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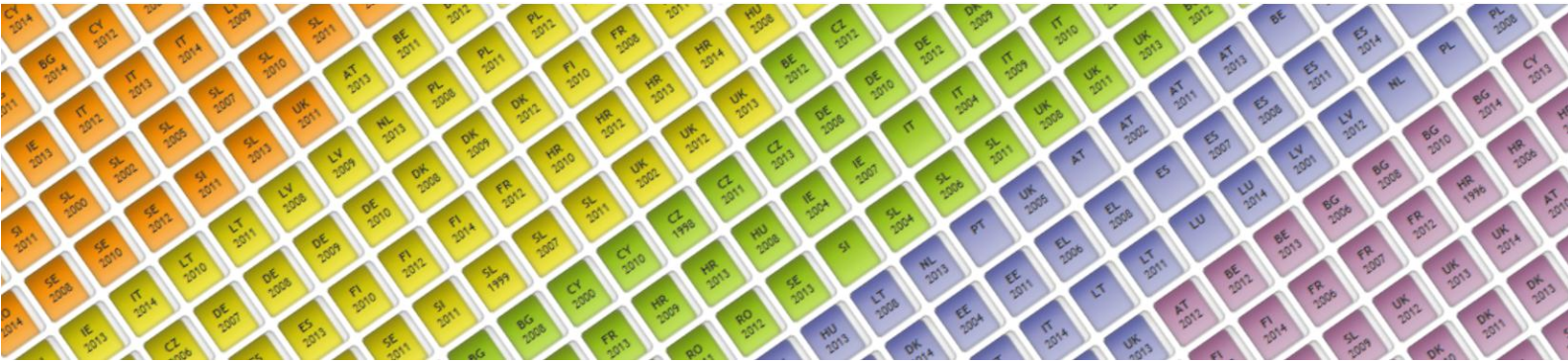

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Contact information
Address: Edificio Expo. c/ Inca Garcilaso, 3. E-41092 Seville (Spain)
E-mail: jrc-ipts-secretariat@ec.europa.eu
Tel.: +34 954488318
Fax: +34 954488300

JRC Science Hub
https://ec.europa.eu/jrc

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Abstract

The report offers an analysis of the R&I system in Austria for 2014, including relevant policies and funding, with particular focus on topics critical for two EU policies: the European Research Area and the Innovation Union. The report was prepared according to a set of guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports, websites etc. The report identifies the structural challenges of the Austrian research and innovation system and assesses the match between the national priorities and those challenges, highlighting the latest policy developments, their dynamics and impact in the overall national context.

Acknowledgments

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Executive summary

This report provides an up to date overview of the research and innovation (R&I) system and policies in Austria. It was prepared according to a set of guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports, websites, etc. The quantitative and qualitative data is, whenever possible, comparable across all EU Member State reports. Moreover, the report highlights recent progress in Austria towards the realisation of the European Research Area (ERA). Similarly, it assesses the effectiveness of current national policies on all fields that are key to the Innovation Union initiative.

Since 2011 the Austrian government has a dedicated national strategy for R&I policies in place. The strategy's implementation is safeguarded by several working groups in government. At large, governance structures for R&I policies in Austria have not been changed significantly in the last years. However, in the wake of the federal elections at the end of 2013, an institutional re-structuring of several ministries established the new, overarching Ministry of Science, Research and Economy (BMWFW). In general, the political and regulatory environment provides sound framework conditions for R&I activities of businesses.

Austria is one of the smaller and richer EU Member States representing only 1.7% of EU's total population (2013). It has a GDP per capita well above the EU-27 average. The Austrian economy focuses on low- and medium-technology and applied R&D. After the downturn of the economic and financial crisis the Austrian economy experienced a fast recovery but is now close to zero GDP growth (2013). The GDP share of gross domestic expenditure on R&D (GERD) stood at 2.84% in 2012 (2014 estimate: 2.88%) and was comparable to innovation leaders in the EU. Austrian businesses finance and perform most of the local R&D. However, business R&D is increasingly financed via public funds, mainly due to the tax incentives provided by government. The structural bottlenecks for growth of the Austrian science and innovation system and the overall economy are the following:

- a strained university system with unfavourable student-to-teacher ratios, limited scientific career options and a persistently low number of S&E graduates: A fact which is aggravated by a declining age cohort of pupils between 15 and 19 years of age, a definitive gender imbalance in S&E studies and, thus, low entry and high drop-out rates in tertiary education;
- a relatively narrow financial base for fundamental research, in particular with regard to competitive funding, little differentiation of university research profiles and insufficient cooperation between higher education institutions (HEI) and public research organisations (PRO); In turn, PROs and HEIs in the Austrian science system are not top-ranked in international rankings and, thus, do not largely attract global talent in R&D and science, even though being an attractive destination for students;
- a stagnating share of R&D financing from the business-enterprise sector, faced with a slightly declining share of corporate R&D funding from abroad since the turn of the century, but partially improved by transfer of a relatively high amount of public funds into the corporate R&D sector, well based on a developed science-industry cooperation portfolio, but with little impact on structural economic change in terms of added-value and high-tech orientation;

- low dynamics in increasing the intensity of private equity and venture capital in the formation of technology-based, innovative firms, aggravated by a deficient regulatory (VC) framework, administrative hurdles in the areas of enterprise formation and service regulations, and characterised by a relatively little developed entrepreneurship culture.

These bottlenecks continue to limit the ability of the system to successfully catch up with innovation leaders in the EU as outlined in the national R&I strategy. The strategy addresses several of these weak points, but a few challenges remain open, namely:

- first of all, there is no roadmap with budgetary indications and responsibilities, which would be required to implement the activities proposed in the strategy;
- consideration of the grand and societal challenges in R&I funding is still expandable – although eventually beginning; at large, it appears that the dominant design paradigm of R&I policies in Austria continues to be a bottom-up one and thus less conducive for thematic approaches.

Regarding the current policy mix, well-known structural deficits, such as the lack of venture capital, remain, as evidenced by the IUS 2013. Most of these deficits, however, are at the focus of public interventions. To date, the share of implemented policy measures and initiatives associated with the strategy is fairly high. This is due to the fact that roughly a third of all associated measures have been already in place before the strategy's official launch. The current emphasis of public intervention is located in the areas of innovation finance, innovation capacity of firms as well as educational reforms.

Despite the fact that encouraging private R&D is essential to reach the 3.76% R&D target of the national strategy by 2020, many recently expanded public policies seemingly did not succeed in further stimulating business investments in R&D and innovation in the last four years, i.e. private financing shares stagnated and absolute investments by businesses did not increase significantly faster than public ones. This is not surprising, however, because the available portfolio of support instruments is already advanced, and the share of public financing of R&D in the business enterprise sector is among the highest in Europe.

Various concrete policy initiatives and measures launched in the last few years have proven successful in challenging certain bottlenecks to growth in Austria. Notably, some valuable trends even emerged without the intervention of policy:

- Even though dedicated budget and policies address scientific excellence only to a limited extent, there is nevertheless preliminary evidence (e.g. ERC successes) on high performing research groups and fields in Austrian HEI and PRO. However, policy efforts targeting the career perspectives of younger researchers should nevertheless be expanded - elsewise these human capital/educational investments will continue to be exploited in other more attractive regions for conducting research elsewhere in the world.
- Notably, R&I governance in Austria has been improved step-by-step and continues to be systematically developed (e.g. implementing task forces for the national strategy); in this context, also a higher quality and impact of public sector services is envisaged and addressed more recently.
- More specifically, R&I governance interfaces with EU and international levels have been fine-tuned and related structures have become even more efficient (e.g. recently developed internationalization strategy). Importantly, updated governance

structures seem to create added value in the national science and innovation system, i.e. financial and knowledge inflows. Similarly, strengthening of strategic intelligence in this area seemingly is an important step in the right direction.

- Notably, gender challenges have been successfully identified and now tackled with a coherent and strategic set of measures and new regulations. However, substantial improvements in this area will very likely take time, also because Austrian society showed a much stronger persistence of traditional gender roles than in most other OECD countries a decade ago.

Moreover, some of the challenges remain unsolved and existing policies need to be adapted accordingly in order to improve the overall performance of the Austrian innovation and science system. Important weak points of the system and current policies are the following:

- Recent public initiatives have so far had a limited effect on the overall availability of venture capital funds, but it may take more time for these impacts to unfold; similarly, measures and next steps outlined in the coalition agreement in this context should be implemented in the near future (e.g. improving the overall investment incentives and regulation for crowd-funding and private investors).
- The overall funding system seems to have lost some of its funding flexibility in times of budgetary pressures. Massive increases in indirect allocation of funds in the last few years was partly only possible at the cost of university finance and funds available for competitive project grants. Accordingly, timely policy responses to new developments have become more difficult in Austria, e.g. funding dedicated to thematic or research excellence approaches.
- Accordingly, the long-awaited evaluation of indirect funding (forthcoming in 2015) will have to provide sound and robust evidence on the effectiveness. Very preliminary assessments suggest that indirect funding, at least, did not meet with expectations for a higher involvement of innovative SMEs.

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1. Overview of the R&I system

1.1 Austria in the European RDI landscape

GDP in Austria amounts to €313bn and thus accounts for 2.1% of the EU's total GDP in 2013. Austria is one of the small and rich EU Member States representing only 1.7% of EU's total population (2013), but with a GDP per capita of €37,000 (2013) well above the EU-28 average (2013: 25,700). Economic growth has slowed down since 2012 and the Austrian economy is now close to zero GDP growth in 2013. Even though the economy experienced a fast recovery in early crisis years 2010 and 2011, the overall situation has worsened since then and now converges to the EU average (2013: 0.1%).

With regard to the availability of R&D funds, the GDP share of gross domestic expenditure on R&D (GERD) in 2012 stood at 2.84% (EU-28: 2.07%) and an estimated 2.88% for 2014. This constitutes a weak but continuous increase since 2011 (2.77%). Only very few Member States among the innovation leaders show higher current GERD per GDP percentages, namely Sweden, Finland, Denmark and Germany. By performing sectors, business expenditure on R&D (BERD) as a share of Austrian GDP stood at 1.95% in 2012. This is significantly higher than EU-28 average (2011: 1.12%). Businesses performed on 69% of total GERD. Government intramural expenditure (GOVERD) and expenditure on higher education R&D (HERD) accounted for 0.15% and 0.73% of GDP in 2012. Again, comparison with EU-27 yields relatively lower average rates for HERD (0.49%), but higher rates for GOVERD (0.26%). In this context, the Austrian private sector finances an estimated 44% of overall R&D expenditure in 2014 (EU-27: 2011: 54.9%), while the public share in GERD finance is 38.7% (EU-27: 2011: 33.4%).[1] The considerable share of GERD financed from abroad is 16.4% in 2014, in particular by MNEs with Austrian subsidiaries but also from EU funding sources. This is significantly higher than the EU-27 average (2011: 9.2%), but has been decreasing in the last few years (2005: 18%). In sum, this period did not provide evidence on a major shift from private to public R&D sources of finance. Nevertheless, very moderate growth of the overall economy may limit the availability of public funds in the next years and will make it difficult to comply with R&D goals outlined in the national R&I strategy and national reform programme for Europe 2020, e.g. the GERD aim of 3.76% of GDP by 2020.

1.2. Main features of the R&I system

Human resources in science and technology (HRST) account for 43.1% of the Austrian working population in 2013 (aged 25 to 64 years; 2012: 41.9%), which is close to an average of 43.4% in the EU-28, but comparatively lower than among innovation leaders and followers. Similarly, tertiary educational attainment of only 17.2% among the overall adult population (aged 15-74; 2012: 16.5%) in Austria is increasing, however, still well below the European average (2013: 23.8%). This difference is mainly driven by one of the

[1] More specifically, the estimated public contribution in 2014 breaks down to €3.06bn spent at national level (roughly 85% and therefore on similar level as in 2013), a total of €0.44bn spent by regional governments and €0.11bn spent by other public entities (local governments, professional chambers or social security institutions).Source: Statistik Austria.

lowest graduation rates for upper secondary and post-secondary non-tertiary programmes designed to prepare students under 25 for university education (2012: 38.9%, ranking only 25th among OECD economies) as well as an attractive and elaborated upper secondary education system unique to Austria.[2] In 2011, 61,170 full-time equivalents (FTEs) were active in R&D, of which 68.8% were employed in the business sector, 26.3% in the higher education sector, 4.2% in the government sector, including public research organisations (PROs), and 0.7% in the private non-profit sector.

