COUNTRY REPORT

Austria

ERA-LEARN:
enabling systematic interaction with the P2P community

August 2019

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Preface

The Austrian context in research and innovation

After a modest performance until early 2016, economic growth in Austria has regained momentum with 1.5% in 2016 and expected 1.6 % in 2017 and 2018.[1] Despite some years of rather moderate growth, Austria presents a remarkable performance in terms of investment in research and innovation. Financial resources have been increasing in recent years, while the European target of an R&D quota of 3% of GDP was already achieved in 2015. With a research quota of 3.16 % of GDP (2017) Austria is currently in second place in the EU behind Sweden, more than a third higher than the EU28 average (1.96% of GDP). As stated in the Annual Report of the Austrian Council, the goal set by the Austrian Government back in 2011 of increasing the research quota by 2020 to 3.76 % of GDP will be fulfilled.[2]

Austria set another important goal in the Research, Technology and Innovation strategy in 2009 that was backed by six ministries coordinated by the Federal Chancellery: to rank Austria among the Innovation Leaders by 2020. However, based on European Innovation Scoreboard (2017) the Austrian Council[2] warns that Austria's innovation performance has not improved on the whole since 2009 in relation to the Innovation Leaders. Whereas it has done quite well in terms of innovation inputs it has performed moderately in terms of innovation outputs (patents, publications or economic effects of innovation) while other international rankings (e.g. of Austrian universities) are not that favourable. The rest of the challenges that Austria faces call for increase in equity capital supply for start-ups and scale-ups as well as competitive basic research funding and a need to reform the financing of the Higher Education sector, which is currently under way[3].

Notwithstanding, Austria is among the most active countries in relation to transnational collaboration. The ERA Progress Report 2018 places Austria in the leading countries for Priority 2a (Transnational Cooperation) with a pronounced lead over the EU-28 scores especially in public-to-public partnerships. Even though Austria's investment into transnational cooperation has not increased significantly, it remains one of the highest in the EU.

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[1] European Semester Country Report Austria 2017

[2] Austrian Council Annual Report 2017

[3] RIO Country Report Austria 2017

Austria also has a strong focus in international (beyond Europe) R&I collaboration with special supporting programmes (such as the Beyond Europe programme of the BMDW) as well as a dedicated strategy. Yet, there are certain challenges that need to be met. Hopes are raised in view of the development of the new RTI Strategy post-2020.

In this report, Austria's performance is compared to the Netherlands, Denmark, Finland and Sweden. The selection of these countries is based on similar levels of total researchers (full-time equivalent - FTE) (DK, FI), similar levels of gross expenditure in R&D (GERD) normalised with the researchers FTE (SE, FI) and diverse levels of P2P involvement (NL – more participations; DK, SE, FI: less participations). These will be referred to in the report as Austria's 'comparator group' of countries.

Introduction

This is the second ERA-LEARN Country Report on P2P (public-public partnerships) participation in a series of country reports that will follow in the course of ERA-LEARN. The first report focused on Poland, this report focuses on Austria and further reports on Romania, Spain and Belgium will follow. The selection of these countries is based on a combination of variables: number of network participations, network coordination and national investments made to date, based on the data provided by the P2P networks to the ERA-LEARN database.

The ERA-LEARN data that are used in the report (cut-off date May 2019) mainly refer to P2P networks that were launched and are supported under Horizon 2020. This data (especially the financial data) is 80% complete, as not all required information has been fully updated by the P2P networks. It is important to emphasise that the data collected in terms of pre-call budget committed or the actual investments in selected projects do not take into account the differences across countries in the eligibility of certain expenses; for example, in some countries only additional costs of a research project are eligible and not personnel costs. In addition, the in-kind contributions made by funding organisations when participating in P2Ps are not usually considered as national investments in P2Ps.

The country reports provide an analysis of P2P participation and try to explain the 'performance' of a country in transnational P2P collaboration within the context of the overall situation in the national research and innovation system. In this regard, data and analysis available in other reports are considered such as the RIO (Research Innovation Observatory) country reports, EU Semester national reports, ERA Progress Report, European Innovation Scoreboard statistics, OECD and EUROSTAT statistics, country reviews and special reports by the Policy Support facility, relevant MLE (mutual learning exercise) special reports, etc.

The goal of the country reports is to provide an overall picture in P2P participation of a particular country, comparing this also to a number of other countries of interest as well as the EU15, EU13 and EU28 overall averages. This may be useful for individual organisations in the specific country as they might only have a fragmented picture of the situation or they might lack explanations for certain features that may be found in the wider R&I context of the given country. The report may also be useful for organisations in other countries that wish to learn the reasons behind the 'position' of a particular country and/or learn from other countries' exemplary performances.

Acknowledgements

We owe special thanks to FFG and in particular Ursula Bodisch and Roland Brandenburg for providing background material and helping to organise the interviews with key stakeholders. We would also like to thank all the interviewees that shared with us valuable insights, data and information about their experience and knowledge of Austria's position in international collaboration and overall performance in research and innovation. In particular, people from the following organisations were interviewed[4]:

- FFG, FWF, BMVIT, BMBWF, BMNT, BMDW,
- Medizinische Universität Wien - Zentrum für Hirnforschung, Wolfgang Pauli Institut.

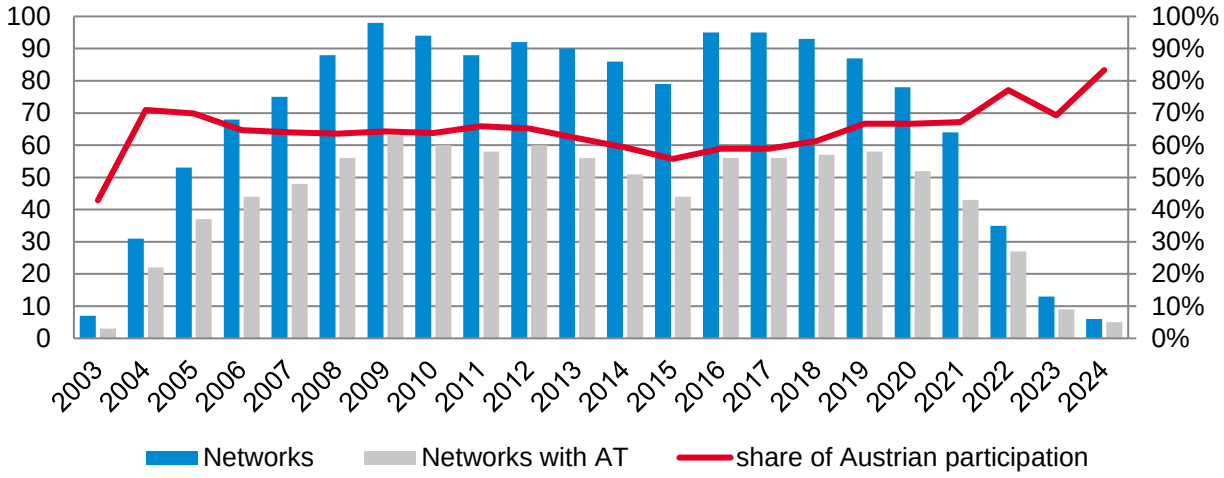
Special thanks are also due to the ERA-LEARN consortium members for commenting on earlier versions of this document and helping to improve it.

[4] Due to GCPR rules the names oft the individuals are not disclosed.

Key Highlights

Austria has been one of the most active countries in P2P participation since the launch of the first ERA-NETs back in 2004 (cf. Figure 1). P2Ps (public-public partnerships) and PPPs (public-private partnerships) are generally considered by Austrian policy-makers as implementation tools of the national research policy in areas that need international collaboration. [5]

Figure 1: Evolution of Austrian Participation in P2Ps



Source: FFG based on ERA-LEARN data

Austria participates in 49 public-public partnerships in Horizon 2020 and leads five of those networks (M-ERA.NET 2, ENSCC, ERA-NET PhotonicSensing, ERA-NET SGplusRegSys and ERA-NET SmartGridPlus)[6]. This is comparable to the scores of Sweden and leaves behind Denmark and Finland, but falls short in relation to the Netherlands. (cf. Table 1, Figure 2)
Out of the 2078 joint calls that have been launched by P2Ps in Horizon 2020, Austria has participated in 82, second only to the Netherlands with 100 call participations. This resulted in the support of 259 projects, which is similar to EU15 average but third in relation to the comparator countries where the Netherlands and Sweden present much higher numbers.

As explained by an interviewee, this can be explained by the limited funds made available for joint calls in several of the societal challenges. If there were more funds in areas such as climate or agricultural and forestry sciences, for instance, there would be more projects. The Austrian research community has been criticising the limited funds in such areas.

[5] Notwithstanding public-private partnerships (PPPs) and other international (beyond Europe) programmes that are of major importance for Austria in relation to international collaboration, this report will be limited to the analysis of Austria's performance in P2Ps i.e. public-public partnerships.

[6] JPIs are not considered as P2Ps under H2020 as they are driven by the Member States. Austria is involved in 8 JPIs and is leading JPI Urban Europe.

