B 2 Challenges of European R&I policy

Download data

European R&I policy uses various programmes and instruments to finance and organize research and innovation activities. In addition to funding excellence in research, European R&I policy aims to overcome development deficits in weaker regions.

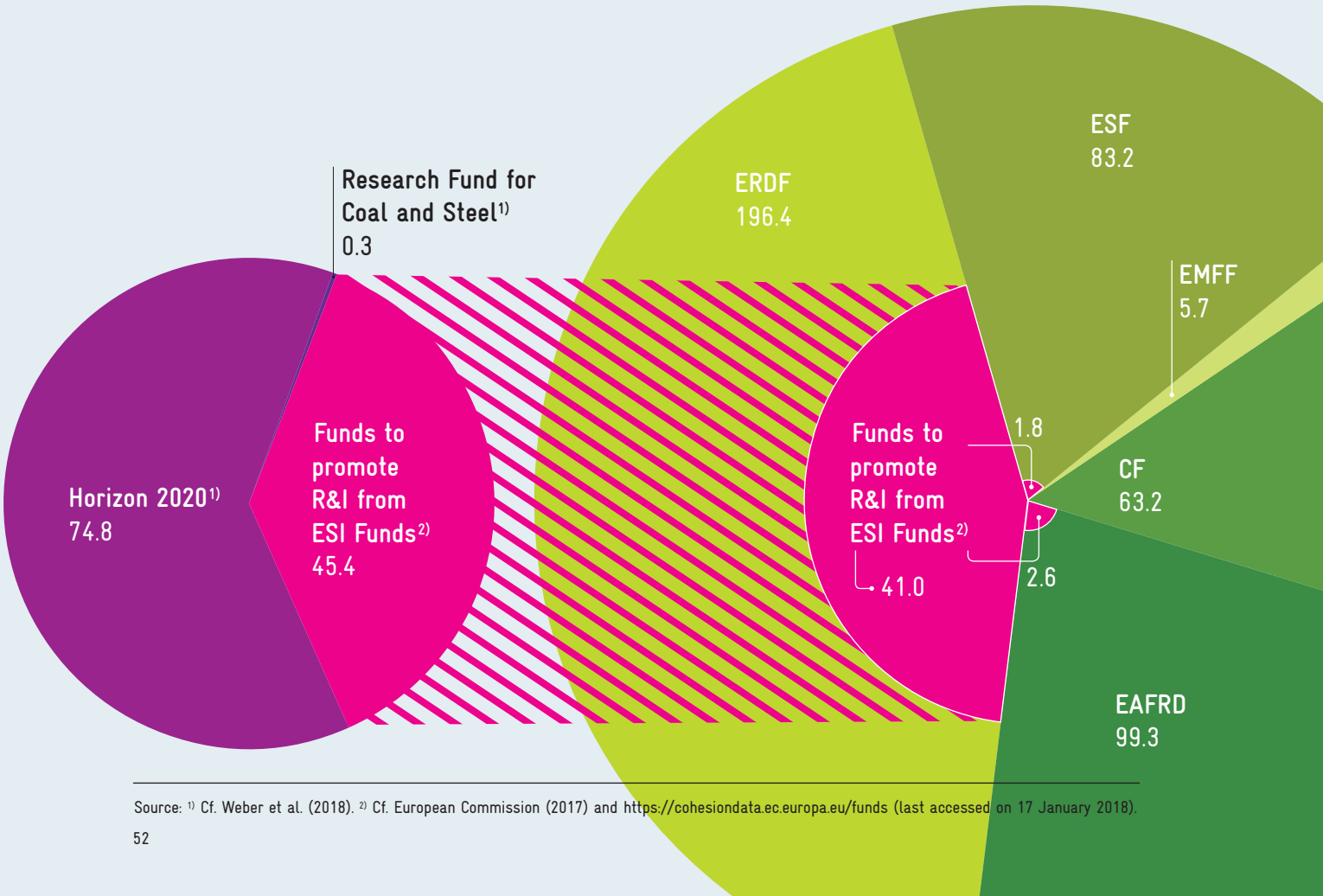
European Commission funds to promote research and innovation 2014–2020 in €bn

R&I programmes of the European Commission €120.5bn

- Horizon 2020: 8th EU Framework Programme for Research and Innovation
- RFCS: Research Fund for Coal and Steel
- Funds to promote R&I from ESI Funds

European Structural and Investment Funds (ESI Funds) €447.8bn (including €45.4bn for R&I)