Next to the corporate sector, actors in higher education institutions (HEI) are the biggest research performers in terms of volume. They also receive the majority of (institutional) public funds available. Other main R&D performers financed by federal sources include those in the non-university sector e.g. the Austrian Academy of Sciences, the Institute of Science and Technology Austria (IST) or the Austrian Institute of Technology (AIT) (cf. Fig. 1).

Average turnover from innovation by Austrian businesses stood at 9.8% (EU-27 in 2008: 13.3%) according to the Community Innovation Survey (CIS) in 2012 (2010: 12%; 2006: 13.6%). This means a loss of close to 4 percentage points when compared to 2006, mainly due to significant losses among small and medium sized firms in both manufacturing and service sectors.[3] The overall rate of innovating firms in Austria is fairly stable around 54% in 2012 (EU-27: 51%; 2010/2008: 56% in Austria), and is mainly driven by largely concentrated innovation activity of larger companies in manufacturing. Notably, the national policy target of a 10% increase of R&D active companies by 2013 proposed in the national R&I strategy was very likely not met successfully. Even though the 2013 series of official R&D firm statistics is not yet available, again, the most recent CIS data seem to indicate a stagnation of the total number of firms conducting (internal) R&D on a continuous basis. At the industry level, Austrian knowledge and R&D intensive sectors accounted for an average innovation intensity of around 5.4% in 2010 (more specifically, 5.1% in science-based services; 5.6% in science-based industries/manufacturing), i.e. firm R&D expenditure by total turnover. Again, this is significantly lower than average intensities in these sectors among innovation leader economies (Germany: 6.4%; Finland: 7.3%; Sweden: 7.2%).

Other output performance measures further indicate an overall low- and medium-tech and applied R&D orientation of the innovation and science system: High-tech patent applications at the European Patent Office (EPO) per capita stood at approximately 13.4 in 2011 (EU-28: 10.0; 2010/AT: 10.2) and Austria's high-tech share in total exports accounted for 14.2% in 2013 (EU-28: 15.3%; 2012/AT: 12.7%). Austria only outperforms innovation leaders in terms of community trademarks and designs (intensities) filled by companies and individuals, with close to 350 trademark and more than 250 design registrations in 2013 and per 1 million inhabitants. As regards scientific performance, scientists in Austria perform well in top-quartile scientific publications worldwide in terms of citations and per thousand inhabitants, e.g. outperforming Germany. However, national growth in high-quality publications does not exceed growth among most other innovation leaders and, hence, makes catching up with innovation leaders unlikely.

[2] Source: OECD, education at a glance (2014).

[3] http://www.bmwfw.gv.at/Innovation/Publikationen/Documents/Europ%C3%A4ische%20Innovationserhebung%20-%20CIS%202012.pdf, last accessed on December 31st, 2014.

1.3 Structure of the national research and innovation system and its governance

The design of R&I governance structures was fundamentally reshaped at the beginning of the century. It has not changed significantly over the previous 3 years (see Fig. 1).

In early 2011 the Austrian R&I strategy "Becoming an Innovation Leader: Realising Potentials, Increasing Dynamics, Creating the Future" has been published.[4] This strategy builds on exchanges of ideas among the most relevant stakeholders and an analysis of the innovation system as a whole: The Austrian "Research Dialogue" (2008), the "System Evaluation" of the R&D support and funding system (2009), and the strategic recommendations of the Austrian Council for Research and Technology Development (2010).[5] It introduces a coordinated vision and strategy across all ministries in charge of R&I. In order to avoid duplication and to better address horizontal policies, as well as ensure the strategy's overall implementation, a task force of senior officials was installed in mid-2011. It has established a total of nine (inter-ministerial) working groups active since 2012. In addition, the Austrian Council for Research and Technology Development ("Rat für Forschung und Technologieentwicklung") as an independent R&I advisory body has the main task to monitor progress of the strategy's implementation and reports to the Parliament (National Council) on an annual basis since 2000. As regards policy advice on the general progress of the science system, in particular its higher education institutions, the Austrian Science Council established in 2004 is the main advisory body in charge.

The coalition agreement of the current government signed in December 2013 foresees an important adjustment of the existing R&I governance structures:[6] Science and innovation policies and all budgets formerly governed by the Ministry of Science and Research (BMWF) and parts of the former of the Ministry of Economy, Family and Youth (BMWFJ) are now headed by a new Ministry of Science, Research and Economy (BMWFW). Critics argue that this institutional merger may limit independence and reduce budgets dedicated to (basic) sciences as well as university funding and may further increase alignment of innovation and science policies with industrial policies in Austria. However, in September 2014 the government was rearranged and in this context the current Minister of Science, Research and the Economy, Reinhold Mitterlehner, also became vice chancellor. This may help strengthen R&D and science policies as a policy priority on the overall agenda.

In early 2014, the "ERA Observatory Austria" has been established[7]. Its main task is to develop a coherent evidence-based governance and provide strategic intelligence regarding Austria's role in European R&I policy. The observatory consists of an interministerial steering committee, the "ERA Policy Forum Austria", as well as a high-level expert advisory body, the "ERA Council Forum Austria". The two bodies plan to exchange views and findings on a regular basis.

Main funding agencies are the AWS (Austria Business Service), the FFG (Austrian Research Promotion Agency) and the FWF (Austrian Science Fund). Notably, there is a clear

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[4] http://www.bmvit.gv.at/bmvit/en/service/publications/downloads/austrian_rti_strategy.pdf, last accessed on December 31st, 2014.

[5] http://www.ratfte.at/tl_files/uploads/Strategie/Strategy%202020_engl_final%20version_march%202010.pdf, last accessed on December 31st, 2014.

[6] https://www.bka.gv.at/DocView.axd?CobId=53264, last accessed on December 31st, 2014.

[7] http://era.gv.at/directory/166, last accessed on December 31st, 2014

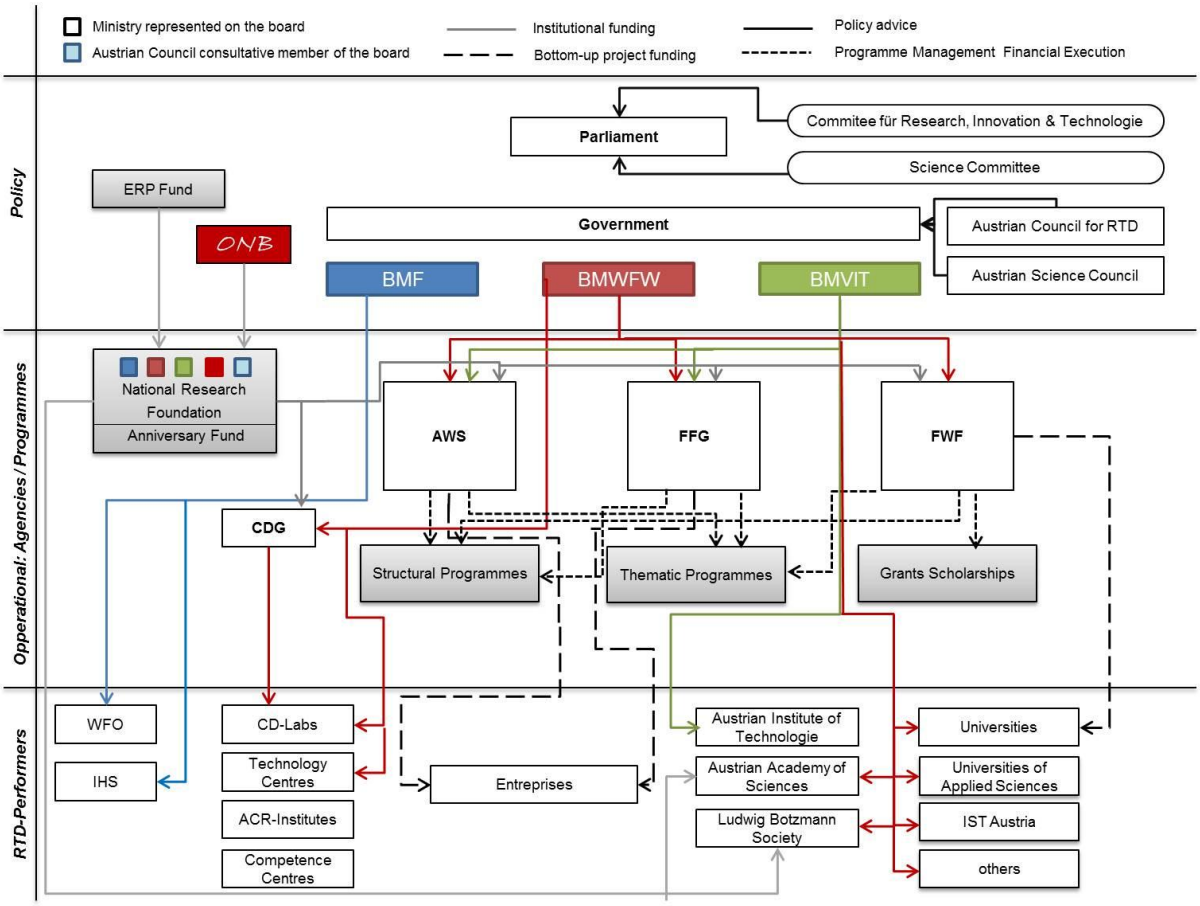
separation of tasks between the ministries and the funding agencies, i.e. between the level of policy making and the operative level. While the activities of the FWF mainly focus on public support for basic sciences, the FFG's and the AWS's mission is to support applied research, translation of knowledge and technology as well as innovation.

The need for coordination of governance levels in Austria's Federal system is limited because policy actors on national level distribute the majority of public funds available within the science and innovation system as will be described at a later stage. However, as far as formal coordination of R&I policies on national and Federal State levels indeed occurs, it is organised on the R&I platform Austria ("Plattform FTI-Österreich")[8], a semi-annual conference involving stakeholders on all levels, first launched by the Austrian Council for Research and Technology Development in 2007. In addition, several ministries regularly meet with representatives from regional governments, or information exchange takes place on an informal but regular basis. Enhanced commitment of Austrian regions to smart specialization activities could also help to fine-tune and coordinate policies launched on multiple levels in medium-term.

Main changes in 2014
- *In September the government coalition was rearranged and the current Minister of Science, Research and the Economy (BMWFW), Reinhold Mitterlehner, also is appointed vice chancellor.* - *"ERA Observatory Austria", "ERA Policy Forum Austria" and "ERA Council Forum Austria" are established.*
Main Changes in 2013
- *Coalition agreement by conservatives and social democrats (ÖVP and SPÖ, respectively) signed in December establishes a new Ministry of Science, Research and Economy (BMWFW), an institutional merger of the former Ministry of Science and Research (BMWF) and parts of the former of the Ministry of Economy, Family and Youth (BMWFJ).* - *Federal elections held in September ("Nationalratswahl").*
Main changes in 2012
- *A total of nine inter-ministerial working groups are established, with the main mission to safeguard the implementation of the Austrian R&I strategy and to develop concrete policy measures in each area of action.*
Main changes in 2011
- *In early 2011 the national R&I strategy "Becoming an Innovation Leader: Realising Potentials, Increasing Dynamics, Creating the Future" is published, following the consultation of main stakeholders in the science and innovation system and an extensive (systemic) evaluation exercise.*
Main Changes in 2010
- *No significant changes.*

Figure 1. Structure of the Austrian Research and Innovation System

[8] http://www.fteval.at/en/platform/, last accessed on December 31st, 2014



Legend: ÖNB (Austrian Federal Reserve), BMF (Ministry of Finance), BMWFW (Ministry of Science, Research and Economy), BMVIT (Ministry of Transport, Innovation and Technology), AWS (Austria Business Service), FFG (Austrian Research Promotion Agency), FWF (Austrian Science Fund), CDG (Christian Doppler Research Society), WIFO (Austrian Institute of Economic Research), IHS (Institute for Advanced Studies), ACR-Institutes (Austrian Cooperative Research Institutes), IST Austria (Institute of Science and Technology Austria)

2. Recent Developments in Research and Innovation Policy and systems

2.1 National economic and political context

The current state of the Austrian economy does not largely differ from the overall worrying state of the Eurozone, both approaching zero growth in 2013. Recent projections by the OECD, however, are more promising and position Austria slightly above EU-15 averages, i.e. they foresee GDP growth rates of 1.5 in 2014 and 2.1 percent in 2015.