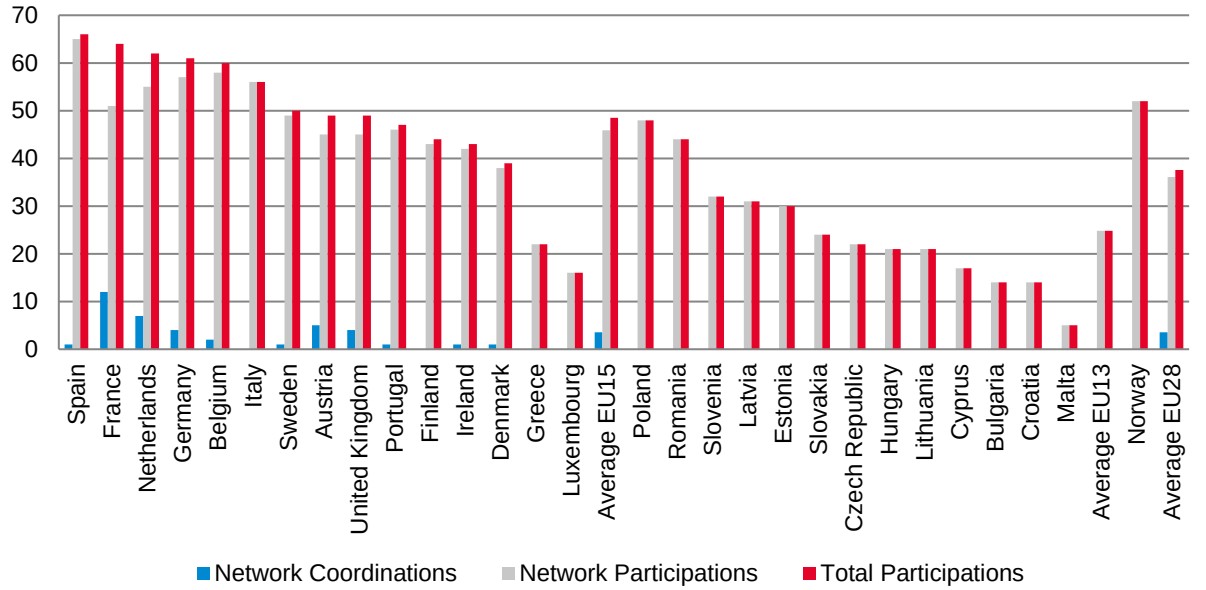
In addition, it can be explained by the research capacity of comparator countries (researchers FTE). The countries with larger levels of researchers FTE, i.e. Netherlands and Sweden, present higher numbers of supported projects. However, Austria outnumbers Denmark and Finland in the number of supported projects although they have similar levels of researchers FTE[7].

Table 1: Participation in H2020 P2Ps[8]

	AT	DK	FI	NL	SE	EU13 av.	EU15 av.	EU28 av.
P2P participations	49	39	44	62	50	25	48	37
P2P coordinations	5	1		7	1	0	3	3
Call participations	82	57	65	100	74	53	85	70
Supported projects	259	257	155	587	360	54	320	196

Source: ERA-LEARN database[9] (cut-off date May 2019).

Figure 2: Network participations and coordinations by countries in H2020



Source: ERA-LEARN database (cut-off date May 2019).
(*) Network coordinations: number of networks a specific country coordinates. Network participations: number of networks a specific country takes part as participant. Total network participations: number of networks a specific country participates in with any role (i.e. coordinator, participant, observer, other).

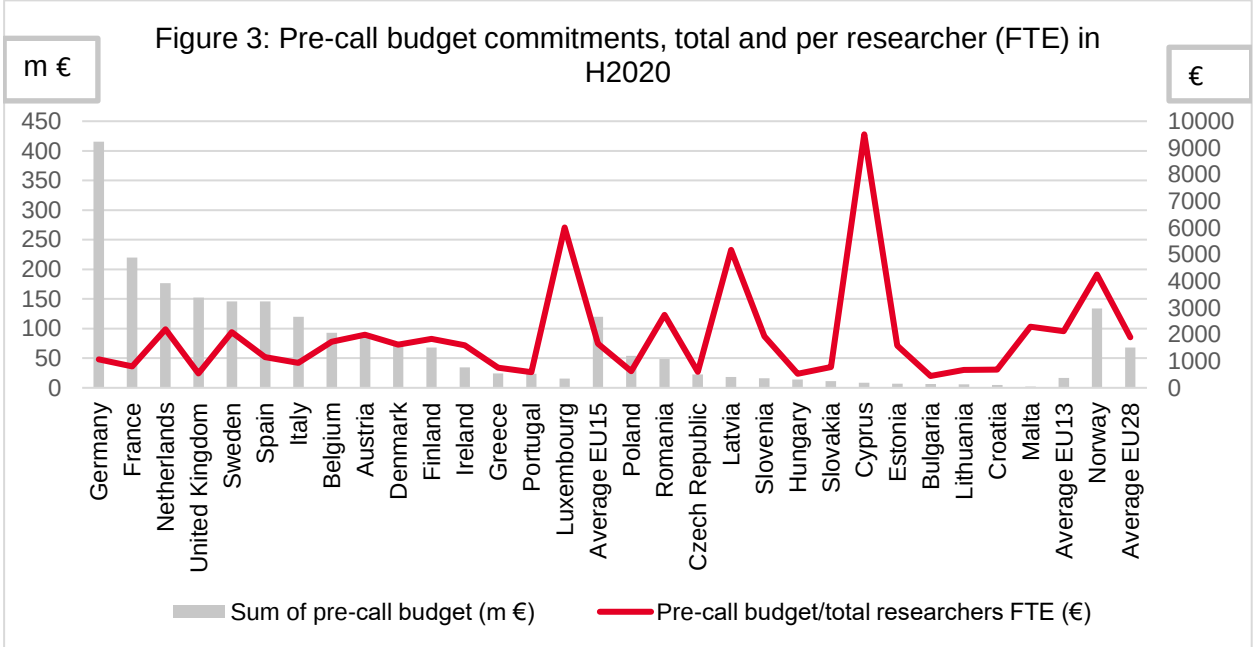
In terms of national funds made available to fund research proposals (total pre-call budget) Austria's contributions are comparable to those of Denmark and Finland but lower than Sweden and the Netherlands. (cf. Figure 3). However, when the pre-call budget is normalised by researchers FTE, the money that Austria allocates per researcher is rather similar to the

[7] Researchers' FTE (average 2014-2017): Austria: 44,896; DK: 43,500; FI: 37,188; NL: 80,450; SE:69,749 (OECD data)

[8] Excluding JPIs.

[9] These figures are actually higher considering that around 20% of the financial data of the H2020 P2Ps have still to be updated by the P2P networks in the ERA-LEARN database.

comparator groups of countries: Netherlands (2192 €), Sweden (2090 €) Austria (1992 €), Finland (1835 €) and Denmark (1619 €).



Source: ERA-LEARN database (cut-off date May 2019)
(*) Pre-call budget is the money committed by each country before the launch of a joint call.
(**) Pre-call budget for each researcher is the total pre-call budget committed by a country divided by the total researchers in the country estimated in full-time equivalents (FTE).

This money, allocated pre-call, eventually gets spent by more than 100%, i.e. the projects with Austrian participants that get approved account for more than 100% of the Austrian funds made available pre-call. For FFG and FWF, the two major funding agencies, this is around 107% and 101.6% respectively. The extra funds needed are made available through increases in the national budget allocated to P2Ps and by the EC top-up contributions.

Based on the interviews with people from the Austrian ministries, there is a shift towards a more selective approach in relation to public-public partnership participation after some 10 years of experimentation. Acknowledging that challenges and difficulties still exist and that there is varied degree of success of the partnerships depending also on the research types and fields addressed, the majority of the interviewees agree that they are a valuable tool for their national research policy in the core areas of interest requiring international collaboration. This is also reflected in the intention to formulate a national strategy for ERA and international collaboration soon.

Participation in P2Ps as well as in H2020 reflects the specialisation areas of Austrian researchers. Austrian science is excellent in several areas in both basic and applied research. Researchers value the high strategic relevance of collaboration enabled in P2Ps in certain areas that would not have been possible in the absence of these partnerships. P2Ps are appreciated as an additional funding source but also as a way out of the high H2020 competition and at the same time a preparatory step for larger programmes such as H2020.

Following the good performance in H2020, Austria is performing quite well in P2Ps, in most cases similarly to the comparator countries. Policy interest remains unaltered and is to be backed by a dedicated national strategy that is under development.

1. Who are the key R&I funders in Austria?

The Austrian Research Promotion Agency (FFG) is the largest Austrian organisation for the promotion of applied research and innovation. FFG offers advice, support and funding for research and innovation projects through a variety of public funding programmes mainly financed by the Ministry of Transport, Innovation and Technology (BMVIT) and the Ministry of Digital and Economic Affairs (BMDW, since 2017)[10].

The Austrian Science Fund (FWF) is the central body for the promotion of basic research. FWF provides support for stand-alone projects, scientific stand-alone publications, Priority Research Programmes, international mobility, and career development of female scientists. FWF is supervised by the Ministry of Education, Science and Research (BMBWF).

Throughout the years three federal ministries, BMBWF, BMVIT, and BMDW, are explicitly in charge of national research strategies. Consequently, they themselves as well as other ministries may also directly or indirectly join various partnerships.

Bundesministerium Bildung, Wissenschaf und Forschung	Federal Ministry Republic of Austria Transport, Innovation and Technology	Federal Ministry Republic of Austria Sustainability and Tourism	Federal Ministry Republic of Austria Digital and Economic Affairs
BMBWF	BMVIT	BMNT	BMDW

How are they doing in transnational R&I partnership participation & coordination?

