines	-	-	-
Water, sewerage	-	-	-
Telecommunications	-	€ 9.5m	-
Services	€ 223.9m	€ 129.1m	-
Industry	-	€ 2,251.4m	-
Solid waste	-	-	-
Total	€ 2,848.5m	€ 2,531.2m	€ 500.6m

Source: EIB loans list (<http://www.eib.org/projects/loan/list/index.htm>)

Note: These figures are based on a manual categorisation by the study team, based on recipients and project descriptions.

E.3 EIB loans to UK universities

Figure 16 EIB university investments 2011-2016, by year of loan agreement



Source: EIB loans list (<http://www.eib.org/projects/loan/list/index.htm>)

Table 24 EIB loans to UK universities and knowledge transfer organisations, signed between 2007 and 2016

University	Year (signature)	Loan amount	Description
University of Bristol Infrastructure	2007	€ 87.9m	Upgrading of teaching and research facilities of Bristol University through new construction and refurbishment of existing buildings.
University of York	2010	€ 53.0m	Construction and development of new university campus (Heslington East).
University of Strathclyde	2011	€ 100.9 m	Restructuring of the two main locations of the Strathclyde University in Glasgow (Scotland)
University of Birmingham	2011	€ 87.6m	Construction of a new library, sports facility and installation of energy-efficient systems
University of Edinburgh	2012	€ 59.9m	Reconstruction and modernization of buildings on the campus of the University of Edinburgh
Swansea University	2012	€ 31.7m	Establishment of an innovation platform with the aim of giving new impetus to the economy of the Wales region through R & D activities in cooperation with companies
Swansea University	2012	€ 43.8m	Establishment of an innovation platform with the aim of giving new impetus to the economy of the Wales region through R & D activities in cooperation with companies
University of East Anglia	2013	€ 47.4m	Development and refurbishment of campus of University of East Anglia in Norwich
University of Leicester	2013	€ 65.1m	Support for University of Leicester campus development
Imperial Innovations RDI	2013	€ 35.0m	R&D and commercialisation of innovations developed by leading UK universities in life sciences sector
University of Exeter	2013	€ 80.1m	The programme loan aims to fund a range of capex investments in British research-intensive higher education institutions.
University of Bath	2013	€ 74.4m	Refurbishment and restructuring of academic and administrative space aim to improve spaces and facilities within faculties, to cater for growth in student and staff numbers and to enhance the overall student experience.
City of Glasgow College PPP	2013	€ 95.3m	Construction and maintenance of a new campus at two locations for the City of Glasgow College
University of Ulster	2014	€ 182.6m	Relocation to Belfast City Centre by 2018 and upgrades at Magee, Coleraine and Jordanstown campuses
Bangor University	2014	€ 54.5m	Bangor University campus investment and expansion
University of Kent	2014	€ 94.3m	Teaching and research facilities
ICL Research and Teaching Excellence	2014	€ 178.5m	The project entails the construction of the Research and Translation Hub, new academic, research, laboratory and office buildings on the new Imperial West Campus situated in the London Borough of Hammersmith & Fulham, as well as renovation of the College's Aeronautics and Mechanical Engineering buildings, located in the London Borough of Kensington & Chelsea. Renovation and expansion of the College's general laboratory and student accommodation stock are also included in the project.

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Aston University	2014	€ 44.0m	The project concerns the construction, redevelopment and refurbishment of facilities of the Aston University (AU) Business School, Institute of Photonic Technologies, School of Languages and Social Sciences, Medical School and the University's main building on the campus in Birmingham.
University of Lincoln Higher Education Corp	2015	€ 67.3m	The project entails the construction of new buildings for the Schools of Psychology, Health and Social Care (the Sarah Swift building) and for the School of Engineering, Computing, Maths and Physics (the Isaac Newton building) on the University of Lincoln Brayford Campus in the city of Lincoln. Refurbishment of the Joseph Banks Laboratories, development of Marina Courts student accommodation and additional catering facilities, as well as some complementary reconfiguration and adaptation works are also included.
University of Hull	2015	€ 54.2m	Capital investment programme dedicated to the development and refurbishment of the University of Hull's campus.
IP Group Innovation Investment	2015	€ 42.4m	The project concerns investments in research and development (R&D) into innovative start-up companies and SMEs. The borrower holds and manages a portfolio of high-tech innovative spin-out companies and small and medium-sized enterprises (SMEs) in five different sectors (energy & renewables; medical equipment & supplies; pharma & biotech; IT & communications; chemicals & materials) in the UK.
Oxford University Research & Teaching Excellence	2015	€ 278.8m	For Oxford University's programme of improvement and expansion of research and teaching facilities. This represents the largest ever single loan for university investment by the EIB.
Imperial Innovations – Life Sciences Research	2015	€ 70.3m	The new loan will be used to support equity investment in life science spin-off companies and follows the successful investment of a GBP 30 million EIB loan agreed two years ago
University of the West of England Bristol	2015	€ 86.0m	The project concerns the refurbishment of existing teaching and research buildings and construction of new general teaching buildings at the current University of the West of England Frenchay Campus in Bristol.
University College London Campus Development	2015	€ 163.0m	The 30-year loan will provide funding for UCL's Bloomsbury campus in central London which is undergoing an ambitious programme to upgrade and expand its historic buildings as well as finance for the building of UCL East, the university's new site at the Queen Elizabeth Olympic Park in east London.
University of Newcastle	2016	€ 129.3m	Suite of projects including building refurbishment, the £58m Urban Sciences Building and the £40m National Ageing Science and Innovation Centre.
University of Edinburgh Capex Programme	2016	€ 257.0m	Increase the relevance and quality of teaching, learning and academic research capacity at the university by increasing and improving the overall quality of the existing academic space. The project will contribute to human capital formation and research, development and innovation (RDI) capabilities in the UK.
University College London Campus Development	2016	€ 202.7m	Development of the Bloomsbury and UCL East campuses.
Bangor University	2016	€ 10.2m	Bangor University campus investment and expansion
Swansea University Campus Optimisation	2016	€ 71.3m	Enhance the Singleton Park Campus and expand research facilities at the new Bay Campus.

Source: EIB funded projects data: <http://www.eib.org/projects/loan/list/index.htm>

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