National elections held in 2013 as well as the restructuring of several federal ministries in the context of the new coalition government slowed down the introduction of new policy measures, also in the field of science and innovation policies. Arguably, this did not spur the further implementation processes associated with the national R&I strategy and outlined in the coalition agreement. Hence, the number of measures, initiatives and funding trends reported for this period in the following sections must be rather limited.

General public consolidation efforts in the wake of the financial and economic crisis have led to a first budgetary stability agreement launched in mid-2012. This became necessary due to public debt limit laws established on national level at the end of 2011 and a stability agreement signed among regional governments within Austria in May 2012.[9] Both, even though not constitutionally fixed, request balanced public budgets on all government levels by 2016/2017. Hence, these efforts also put pressure on specific budgets dedicated to R&D.

A reform of laws governing competition and cartels was introduced in 2012 by the Federal Ministry of Economy, Family and Youth (BMWFJ) and the Federal Ministry of Justice (BMJ) that strengthens the role of government agencies and increases transparency of regulatory and antitrust procedures. According to the Austrian Council for Research and Technology Development (2012), expected higher levels of competition may also serve as a new impetus to innovation activities in the Austrian economy in the medium and long term. The 2013 coalition agreement of the new government announces further reforms as regards competition in the near future, among others, (1) prescription abolishment of antitrust breaches during merger control cases, (2) earmarking antitrust fines for finance of consumer protection initiatives, and (3) reversal of burden of proof as regards price-setting abuses in specific (energy) sectors.

Implementation of the on-going, public budgeting reform progresses in accordance with its major milestones in 2009 and 2013 ("Haushaltsrechtsreform"). More specifically, January 2013 saw the implementation of the second stage of the reformed budget law with – next to gender budgeting and a general reorganisation of the federal budget – the so called performance budgeting being introduced into the budgets of all federal ministries and providing mechanisms for a goal-oriented budget management. This includes a perennial plan for both resources and goals. With the general reorganisation of the federal budget away from cameralistics ministries and the departments gain more control over their budget (e.g. setting up reserves) in exchange for more public control over the effectiveness of their resource management.

[9] This most recent agreement among regional governments sanctions excess deficits. Surcharges are distributed among those regional governments that comply with deficit rules.

2.2 National R&I strategies and policies

The most important strategic recommendations emerging from the *ex-ante* consultation process for the national strategy were: 1) enlarge from a narrow innovation policy towards a broader approach including linkages towards educational policies and other social and economic framework conditions, 2) transform governance from fragmented to coordinated and consistent public interventions based on a shared vision and a joint strategy, and lastly, 3) to advance from an imitation to a more radical innovation strategy. The national R&I strategy itself, published in March 2011, reflects most of these long-term targets. Notably, the ex-ante consultation process included all relevant stakeholders.

While the strategy does not provide a multi-annual roadmap with budgeting, it makes transparent and traceable the political target to invest 3.76% of GDP for R&D by the year 2020, based on a public versus private split of 1:2. Furthermore, the strategy also committed to a 10% increase of R&D active companies by 2013, is likely to have failed in this respect, judging from data from the 2012 Community Innovation Survey (cf. section 1.2). A new national target, recently announced by the new task force on "knowledge transfer and start-ups" (see below), also aims to increase the annual number of newly founded companies by three percent and by 2020.

In the course of implementation of the national R&I strategy, a total of nine inter-ministerial working groups have been established in 2012, headed by a central R&I strategy task force of high-level ministry officials.[10] Only two of these working groups focus on thematic priorities outlined in the national strategy. However, thematic foci are in line with some of the key priorities in Europe 2020 and Horizon 2020, namely "Climate change and diminishing resources" and "Quality of life and demographic change". More prominently, all other seven working groups focus on policy measures and framework conditions in *horizontal* policy areas. More specifically, these include "Human potential", "R&D infrastructures", "Knowledge transfer and start-ups", "Corporate research", "International rankings" and a last combined working group on "Internationalisation and RTI foreign policy / plan of action for Austria and the European Science Area 2020". So far only few of these working groups have delivered first results and proposals for substantial reforms in the next few years.

Notably, the two working groups on EU/internationalisation recently published strategic documents,[11] e.g. an update of the national EU action plan for the period 2013-2020 (whose successful implementation will be monitored / evaluated in 2016). This plan foresees, among other things, a) optimizing interfaces of Austrian STI policies with the Europe 2020 strategy (e.g. national funding criteria in line with EU ones; diversity and gender aspects in national funding activities), b) further implementation of the ERA in the Austrian domain/territory, c) increasing national benefits from innovation union and from Horizon 2020 in particular via an increased industry participation and provision of strategic consultation services for R&I agents in Austria, d) effective governance via an improved strategic intelligence for Austrian actors on EU level (e.g. national activities within ERA

[10] https://www.bka.gv.at/site/7463/default.aspx, last accessed on December 31st, 2014.

[11] Beyond Europe. Die Internationalisierung Österreichs in Forschung, Technologie und Innovation über Europa hinaus. Working group recommendations for the federal government's R&I task force (July 2013) and Austria's EU action plan (to be passed by the federal government): Strengthen Austria's R&I stakeholders – actively make use of Europe – join group of innovation leaders; http://www.bundeskanzleramt.at/site/6485/default.aspx, last accessed on December 31st, 2014.

observatory), and e) stronger emphasis on multilateral cooperation (e.g. reinforced implementation of macroregional EU strategies such as the Danube strategy and further internationalisation on Austrian university (actor) levels).

Government budget appropriations or outlays for R&D (GBAORD) are around €2.7bn in 2014 and roughly account for 1.6% of all government expenditure in the period (2013: €2.6bn). The highest shares of GBAORD by socio-economic objectives can be found in the following categories: promotion of the general advancement of knowledge (32.4%; 2013: 30.4%), promotion of industrial production and industry (24.8%; 2013: 27.6 %), and promotion of health (20.3; 2013: 20.8%). Around two thirds of direct public funding is distributed via bottom-up programmes which are not pre-assigned to any thematic priority ("generic funding"). The multitude of structural and thematic programmes shares the rest. Thematically targeted R&D priority funding still remains relatively small in Austria.

Most thematic or sectoral R&D programmes in Austria are managed by FFG, which spent around 26% (equal to €117m; 2011: 27%) of its total funds in 2013 on thematic lines on behalf of the ministry in charge.[12] Additionally, most public support by the AWS targets specific sectors (2013: €35m), focusing venture capital funds and subsidies on companies and start-ups in ICT, life sciences and, most lately, also creative industries. Apart from very few exceptions in the field of agriculture and environment, the respective thematic programmes are mainly commissioned by the BMWFW and BMVIT and not by sectoral ministries.[13] Another €110m of funds were invested by the Austrian climate and energy fund in 2014 and allocated on several programme lines and agencies (note: figure excluding FFG and AWS). However, it seems difficult in this context to disentangle the precise share of funds dedicated to R&D. In sum, thematic funding in 2013 accounts for roughly 10% of total GBAORD in Austria. One of the main focus areas for grand challenges and in terms of budgeting is climate and energy R&I.

In 2013, the main funding programmes of the FFG without a thematic focus included the "Comet", "Coin" and "Bridge" programmes, mainly targeting the joint development of knowledge and technology transfer, with close to 20% of total agency funds.[14] Additionally, the "headquarter" initiative and the general programme ("Basisprogramm") were the main generic, bottom-up schemes for companies in Austria, accounting for almost half of total funds and being commissioned by BMWFW and BMVIT. Compared to 2012, no or only minor changes can be observed in terms of allocation to specific programmes and lines.[15] One exception is the new "frontrunner" programme with a budget of €5m in 2013 (total budget: €20m), which subsidises risky R&D ventures of technology and innovation leaders among companies resident in Austria.[16]

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[12] Cf. FFG (2013), Annual Report 2013.

[13] Generally speaking, thematic programmes support application-oriented research and technology development in collaborative projects (making science-industry cooperation a non-thematic priority in many thematic programmes) or industrial research projects in a moderately pre-defined thematic field, and they are normally complemented by a set of specific additional measures (e.g. networking, feasibility studies etc.). The typical target groups are universities, research institutes and companies. Projects can normally be submitted during limited calls for proposals and they are selected for funding in a standard selection procedure, generally involving assessment by national and international experts.

[14] https://www.ffg.at/comet-competence-centers-excellent-technologies, https://www.ffg.at/coin-cooperation-innovation and https://www.ffg.at/Bridge%20Wissenschaftstransfer, last accessed on December 31st, 2014.

[15] Cf. FFG (2013, 2012): Annual Report.

[16] https://www.ffg.at/frontrunner-f-rderung-bedingungen, last accessed on December 31st, 2014.

More than half of all funds distributed by the FWF in 2014, i.e. €92m (2013: €107m; 2012: €98m), were granted to individual scientists. Close to 20% of total funds supported the establishment of new or the continuation of structured doctoral training programmes in the higher education sector ("Doktoratskolleg"). This constitutes a strong increase compared to pre-period, i.e. only 5% of FWF funds targeted this area in 2012, and it is the main reasons why total FWF funding increases by more than 3% or €6m.[17] Two small-scaled programmes were announced in 2013, namely, a scheme offering financial support up to €100,000 for the launch of an open access journal in social sciences and an annual programme that provides funding of up to €50,000 for individual scientists and their science communication and dialogue activities.

Among the more recently adopted policy initiatives is the national infrastructure roadmap by the task force on research infrastructures, published in February 2014.[18] The roadmap targets demand-based allocation of investments to new and existing infrastructures on national and international levels. Similar to the grand coalition agreement (for the period 2013-2018), the new infrastructure roadmap argues for an improved science-industry cooperation as regards new and existing infrastructure on national level as well as better usage of ESFRI infrastructures and co-financing opportunities at EU level. More specifically, the national roadmap discusses and identifies priority areas with respect to 1. basic science infrastructures (including international infrastructures such as ESFRIs) hosted by e.g. the Institute of Science and Technology Austria (IST Austria), the Austrian Academy of Sciences (ÖAW), the Christian Doppler Research Society (CDG) or actors in the HEI sector, and 2. applied research infrastructures, e.g. hosted by the Austrian Institute of Technology (AIT), semi-public ACR networks or the Competence Centers for Excellent Technologies (COMET centers). As far as institutional and federal funds are implemented via performance contracts, the latter contracts already condition finance and use of infrastructures hosted by these research institutions.

In late 2013, the Federal Procurement Agency (FPA) set up an innovation-friendly public procurement (IPP) service centre that serves as a first point of contact and supports pilot projects of interested agencies. The service centre also partners with other institutions in this area, namely AustriaTech, Energieagentur, AWS or FFG, and offers education and training modules (please also refer to section 4.7 in this report). Already in 2012, the federal government adopted a national IPP roadmap and, accordingly, amended the Public Procurement Act (BVergG) in mid-2013 to include innovation as a secondary procurement criterion.[19]

Among the most recently adopted policy measures are the newly established "Knowledge Transfer and Exploitation of IPR Centres" launched by the BMWFW, with a total volume of €20m, and administered by AWS.[20] By mid-2014, three regional knowledge transfer centres (in the Easter, Southern, Western part of Austria) and a life sciences knowledge transfer centre (with no regional focus) have been selected. One main focus of funding is collaborative projects in the humanities, social sciences, and cultural studies. Among other

[17] Cf. FWF (2013, 2012): Annual Report.