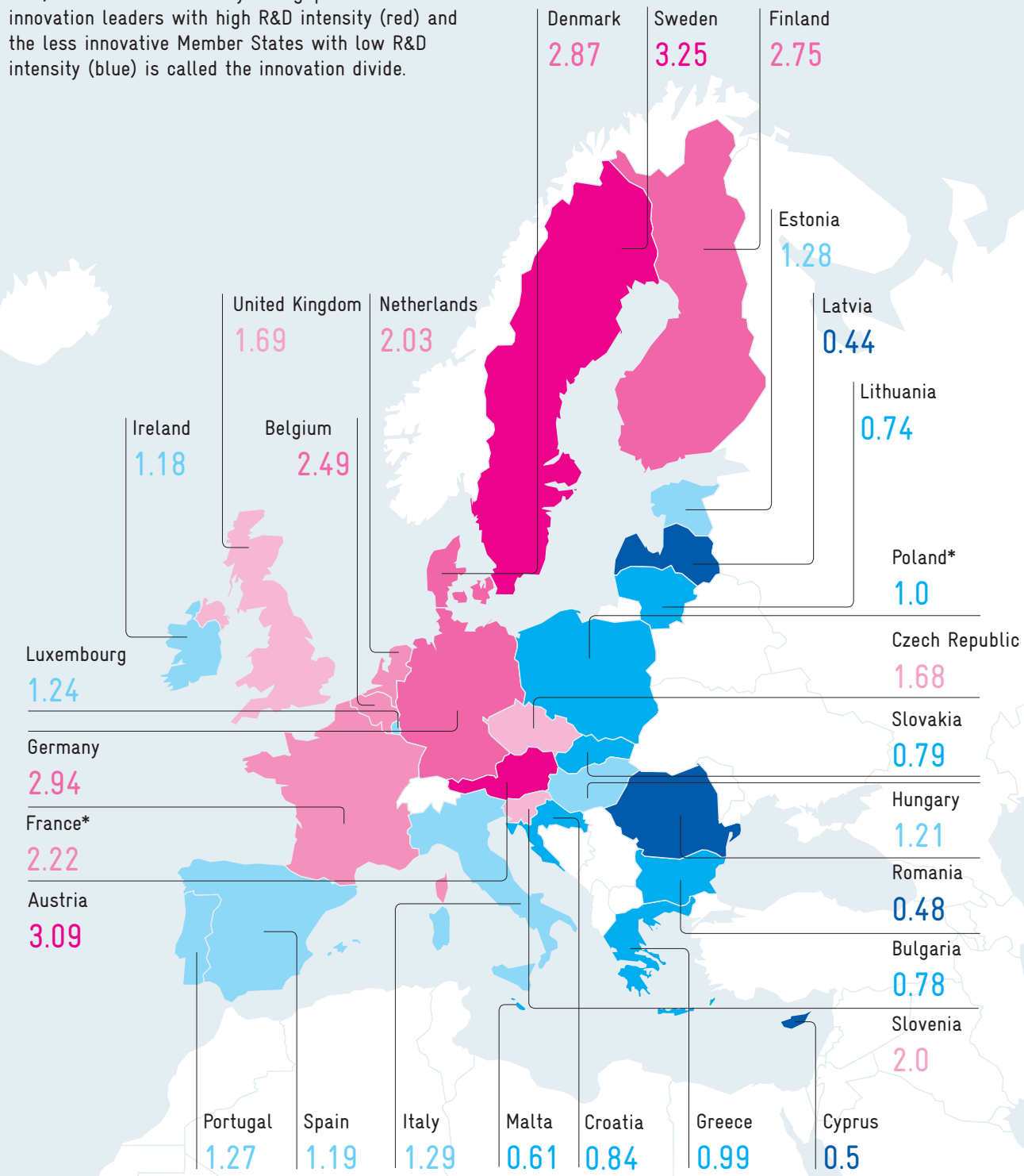
- ERDF: European Regional Development Fund
- ESF: European Social Fund
- EMFF: European Maritime and Fisheries Fund
- CF: Cohesion Fund
- EAFRD: European Agricultural Fund for Rural Development



Source: [1)] Cf. Weber et al. (2018). [2)] Cf. European Commission (2017) and https://cohesiondata.ec.europa.eu/funds (last accessed on 17 January 2018).

R&D intensity of the EU Member States

The innovation performance of Member States of the European Union – as shown by the R&D intensity indicator (= R&D expenditure as a percentage of GDP) – varies considerably. The gap between the innovation leaders with high R&D intensity (red) and the less innovative Member States with low R&D intensity (blue) is called the innovation divide.



* 2015 figure

Source: OECD (2018).

B 2 Challenges of European R&I policy

B 2-1 Introduction

Global competition for knowledge and innovation has intensified in the past decades. The European Union (EU) has responded to this challenge inter alia with the Lisbon Declaration (2000), in which it formulated the intention of making Europe the most competitive and dynamic knowledge-based economy in the world.[216] In order to reach this highly ambitious goal, the EU Commission and the EU Member States decided to coordinate their science, research and innovation policies more strongly than before and in this way create a European Research Area (ERA). The ERA aims to interconnect the national research systems and make them more effective, to ensure an open labour market for researchers, and to improve the exchange and transfer of scientific findings.[217]

The EU can point to successes in its R&I policy in the meantime. For example, in 2007 the European Research Council (ERC) was created – an important European institution to support excellent research projects. The cross-border and intersectoral mobility of researchers has also been strengthened, e.g. by the Marie Skłodowska-Curie actions (since 2007). In addition, the European satellite navigation system Galileo was launched in 2016, after overcoming numerous hurdles.[218]

Despite these successes, the list of challenges remains long. The further development of European R&I policy is an extremely complex undertaking. Against this background, the Commission of Experts concentrates its analysis on four areas of European R&I policy:

- the structures of European R&I policy, focusing on the 8th Framework Programme for Research and Innovation (Horizon 2020) and the European Structural and Investment Funds (ESI Funds),
- the funding of German companies by European programmes (particularly Horizon 2020),
- the establishment of a European Innovation Council (EIC), and
- the planned withdrawal of the United Kingdom from the EU (Brexit).