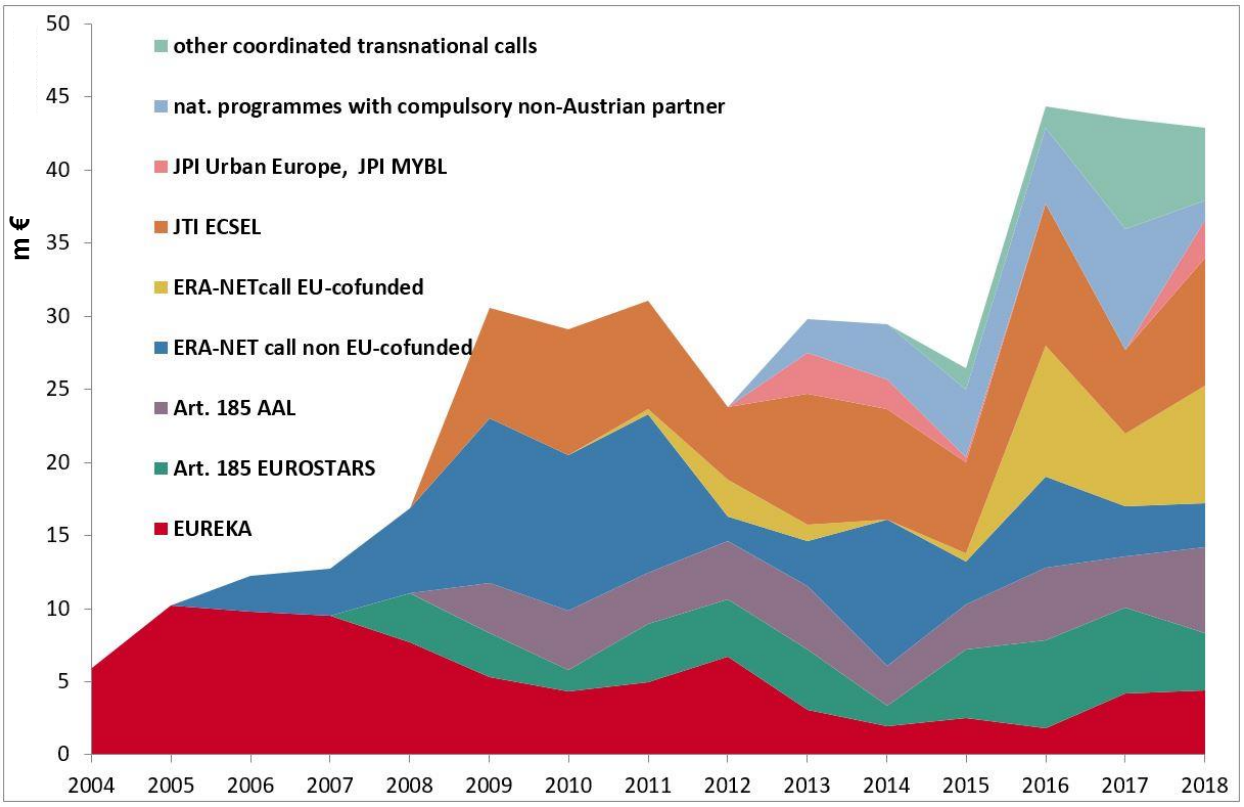
The Austrian Research Promotion Agency (**FFG**) has always been active in P2Ps since the very beginning (2004). FFG uses national programmes (in the framework of transnational partnerships) also as a preparatory step to make organisations fitter for applying in larger European and international collaborative programmes. The annual budget for trans-national projects have been increasing from about 5 m € per year in 2004 (mainly for the EUREKA network) to around 40 m € per year in 2018. (cf. Figure 4)

Decision on P2P participation is normally coordinated between BMVIT and FFG and decisions are strategic for the respective R&D fields. FFG is the agency carrying out R&D programmes on

[10] BMDW and BMBWF were created in 2017 when the ‚old' Federal Ministry of Science, Research and the Economy was split into BMDW (Federal Ministry for Digital and Economic Affairs) and BMBWF (Ministry of Education, Science and Research).

behalf of BMVIT and to a smaller extent of other Austrian entities. Decisions are usually based on a check-list of criteria including relevance, value added, existence of corresponding programme, need for additional human resources and levels of available budget. Currently, FFG is involved in 25 P2Ps.

Figure 4: Annual FFG investments in trans-national projects (m €)



Source: FFG

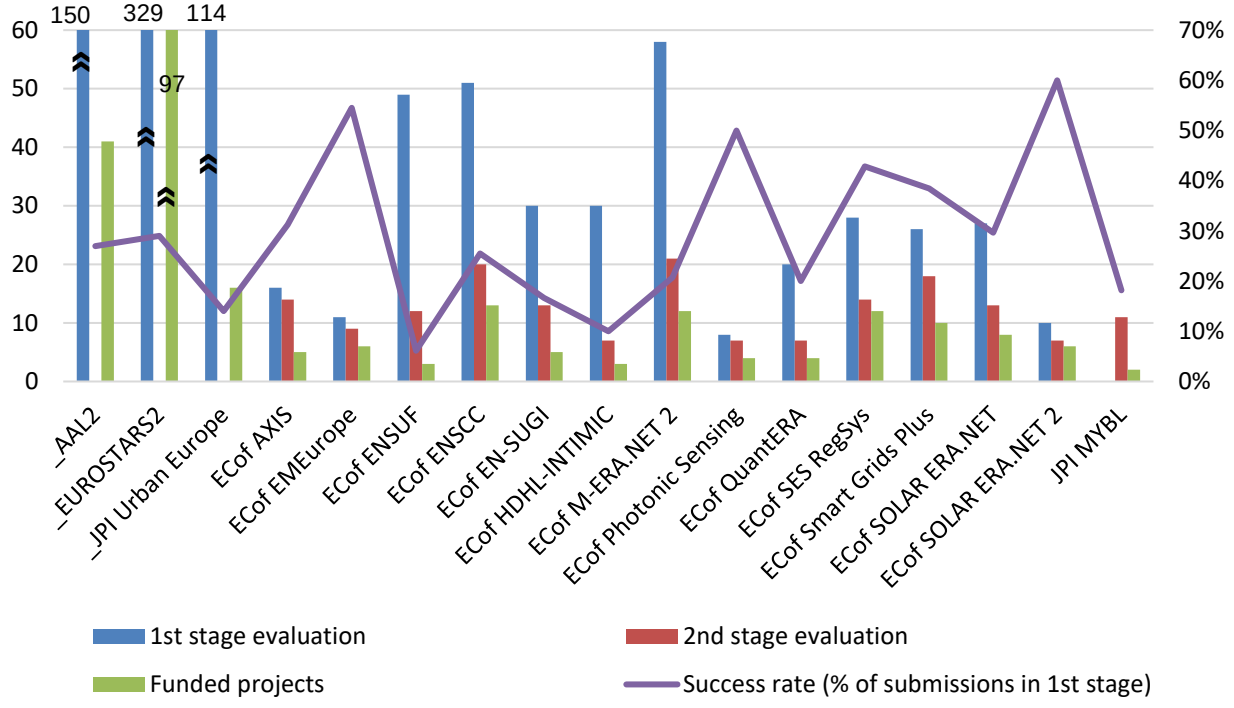
In assessing their overall experience in P2P participation, the relevant ministries as well as FFG officials appreciate the opportunity to be connected to European R&I policy structures such as H2020, P2Ps, and PPPs and thus have the chance to contribute to the formulation of EU R&I policies. For FFG learning from other agencies about better ways to organise themselves in collaborating internationally is also highly valued.

During H2020 FFG funded a total of 253 projects with varying success rates across the different networks (cf. Figure 5). The number of the proposals submitted under each network varies with those that have received the largest number of proposals being AAL2 (150), EUROSTARS2 (329) and JPI Urban Europe (114). Then, there is a middle group of networks that have received around 50 proposals during H2020 (M-ERA.NET 2: 58, ERA-NET Cofund Smart Cities and Communities: 51 and ERA-NET Cofund Smart Urban Futures: 49) while the rest have attracted 30 proposals or less. The number of funded projects in most networks varies between 2 and 16 with the exception of AAL2 (41) and EUROSTARS2 (97) that stand out.

Interestingly, it is not the networks that attract most of the proposals that present the highest success rates. Success rates, measured by the number of funded proposals as a share of proposals submitted in the 1st stage of evaluation, are highest in the cases of ERA-NET Cofund SOLAR ERA.NET 2 (60%), ERA-NET Cofund Electric Mobility Europe (55%) and ERA-NET

Cofund Photonic Sensing (50%). Two networks (ERA-NET Cofund SES RegSys and ERA-NET Cofund Smart Grids Plus) present success rates between 35-45%, while the rest of the networks score 30% or lower. The lowest success rate (6%) is found in the ERA-NET Cofund Smart Urban Futures, while a P2P in a similar area of research, JPI Urban Europe, presents 14%.