[18] Core members of the task force are the Federal Chancellery, Federal Ministry of Finance (BMF), Federal Ministry for Transport, Innovation and Technology (BMVIT), Federal Ministry of Science, Research and Economy (BMWFW) and the Austrian RTD Council. The roadmap can be accessed via http://www.bundeskanzleramt.at/DocView.axd?CobId=54964, last accessed on December 31st, 2014.

[19] Cf. http://www.bmwfw.gv.at/Wirtschaftspolitik/Wirtschaftspolitik/Documents/IÖB-Leitkonzept_2012.pdf, last accessed on December 31st, 2014.

[20] Cf. BMWF, BMVIT and BMWFJ (2014), p.50.

things, the programme supports strategic patenting and prototype development at universities and public research institutions that result from the basic and applied research. The centre programme is a follow-up of the "uni-invent" scheme (i.e. technology transfer offices hosted at individual universities) which phased out in 2010 and was ex post evaluated in 2011.

As discussed in earlier ERAWATCH country reports (Cuntz 2012, 2013), public funding in the area of scientific excellence and frontier science is still relatively scarce. However, based on a set of excellence criteria, a recent report by OECD (2013) identifies one Austrian policy scheme dedicated to frontier science, namely the Competence Centres for Excellent Technologies (COMET). Notably, the OECD here uses a fairly broad definition of the term, e.g. COMET centres have a high acceptance rate of close to 50% which, arguably, is not very selective in terms of funding allocation and in an international comparison. Similarly, public discussions in Austria on whether to implement an "excellence cluster" scheme continue and indicate that there is still room for improvement in this area. Even though there are very few explicit excellence schemes with long-term and a high total volume in place, there are indeed publicly funded research institutions in Austria that already host excellent scientists such as the Institute of Science and Technology Austria (IST), launched in 2006 and opened in 2009.[21] This is reflected e.g. by Austria ranking 4th - together with the UK - in terms of successful ERC proposals (cut-off: October 2013), thereby outperforming scientists in many other innovation leader countries such as Germany, Sweden or Denmark.

2.3 National Reform Programmes 2013 and 2014

Among the country-specific recommendations outlined in the Austrian NRP 2013 and 2014[22] only some apply to the science and innovation nexus. For an assessment of policy responses on competition and budgetary reforms please refer to the general remarks outlined in above section 2.1. Country-specific recommendations target a higher labour market participation of women by "reducing the high gender pay gap and enhancing full-time employment opportunities for women, in particular through the provision of additional care services for dependants." One main issue at stake are educational outcomes in Austria, more specifically, of disadvantaged young people as well as drop-outs from higher education tracks. In this way, all relevant recommendations largely focus on maximizing the labour market and innovation potential ("reserves") among women and migrants.

Several policy measures in Austria address gender specific aspects because e.g. the Austrian economy and society shows a much stronger persistence of traditional gender roles than in most other OECD countries, at least in the last decade.[23]. More recently, a "National Action Plan for Gender Equality" in the labour market has been introduced, and a "Charter for a Better Reconciliation of Family and Work"[24] was adopted. The Plan covers the

[21] https://ist.ac.at/en/, last accessed on December 31st, 2014..

[22] Cf. National Reform Programme 2013, http://ec.europa.eu/europe2020/pdf/nd/nrp2013_austria_en.pdf, last accessed on December 31st, 2014.

[23] Women spend more than twice as much time caring for children and/or elderly per week than men, the largest difference among OECD countries (OECD, 2011).

[24] The Charter is a statement of public commitment to family-friendly measures in companies and organisations. It was co-signed in 2012 by the Federal Ministry of Economy, Family and Youth, the Social Partners and the Federation of Austrian Industries. Additionally, Austrian enterprises are increasingly taking

period 2010-2013, with four strategic goals: i) providing gender-sensitive career guidance and diversifying education paths and career choices; ii) reducing gender-specific differences in employment, and supporting transitions to full-time employment; iii) promoting more women in leadership positions; and iv) reducing the gender pay gap. This plan contains a package of 55 measures, of which 35 have already been implemented by mid-2014.

However, this legal framework and recent policy effort leave open the issue of voluntary trade-offs by women and men between work and family responsibilities. Such trade-offs are found not only in Austria, but also in similar countries such as Denmark, the Netherlands and Sweden and will affect future GDP per capita growth according to a recent study of the OECD.[25] E.g. part-time work take-ups by women do not decline in Austria, but are still on the increase.[26] Again, the National Action Plan for Gender Equality mainly promotes full-time labour force employment of women, and, thus, falls short addressing parent and family incentives, i.e. trade-offs outside the gender dimension. Although total public family benefits accounted for roughly 3% of GDP in 2009 (only topped by public benefits in France and Sweden), policy efforts should be rebalanced in this respect, e.g. increase availability of high-quality childcare facilities, also in rural regions and for children from 0 to 2 years.

Migration in general contributes to Austrian labour force growth and skill supply. However, certain migrant groups tend to suffer from important shortcomings in their human capital, which tends to be passed on to their children, especially given the important role of the family in Austrian education.[27] Policymakers have taken several important initiatives in this area, in particular aiming to improve the situation for those children with migrant background. In general, the proportion of migrants attending schools providing a university entrance qualification – and with high STI policy relevance - is also below average.

Curbing early drop-out rates seems a key policy target in this policy field. The proportion of school drop-outs in Austria is lower than the EU average for natives, but higher for migrants. E.g. nearly 15% of pupils who do not speak German at home and completed their 8th grade in 2010 did not continue their education. Only 4% of German-speaking pupils were in this situation.[28] New policy initiatives include youth and apprentice coaching, free-of-charge programmes to provide qualifications to pupils who have not completed schooling (second-chance education), and training guarantees for students who have not found company based apprenticeships (by training them in dedicated public facilities). Early results from these initiatives are rather encouraging: Between 2007 and 2010, Austria succeeded in reducing the average school drop-out rates more than in the other EU countries (despite starting from a lower average level) and reduced the rates for migrant children – while these rates increased in the EU. Arguably, one main caveat of these specific education policy measures is that they cannot fully avoid early streaming of migrant children to less demanding education streams before they have developed.

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part in "Work and Family Audits" which aim to help companies develop a family friendly corporate culture. These audits have been run successfully in large companies and are now being extended to SMEs.

[25] Cf. OECD (2012).

[26] Cf. http://ec.europa.eu/europe2020/pdf/csr2014/nrp2014_austria_en.pdf, page 7, last accessed on December 31st, 2014.

[27] Cf. EC (2012).

[28] Cf. Statistik Austria (2012).

2.4 Policy developments related to Council Country Specific Recommendations

Not applicable to Austria.

2.5 Funding trends

2.5.1 Funding flows

The main policy target is to invest 3.76% of GDP for R&D by the year 2020 as outlined in the national R&I strategy, based on a public versus private split of 1:2. The estimated 2.88% for 2014 are a valuable, logical next step in the right direction. However, as noted before, very moderate growth prospects of the economy and recent budgetary reforms may limit the availability of public funds in the next years and will make it difficult to comply with this target. Furthermore, the national R&I strategy also committed to a 10% increase of R&D active companies by 2013, but did not meet this target (cf. section 1).

With respect to the ratio of public versus private sources of R&D finances, the private sector finances the largest share of conducted R&D, with an annual growth rate of 3.6% compared to 2013 and an estimated 44% of overall R&D expenditure in 2014. The public share in GERD finance is less fast increasing by 2% and estimated 38.7% of the total in 2014. More specifically, the public contribution breaks down to €3.06bn spent at national level (roughly 85%), a total of €0.44bn spent by regional governments and €0.11bn spent by other public entities (local governments, professional chambers or social security institutions).[29] The considerable share of GERD financed from abroad is 16.4% in 2014, in particular by MNEs with Austrian subsidiaries. In 2011, more than 50% of these investing MNEs were headquartered in Germany and active in the manufacturing sectors (e.g. automotive).[30] EU funds, mainly from FPs and mostly financing HEIs, account for roughly 10% of total external funding or €150m in 2011 (only 1.8% of total GERD). More specifically, since Austria is not a cohesion country, structural funds do not play a role on federal level, but partly on regional level (see section 2.6).[31] Close to €1.2b of EC funds were channelled through close to 2,500 FP7 projects since 2006, funding more than 3,500 participants in Austria. Thus, the private sector, in sum, accounts for roughly 60% of GERD; many countries among innovation leaders currently have shares of up to 70%. In turn,

[29] Source: Statistik Austria.

[30] Cf. Statistik Austria. Data sheets on R&D investment of companies located in Austria but with headquarters abroad, by industry sector and by country of origin.

[31] The Structural Funds (SF) agreements for the next planning period 2014 – 2020 have just been signed in late October 2014 (http://www.oerok.gv.at/esi-fonds-at/partnerschaftsvereinbarung-stratat-2020/grundlagen.html, last accessed on December 31st, 2014). For the planning period 2007 – 2012 a total of €1,204.5m were available for Austria. A financial breakdown according to EU Areas of Assistance has been published in the National Reform Programme 2008-2013; it shows that the importance of R&D and innovation has increased tremendously to 43.5% of the total budget, i.e. €524m compared to €143m or 14% in the previous planning period. Austrian provinces have earmarked approx. 15% of their SF budget on R&D equalling €177m.

Note however that the data on structural funds (RIO elaboration of DG REGIO data) is low in comparison to data reported elsewhere such as last year's country report. One of the explanations for this difference is the definition adopted. The data presented here refers to Core RTD (See Annex for categories included), whereas the information provided elsewhere adopts a broader definition of RTDI and linked activities. In addition the data reported here refers to ERDF funding only and does not include cohesion funds.

contributions from the private sector in Austria will need to increase at a higher rate than those from the public sector in order to meet the targeted ratio by 2020.

Table 1 Basic indicators for R&D investments* (Source: Eurostat, if not stated differently)

	2009	2010	2011	2012	2013	EU28 (2013) *
GDP growth rate	-3.8%	1.8%	2.8%	0.9%	0.3%	0.1%
GERD (% of GDP)	2.61%	2.74% *(e)*	2.68%	2.81% (*e*)	2.81% (*ep*)	2.02%
GERD (euro per capita)	897.4	965.9 *(e)*	988.2	1,060 *(e)*	1,073.6 *(ep)*	539.2 *(ep)*
GBAORD - Total R&D appropriations (€ million)	2,149.8 *(d)*	2,270.0 *(d)*	2,428.1 *(d)*	2,453.0 *(d)*	2,621.2 *(dp)*	90,505.6 1
R&D funded by Business Enterprise Sector (% of GDP)	1.27%	1.25% *(e)*	1.28%	1.24% *(e)*	1.23% *(ep)*	1.12% (2011)
R&D funded by Private non-profit	0.02%	0.02% *(e)*	0.01%	0.02% *(e)*	0.01% *(ep)*	0.03% (2012)
R&D funded from abroad	0.45%	0.45% *(e)*	0.47%	0.43% *(e)*	0.46% *(ep)*	0.19% (2012)
R&D related inward FDI (€ million) ***	2074	N/A	2095	N/A	-	-
R&D performed by HEIs (% of GERD)	26.1%	26.1%	25.6%	25.6%	25.6%	23.3%
R&D performed by Government Sector (% of GERD)	5.3%	5.3%	5.1%	5.1%	5.0%	12.4%
R&D performed by Business Enterprise Sector (% of GERD)	68.1%	68.1%	68.8%	68.8%	68.7%	63.9%
Share of institutional public funding for R&D (% of total GBAORD)	N/A	N/A	72%	73.6%	-	N/A
Employment in high- and medium-high-technology manufacturing sectors as share of total employment	5.0%	5.2%	5.5%	5.8%	5.8% *(b)*	5.6% (2011)
Employment in knowledge-intensive service sectors as share of total employment	36.5%	37.1%	36.1%	36.5%	37.5% *(b)*	39.2%
Turnover from innovation as % of total turnover	11.2% (2008)	11.9%	N/A	9.8%	-	13.4% (EU27, 2010)
Patent applications at the European Patent Office (EPO) **	N/A	14,087	N/A	N/A	-	-
Patent applications via the Patent Cooperation Treaty (PCT) route **	N/A	11,965	N/A	N/A	-	-

* Source: OECD/AMNE database and Austrian National Bank (OeNB), inward (internal) R&D expenditure by multinational enterprises targeting the Austrian manufacturing sectors.