Key programmes of European R&I policy B 2-2

The need for a European R&I policy – alongside national R&I policies – is justified by the creation of European added value. This added value arises structurally from cross-border and transdisciplinary cooperation, as well as from exchanging and sharing knowledge and infrastructure.[219]

Furthermore, referring to the great societal challenges in the regulation establishing its current Framework Programme for Research and Innovation, Horizon 2020, the EU points out that Member States individually will not be able to address these challenges. One form of the added value of European R&I policy therefore also lies in jointly meeting these challenges.[220]

European R&I funding comprises a large number of programmes which are administered by different EU Directorates General. There are also further programmes that are organized multilaterally and sometimes include non-EU states in addition to the EU and the Member States. These structures are complex, fragmented and very difficult to coordinate.

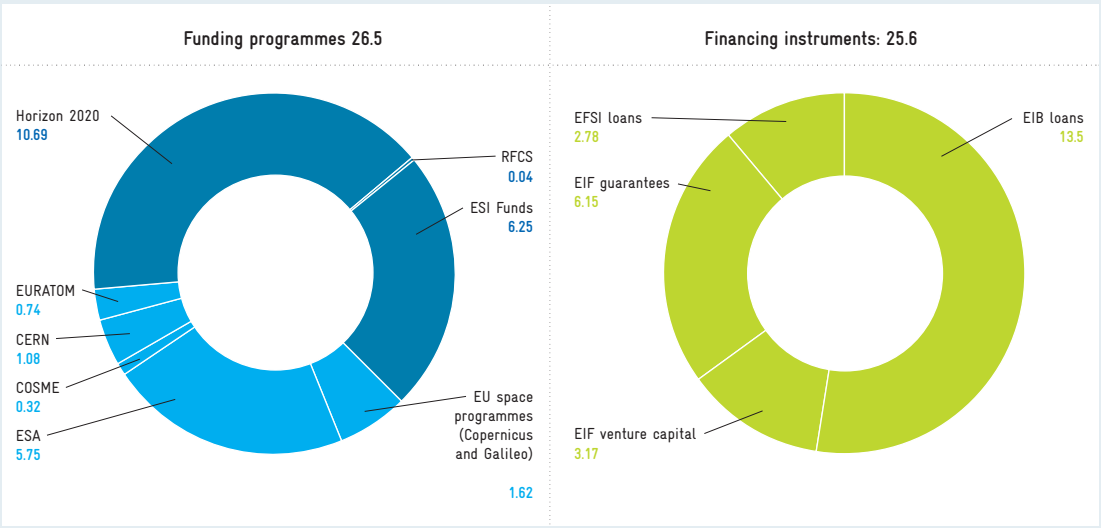
Furthermore, the financial means from the ESI Funds are provided by the EU, but are administrated at the national level. This involves a risk that the funds might not be used in line with the original targets.

Figure B 2-1 provides an overview of European R&I funding.[221] The EU's most important R&I funding programmes are the 8th Framework Programme for

Fig. B 2-1

Download data

Assignment of funds in important programmes of European research and innovation policy in €bn per annum



For further information on the funding programmes and financing instruments, cf. endnote 221.
Source: diagram based on Weber et al. (2018: 14).

Research and Innovation, Horizon 2020, and the ESI Funds; both programmes run from 2014 to 2020. In addition to the EU's R&I funding programmes, there are other multilaterally organized R&I programmes as well as financing instruments for R&I activities, such as loans, guarantees and risk capital. The financing volume of the funding programmes described is about €26.5 billion per annum. An additional €25.6 billion per annum is made available via the R&I financing instruments.

The current discussion on the structure and objectives of European R&I policy focuses primarily on two issues. One is strengthening the transfer of knowledge and findings from research to economic application – an issue that already made it onto the agenda of the Lisbon Strategy during the discussion on the European Paradox (cf. box B 2-2) but has not yet been satisfactorily solved by the various framework programmes. The other is concern about an uneven development of R&I activities among the EU Member States – a problem that is discussed as the innovation divide (cf. box B 2-3) and for which R&I policy solutions are being discussed.

Strengthening the innovation aspect in Horizon 2020

The goals of Horizon 2020 are to build up an EU-wide knowledge and innovation-based society, strengthen Europe's scientific and technological base, and promote its benefits for society. The idea is thus for Horizon 2020 to contribute to the implementation

Box B 2-2

The European Paradox

In 1995, an EU document stated for the first time that Europe was weaker than the USA in the transfer of knowledge and findings, despite its relatively strong scientific performance.[222] This hypothesis is referred to as the European Paradox. The weaker transfer of knowledge and findings is regarded as the main reason for Europe's weaker innovation performance compared to the USA. More recent studies indicate, however, that Europe might also be behind the US in terms of science.

To this extent, there are doubts as to whether Europe's performance in innovation will catch up with the US in the foreseeable future.[223]

Box B 2-3

The innovation divide between the EU Member States

The R&I performance of the EU's Member States is very unevenly distributed. For example, there is a large gap between the innovation leaders in Northern and Central Europe and the less innovative Member States in Southern and Eastern Europe; this gap is referred to in the literature as the innovation divide.[224]

Within Horizon 2020, the programme entitled Spreading Excellence and Widening Participation in particular is intended to help close the innovation divide. The aim of the programme is to broaden the excellence base in the field of R&I and to expand participation – especially by the less innovative Member States – in excellence-oriented European R&I programmes. The excellence and innovation potential of the EU will, it is hoped, be released and promoted on a broader level with the help of partnership measures (cf. endnote 236).[225]

Another aim is that this promotion will also generate synergies with the ESI Funds (cf. p. 58) by coordinating the measures with the priorities encouraged under the EU's Cohesion Policy.[226]

of the Europe 2020 strategy for smart, sustainable and inclusive growth, as well as to the realization of the ERA.[227]