Figure 5: Proposals, submitted and approved and success rates for FFG in H2020 P2P Calls



Source: FFG

Based on the views of FFG officials, P2Ps and specifically ERA-NETs have had positive impact on project beneficiaries in the sense that they started being involved in larger European projects under the EC Framework Programmes. They also improved their international networks, finding good collaborators at EU and international levels. As noted during the interviews…

> *"…after experimenting in the first years of how we should best participate, now we see return on our investments overall." …"The main point is that agencies benefit as well as the research community. "…"There have been some partnerships that have not brought outputs and impacts as expected but we have to look at the overall picture and at different kinds of benefits." (FFG official)*

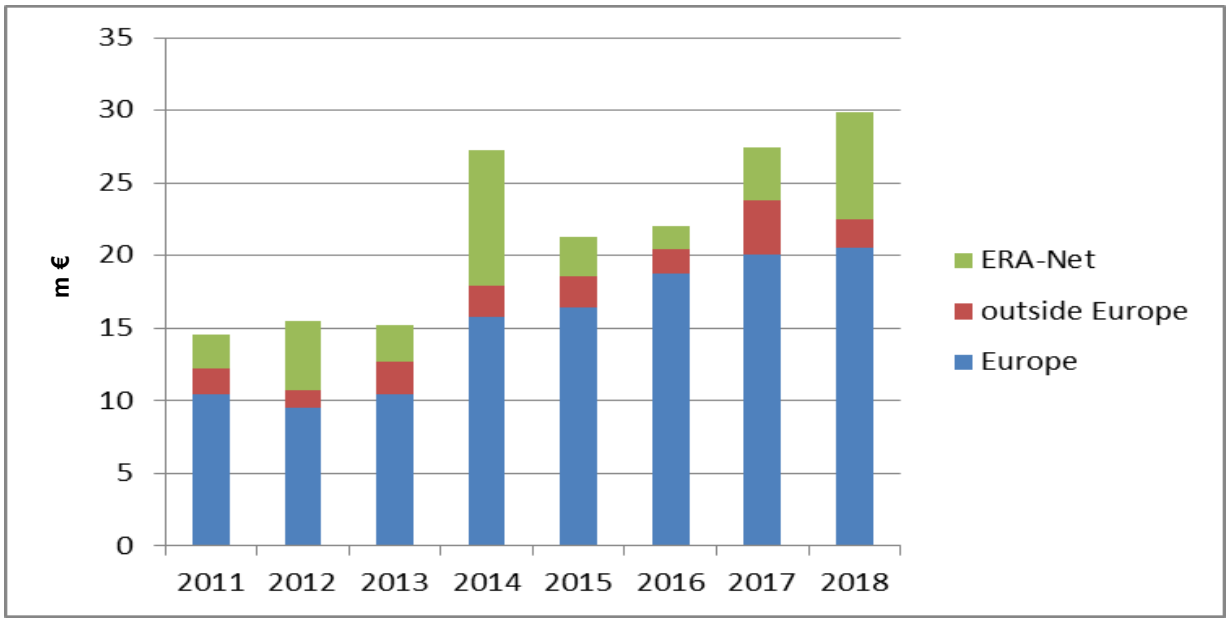
Still, the question remains what is the value of the instruments for smaller SMEs. At the same time, it is important to reduce the complexity of the partnerships landscape and make the entry points more clear for smaller entities.

The Austrian Science Fund (**FWF**) participates in ERA-NETs that have some component of basic research and priorities that are relevant for Austrian science. They participate in 85-90% of relevant calls. There are specific procedures to follow when taking decisions on which ERA-NETs to participate in. The criteria include: existence of a basic research component, existence

of strong research community with proven competence in the respective national programme(s) in the area of interest, which is not the case in all areas.

> *"When we decide on which ERA-NETs to take part the goal is to manage to finance all projects in the ranking list. In most cases this is achieved." (FWF official)*

Figure 6: FWF annual investment in trans-national projects (m €)



Source: FWF

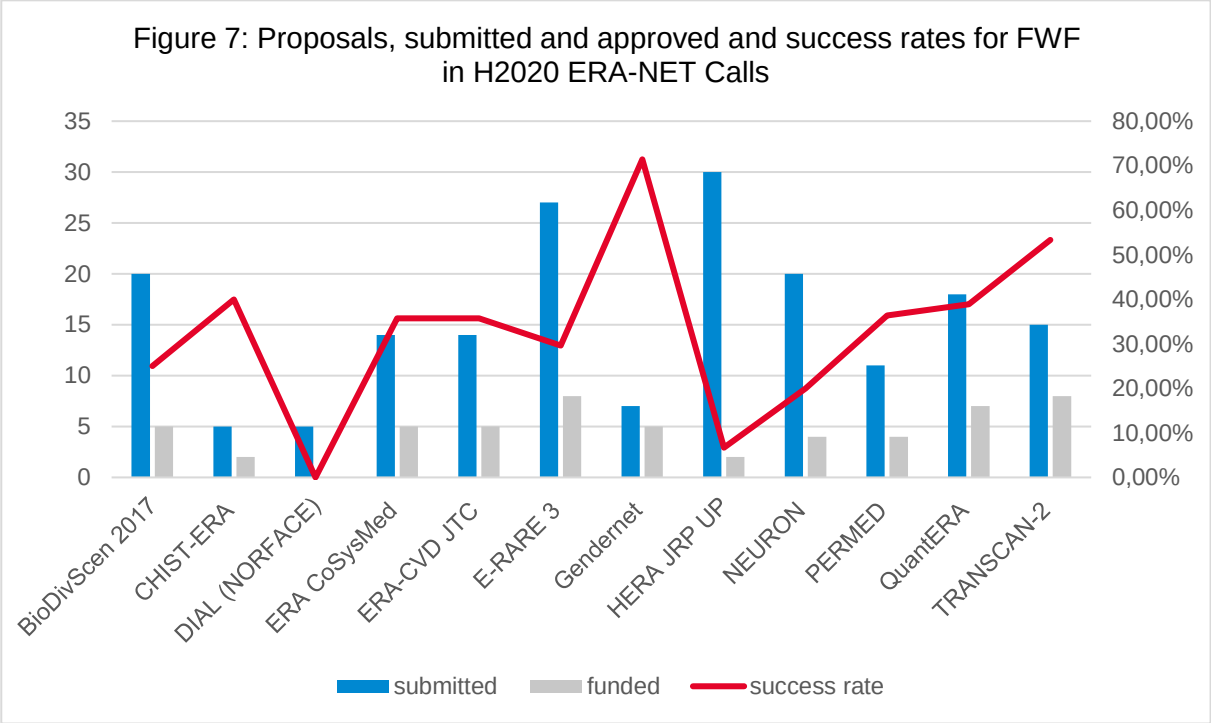
FWF have a total annual international budget of 32 m € to support projects under international programmes. However, they usually spend only around 2-7 m € for ERA-NET supported projects per year. The majority of the budget is spent on other international programmes, which are complementary and of equal importance and relevance to the international collaboration performance of the country.

On average, they fund between 2.2 and 2.5 ERA-NET supported projects per call with the exception of QuantERA[11] where they funded 7 projects in the first call in 2017. In relation to success rates, there is great variation from one partnership to another, ranging from HERA JRP[12] UP with a success rate of less than 10% to Gendernet[13] with a success rate of over 70%. On average the success rate in ERA-NET Calls in H2020 reaches 30%.

[11] https://www.quantera.eu/

[12] http://heranet.info/

[13] http://www.gender-net.eu/



Source: FWF

Comparing transnational and national programmes the latter have higher success rates. According to the findings of the evaluation of the international programme portfolio,[14] ERA-NET projects deliver excellent results on par with the other cooperation programmes; however, for FWF the wider impact of participating in ERA-NETs is questionable as since 2005 FWF participated in more than 60 calls but only funded approximately 150 projects. It is also noted that the administrative overhead for ERA-Net programmes is considerably higher in comparison with the other cooperation programmes.

Austrian Ministries have been very active in taking responsibilities at the EU level in relation to the formation and participation in European and international partnerships. The Federal Ministry of Education, Science and Research (**BMBWF**) has always given particular attention in enhancing international collaboration. Yet, as noted by the interviewee, an overarching strategic approach is missing that would enable to ensure focused investments and more efficient management of participation. Currently decisions are made on a case-by-case basis although following a concrete procedure and criteria. As recently noted by the latest OECD review Austria[15] needs a strategic approach for international relations in general. However, although there is no overall strategy there is a good match of the national priorities with the EU priorities and thus a level of compatibility with the agendas of the partnerships can be ensured. At the same time, alignment of policies at the trans-national level is evolving. With Horizon Europe, a new stage for the partnerships is emerging. Although the procedure on how this is to be done is

[14] Degelsegger---Marquéz, A., Wagner I., Kroop S., Rigby, J. Cox D. 2017 Portfolio Evaluation of FWF International Programmes. Final report. September 2017

[15] OECD Review of Innovation Policy Austria 2018.

not known yet, the idea is to enhance alignment and improve commitment from participating states.

> *"The JPI potential is heavily underestimated in terms of the benefits it can bring to the EU. You get national systems and institutes aligned and involved in joint efforts. This is much more than having EU funds invested in an area." (BMBWF official)*

Likewise, the Federal Ministry for Transport, Innovation and Technology (**BMVIT**) has put significant emphasis in international collaboration of Austrian organisations. BMVIT is responsible for RTI activities in the domains mobility, transport, energy, ICT, production, materials, nanotechnologies, security, aeronautics and space. BMVIT runs competitive R&D programs with calls for proposals in these domains, together with the FFG as funding agency on behalf of the BMVIT. BMVIT uses P2Ps and PPPs as complementary implementation tools for their national research policy in the core areas of interest requiring international collaboration, in particular in energy, sustainable urban development, transport and mobility, ICT, production technologies, materials, space and security.