** Note: Data covers the period 2000-2010 and uses fractional counting.[32]

b break in time series

e estimated

p provisional

f total EU funds allocated to national performers

[32] Cf. INCENTIM KU Leuven, Universita Commerciale Luigi Bocconi, KITeS and Technopolis Consulting Group, 2014, Measurement and analysis of knowledge and R&D exploitation flows, assessed by patent and licensing data. Study performed for DG Research and Innovation, 2009-2015.

Notably, the massive expansion of subsidies for corporate research, attributable primarily to the increase in the indirect research (tax) premium effective in 2011, has caused a major shift in how increasing public funds are used.[33] In 2002, the business enterprise sector accounted for just 11% of such public funding. By 2011, this figure had risen to 25%. During the same period, the share going to the higher education sector fell from 74% to 62%. Still, federal government is the main source of funding for HEI performers, even though industry (third party) funding and funding from abroad have been increasing lately in this sector. Similarly, the majority of R&D performed in businesses stems from within this sector. Nevertheless, the long-expected evaluation of the research premium in 2015 will need to provide sound empirical evidence on the effectiveness of the latter policy. It may ex post legitimise the observed shifting of public funds, or it may call for an urgent reform and adjustment of financing flows.

A new national target, recently announced by the new ministerial task force on "knowledge transfer and start-ups" (see above), also aims to increase the annual number of newly founded companies by three percent and by 2020. Arguably, given that good framework conditions in entrepreneurial finance are a main ingredient for success in this policy field, the stagnating or only weakly increasing availability of venture capital in Austria so far already seems to put this target at risk. However, several recent policy initiatives including the establishment of (semi-) public venture funds aim to address precisely this issue (please refer to section 4.6 for details).

2.5.2 Project vs. institutional allocation of public funding

In general, public funds in Austria are more often distributed via institutional than via project-based modes,[34] roughly accounting for 3/4 and 1/4, respectively, of all (direct) public funds. This relation has not changed significantly but remained stable in the ultimate three years. However, the share of institutional funds allocated on a competitive basis in Austria has been weakly increasing in this period.

According to the IU Competitiveness Report (2011), public funding performed in the higher education sector is mostly institutional and accounting for more than 90% of total institutional funding in Austria. Only a very small fraction of institutional funds is performed in government and private non-profit R&D sectors. The share of institutional HEI funding in civil GBAORD is close to a remarkable 60% in 2013 in Austria and the highest among all OECD economies, only comparable to the shares observed in Sweden or the Netherlands. Project-based funding is relatively scarce in the higher education sector, whereas more than 60% of this type of funding is performed by Austrian businesses.

The financing structure of the higher education system changed considerably with the University Act of 2002 which bases competitively allocated institutional and block funding to universities on three-year performance contracts between each university and the BMWFW.[35] The current contracting period is 2013 to 2016. More specifically, competitively allocated institutional funding to HEIs outlined in these performance contracts considers

[33] In 2011, the research premium had been increased from 8 to 10%, while simultaneously disposing tax allowances under § 4 Para 4 of the Austrian Income Tax Act.

[34] The share of project-based funding in total public funds in Austria almost doubled between 2000 and 2008. For further details please refer to Steen (2012).

[35] https://www.ris.bka.gv.at/Dokumente/BgblPdf/2002_120_1/2002_120_1.pdf, last accessed on December 31st, 2014.

separate budget areas, namely 1) budgets for teaching, 2) budgets for research and advancement of the arts, and 3) budgets for large scale infrastructures. HEI performance assessments in all three budget areas are based on a variety of indicators. These indicators include e.g. 1) number of active students per scientific discipline, number of graduates per scientific discipline, 2) the number of PhDs, project volume financed by the Austrian Science Fund, project volume financed by industry or other sources, and 3) societal indicators such as the share of women in PhDs programs, participation in outgoing mobility programs, number of foreign graduate students. Currently, more than 20% of total institutional funds to HEIs are competitively allocated according to this performance-based institutional funding model outlined in contracts. The latter model will be fully implemented until the performance contract period 2019-2021, for period 2016-2018 up to 60% of institutional funding to HEIs will be based upon this model. At large, the share of institutional funds in Austria that is allocated competitively has been increasing in the past years and will continue to do so in the next few years.

The 2002 regulations of this financing system have been revised in 2013 and now increasingly account for research, teaching and infrastructure demands at Austrian universities. It aims to make financing more transparent and flexible, e.g. easier and faster budget access when buying equipment or hiring professors.[36] Furthermore, it seeks to improve the student-professor ratio, mainly by provision of additional public funds and by regulating institutional rules for capacity-constrained student access at university level and for fields of study with high demand e.g. computer sciences and pharmacy. Revisions will become fully effective by 2019, at the latest. By the end of 2014 this bottom-up "pilot regulation" for student access will feed into a first Austrian-wide university development plan ("Gesamtösterreichischer Universitätsentwicklungsplan") headed and drafted by the BMWFW in cooperation with the Assembly of Universities and the Austrian Science Council. The plan will become effective for the performance contract periods 2016-2018 and 2019-2021.

The major sources for project-based funding of R&D activities defined 'bottom-up' are the general programmes of Austria's two major funding agencies FWF and FFG (and their respective predecessor organisations). The major part of project-based funding in Austria addresses functional or horizontal priorities, e.g. scholarships and grants for individual researchers or the cooperation between various players of the research system, mostly academia and businesses.

Again, the FWF is the main funding agency for basic research in Austria, open to all fields of science. Projects can be submitted by individual researchers as well as by teams. Each project is evaluated by international peers and funding decisions are taken according to the standards of the international scientific community. In 2014, the total FWF funding stood at €211.4m (2013: €202, 2012: €196.4m, 2011: €195.2m). Most of these funds went to Austrian universities (2014: 85%; 2013: 83%, 2012: 80.8%; University of Vienna: 19.9% of total in 2014, 2013: 18.7%); 8.2% to the Austrian Academy of Science (2013: 7.0%) and 5.0% to other R&D institutions (including universities from abroad, 2013: 6.2%) or to applicants with no current affiliation. The majority of FWF funds are allocated based on international peer-review, e.g. stand-alone projects.

[36] https://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20002128, last accessed on December 31st, 2014.

Through its general programme, the FFG funds applied R&D and innovation projects performed by Austrian companies individually or in cooperation with scientific partners. The programme is open to all fields of business R&D. In 2012, the volume of funding granted (incl. guarantees) in the general programme was €271m (2011: €258.4m and 2009: €263.5m). 64% of all FFG funds in the same year went to Austrian companies, 23% to non-university research institutions and competence centres, and only 8% to universities. Universities mainly received funding from technology transfer-orientated and European as well as the few thematic programme lines, while businesses received funds across all FFG instruments. Decisions on funding of applied research and innovation by the FFG are seldom based on international peer reviews. One important exception is the more recently introduced qualified certification procedures of the Christian Doppler Research Agency (CDG). In general, the agency operates a number of research programmes, to which specific tailored evaluation criteria apply. However, its funding decisions have to be taken upon the principles of transparency, impartiality and fairness as regards application and funding procedures. The latter principles are outlined in FFG-Directives already established in 2008.[37]

With regard to (pre)seed, guarantees or expansion and growth-finance of start-ups and SMEs, selection criteria and processes (mainly) by the AWS typically require an affiliation to one of Austria's high-tech sectors, in particular ICT, life sciences, physical sciences or nano technology. Procedures follow common investment and banking ones as regards start-up and SME access to venture capital (e.g. letter of intent, due diligence and exit).

In early 2013, a gender budgeting system has been introduced in Austria in order to further promote a gender balance in the research system.[38] More specifically, each federal ministry and supreme state organ now has to determine gender equality outcomes for every societal aspect of its activities which – as a consequence – will require gender-specific data (i.e. see "Federal Constitutional Act (BV-G)", "Federal Budget Act (BHG)" and "Federal Equal Treatment Act"). In a next step, these federal authorities have to define concrete measures (outputs) and indicators in order to realise and monitor the respective gender equality outcome.

In sum, the allocation and mix of direct funding seems appropriate. The share of competitively allocated, direct funds weakly increased in the last few years. Arguably, this suggests that direct public funds are used more efficiently and effectively as high(er) performers in the Austrian science and innovation system are increasingly selected from the overall pool of applicants. More of a concern is the balance between direct and indirect funds in the system which we turn to now.

2.5.3 R&I funding

In Austria, direct government funding of business R&D and indirect support via R&D tax incentives each accounted for 0.1% of GDP in 2011, i.e. a 1:1 relation between direct and indirect allocation of funds to businesses according to the latest available figures by

[37] Cf. "FFG-Richtlinien", http://www.ffg.at/sites/default/files/dok/ffg_rl_2008.pdf, last accessed on December 31st, 2014.

[38] Cf. http://www.imag-gendermainstreaming.at/cms/imag/attachments/6/1/4/CH0136/CMS1329995383009/folder_gender_budgeting_(englisch).pdf, last accessed on December 31st, 2014.

OECD.[39] More specifically, as regards the share of indirect funding, Austria ranks 6th among OECD economies; it ranks 11th in terms of the share of direct funding from public sources. Notably, in comparison with other OECD economies with a high share of indirectly allocated R&D funds like France, Canada or Korea, Austria simultaneously spends considerable more funds on direct support of businesses than governments in aforementioned countries. Thus, the Austrian government is one of the few that does not seem to select or focus on one specific funding approach.

In Austria, R&D premium refunds by tax authorities effectively allow firms to benefit from incentives as if they were profitable (even if they are not at present). Firms are eligible for the research premium once they are certified by the FFG (implemented with the premium reforms in 2011). Furthermore, in an international comparison the existing system does not seem to emphasise or favour specific actors, e.g. SMEs or large firms. Furthermore, the premium can be deducted or claimed on internal as well as external R&D projects/expenditure. On the one hand, the type of expenditure for "research and experimental development" eligible is set out and defined in national income tax laws (i.e. § 108c Abs 1 Z 1 "Einkommensteuergesetz" 1998). On the other hand, since 2012 the FFG certifies and assesses the orientation and main focus of claimed company expenditure on the basis of OECD's Frascati-Manual (2002: 30).

Notably, €574m were allocated in this way to Austrian businesses in 2012. This constitutes a massive increase in absolute numbers by more than 80% when compared to the previous year (2011: €313m), even though it has declined most recently (2013: €378m). Similarly, while the relative tax incentive share in total government funds for R&D stood at 41% in 2006, it reached more than 50% in 2011. This equals an annual growth rate of indirect funding of 9% between 2006 and 2011, while direct funds only grew by less than 1% in this period. Here, Austria experienced the fastest relative growth of indirect funds among all OECD economies.[40]

Other tax incentive schemes such as explicit patent boxes have not been introduced so far. However, the Austrian tax system already offers specific regulation (i.e. favourable tax treatment) for corporate groups of firms and their headquarters when located in Austria.

In general, public funding streams available in the overall funding system cover the entire R&DI process from fundamental research to market innovation. More recently, missing links in this process are being addressed, e.g. funds are allocated to prototype research targeting the commercialisation of university (basic) research results (i.e. new technology transfer centre program "Prize" launched in 2014). Similarly, overall funds assure a high connectivity among major actors in the science and innovation system. High connectivity is correlated with a high number of fairly effective policy instruments fostering knowledge and technology transfer, launched in the past decade. Similarly, Austria has a relatively high share of public-private co-publications of 2% of the total (EU28 average: approximately 2%) and it ranks 4th worldwide in terms of university-industry research collaborations (WEF Competitiveness Report).

[39] Cf. http://www.oecd.org/tax/rd-tax-stats.htm#design, last accessed on December 31st, 2014.