While the previous Framework Programmes were geared exclusively towards funding research activities, Horizon 2020 explicitly for the first time aims to integrate programmes to fund innovation.[228] Facilitating the transfer of outstanding research findings into successful innovations is the intention behind this extension, and it will principally benefit SMEs. One idea is to award 20 percent of all funds disbursed by Horizon 2020 to SMEs.[229]

In terms of content and structure, Horizon 2020 is divided in three pillars: Excellent Science, Industrial Leadership, and Societal Challenges (cf. table B 2-4); each of these focal areas is made up of different subprogrammes.[230] The first pillar, Excellent Science, primarily aims to fund science-driven basic research, better networking and increased mobility for researchers, and easier access to research infrastructures. This pillar includes the European Research Council (ERC)[231] and the Marie Skłodowska-Curie actions,[232] among others. The second pillar, Industrial Leadership, emphasizes the transfer dimension and comprises programmes for promoting industrial and key technologies.[233] This pillar for the first time also contains programmes to simplify access to venture-capital funding,[234] and includes an instrument to fund innovation in SMEs.[235] The third pillar, Societal Challenges, funds projects that can contribute to tackling major societal challenges, such as climate change or sustainable mobility.

In addition to the pillars, Horizon 2020 includes four additional cross-cutting areas (cf. table B 2-4). The Spreading Excellence and Widening Participation programme element aims to take suitable measures[236] to close the gap between the EU Member States in terms of innovative capacity (cf. box 2-3). The cross-cutting area Science with and for Society aims to improve the level of acceptance for science in society. The Joint Research Centre (JRC) acts as the European Commission's scientific service. Its remit includes compiling scientific studies in support of EU policies. The European Institute of Innovation and Technology (EIT), which was taken over into Horizon 2020 in 2014, aims to contribute to an increase in innovative capacity in the EU Member States by integrating all areas of the knowledge triangle consisting of education, research and innovation (cf. p. 60).[237]

Tab. B 2-4

Download data

Comparison of grants between the 7th Research Framework Programme (FP7) and Horizon 2020 in €m

Programme areas	FP7 2007-2013[1]	Horizon 2020 2014-2020	Percentage change from FP7 to Horizon 2020
Pillars			
I. Excellent Science	13,975	24,232	73%
II. Industrial Leadership	15,291	16,467	8%
III. Societal Challenges	18,458	28,630	55%
Cross-cutting areas			
Spreading Excellence and Widening Participation	716	817	14%
Science with and for Society	330	445	35%
Joint Research Centre (JRC)	1,751	1,856	6%
European Institute of Innovation and Technology (EIT)[2]		2,383	

[1] Since the structural realignment, several areas of the FP7 cannot be compared with areas in Horizon 2020.
[2] EIT is not part of the FP7.
Source: Weber et al. (2018).

In addition to a wide variety of different funding areas, Horizon 2020 also includes several different forms of funding such as research and innovation measures, coordination measures, co-financing measures and partnerships.[238]

Horizon 2020's total budget amounts to €74.8 billion.[239] This represents an increase of 34 percent compared to the budget of the 7th Research Framework Programme (FP7) of €55.8 billion.[240] Horizon 2020's share of the entire EU budget for the period from 2014 to 2020 is 7.3 percent.[241] The strong increase in funds is, on the one hand, the result of the integration of different programmes;[242] on the other hand, some parts of Horizon 2020 are significantly better funded than under FP7.[243] Table B 2-4 documents the budgetary development from FP7 to Horizon 2020. It shows that there were marked increases in the budgets of the pillars Excellent Science and Societal Challenges compared to FP7.[244] Funding for the Industrial Leadership pillar, by contrast, rose at a below-average rate of only 8 percent. In order to estimate the growth of the transfer of knowledge and findings dimension between FP7 and Horizon 2020, this 8 percent needs to be increased by the transfer elements that are contained in Societal Challenges, but are not clearly quantifiable, as well as the increase resulting from the integration of the EIT.

The growing importance of the ESI Funds in R&I funding

Next to Horizon 2020, the ESI Funds[245] with their resources for funding R&I are the financially strongest instruments of European R&I policy.[246] Their primary objective of overcoming development deficits in weaker regions was extended among other things by the aspect of funding research, technological development and innovation in 2007.[247] The current EU regulation on the ESI Funds passed in 2013 lists strengthening research, technological development and innovation as their main thematic goal.[248] The ESI Funds consist of five funds, three of which include resources for promoting R&I activities (ERDF, EAFRD, ESF). The overall budget of the funds for the period from 2014 to 2020 amounts to about €448 billion, approximately one tenth of which (€45 billion) is earmarked for R&I activities.

Within the framework of European Cohesion Policy, the R&I measures of the ESI Funds are supposed to help build up or enhance R&I infrastructures and R&I capacity in the less innovative EU Member States. The aim of the funding is to close the existing innovation divide between EU Member States where innovation is strong and the less innovative states, and to place the ERA on a broader basis.[249]

The European Regional Development Fund (ERDF) has a central role to play with a funding volume of

about €41 billion for R&I activities.[250] The ERDF's investment priorities lie in strengthening research, technological development and innovation. By supporting the development of R&I infrastructures and promoting the enhancement of capacity for the development of top-level achievements, the ERDF aims to help reduce the innovation divide between the EU Member States.[251]

A further €2.6 billion is being made available for R&I activities by the European Agricultural Fund for Rural Development (EAFRD).[252] In addition, €1.8 billion has been earmarked by the European Social Fund (ESF) for the intensification of human capital in R&I.[253]

B 2-3 EU funding of German actors

With Horizon 2020, the EU has extended its research funding and now promotes both research and innovation. In this context, much more emphasis is now attached to the topics of transfer and SMEs. The following subsection analyses the importance of European funding for German companies compared to national funding.