Reflecting the strong support concerning international collaboration, a more coordinated process on P2P (as well as PPP) participation will be developed in the frame of the new Science, Technology and Innovation strategy that is about to be ready by end of the year.

> As a rule of thumb success in P2P participation dictates that *"the organisation participating in the partnership must have decision making power and also enthusiastic people that have realised the value of transnational partnerships. An important asset is the possibility to participate in European research that would not be possible otherwise and to set European priorities." (BMVIT official)*

The Federal Ministry for Digital and Economic Affairs (**BMDW**) is responsible for Austrian participations in Art 185s and particularly EUROSTARS and EMPIR that are considered highly important for Austria. The non-thematic focus is a particular feature of the BMDW programmes and this is the reason for the limited participation of the ministry in other than the specific Art 185 initiatives, which accommodate a bottom up approach.

BMDW considers important to strengthen collaboration with European countries but further highlights the need to enhance collaboration with non-European countries for knowledge and market purposes. In this regard, the value of initiatives such as the GlobalStars[16] (under EUREKA/EUROSTARS) and the Global Incubator Network (GIN)[17] are important.

GlobalStars is complementarity to the Beyond Europe initiative[18], the national programme that was created to enable collaboration with organisations in non-European countries. To some extent the latter can be considered as a starting phase of R&I collaboration providing financial support to the Austrian as well as to the foreign partners (who may receive up to 20% of the

[16] https://www.eurekanetwork.org/content/globalstars-multi-track-approach-internationalisation-eureka

[17] http://www.gin-austria.com/index.html

[18] https://www.ffg.at/en/program/beyond-europe-programme

total funding). This collaboration can then be strengthened and continued in the frame of the GlobalStars programme where each country finances their own organisations. The Global Incubator Network, an activity under the Beyond Europe strategy[19], stimulates an innovative start-up culture from a transnational collaboration perspective with a particular focus on Asian countries (China, Hong-Kong, Singapore, South Korea and Israel). These instruments are very important as they enable collaboration with several countries including e.g. Canada, South Korea, Brazil, Chile, Argentina, South Africa, etc.

> *"Collaboration between partnerships may be improved. EUROSTARS might offer the next step for collaboration among organisations and smaller companies that may have started their collaboration in specific partnerships. However, it is important that EUROSTARS remains a bottom-up programme." (BMDW official)*

The remit of the Federal Ministry for Sustainability and Tourism (**BMNT**) is quite broad addressing the areas of energy, bioeconomy and agriculture, forestry, water, environment, mining and also tourism. BMNT has been active in P2P participation since their beginning. Past decisions on where and how much to invest were made on a case-by-case basis following certain criteria in similar line to the other ministries and agencies. Now BMNT is considering a more selective approach towards a limited number of ERA-NETs with more substantial investments.

According to the interviewee, overall, the ERA-NET scheme is an established additional opportunity for Austrian researchers to get research funding and collaborate within the EU with the benefits of gaining new knowledge and advancing their scientific careers. Regarding impacts on the funding community,

> *"ERA-NETs help us streamline our research priorities and support the decision process at the national level. However, impacts are not yet visible and mature enough to be able to justify considerable investments. More time is needed to make impacts visible in order for joint trans-national calls to attract a critical mass of national funding." (BMNT official)*

Cooperation among the Austrian funding agencies (FFG, FWF) is effective and positive. Yet, collaboration at the ministerial level is more difficult. The ministry landscape is complex. Different ministries may be involved in H2020, in public-public partnerships and public-private partnerships. This may cause delays in the funding of R&I projects as is the case of FFG that occasionally has to combine different budgetary lines to support projects. As the 2018 OECD review noted the Austrian research community would benefit from an increased autonomy of the funding agencies.

[19] https://www.era.gv.at/directory/160

What is the overall approach to transnational P2P participation?

There seems to be an understanding that a shift is necessary towards a more coordinated approach for P2P participation. This is pertinent in view of the preparation of Horizon Europe, the mission areas and the new partnership types, as well as the new (post-2020) national strategy in Science, Technology & Innovation. In view of the current preparations for the new national strategy a dedicated working group is formed to deal with so called 'missions in partnerships'. This highlights an attempt to form a coordinated approach for trans-national collaboration as time has matured and valuable insights have been gained. A better coordinated and more strategic approach in transnational collaboration would also be valuable because of the complexity of the partnership landscape.

Some Ministries have more funds available for trans-national / international research support than others. This may lead to inability to take part in certain partnerships although the respective research community may be strong in the area (as in the case of Water JPI). At the same time, the issue of whether the partnerships are raising critical mass is always relevant. Certain partnerships may be less beneficial for Austrian researchers than others. This has certainly been the case for basic research given also that the opportunities offered are less due to the focus of the partnerships in applied rather than curiosity-driven research. Thus, the efforts of FWF to foster international collaboration in basic research by dedicated programmes jointly with its partner organisations in Europe and worldwide are important. These efforts account for around 20-25 m € per year.

In addition, certain instruments such as the ERA-NET Cofund may be more complex than others to manage and the availability of human resources to manage participation in partnerships is always an issue.

Despite the challenges however, transnational and international collaboration through the partnerships is still worth the effort based on the views of the interviewees. As they note there is very good feedback coming back from scientists as they appreciate the opportunities offered to be members of European and international networks, gain excellence in their research and become stronger in H2020 competition.

After many years of active participation, Austria is now shifting towards a more coordinated approach for transnational collaboration in R&I, following the new approach on European partnerships in Horizon Europe. Acknowledging the challenges that still exist and the varied degree of success from one network to another, the interest in participating in P2Ps remains strong and will be supported by a dedicated national strategy.

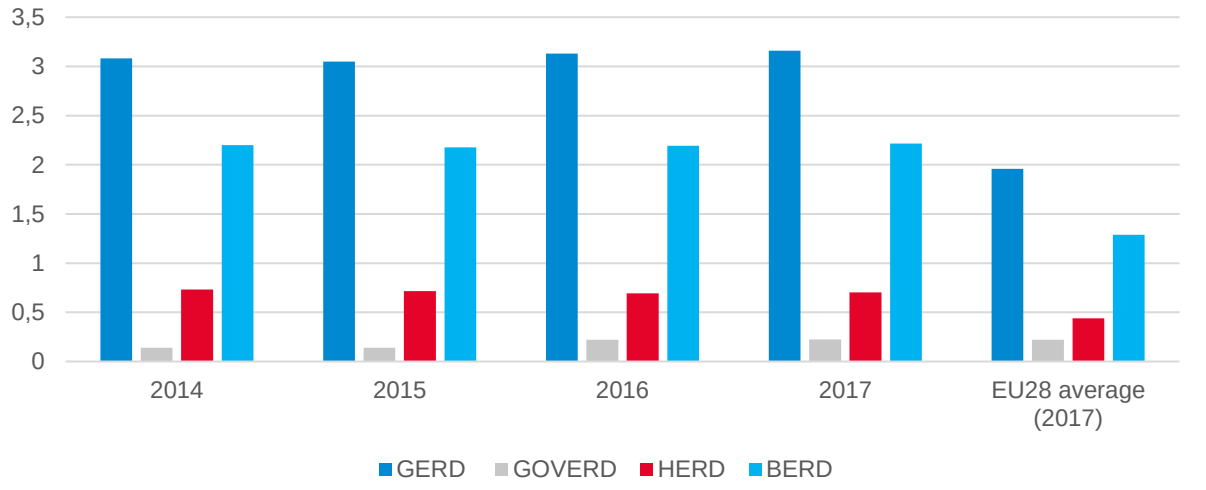
2. Who are the key R&I performers in Austria?

Within the higher education system, 22 public universities play the largest role as research performers. In addition, the Austrian Academy of Sciences (ÖAW) complements the universities' basic research activities. The Austrian Institute of Technology (AIT) is the largest research organisation in applied research. Moreover, there is a small group of regional institutes that mostly focus on applied research and technology development. Some of them belong to Austrian Cooperative Research, a network of non-university applied research institutes organised mostly as limited companies which perform industry-oriented R&D and provide R&D services for industry.

Business R&D activities are highly concentrated in a few large companies. The majority of business R&D activities especially in the manufacturing sector is performed by foreign-controlled enterprises indicating that Austria is a preferred location in Europe for multinational companies' R&D activities. Based on EUROSTAT data the average size of the Austrian research community in the last 3 years (2014-2017) is around 46,500 people (full-time equivalent).

The gross expenditure in R&D (GERD) reaches 3.16% of GDP in 2017, second only to Sweden (3.33) and much higher than the EU15 average (2.11). The majority of GERD (70.21%) is performed by businesses and the business expenditure in R&D (BERD as %GDP) is again the second highest in the EU28 following Sweden (2.22 vs. 2.35). HEIs and public research organisations perform around 22% and 7% of GERD respectively.