[40] Here the focus is on OECD economies that expanded funding in this period, i.e. with positive growth rates in direct and indirect funding.

2.6 Smart Specialisation (RIS3)

All regional governments have developed economic and innovation strategies,[41] but are not necessarily (officially) registered on the S3 Platform at present, e.g. Styria, Tyrol or Carinthia.[42] Having a smart specialisation in place is a pre-condition for Austrian regional governments to be able to spend European Regional Development Funds on R&I (based on new "ex ante conditionality" clause); in this context, Austria will have but one national operational programme for ERDF (with regional chapters).[43] Similarly, the BMWFW has supported the RIS3 Platform from its beginning and has been a strong partner for both the EC and the Platform in (1) translating the RIS3 concept for practical use throughout the EU, (2) mutual learning exercises and (3) spreading the concept in the macro-regional context, e.g. the EU Danube Strategy. Strategy development in many of these regions has been co-financed with EU funds (e.g. under the Regional Innovation and Technology Transfer Strategies (RITTS) programme).

- The regional government of Lower Austria has a dedicated Economic Strategy Lower Austria 2015[44] launched in 2010. It also includes an updated innovation strategy. Based on a SWOT and comparative regional analysis the latter identifies a number of strategic "technopoles" (clusters) and sets out explicit RTI targets, e.g. an increase of regional human resources in science and technology by 2015. Thus, it is based on a rather comprehensive assessment of the region's strength and weaknesses. The strategy was mostly developed bottom-up with SMEs located in the region. In addition, it lists a number of on-going or planned policy measures encouraging regional R&D, e.g. training for R&D staff in SMEs and coaching services for entrepreneurial ventures. Furthermore, in 2012 Lower Austria started to develop its own research, technology and innovation strategy. A first result including extensive consultations with a variety of stakeholders in the region has been published in 2013.[45]
- Similarly, Upper Austria has launched regional economic and science strategy ("Innovatives OÖ 2010plus"[46]) for the period 2010-2013; an update has been recently launched to cover the period until 2020 ("Innovatives OÖ 2020").[47] The update has been based on an ex ante evaluation exercise and fine-tuned with prospect activities under Horizon 2020 and GSR funds/EFRE.[48] The regional strategies focus on 5 main thematic fields and set out specific targets for each and across themes, e.g. an increase of regional R&D expenditures or being among the top 3 innovative regions in Austria. It also lists in greater detail a wide range of policy initiatives relevant to the regional innovation system. The strategy has a

[41] In 2014, Burgenland launched its new Research, Technology and Innovation Strategy 2025 (www.fti-burgenland.at). Strategy processes are underway in Salzburg, Vienna and Vorarlberg.
[42] Cf. Styrian Government (2011), Tyrolean Government (2013) and Carinthian Government (2009).
[43] http://www.oerok.gv.at/fileadmin/Bilder/3.Reiter-Regionalpolitik/2.EU-Kohaesionspolitik_2014_/EFRE/IWB_EFRE_AT_Draft_2.0_2014-02-05_inkl_Anhang.pdf, last accessed on December 31st, 2014.
[44] Cf. Lower Austrian Government (2010).
[45] Cf. Upper Austrian Government (2012) and https://www.noe.gv.at/bilder/d71/FTI_Grundstrategie.pdf, last accessed on December 31st, 2014.
[46] Online information platform at http://www.ooe2010plus.at/index.php, last accessed on December 31st, 2014.
[47] http://www.ooe2020.at/313_DEU_HTML.php, last accessed on December 31st, 2014.
[48] http://www.ooe2020.at/312_DEU_HTML.php, last accessed on December 31st, 2014.

dedicated total programme budget of €150m for the three-year period (another €300m is intended to come from federal funds and industry investment). In addition, the existing R&D funding agreement between the national funding agency FFG and Upper Austria, first established in 2006, was prolonged in 2010 and is an important milestone for the strategy's implementation. The agreement involved funds from FFG's basic programme and is complemented by regional public funds dedicated to eco-, cooperative and start-up innovation.

- Styria also has its own economic strategy called "Styria 2020" that is building on growth through innovation.[49] Five main strategies are combined in this document to increase the general level of innovativeness in Styria: location development and management, internationalisation, human resources, entrepreneurship and growth, and innovation, development and research. With regard to the latter three main objectives were agreed upon: increase the number of Styrian companies with regular innovation activities, improved framework conditions for knowledge and technology transfer, increase the number of Styrian companies in national and European research funding programmes, and improved knowledge in Styrian companies regarding IPR. The strategy also acknowledges the increasing relevance of service sector innovations.
- In September 2013, the Tyrolean government passed the Tyrolean "Research and Innovation Strategy" including seven main fields of activities and various objectives such as intensifying the cooperation of industry and academia in Tyrol, developing a coherent concept of regional specialisations, recruitment of top researchers, increased knowledge and technology transfer.[50] As part of this strategy, Tyrol plans to introduce its own Council for Research and Innovation for strategic issues and a coordinator for regional innovation activities at the operational level.

At the national level, the BMWFW uses the smart specialisation concept to support a "lead institution initiative" that aims at empowering universities and STI institutions to team up with regional planners and lead companies to become strong expert partners in regional smart specialisation. In their three-year performance contracts, 15 out of 22 public universities agreed to develop regional/location concepts ("Standortkonzepte") in relation with their internationalisation strategy and development plans.[51] For example, the Alpe Adriatic University of Klagenfurt identified three "orbits of co-operation", starting from their local network, touching upon the greater Alpe-Adriatic region (reaching out to neighbouring regions in Austria, Italy and Slovenia), towards their international partners. BMWFW's lead institutions initiative was nominated "smart policy scheme" by an EC expert group in 2014.[52]

To date (end of 2014), none of the three regional authorities registered on the Smart Specialisation Platform has undergone peer-review in the process organised by the S3 Platform since the beginning of 2012. However, Austrian regions and the federal

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[49] http://www.verwaltung.steiermark.at/cms/dokumente/11685083_74838386/a91867ab/Wirtschaftsstrategie%20Englisch.Orig.pdf, last accessed on December 31st, 2014.

[50] https://www.tirol.gv.at/fileadmin/presse/downloads/Presse/forschungsstrategie.pdf, last accessed on December 31st, 2014.

[51] http://wissenschaft.bmwfw.gv.at/fileadmin/user_upload/forschung/Standortpolitik/oead-news-91_pdf_-_Adobe_Acrobat_Pro.pdf, last accessed on December 31st, 2014.

[52] The role of Universities and Research Organisations as drivers for Smart Specialisation at regional level, www.era.gv.at/regions, last accessed on December 31st, 2014.

government (BMWFW) repeatedly contributed to regional and national S3 peer reviews. Upper Austria was recently branded a "model demonstrator region" by the EC and also joined the Vanguard Initiative of European industrial regions for smart specialisation in December 2013. The Austrian government, more specifically, the BMWFW together with Joanneum Research, took an active role as leading/coordinating country in a recent OECD-TIP project on smart specialisation.[53] This led (among other things) to the development of a self-assessment tool for mobilising and profiling regions anywhere in Europe[54]. In general, regional strategies and activities of regional funding agencies in Austria complement and adjust to RTI policies and activities on national and EU levels. Nevertheless, multilevel governance structures have led to significant overlap of activities and limited horizontal coordination in some specific areas: E.g. there are currently more than 40 cluster initiatives run on federal state and national levels, but virtually no funds available for innovation clusters that span across regional governments.[55]

2.7 Evaluations, consultations, foresight exercises

The evaluation culture in Austria is well developed. Ex-post, interim and, to a lesser degree, ex-ante evaluations are standard practice at programme, institution and system's level evaluations in Austria.

An important stakeholder in R&I evaluation in Austria is the Platform Research & Technology Policy Evaluation (fteval), already founded in 1996. It is an informal cooperation of policy-makers, research funders and evaluation practitioners and aims at presenting approaches and methods of evaluation, discussing the current evaluation practice on an international level and, thus, contributing to the further development of an evaluation culture by standard-setting activities.

As regards evaluation practice in the HEI sector, with the legal validity of the "Quality Assurance Framework Law" ('Qualitätssicherungsrahmengesetz' [QSRG]) a new and single agency (i.e. Agency for Quality Assurance and Accreditation Austria) has been established in March 2012 which is responsible for external quality assurance in public universities, universities of applied sciences and private universities.[56] The Agency for Quality Assurance and Accreditation Austria includes the competences and activities of three previously existing organisations, namely the Österreichischer Akkreditierungsrat (Austrian Accreditation Council – ÖAR) the Fachhochschulrat (FH Council - FHR) and the Austrian Agency for Quality Assurance (AQA).

In terms of evaluation providers, the Austrian scene is dominated by non-university research institutions like WIFO, KMU Forschung Austria, Joanneum, international operating consultancies such as Technopolis, and many others. All of them are member of fteval. Finally, the research funders at national (FWF, FFG) or state level (e.g. WWTF in Vienna) are also promoting the usage of evaluations.

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[53] The project website as well as draft synthesis report: https://community.oecd.org/community/smartspecialisation, last accessed on December 31st, 2014. The self-assessment tool can be accessed via www.era.gv.at (available in Czech, English, German and Spanish).

[54] www.bmwfw.gv.at/ris3-key

[55] Cf. Aiginger et al. (2009).

[56] http://www.ris.bka.gv.at/Dokumente/BgblAuth/BGBLA_2011_I_74/BGBLA_2011_I_74.pdf, last accessed on December 31st, 2014.

At the beginning of the 1990's, the Austrian Technology Monitoring System (ATMOS) was implemented and the first systematic foresight studies in Austria were already ran between 1996 and 1998.[57] -They involved expert panels and were completed by two Delphi exercises that combined technology foresight with a society and culture foresight. To the best of our knowledge, no other national foresight exercise of comparable scale has been carried out since then, but several sectorally and thematically focused foresight projects have been conducted.

Notably, eight major evaluations relevant to federal policy and publicly accessible have been undertaken between mid-2013 and late 2014.[58] Selected evaluations in 2013 include:

- An interim evaluation of the Austrian security research programme KIRAS (on behalf of the BMVIT), the latter focusing on public support to security research:[59] Two main areas for improvement were identified, namely, a) management complexity increased once content sharing and building on each other's ideas across KIRAS projects occurred, and b) further coordination need for public and private customers/procurers when multiple agencies and ministries are involved. Both aspects should be anticipated when selecting and designing projects (a) and when aligning project interests of the different parties (b).
- An interim evaluation of the regional contact points (RCP), commissioned by the BMWF:[60] Since 2009, the Austrian RCPs provide information and advice services to regional stakeholders in science, industry and administration in terms of EU Research Framework Programmes and other European programmes participation. On the basis of quantitative and qualitative assessment (including an online user survey) the evaluation documents a client-centred approach of services offered and reasonable satisfaction among users; regional access seems to create additional value. However, given the changes in customer structures (less university scientists, but a clear focus on SMEs) the evaluation recommends the establishment of minimum competences for European programmes in the province's innovation agencies, i.e. budget cuts between 20% and 50%, depending on the RCP in question.
- Ex-post (methodologically advanced) quantitative evaluation of the competence centres Kplus and K_ind/K_net as one of Austria's largest structure programmes (on behalf of the BMVIT and BMWFJ):[61] Public support to centres of more than €800m in the period from 1998 to 2009 mainly sought to increase interaction and cooperation between industry and the sciences, frequently with regional anchoring of such R&D activities. The overall assessment of the programmes is mostly negative. (Causal) programme effects using a difference-in-difference approach show that companies funded through the K-programmes represent an extremely positive select group from the Austrian company landscape. Comparison of R&D expenditure intensity (share of R&D expenditure in total turnover) of the K-companies during the period 2002 and 2009 shows an absolute decline, while the

[57] http://wug.akwien.at/WUG_Archiv/1997_23_2/1997_23_2_0193.pdf, last accessed on December 31st, 2014.
[58] Cf. BMWF, BMVIT and BMWFJ (2013, 2014) and information from platform ft-eval.
[59] Cf. Pfirrmann et al. (2012)
[60] Cf. Good and Radauer (2013).
[61] Cf. Schibany et al. (2013). Note that many of the companies and research institutions which have participated in a K-programme are now part of a COMET centre (i.e. COMET is the follow-up scheme).

control group – starting from a low level – recorded an increase of R&D expenditure intensity. Similarly, the policy scheme neither induced additional industry-science cooperation at large nor did it generate large international knowledge spill over from foreign industry participation. For the R&D personnel intensity of companies (share of R&D employees among total employees) and with regard to the profile-building at the technically oriented universities involved, however, some positive effects are reported.