Funding by Horizon 2020 important for German companies

Horizon 2020 grants funding amounting to approximately €317 million per annum to German companies. By contrast, the Federal Government's Specialized Programme disburses about €750 million per annum. In addition, the internal R&D activities of companies are funded to the tune of approximately €280 million per annum via the Central Innovation Programme for SMEs (ZIM).[254] Further support comes from the Länder and other sources outside the Federal Government's Specialized Programmes.

The funding provided by Horizon 2020 only makes up a small part of the public funding that is made available to German companies, tertiary education institutions and non-university research organizations (Außeruniversitäre Forschungseinrichtungen, AUFs) to finance R&D. For example, the funds provided by Horizon 2020 are the equivalent of only 3.1 percent of total state R&D financing (Horizon 2020, Federal Government and the Länder) provided for tertiary education institutions. The figure for AUFs is slightly higher at 4.8 percent.[255] In the corporate sector, Horizon 2020 provides 16.5 percent of all state funds. However, relative to total R&D expenditure in the corporate sector, Horizon 2020 funding only represents a share of 0.56 percent.[256]

Similar priorities of German and European R&I funding

Looking at the sources of funding (EU Framework Programmes, BMBF, BMWi and the Länder) provided to the recipient companies from different industries, it becomes clear that the funding priorities of the EU Framework Programme do not differ systematically from those of the national funding programmes (cf. table B 2-5). For example, the sector structure of the companies funded by EU Framework Programmes broadly corresponds to that of companies funded by national Specialized Programmes. In particular, the BMBF's Specialized Programmes largely match Framework Programme funding.[257] Only in Chemicals/Materials and Other Services is there a relatively high percentage of companies that receive their funding exclusively from the EU Framework Programme.[258]

Furthermore, many companies find and often use funding opportunities for their R&D activities in both programme types (71 percent across all industries). As a result, most companies that receive funding from an EU Framework Programme are also funded by the Specialized Programmes of the Federal Government.

Looking at the funding of research at SMEs, here too there are clear similarities between EU Framework Programme funding and funding by the Federal Government's Specialized Programmes. For example, SMEs make up 66 percent of all companies funded by FP7 and Horizon 2020; this is only slightly lower than the SMEs' share of Federal Government Specialized Programme funding, which was 69 percent during the reference period 2007–2016.[259]

Strengthening transfer through EU funding

By supporting R&D activities, European R&I policy contributes to the transfer of knowledge and technology in different ways. A key contribution is providing financial support for cooperation projects with different innovation actors from the EU. Since such cross-border collaborations are only promoted in exceptional cases by the German Specialized

Tab. B 2-5

Download data

Companies receiving public innovation funding, by industry* and source of funding, average 2006–2014, as percentages and in absolute terms

	Solely funding from the EU Framework Programme		Funding from the EU Framework Programme and funding by the Federal Government		Funding by the Federal Government				Länder funding	
					BMBF		BMWi			
	%	absolute	%	absolute	%	absolute	%	absolute	%	absolute
R&D services	4	30	19	322	12	682	7	548	6	489
Pharmaceuticals/electronics/ measurement technology/optics	5	34	9	149	10	618	9	698	6	523
ICT services	14	98	12	207	17	1,013	9	698	10	887
Electrical engineering/mechanical engineering/vehicle construction	11	74	14	226	16	927	22	1,693	16	1,373
Engineering services	7	51	4	74	9	551	8	603	6	532
Chemicals/materials	19	130	14	235	11	672	15	1,158	12	1,009
Other industries	9	65	12	205	15	909	20	1,526	22	1,920
Other knowledge-intensive services	9	60	5	85	5	305	4	270	7	644
Other services	22	153	10	162	4	233	6	471	14	1,214
Total	100	693	100	1,666	100	5,910	100	7,664	100	8,591

Legend: 19 percent of all publicly subsidized companies that receive funds from both the EU Framework Programme and the Federal Government can be categorized as R&D services.
* Economic sectors in R&D-intensive industries and knowledge-intensive industrial services: R&D services 72; pharmaceuticals, electronics, measurement technology, optics 21, 26; ICT services 61–63; electrical engineering, mechanical engineering, vehicle construction 27–30; engineering services 71; chemicals, materials 13, 16–17, 19–20, 22–24; other industries 5–12, 14–15, 18, 25, 31–39; other knowledge-intensive services 58–60, 64–66, 69–70, 73–74; other services 46, 49–53, 78–82.
Source: ZEW, Mannheim Innovation Panel in Weber et al. (2018) and own calculations.

Programmes, or only constitute a small proportion of their overall funding activities, this is a unique selling point for the EU Framework Programme.[260]

R&D collaborations are funded by the EU Framework Programme in large project consortia. On average, eighteen actors are involved in Horizon 2020 Projects, more than twice as many as in Specialized Programme projects of the Federal Government (seven actors). The coordination of these large international project consortia involves high transaction costs both for the companies concerned and for research organizations.[261]

In projects with the participation of at least one company, the composition of the cooperation partners differs little from that in the programmes of the EU Framework Programme and in the Specialized Programme projects of the Federal Government (cf. table B 2-6). In both EU and federal programmes, the companies' cooperation partners are often other companies.[262] Approximately 40 percent of the cooperation partners of companies are tertiary education institutions and non-university research organizations, in both federal and EU programmes.