Figure 8: R&D expenditure in Austria (% of GDP)

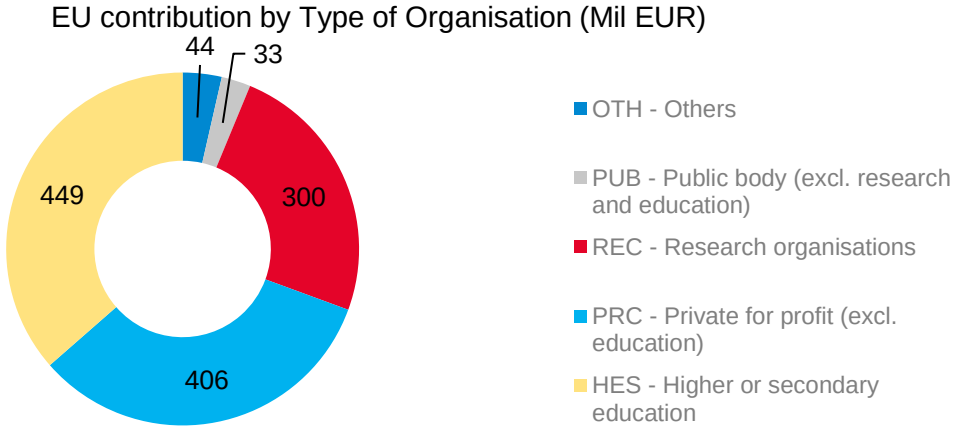


Source: OECD STI Indicators

Austria is above the EU average in relation to successful participation in H2020 with 16.4% success rate against 11.7% for total proposals/eligible applications. Austrian participations in H2020 projects account for 3.17% of total H2020 participations and for 3.06% of total net EU

contribution. The total EC contribution of approved projects reaches 1.23 b € (until July 2019). The performance of the Austrian research actors in H2020 is slightly taken over by HEIs with 36.5% of EC contributions followed by private for-profit companies (33%) and research centres (24%).[20] Austria is performing quite well in H2020 presenting higher success rates in the areas of national specialisation (cf. Section 3). In addition, Austria is also quite successful in ERC grants having received 193.7 m € in funding.[21]

Figure 9: Performance of Astrian research actors in H2020



Source: H2020 data https://webgate.ec.europa.eu/dashboard/extensions/CountryProfile/CountryProfile.html?Country=Austria

How are they doing in P2P-project participation?

Based on data from the ERA-LEARN database, Austrian research organisations took part in 259 P2P-supported projects and absorbed 50.5 m € from Austria during H2020. This leaves behind Finland (30 m €) but is behind the rest of the comparator countries (DK: 55 m €; SE: 83m €; NL: 126 m €)

Furthermore, this amount accounts for around 3.9% of the total actual investments made by all involved countries in P2Ps in H2020.[22] This is higher than the share of EC contributions absorbed by Austrian organisations in H2020 (3.9% vs. 2.74% of total EC contributions). At the same time Austrian participations account for 3.8% in total P2P project participations while this score gets down to 2.8% in for H2020 projects. It can be argued that, overall, Austria benefits slightly more in P2Ps than in H2020.

Based on the interviewees, the interest from the Austrian research community in joint transnational calls is well established by now. ERA-NETs are acknowledged as an additional funding source to H2020. Austrian researchers do take the opportunity as long as it is not highly complicated, but for ERA-NETs this is not the case as eventually it is the national procedures that have to be followed. Researchers prefer to get funding from EU than national programmes

[20] https://webgate.ec.europa.eu/dashboard/sense/app/a976d168-2023-41d8-acec-e77640154726/sheet/0c8af38b-b73c-4da2-ba41-73ea34ab7ac4/state/analysis

[21] https://era.gv.at/object/news/4286

[22] These figures may actually be higher considering that around 20% of the financial data of the H2020 P2Ps have still to be updated by the P2P networks in the ERA-LEARN database.

as this might be 100% of eligible costs whereas the national programmes may be providing less than that. This has started discussions in Austria to better align with EU financing regulations or to simplify the national procedure related to cost approval. At the same time, however, EU programmes are oversubscribed and have lower success rates than the national programmes, which is not the case for P2Ps. In fact, P2Ps can be a way out of the high H2020 competition and at the same time a preparatory step for larger and more competitive programmes as H2020.

Interviewees also verified that researchers value the high strategic relevance of collaboration enabled in P2Ps in certain areas that would not have been possible in the absence of the partnerships. They are positive about being involved and they want to maintain such opportunities. They appreciate the knowledge sharing, collaboration and gaining of experience in smaller projects/programmes that will later translate to easier access to EU larger programmes/funds. Building up technology competences is also highly valued.

These perceptions may change however from one area to another. Whereas the overall impression is quite positive when applied research areas are addressed, satisfaction of researchers engaged in curiosity-driven research is more moderate. There are several reasons for this. First, relevant calls are not that many as the majority of P2Ps are addressing more applied research areas. Second, there are national programmes supporting basic research that also allow for international collaboration and these may act as important competition to P2Ps even though they may not allow as many international partners. Third, any negative feelings coming from the administrative burden associated with P2P project management may take over the positive feelings about the value of the collaboration.

> As the FWF official noted, *"scientists need higher success rates to increase their interest and participation in ERA-NETs; tailor made calls for specific communities might be an option and bigger initiatives – the changes in the partnership types in Horizon Europe might be a step in the right direction."*

At the same time, experiences across researchers dealing with curiosity-driven research can be widely different as shown below based on the view of some project beneficiaries.

> *"Partnerships are absolutely critical for Europe in providing opportunities for trans-national collaboration with the best scientists in the area. The projects helped create a European network (multiple sclerosis research and especially neuron immunology) of top labs that are highly engaged in such projects. This is a critical advantage that goes much beyond what the national projects can do that allow for international partnerships but usually not more than 1-2 partners… obviously collaboration with some partners is easier than with others, but overall the project was successful and the PhD exchange (among labs) was valuable. The research led to changes in scientific perceptions of how multiple sclerosis research should be addressed and this paved the way for significant progress in the field." (NEURON project beneficiary)*

> *"The positive features (of two QuantERA projects) have to do with the excellent collaboration among the partners, the opportunity to have a 'space' to meet and discuss about new scientific frontiers, to share and produce new knowledge and the links created between one of the projects and COST. But, overall….(due to administrative*

complexities and the different national funding rules and ceilings)…. I would have preferred to spend this effort on a national programme that allows for international partners even though it would have been possible to have say two international partners instead of five (as is the case of QuantERA)" (QuantERA project beneficiary)

P2Ps are appreciated by Austrian researchers as an additional funding source but also as a way out of the high H2020 competition and at the same time a preparatory step for larger and more ambitious programmes such as H2020. Levels of appreciation may vary, however, depending on the research type and complexity of the instruments at stake reflecting the different national funding and participation rules.

3. In which R&I areas is Austria strong?

The national Austrian priorities in research and innovation based on the national Smart Specialisation Strategy are the following[23].

i. Information and Communication Technology,
ii. Life Sciences,
iii. Material sciences and smart production,
iv. Bio-economy and sustainability,
v. Humanities, social sciences and cultural studies (including social innovation),
vi. Climate change
vii. Energy use and handling scarce resources
viii. Securing quality of life in view of demographic change (including urbanisation, mobility and migration).

It becomes evident that the national priorities are well aligned with the EU priorities for R&I.

Austrian science is internationally acknowledged in several research fields. For example in the field of quantum communication and information, Austrian research is world-renowned. Vienna is a major biotech hub in Europe, as is Linz in mechatronics and Graz in automotive and production technologies. Austria is also home to a number of firms which are world leaders in certain technological fields and niche markets and performs well in the field of smart grids, leading some major EU projects in public transport in Europe. Vienna is also an international hub for music and arts. Austria is also leading in electronics-based systems and microelectronics and investing heavily in ICT (see for example the Silicon Austria Labs). Policy makers also recognise the transformational importance of digitalisation.[24]

Accordingly, Austria has been particularly successful in H2020 pillar 'Industrial Leadership' where it secured a 3.1% share of funding, reflecting national strengths in applied industrial R&D. In particular, the ICT programme remains the largest national focus for participation for Austrian organisations that have achieved 18.1% success ratio, which is above the EU28 average of 13.6%. In the 'Societal Challenges' pillar Austria received 2.9% of the Horizon 2020 funds available in 2018. In this pillar, Austria is particularly successful in the areas of energy and transport, which account for more than 50% of the funds allocated to Austria within this pillar. Austria also features a success ratio that is well above average the EU28 average in both areas (18.8% vs. 16.1% and 39.2% vs. 29.8% respectively).[25]

In relation to Pillar I "Excellent Science", that has attracted 25.4% of national participation, Austrian researchers have also performed well in the Marie Skłodowska-Curie Actions (MSCA)