- An international comparison of the selection procedures of research funders (on behalf of the BMVIT, now BMWFW):[62] Funding agencies considered by the analysis were the Danish Agency for Science, Technology and Innovation (DASTI), the Research Council for Technology and Innovation and the Council for Strategic Research in Denmark, the Research Council of Norway (RCN) in Norway, the Verket för innovationssystem (Vinnova) in Sweden, Teknologian Kehittämiskeskus (Tekes) in Finland, and the German Project funders Jülich (PTJ), Technischer Überwachungsverein Rheinland (PT TÜV Rheinland), Verein Deutscher Ingenieure-Technologiezentrum (PT VDI-TZ) and the Verein Deutscher Ingenieure/Verein Deutscher Elektrotechniker-Innovation und Technik (PT VDI/VDE-IT). The evaluation and international comparison found, among other things, that there is a noticeable trend towards a standardization of selection procedures amongst research funding agencies, especially those in the Scandinavian countries. Similarly, the use of external evaluators in the project selection process is increasing across all agencies. Furthermore, organisations are making increasing attempts to create more objective selection processes. Measures that have been implemented include the use of multi-stage, criteria-driven selection procedures that are spread across the entire organization (RCN), new combinations of evaluators and the use of programme committees (Vinnova, PT Jülich).
- A qualitative and quantitative evaluation of research cooperation under the framework of the bilateral Science and Technology Cooperation agreements (WTZ), based on (case study) interviews, an online survey, bibliometric data and econometric analysis (on behalf of the BMWFW):[63] The WTZ programme is implemented partly in cooperation with the Federal Ministry for European and International Affairs (BMeiA) and managed by the Austrian Agency for International Cooperation in Education and Research (OeAD). The evaluation targeted mainly efficiency and effectiveness of the programme and found that it has a significant effect on cross-border mobility of Austrian researcher, triggered by a comparatively low funding budget. However, the programme mainly supports existing bilateral cooperation ties, seldom helps initiate new linkages and so far is little known in the scientific community. Notably, many co-operations seem to endure even after the funding period is over and give beneficial access to foreign infrastructures and data sources. An implication from the evaluation results seems to be that bilateral co-operations run under the WTZ should be more strategically aligned with long-term

[62] Cf. Biegelbauer and Palfinger (2013), http://www.fteval.at/upload/Auswahlverfahren_von_Forschungsfoerderungsorganistaionen_im_international_Vergleich.pdf, last accessed on December 31st, 2014.
[63] Cf. Schuch et al. (2013), http://www.fteval.at/upload/Evaluierung_der_Forschungskooperationen_im_Rahmen_der_bilateralen_wissenschaftlichtechnischen_Abkommen_und_Vereinbarungen.pdf, last accessed on December 31st, 2014,

funding opportunities in European or international programmes (e.g. HORIZON 2020, EUREKA).

Selected evaluations since the beginning of 2014 include:

- A final evaluation report that summarizes annual interim assessments of the Laura Bassi Centres of Expertise, i.e. a policy scheme which establishes excellence centres led by female researchers and bridging the industry-science gap (mainly focusing on the first funding period 2009-2013):[64] The evaluation series and the scheme were conducted under the auspices of the BMWF (now: BMWFW) and managed by the FFG. Assessments throughout the first funding period (2009-2013) were mainly based on qualitative interviews, online surveys and workshops held with stakeholders and actively encouraged learning and feedback loops of the latter throughout this period. They accounted, among other things, for research and industry output and impact of centres and scientists as well as monitored the perception of the programme in the scientific community ("female research leaders as role models"). In sum, the evaluation team has given the Centres and the overall scheme positive marks, in particular the "innovative" two-stage selection procedure and its pilot character for gender-mainstreamed design and management of other (future) programmes and agencies in Austria. However, even though design of the evaluation had to capture a large variety of objectives and perspectives, it is not very ambitious in terms of developing more robust impact and effect assessments based on control group or comparable approaches.
- The Austrian genome research programme (GENome Research in Austria – GEN-AU) launched by BMWFW underwent a comprehensive ex-post evaluation after a total programme length of 10 years:[65] This largest thematic support programme in Austria and in the life sciences field was managed by the FFG, with a total funding volume of around € 85 million. The qualitative and quantitative evaluation concludes that programme results were negligible from an economic (e.g. measured by patenting) as well as health policy perspective, and programme goals were too broadly defined. However, it also claims that the consistent application of the "excellence" concept already during the 2000s and the room for experimentation in this discipline provided by these funds resulted in the creation of top research institutions such as Austrian Academy of Sciences' Excellence Institutes and the IST Austria. The high number of ERC grants and publication output increases in this research field are meaningful indicators of research excellence in this regard. However, the evaluation puts relatively little emphasis and effort in dissecting the effects of the different national and international funding sources in this period.
- A most recent, mainly interview-based evaluation of the FWF Doctoral Programme on behalf of the FWF:[66] When looking at the overall performance of the DK ("DoktoratsKolleg") programme, its impact on doctoral training at Austrian

[64] Cf. Dörflinger and Heckl (2014), http://www.fteval.at/upload/Begleitende_Evaluierung_der_Impulsaktion_Laura_Bassi_Centres_of_Expertise_Endbericht.pdf, last accessed on December 31st, 2014.
[65] Cf. Warta et al. (2014), http://www.fteval.at/upload/Evaluierung_des_oesterreichischen_Genomforschungsprogramms_GEN-AU.pdf, last accessed on December 31st, 2014.
[66] Cf. Ecker et al. (2014), http://www.fteval.at/upload/Evaluation_of_the_FWF_Doctoral_Programme_(DK_Programme).pdf, last accessed on December 31st, 2014.

universities, and the incentives that the programme provided for the reform of doctoral training (i.e. offering structured doctoral programmes) it can be stated that the programme has achieved these goals to a very high extent, in particular DKs in the life sciences and as a complementary activity to structured doctoral training launched by universities themselves.[67] Furthermore, on average, DK's hiring practice led to more than 50% of international students (high inward mobility), outperforming the envisaged target to integrate about 30% of foreigners, but at the same time Austrian students were less likely to go abroad (low outward mobility). However, not all relevant data were accessible for the evaluation team and accordingly the evaluation cannot assess success of funded doctoral candidates and their time-to-degree. The evaluation calls for an extension of the funding period (currently 3 years) and also questions the current outcomes of the DK, i.e. the programme mainly preparing doctorates for an academic career and frequently for other labour markets abroad (many moving abroad once their PhD is completed).

[67] Notably, performance agreements between the universities and the federal government already explicitly consider the establishment of new and the continuation of existent doctoral programmes Furthermore, following the evaluation outcomes outlined here and notwithstanding current budgetary pressures at FWF, budgets dedicated to this programme line have increased most lately (see discussion above).

3. National progress towards realisation of ERA

3.1 ERA priority 2: Optimal transnational co-operation and competition

Cross-border R&I cooperation is well established in Austria at the level of researchers, research organisations from industry and academia, and research funding agencies. In the field of basic research, there is a high propensity and readiness to finance also research conducted outside Austria. In general, Austria is a small, but open economy with a comparatively open funding and innovation system, in terms of its labour market as well as relative availability of public funds to foreign researchers.[68] This can also be seen in a remarkably high share of national public funding allocated to transnationally coordinated R&D (as % of GBAORD) which amounts to approximately 5% in 2010 according to the latest EUROSTAT data available and ranking Austria third among Member States, close to Belgium and Switzerland.

On national level, consideration of the grand and societal challenges in Austrian R&I funding is still expandable. In 2013, as noted above, thematic funding only accounts for roughly 10% of total GBAORD in Austria and thus alignment with international themes is per se limited in scope. Notwithstanding efforts by the respective working groups implementing the national R&I strategy to address grand challenges, a horizontal (cross-ministerial), theme management is underdeveloped in Austrian R&I governance. In addition, most policies directed towards grand challenges lack continuous evaluation as well as identification of new challenges on national level is not based on systematic assessment. However, with its 2020 perspective, the national strategy is explicitly embedded in Europe's 2020 growth strategy and contributes to the implementation of the Innovation Union.

Austria is an active and important player in a variety of EU level initiatives including cross-border research cooperation and coordination such as ESF, EUROHORCS, ERA-Nets, Joint Undertakings and JPIs, in particular those addressing grand challenges, but also with regard to the development of supranational or EU-wide standards for coordination of research.

Austria is involved in a large number of ERA-NETs compared to the size of its economy and innovation and science system. More specifically, it was active in 66% of all active networks in 2013, often in charge of a coordinating role and ranking among the top 5 countries in terms of participation. In turn, it contributes not only to a more efficient allocation of funding but also embraces cross-border relations with researchers from other EU Member States. Similarly, Austria is active in 8 out of 10 Joint Programming Initiatives (JPIs) in 2013 focusing on grand challenges. In 2010, Austria also committed to and taking the lead in the coordination and support action (CSA) "JPIs to Co-Work", explicitly focusing on framework conditions for Joint Programming.[69]

In the context of international projects and agreements, only the FWF as the main funder of basic sciences approved a grant volume of €15.8m in 2013. This equals 15% of its total funds. Two thirds of these international grants were allocated in the lead agency procedures; the remaining funds were national contributions to ERA-Net and international/bilateral research agreements. This constitutes a relative decrease when

[68] Cf. Cuntz and Peuckert (2014).
[69] Cf. Özbolat and Boden (2014), NETWATCH mapping and monitoring, 5th exercise.

compared to 2012 (€17.9m, equal to 18% of FWF's total funds), back to the level in 2011 (€15.1m).[70] With a current budget of €27.2 in 2014, there is, however, a significant increase of funding in this area.

The D-A-CH agreement follows the idea of a lead agency. The core of the lead agency principle is that partners of international research projects have to apply only to one funding agency. That agency is responsible for the entire administration including the peer review process. The lead agency procedure foresees that research agencies accept the evaluation of the international projects of one lead agency and fund the parts of the project that are being performed in their part of the respective country. This principle only works if individual national systems are close enough in terms of proposal selection criteria and national success rate. In the case of D-A-CH the German Research Foundation (DFG), the Swiss National Science Foundation (SNSF) and the FWF have agreed to follow a lead agency principle for research projects with participants of at least two of the three countries. Negotiations are ongoing to include similar funding agencies from other Member States such as the Netherlands' NWO or the UK's ESRC. Notably, the D-A-CH agreement can be regarded as innovative practice in the EU.

The FFG usually accepts evaluations within European initiatives such as ERA-Net and Art. 185. However, formal eligibility might be ensured by national authorities.

Austria has signed various intergovernmental bilateral S&T agreements with China, FYR of Macedonia, India, Korea (mainly in the EU project KORANET), Croatia and Ukraine. This not only includes agreements on federal government level, but also cooperation across borders on the levels of universities or PROs, e.g. the ÖAW and its Slovenian counterpart, or involvement of the national exchange services (OeAD) or Austria's main funding agencies.

Additionally, a multilateral (and "macro-regional") strategic communique was signed in 2012 by eleven countries in the Danube region, addressing potential R&D synergies for Horizon 2020 and Structural Funds. By the end of 2013, 6 scientific clusters have been launched in the strategy's context, e.g. clusters in energy and sustainability research. The strategy itself has been positively evaluated in 2013, but the evaluation recommends an even tighter alignment of signatory countries with European Structural and Investment Funds. Furthermore, the recent coalition agreement of the new government stresses the national importance of an additional macro-regional strategy for the Alpine region in the near future.