The relatively sharp increase in the participation of the public administration in EU Framework Programme projects (FP7: 2.5 percent; Horizon 2020: 4.3 percent) could be due to the increase in public-private partnerships in the context of Horizon 2020 (cf. table B 2-6).

About a third of the cooperation partners of German companies in Horizon 2020 projects come from Western or Central Europe. The percentage of partners from Southern Europe amounts to 23 percent. The partners of 20 percent of the projects come from Germany, and 18 percent from Northern Europe. Collaborations with partners from Eastern Europe account for only 6 percent.[263]

Horizon 2020 is thus making an important contribution to collaborations between German companies and academic organizations or other companies in other European countries.

In addition to its programme funding, Horizon 2020 provides another instrument for promoting the transfer of knowledge and findings: the European Institute of Innovation and Technology (EIT), which was established in 2008. Between 2014 and 2015, German actors received the largest share of EIT funding in Europe: approximately 16 percent.[264]

The operational part of the EIT is made up of six Knowledge and Innovation Communities (KICs), two of which have their headquarters in Germany. The KICs' task is to strengthen innovative activities and entrepreneurship, advance start-up training, and finance start-ups. In this context, the KICs pursue issues that are related to the great societal challenges, such as climate change.[265]

The assessment of the EIT is ambivalent. On the one hand, an interim evaluation conducted by the European Court of Auditors in 2016 attested the EIT significant deficits with regard to "overall efficiency as a result of the complex organizational framework and management problems".[266] On the other hand, the EIT points out that the six KICs created around 375 start-ups and about 500 new products and services between 2010 and 2016. Furthermore, 18 EIT founders are to be found on the '2017 Forbes 30 under 30 Europe List'.[267]

European Innovation Council: a new instrument of EU innovation funding

B 2–4

The plan to set up a European Innovation Council (EIC) was first put forward in June 2015 by Carlos Moedas, EU Commissioner for Research, Science and Innovation. From 2021, the EIC is envisaged as a powerful and visible institution for European innovators, offering similar services to those provided to European science by the European Research Council (ERC).[268]

The European Commission considers the establishment of an EIC necessary for various reasons. For example, the EU suffers from a series of deficits, particularly vis-à-vis the USA, that inhibit innovation performance. These deficits include a lack of start-up dynamics, as well as an insufficient number of fast-growing, internationally successful start-ups, especially in the high-growth digital and internet economy. According to the Commission, the existing European instruments for funding innovation have proved too unwieldy and cumbersome to rectify these deficits.[269] Although the EU now has a wide range of instruments for funding innovation, these are not regarded as effective enough when it comes to opening up new markets. It is therefore doubtful whether the funding instruments have kept pace with the changing forms and practices of innovation – particularly in the high-growth digital and internet economy.[270]

Tab. B 2-6

Download data

Project cooperation partners of companies receiving funding, by source of funding (EU, federal) and funding period as percentages

	EU Framework Programmes			Fed. Govt.'s Specialized Programmes		
	FP7 2007–2013	Horizon 2020 2014–2020	Percentage change	2007–2013	2014– continuous	Percentage change
Companies	49.4	51.4	4.0	61.2	56.3	–8.0
Universities	25.6	22.1	–13.7	21.5	25.4	18.1
Research institutions	19.4	17.6	–9.3	15.6	16.0	2.6
Public administration	2.5	4.3	72.0	0.6	0.6	0.0
Other institutions	3.1	4.7	51.6	1.2	1.6	33.3
Total	100	100	–	100	100	–

Source: Weber et al. (2018) and own calculations.

Extremely diverse demands on the EIC

Expectations and the demands made on the EIC are extremely diverse and in some cases mutually contradictory.[271] Overall, most of the proposals for the organization of the EIC can be assigned to four different models:

- support tool for scale-ups,
- funding instrument for excellent innovations with a focus on tackling societal challenges,
- motor for the coordination and integration of existing instruments,
- key to an integrated R&I policy by improving political consultations and coordination between R&I policies.[272]

The plans for the creation of an EIC were the subject of considerable controversy from the outset,[273] mainly because there are already many instruments aimed strengthening innovative activities whose relationship with the EIC is uncertain.[274] Among other things, it is uncertain where to draw the line between the EIC's role and that of the EIT, which was founded back in 2008 with the aim of it becoming the figurehead of European innovation policy.[275] The EIT supports long-term, largely autonomously operating KICs, which is a different approach from the EIC whose support is based on a bottom-up design, i.e. without thematic requirements.[276]

EIC pilot project launched in October 2017

In spite of the existing controversies, an EIC pilot project was launched at the end of October 2017 with a budget of €2.7 billion (for the period 2018–2020). Its self-declared aim is to support outstanding researchers, innovators and SMEs with brilliant ideas and international ambitions.[277] Furthermore, the pilot project is to experiment with new approaches to support the emergence of radical innovations.[278, 279]

The following key points of the project are named:
Integrated and transparent access to previous Horizon 2020 elements: Instruments such as FET Open, SME Instrument, Innovation Prize and Fast Track to Innovation[280] are bundled together to provide support, particularly for scale-ups. The objective here is to realize a one-stop-shop model and simplify access for potential funding recipients, especially for growth-oriented young companies.