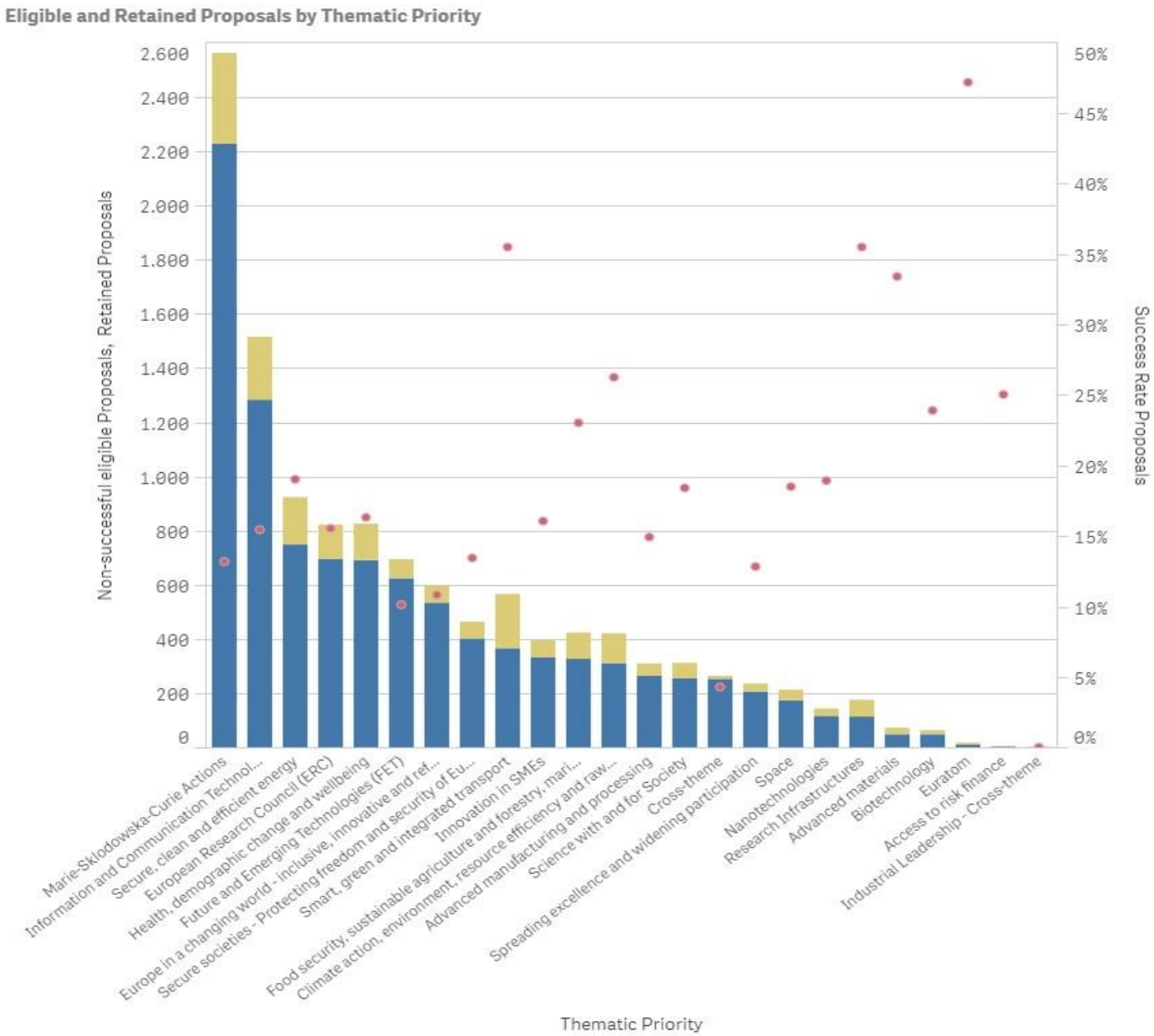
[23] RIO Country Report Austria 2017

[24] OECD Review of Innovation Policy Austria 2018; Austrian Research and Technology Report 2018

[25] Austrian Research & Technology Report 2018

and the European Research Council (ERC). Austrian universities feature above-average rates of success in this pillar too with 13.3% (EU28 12.1%) and 17.1% (EU2812.3%) respectively.[26]

Figure 10: Success rates for Austrian organisations in H2020 per thematic area



Source: H2020 data https://webgate.ec.europa.eu/

(*) The blue part of the bars show non-successful eligible proposals, the yellow part shows the retained proposals. The red dots show the average success rates.

Austria has been investing mainly in the ICT and energy and transport areas in P2Ps, but also in health, demographic change and wellbeing reflecting the third in rank Societal Challenge (Society) with most Austrian participations in H2020.

Austria is world-renowned for its excellence in several research fields. This is reflected in their performance in H2020 as well as in their participations in P2Ps.

[26] Austrian Research and Technology Report 2018

4. With whom does Austria collaborate in R&I and why?

The Strategy for Research, Technology and Innovation (RTI) of the Austrian Federal Government (2011)[27] includes a chapter dedicated to "International Positioning" highlighting the importance of a strategic approach to the European Research Area as well as to international cooperation. It is noted that strategic collaboration with countries outside the EU – with innovation front runners such as the USA, as well as the rising BRIC countries (Brazil, Russia, India and China), and the countries bordering Central, Eastern and South-Eastern Europe – still has significant expansion potential and calls out for a coordinated approach. The strategic significance of Asia must also be taken into account. One of the suggested support measures is the development of a coherent cooperation strategy for various priority areas: Central, Eastern and South-Eastern Europe, North America, Asia and the BRIC countries.

Apart from participation in EU Framework Programmes and P2Ps, European and international collaboration for Austrian organisations is facilitated through bilateral agreements. The Austrian Federal Ministry of Education, Science and Research (BMBWF) has signed agreements with selected targeted countries. Even though there is a strong focus on neighbouring countries and Eastern and South-eastern Europe, bilateral agreements are also concluded with countries outside of ERA such as Argentina, China, India, the Russian Federation and South Africa. New agreements with Brazil and South Korea are under preparation. Additionally, there are two Offices of Science and Technology Austria located in the US and China.[28]

In addition, the numerous international programmes of FWF have to be mentioned supporting fully-fledged collaborative research projects. FWF has concluded agreements on applications and funding for bilateral joint projects with organisations in EU Member States (Belgium, Czech Republic, France, Germany, Hungary, Italy, Luxemburg and Slovenia) and beyond (Argentina, China, India, Israel, Japan, Poland, Russia, South Korea, Switzerland and Taiwan).[29] FFG has also been involved in a series of further activities designed to strengthen international collaboration. These include, among others, bilateral agreements with countries beyond the EU such as Brazil, China, South Korea and Taiwan.

Traditionally Austria has had strong economic as well as scientific and technological linkages with Germany, also due to language. Based on the interviewees, however, the EC Framework Programmes including H2020 as well as the P2Ps and the other international programmes offered opportunities to Austrian organisations to collaborate with counterparts from other countries. Strong links have been established with the UK as well as with neighbouring countries (Hungary, Poland, Slovakia and Romania) and other Central and Eastern European countries. Austria has also been making efforts to collaborate with the Western Balkan

[27] https://era.gv.at/directory/158

[28] ERA Progress Report Austria 2018

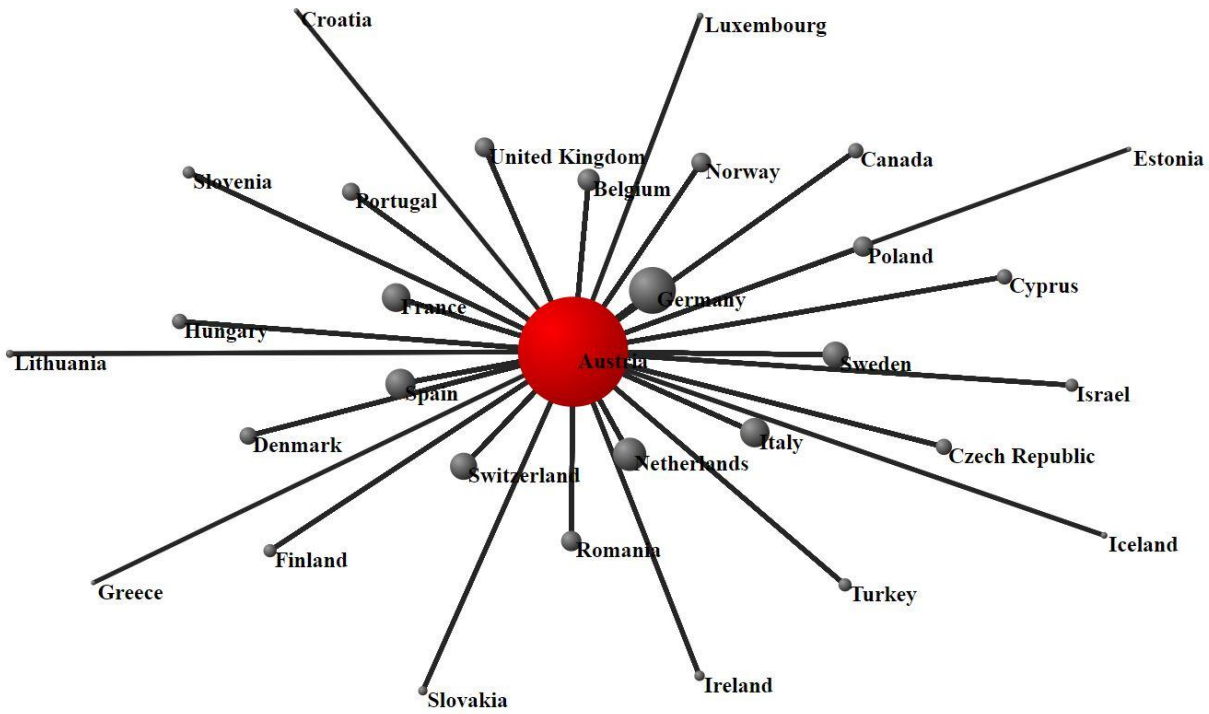
[29] https://www.fwf.ac.at/en/research-funding/fwf-programmes/international-programmes/joint-projects/

countries. In relation to basic research, links are quite strong with German, US, UK, French and Italian organisations. Overall, the countries that Austrian organisations collaborate with are quite widespread including also Switzerland.