New administrative procedures: In order to make the funding process faster and more adaptable, tenders will be thematically unspecified and follow a two-stage procedure in which the applicants will also be interviewed. The personality of the innovators thus carries more weight than in classic, purely project-related programmes.

Establishment of a group of high-level innovators: A group of experienced figures from the fields of innovation, risk capital and innovation funding are to share their experience in the selection of grant applications.[281]

The intention is that the experience gained with these pilot activities will form the basis for the development of the EIC in the next Framework Programme. That the establishment of an EIC is likely is suggested by the Lamy Report – an experts' report on maximizing the impact of European R&I programmes published in June 2017 on behalf of the EU Commission. The Lamy Report recommends the establishment of an EIC as a central institution within the upcoming 9th Framework Programme and as a complementary pillar to the ERC.[282]

The German government has also come out in favour of setting up the EIC. The EIC should serve as an umbrella organization for a consolidated portfolio of European innovation-funding instruments that first and foremost benefits companies.[283] In this context, the introduction of the EIC should be used to reform the existing SME Instrument which, in the Federal Government's view, currently only duplicates the funding activities of the Member States. The aim should be for EIC funding to require SMEs to cooperate with European partners from the outset "to enable SMEs to scale-up their activities on European and international markets".[284] The German government rejects the individual funding of SMEs at the European level, referring to ongoing negative developments, e.g. lack of effectiveness, decline in national funding commitment and high oversubscription rates of funding programmes.[285]

EIC support for radical innovations is mentioned, but no further details are given. It is merely pointed out that the EIC must make a contribution so that more market-opening, radical innovations are created in Europe.[286]

Concepts for funding radical innovations

Parallel to the discussion on the EIC, ideas were developed last year in Germany and France on setting up institutions aimed at generating radical innovations.

Within the framework of the Innovation Dialogue (between the Federal Government, business and science) held in summer 2017, a draft concept on the creation of an agency for radical innovation was presented to the Federal Chancellor. The reasons put forward in favour of the proposal stated that, although a well-functioning system for funding evolutionary innovation processes exists in the German innovation system, no support structures exist that are explicitly focused on generating radical innovations.[287]

To overcome this deficit, an agency was proposed whose structures would be clearly distinct from those of established funding bodies. As in the case of the DARPA (Defense Advanced Research Projects Agency) model in the USA, the agency should have an extremely high degree of independence from political control and monitoring, as well as great flexibility in managing its programmes. Scope for entrepreneurial activities and for conducting experiments are planned. The managements of both the agency and the projects would be periodically renewed to avoid institutional rigidity and ensure the influx of new ideas.[288]

In France in October 2017, representatives of science and industry called for the creation of a Franco-German agency for radical innovations.[289] The Joint European Disruptive Initiative (JEDI) is also modelled on the US DARPA. However, it differs in that it has a top-down approach, i.e. the topics are specified at management level. The initiative intends to concentrate on a small number of priorities, select projects quickly, encourage daring technological ventures, be able to provide funding of between one and €30 million per project, and focus its work on expediting prototype development wherever possible. Although JEDI is conceived as a Franco-German initiative – hitherto without any official government support – outside of the EU institutions, the initiators emphasize that they are open for other European partners.[290]

The challenge of Brexit B 2–5

United Kingdom's importance for European research

The United Kingdom is one of the most important actors in the European Research Area (ERA) and involved in numerous research collaborations. In Horizon 2020, it is participating in 4,793 projects and thus takes first place in Europe, ahead of Germany with 4,750 project participations and Spain with 3,785.[291] More than 7,300 scientists there receive funding from Horizon 2020, more than in any other EU country.[292]

The close scientific cooperation between the UK and other EU Member States is also reflected in the number of co-publications. While British researchers issued 198,000 joint publications with US researchers between 2005 and 2015, the number of publications with the three most important European partner countries alone – Germany, France and Italy – totalled 218,000 in the same period.[293]

The United Kingdom is also extremely attractive for foreign research staff. About 16 percent of the academic personnel at British universities come from the EU, a further 12 percent from outside Europe. The percentage of EU foreigners among doctoral students is 14 percent, that of non-EU foreigners even higher at 36 percent.[294] The attractiveness of the UK as a research location is also reflected in the fact that there are more ERC recipients researching at British institutions (79) that at institutions in Germany (67), France (53) or the Netherlands (35).[295]

Following the UK's decision to leave the EU taken in the referendum in June 2016, and taking into account the proposed two-year negotiation period, the EU will lose one of its most important actors and one of its most valuable science locations as from March 2019.

What this exit means for the UK and the ERA is still largely unclear. Although, in a position paper on the future of scientific cooperation with the EU, the British government has stated its desire to form a more ambitious and closer partnership with the EU after Brexit than any previous partnership between the EU and a non-EU country,[296] there have been no concrete statements on how this goal is to be achieved.

Models for links between the UK and the EU after Brexit

15 countries are currently associated with Horizon 2020. The association agreements are based on bilateral arrangements between the EU and the respective associated country. Each agreement is therefore designed very differently, especially since each has to relate to other agreements, e.g. participation in the EU Single Market.[297] In addition to association, there is also the possibility of participation in Horizon 2020 as a so-called third country.[298]

The following sections describe three countries as model examples of the different possibilities of involvement in, or ties with, European R&I policy.[299]

The Norwegian model – fully associated partner

As a member of the European Economic Area (EEA), Norway participates in the EU Single Market. Accordingly, the four fundamental freedoms – free movement of goods, services, capital and persons – apply, as do much of the rest of Union law. As a fully associated country, Norway pays contributions to the EU budget and participates fully in the EU's research-policy initiatives.