At the level of researchers, the factors driving collaboration with a counterpart in another country include strength in the specific research domain, willingness to collaborate, existence of joint priorities/interests. Project consortia are primarily based on these factors as well as personal contacts reflecting prior positive collaboration experiences.

Based on ERA-LEARN data, Austrian researchers mostly collaborate in H2020 P2P-supported projects with counterparts from Germany, Netherlands, Spain, Italy, France, Switzerland and Sweden (cf. Figure 11). These countries are also among the most active countries in Horizon 2020 (Germany, UK, France, Italy, Spain and the Netherlands). Other collaborators include Belgium, Denmark, Norway and the UK as well as Poland, Romania and Portugal.

Figure 11: Collaborations of Austrian organisations in P2P-supported projects in H2020



Austrian research organisations collaborate with counterparts in the most active countries in both P2Ps and H2020. This is driven by scientific as well as personal and historical links among individuals and/or organisations. The EU Framework Programmes as well as P2Ps and the other international programmes available offered opportunities to Austrian organisations to become more 'Europeanised'.

5. What are Austria's overall strengths in R&I?[30]

- Strong long-term economic performance, with high living standards and quality of life
- Rapid advances in the provision of human resources
- Rapid increase of research and development (R&D) intensity achieving a leading position in the European Union (EU)
- Increase in research output, with notable institutional innovations (e.g. Institute for Science and Technology Austria) and some international research strengths, such as quantum communication as well as several areas of industrial R&I
- A multiform sector of research institutes and research and technology organisations
- Strong policy commitment to innovation and digitalisation
- Strong policy commitment to European and international research collaboration
- Upcoming national strategy on ERA and international R&I collaboration
- Successful participation in the EU's 7th Framework Programme, Horizon 2020 and European Research Council grant processes as well as P2Ps
- An established programme monitoring and evaluation culture
- New upcoming RTI strategy addressing several of the identified weaknesses/challenges

[30] Adjusted from OECD Review of Innovation Policy Austria 2018

6. What are Austria's overall challenges in R&I?

- Need to strengthen the co-ordination of internationalisation and participation in EU programmes at the ministerial level. This is particularly important as the current and future European framework programmes focus increasingly on cross-sectoral issues, which will require closer alignment of funding
- Limited innovation output compared with the investments made
- Comparatively low PhD attainment and a weak system of doctoral education
- Lagging performance in the education system (PISA results), high drop-out rates in public universities, shortcomings in adult education (PIACC results)
- A university system which is not operating in ways that will continuously attract leading researchers, with performance contracts that fail to strategically steer the university system
- Need to reform the financing of the Higher Education System
- Shortage of internationally visible research universities and institutes
- Inadequate competitive funding for basic research
- Lack of strategic steering and co-ordination of research and technology organisations
- Specialisation in medium-tech industries and low growth expectations among new enterprises
- Weaknesses in the business environment supporting scale-up

7. Country-specific topic of interest for Austria: "Enhancing internationalisation in European R&I partnerships"

M-ERA.NET 2 – AUSTRIA'S HIGHLIGHT IN HORIZON 2020

The case of M-ERA.NET (ERA-NET for materials research and innovation) coordinated by FFG, is presented as an example of successful efforts to increase trans-national collaboration with European countries as well as non-European countries reflecting the importance of this for Austrian R&I policy. M-ERA.NET has a long history as it has evolved from the merge in 2012 of two separate networks (MNT-ERA.NET and MATERA) that have been running since 2004 and 2005 respectively.

Currently, M-ERA.NET 2 is running under H2020 since 2016. It is impressive that from 8 original partners under MNT in 2004, M-ERA.NET 2 now includes close to 50 partners, while the scope of research evolved from a network focusing only on applied research to covering almost the total of the TRL scale (1-7)[31]. At the same time, M-ERA.NET 2 has funded the largest number of projects among all ERA-NET Cofund actions in H2020 so far: 93 projects in 3 calls, of which 46 under the single cofunded call launched by all networks. Most networks have funded 30 projects or less, while the highest frequency of networks is between 11 and 20 projects.

M-ERA.NET dedicates significant activities (such as visits, workshops and promotional events) to expanding collaboration beyond EU Member States and this has led to noticeable achievements until now. A series of non-European countries have been participating in M-ERA.NET calls since 2012 including Taiwan, Russia, Brazil, South Korea and South Africa. This resulted in a total of 342 applications from these countries between 2012 and 2019, i.e. 6% of the total, and 29 funded participations, with Taiwan being especially successful.[32]

Additional promotional activities are organised addressing a number of other countries such as USA, Japan, Mexico and Singapore. A latest achievement is the collaboration of M-ERA.NET with Quebec as contributor to the 2019 joint call and as participant in the other joint activities of M-ERA.NET.

Furthermore, M-ERA.NET also presents a good performance in terms of engaging widening countries. In the last three calls (2016-2018) 33.7% of the funded research groups and 31% of the project coordinators were located in EU13 countries absorbing 27% of the total call budgets.

[31] Technology Readiness Levels: https://enspire.science/trl-scale-horizon-2020-erc-explained/

[32] Decisions for the 2019 selection process is expected in January 2020.

More information at: https://m-era.net/

Annex

Main indicators for P2Ps in H2020 [33]	Austria	Denmark	Finland	Sweden	Netherlands	EU13 average H2020	EU15 average H2020	EU28 AVERAGE
Total pre-called budget available for P2P calls (€)	89.468.812	70.584.883	68.257.008	145.819.185	176.405.681	16.898.260,99	119.653.202,80	68.275.731,90
Number of network participations	49	39	44	50	62	25	48	38
Number of network coordinations	5	1	0	1	7	0	2,5	1
Number of funding organisations participating in P2Ps	49	39	44	50	62	25	48	37
Number of P2P calls with specific country participation	82	57	65	74	100	54	85	71
Number of proposals submitted to P2P calls (*)								
Number of eligible proposals submitted to P2P calls (*)								
Number of projects funded under P2P calls	259	257	155	587	360	54	320	196
Success rate (funded/submitted proposals) (*)								
Number of participants in projects from specific country								
EU top-up funding received (m €)(*)								
Total budget of funded projects (m €) (*)								
Total requested EC contribution for funded projects (€) (*)								

Sources: ERA-LEARN database (cut-off date May 2019)
(*) Data to be collected in the future

[33] Excluding JPIs

Main R&I indicators	Austria				Denmark	Finland	Sweden	Netherlands	EU 28 average
	2014	2015	2016	2017	2017	2017	2017	2017	2017
GERD (as % of GDP)	3,08	3,05	3,13	3,16	3,06	2,76	3,33	1,99	1,96
Percentage of GERD funded by the business sector	47,00	49,74	53,11	53.98	58.31	56.99 (2016)	57.26 (2015)	52.02 (2016)	54.64 (2015)
Percentage of GERD funded by government	35,81	32,59	30,67598		29,38 (2015)	28,89 (2015)		33,13 (2015)	31,74 (2015)
Percentage of GERD funded by rest of the world	15,79	16,55	15,48098		6,56 (2015)	14,52 (2015)		15,50 (2015)	10,87 (2015)
R&D funded by EC (% of GDP)		0,06			0,06 (2015)	0,07 (2015)	0,05 (2015)	0,03 (2015)	
Percentage of GERD performed by the business sector	71,29	71,42	70,21	70,21	64,44304216	65,25464913	70,58244333	58,77891724	65,66757471
Percentage of GERD performed by higher education	23,69	23,51	22,22	22,22	32,98025782	25,38715739	25,71993094	29,81159075	22,17320767
Percentage of GERD performed by government	4,55	4,58	7,09	7,09	2,223624508	8,53852135	3,697625721	11,40949201	11,31395043
GOVERD (% of GDP)	0,14	0,14	0,22	0,22	0,067950159	0,235426009	0,123022613	0,22717652	0,22
percentage of GOVERD financed by the business sector		6,04			2,027027027	9,12 (2016)	3,95 (2015)	16,11 (2016)	8,09 (2016)
HERD (as % of GDP)	0,73	0,72	0,69	0,70	1,007820237	0,699980348	0,855720224	0,593584136	0,435256656
percentage of HERD financed by the business sector		5,29			2,605803836	3,65 (2016)	4,02 (2015)	7,79 (2016)	6,54 (2016)
BERD (% of GDP)	2,20	2,18	2,19	2,22	1,969269081	1,799215693	2,34832762	1,170357969	1,289044392
percentage of BERD fudned by the business sector		67,38			89,00960552	84 (2016)	80,42 (2015)	82,06 (2016)	81,91(2015
percentage of BERD fudned by government		11,95			2,028350275	3,57 (2016)		1,662833688	6,35 (2015)
percentage of BERD funded by rest of the world		20,60			8,211321459	12,39 (2016)		16,01 (2016)	11,45 (2015)
Total researchers (full-time equivalent)	42627	43562	44933		45277	37047	75247	85300	1957773
GERD current PPP (av 2014-2017)/Total researchers FTE (av 2014-2017)				0,29	0,18	0,18	0,22	0,21	
Percentage of scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	11.47	10.75			13.04 (2015)	10.48 (2015)	11,86 (2015)	14.58 (2015)	
ERC success rate (granted over evaluated)	0,14	0,18			0.09 (2015)	0,05 (2015)	0,12 (2015)	0,19 (2015)	

Sources:
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