The Norwegian model – including membership of the EEA – would secure the full participation of British organizations in the Framework Programme, albeit with less say at the political level.

Swiss model (2014–2016) – partially associated partner

Switzerland is not a member of the EEA, but regulates a wide range of legal matters through bilateral agreements with the EU. In this way, Switzerland also secures access to many areas of the European Single Market.

In 2004, Switzerland was fully associated with the then 6th Research Framework Programme and paid a compulsory contribution to the EU. As a result, Swiss researchers had the same rights as their colleagues from EU member states when it came to filing project proposals. They could also receive funding directly from the EU.[300]

In 2014, the EU rejected Switzerland's return to full association with its new Framework Programme Horizon 2020 due to ratification problems regarding the free movement of persons. Switzerland thereupon received the status of a third country.[301] After the problems regarding the free movement of persons were solved, full association was restored at the beginning of 2017.

As a partially associated partner country, Switzerland was not able to participate in all areas of Horizon 2020 between 2014 and 2016. It remained associated with the so-called first pillar of Horizon 2020 (Excellent Science) and with Euratom, but was given only third-country status for the second (Industrial Leadership) and third pillars (Societal Challenges). Although Swiss researchers could still participate in European cooperation projects in these two areas, they no longer received any funding from the EU.[302]

Canadian model – non-associated third country

Canada, just like the rest of the world, is in the category of a non-associated third country as regards its relations with Horizon 2020.[303] This is also the status the United Kingdom would have without any further bilateral agreements with the EU. Although organizations from non-associated third countries can take part in Horizon 2020 projects, as a rule they receive no financial support from the EU for their participation. They only receive funding from the EU if this is explicitly provided for in the invitation to tender, or if participation by the organization concerned is considered absolutely essential for the success of the project. Canadian participants must therefore seek co-financing in their own country.[304]

Otherwise, the only remaining chances to participate in Horizon 2020 are projects that expressly provide for international cooperation with non-associated third countries, such as the ERA-NET. The ERC and the Marie Skłodowska-Curie actions also offer non-associated third countries opportunities for participation. ERC grants are open to researchers from other countries if they use the assigned funds to carry out their research projects at an institution in the EU or an associated state.[305]

B 2-6 Recommendations

The EU's R&I policy is a relatively young policy area characterized by the formulation of very ambitious goals.

As early as 2000 in Lisbon, the European Council formulated the intention of making Europe the most competitive and dynamic knowledge-based economy in the world by 2010.[306] In this context, the EU also expressed its aim to increase R&D expenditure to 3 percent of gross domestic product (GDP) in all EU countries by 2010.[307] A few years later, the EIT was founded with the intention of creating a European answer to America's MIT (Massachusetts Institute of Technology).[308] What combines all three goals is that their realization was probably already far beyond what was feasible when they were formulated.[309] The current discussion about the European Innovation Council (EIC) reveals parallels in this respect. The expectations formulated in connection with the establishment of the EIC are so ambitious and varied that they are unlikely to be fulfilled.

The Commission of Experts is concerned that the EU's repeated marked failure to meet self-proclaimed objectives will undermine the credibility of European R&I policy in the medium term.

Structures of European R&I policy

The structures of European R&I policy are very complex, and responsibilities fragmented.

– The Commission of Experts regards the consolidation and simplification of European R&I structures as a key task of national and European policy. This task must take precedence over the creation of new institutions and the development of additional funding instruments.

European R&I policy should keep to its goal of promoting excellent research. Overcoming the so-called innovation divide between Member States must be seen as an equally valid goal and pursued more effectively than hitherto.

– Horizon 2020 is primarily geared towards excellence in research. This orientation must be maintained in the design of the 9th Framework Programme for Research and Innovation and should not be diluted by the inclusion of additional elements.
– At the same time, a governance structure must be created which ensures that the funds earmarked in the ESI Funds for the promotion of research and innovation are used by the national governments in a more target-oriented and effective way than in the past. For example, an EU body should be involved in the operational planning of the respective national funding.

European Innovation Council (EIC)

The Commission of Experts is critical of the establishment of an EIC on the basis of the current pilot project, since its integration into the institutional structure of the European R&I policy is unclear and its orientation insufficiently substantiated.[310]

– The establishment of an EIC should be made subject to the condition that applicants must prove a concrete need for funding which can best be covered by the EU. If this happens, the tasks and structures of an EIC should be defined promptly and precisely.
– The Commission of Experts is sceptical about whether creating a new EU institution is the best way to effectively promote radical innovations. The short decision-making paths and flexible structures necessary for such a venture are difficult to realize within EU structures that are geared towards balancing interests and achieving a proportional representation of countries. The Commission of Experts therefore recommends creating an institution for the promotion of radical innovations outside EU structures. Two proposals that are differently structured in terms of content have been made here: the concept for setting up an agency for radical innovations in Germany and the French Joint European Disruptive Initiative (JEDI).

Brexit

– In view of the importance of the United Kingdom as one of the strongest R&I systems in Europe, the Commission of Experts urgently advises forging the closest possible links between the country and European structures. Ideally, integration would follow the Norwegian model, i.e. a soft Brexit with as few changes to the status quo as possible. In such a case, the continuation of tried-and-tested cooperation in the Framework Programme, the mobility of researchers between

British and continental European institutions, and the unhindered exchange of knowledge would still be possible.