The coalition agreement of the new government also foresees a tightening of international strategic S&T partnerships via the establishment of FTI-Attachés and additional Offices of Science and Technology Austria (OSTA) to be located in priority countries outside Europe. Most recently, the working group on internationalisation has published the strategic document "Beyond Europe" (please also refer to the discussion in section 2.2).

[70] Cf. FWF (2011, 2012, 2013, 2014), Annual Report.

3.2 ERA priority 3: An open labour market for researchers. Facilitating mobility, supporting training and ensuring attractive careers

3.2.1 Introduction

Austria's labour market for researchers is fairly open and characterised by a high institutional autonomy, in particular for higher education and other public research institutions.[71] Again, human resources in science and technology (HRST) account for 35.3% of the Austrian working population in 2013 (aged 25 to 64 years; 2012: 34.3%), which is slightly higher than the average of 31.8% in the EU-28, but comparatively lower than among innovation leaders and followers. In 2011, 61,170 full-time equivalents (FTEs) were active in R&D, of which 68.8% were employed in the business sector, 26.3% in the higher education sector, 4.2% in the government sector, including public research organisations (PROs), and 0.7% in the private non-profit sector. This already constitutes a significant increase compared to the 56,438 FTEs in 2009. It also provides preliminary evidence on a fairly limited effect of the crisis, in particular in the labour market for researcher (2007: 53,252 FTEs). In general, with 17% foreign-born, Austria is among the OECD countries which have a large share of immigrants in the workforce. Here, the crisis negatively affected labour market outcomes of immigrant men and immigrant offspring, but not of immigrant women.[72]

3.2.2 Open, transparent and merit-based recruitment of researchers

Austria's science and innovation system experienced a balanced net migration of mobile academics close to zero in the past 15 years, i.e. actively publishing scientist inflows versus outflows between 1996 and 2011. At the same time, there was a net loss of high-performing academic talent as regards scientific impact (citations) of mobile researchers' publications.[73] This also applies for the top-level scientists with Austrian nationality: By the end of 2010, close to 40% of all Austrian (advanced and starting) grantees under the European Research Council scheme worked at research institutions and universities abroad and not in Austria; by the end of 2013, this non-resident share stood at more than 50%.

Similarly, as regards diversity in industry innovation, the share of patenting inventors with foreign nationality resident in Austria stood at roughly 12% in the last decade, i.e. between 2001 and 2010 (1991 - 2000: 8%). This is comparable to levels observed for the Netherlands or the UK.[74] However, in sum, there was a net loss of inventors resident in Austria, i.e. lower foreign inventor inflows than outflows of inventors with Austrian nationality. Noteworthy, as a destination country for higher education (i.e. obtain a PhD), Austria ranks well above EU average being a common destination among small and open economies (Luxembourg, Switzerland and Belgium) according to the MORE2 study.[75]

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[71] Cf. Doussineau et al. (2013), http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/30386/1/ipts_erasynthesisreport_final.pdf, last accessed on December 31st, 2014.
[72] Cf. OECD (2012), Jobs for Immigrants, vol.3.
[73] Cf. OECD (2013): "Researcher on the Move".
[74] Cf. WIPO (2013).
[75] Cf. MORE2 Higher Education Survey (2012).

Since 2009, Austrian university laws require public research institutions to advertise for research positions internationally.[76] However, it is up to autonomous research institutions in Austria to publish job vacancies in English, systematically establish selection panels or establish clear and transparent rules for the composition of selection panels, among other things. Additionally, Austria has implemented the Scientific Visa Directive 2005/71/EC and recommendations 2005/762/EC and 2005/761/EC. General immigration procedures for researchers from all over the world have been facilitated in 2008. However, migratory regimes will undergo further revision following an evaluation exercise (e.g. "Rot-Weiß-Rot" visa card) and a coherent national migration strategy (including monitoring etc.) will be developed according to the recent coalition agreement of the new government.

Academic inbreeding in public research institutions (i.e. the practice of hiring internal candidates) is the result of the informal favouritism of internal candidates despite formal provisions for open recruitment, but it is not frequently observed in Austria. Here, transparent procedures and advertisement standards, which are regularly checked, often prevent academic inbreeding and assure fair and international recruitment.

Currently there is no official system in place to establish the equivalence of foreign academic ranks (e.g. professor, senior lecturer) with national ones, whether tenured or non-tenured. In contrast, such decisions are often taken on a case-to-case basis in Austria. More generally, the faster recognition ("Nostrifizierung") of foreign diploma and training qualifications, however, has been implemented in 2011 and has proven relatively successful so far (in the first half of 2011, 1,036 foreign diplomas were approved; for the same period in 2012, already 1,239 were approved). However, the coalition agreement of the new government (2013) outlines plans to further simplify the overall approval of foreign qualification and degrees including equivalence of academic ranks.

Language barriers for students as well as for employment of foreign university researchers persists as most Master programmes and courses are still held in German, notwithstanding the fact that Austrian foreign-born researchers are frequently from German-speaking neighbouring countries as well strong cultural ties with surrounding former communist countries. The same applies for many higher level courses.

Even though Austria is a preferred destination country for students in higher education, the science system still lacks career opportunities for young researchers. The latest available data in the HEI sector (estimations based on 2009 official statistics[77]) further illustrates this point: Close to 60% (20%) of university staff (doctoral students, technical staff etc.) held temporary (permanent) contracts; only 13% of the total accounted for junior staff on tenure track and 9% held full professor positions. Similarly, as noted above in the context of the FWF's doctoral programmes, many (foreign and Austrian) doctoral students under this scheme pursue scientific careers abroad once their grant support terminates.

3.2.3 Access to and portability of grants

Austrian researchers are only allowed to move their publicly-funded grant to another ERA country to a fairly moderate extent as portability largely depends on the specific research funding organisation. In general, grant portability is frequently limited to individual grant

[76] Cf. revision of and amendment to the original 2002 laws, Bundesgesetz BGB l. I Nr. 81/2009.
[77] Cf. Kreckel (2010), http://www.gew.de/Binaries/Binary65439/WiKo10_Reinhardt_Kreckel.pdf, last accessed on December 31st, 2014.

merits rather than organisation associated grants. Additionally, scientist affiliation to a recognised institution is often more relevant than residency criteria with regard to individual grant portability.

For example, grants allocated by the FWF are very flexible in this respect, while for instance the Vienna Science and Technology Fund (WWTF) is much more restrictive in this respect, because it has a local or regional mission (directed to the science and innovation location Vienna). At the very end, it is frequently a matter of negotiation and decisions are taken on a case-to-case basis. Research fellowships and programmes administered by the Austrian Academy of Sciences (ÖAW) may be used either domestically or abroad, i.e. APART, DOC and DOC-fFORTE Programmes.[78] Since 2006, approximately 20% of fellows have used their grants to perform their research project or doctoral thesis at a research institution abroad. Again, as noted above, the DACH-agreement between the main (basic) science funds from Austria, Germany and Switzerland allows grant portability between these 3 countries to a very high extent. This can be considered as EU-wide best practice among funding agencies.

In terms of access, the latest available data on (formal) eligibility criteria for non-resident scientists to R&I funding programmes in Austria shows that roughly 25% of programmes were not open for the latter group. In 20% of the programmes researchers from abroad were allowed to participate, but only without access (cross-border) funding. In more than 40% of programmes these researchers were provided with public funding, but could only participate together with a partnering research institution in Austria. Close to 15% of programmes were considered fully open, i.e. did not require a domestic partner in order to access to national funding. Accordingly, Austria has one of the more open national funding systems in the EU27 in this respect.[79]

3.2.4 EURAXESS

Austria advertises most positions internationally as stipulated by law (also refer to section 3.2.2), including on EURAXESS Jobs. It participates in the EURAXESS initiative with a national portal[80] and several EURAXESS service centres. In 2011, the number of researchers posts advertised through the EURAXESS Jobs portal per thousand researchers in the public sector was 34 in Austria compared with average 47 among its innovation followers. In 2012, 58 posts were advertised (innovation followers: 67; EU-27: 41). In 2014 and 2013, close to 1,000 (2014: 1043, 2013: 1042) total jobs in Austria were offered via EURAXESS Jobs. Offers advertised online have been constantly increasing in the last few years (2012: 779; 2011: 578).

More than 300 Austrian research institutions had registered by the end of 2013 (Deloitte 2013, Austria country report; 2012: 250), including more than 25 universities and universities of applied sciences. The Austrian Bridgehead Organisation and a number of EURAXESS Services Centres have signed the Declaration of Commitment.

[78] http://stipendien.oeaw.ac.at/de/stipendium/apart-austrian-programme-advanced-research-and-technology and http://stipendien.oeaw.ac.at/de/stipendiat/unterlagen-doc-und-doc-fforte, last accessed on December 31st, 2014.
[79] Cf. Cuntz and Peuckert (2014).
[80] www.euraxess.at

3.2.5 Doctoral training

Structured doctoral programmes ("Doktoratskolleg") have been launched in 2004. They are funded on federal level by the FWF and have increased most lately (please refer to section 2.2), with a total budget approved for the period 2004–2013 of roughly €130m.[81] As of September 2013, 34 "Doktoratskollegien" had been active, comprising more than 1,000 PhD-posts. The approval rate of full proposals from concept proposals stood at 31% on the project level and 24% on the funded budget level.

This main initiative is complemented by existing (post-) doctoral fellowships run by the Austrian Academy of the Sciences (ÖAW) as well as several self-financed doctoral programmes launched on institutional level by individual universities ("Initiativkollegien" financed from general university funds). One example for doctoral training launched by an individual university is the twelve on-going 3-year programmes at the University of Vienna. Additionally, the Marietta Blau grant aims at generating internationally competitive PhD diplomas in Austria since 2010.[82] It offers financial support to highly-qualified doctoral candidates at Austrian universities for carrying out the abroad part of their doctoral programme (6 - 12 months). The new government also has secured funds for an additional 2,500 (post-) doctoral posts in the science system for 2014 and subsequent years, according to the latest coalition agreement.

More specifically, a "Doktoratskolleg" is formed as a result of a joint initiative by several scientists or scholars whose research is of internationally leading standard, and is based on a clearly defined research programme. The doctoral programmes have close cooperation with an existing large-scale research programme. Interim reviews every four years decide on continuation of funding of the doctoral programme, with a maximum length of 12 years. Doctoral candidates are employed on work contracts with full social coverage, the positions are advertised internationally. The programmes provide for a stay abroad and offer transferable skills training.

Similarly, the selection of an "Initiativkolleg" is subject to strict quality assurance the assessment is made by international peers. Admission to an "Initiativkolleg" is competitive and based on an international call for applications. Doctoral candidates are employed by the university, with full social coverage. They work together in a research field, thereby focusing on their topic but at the same time being part of a comprehensive research project, and thus enabling them to network on an international and often interdisciplinary level. They are supervised by a team of top scientists.

A recent evaluation of the "Doktoratskolleg" concluded (at large) with a positive assessment of the programme and only recommended minor changes (please refer to section 2.7). Among other things, it emphasizes that "Doktoratskolleg" and "Initiativkolleg" often complement each other in a meaningful way. Similarly, the most central criteria of *Principles for Innovative Doctoral Training* have been implemented in the current practices and processes of the "Doktoratskolleg", even though official programme documents of the FWF did not yet integrate them.

More specifically, structured doctoral training in Austria is implemented via funding of long-term research groups, in many cases following an interdisciplinary approach, "Doktoratskolleg" seem to provide a stimulating research environment to doctoral candidates. Accordingly, the principles of "research excellence" in the training and the

[81] https://www.fwf.ac.at/en/research-funding/fwf-programmes/dks/, last accessed on December 31st, 2014.
[82] https://www.oead.at/index.php?id=4286&L=1, last accessed on December 31st, 2014.

"provision of interdisciplinary research options" are realised. Furthermore, good scientific performance of these groups provides preliminary evidence on a well-functioning research environment. "International networking" is only implemented to a moderate extent. Even though the programme attracts many foreign doctoral students (i.e. inward mobility), outward mobility is relatively low, in particular with a view on long-term stays abroad. Similarly, orientation of the training towards needs of labour markets outside higher education and research has become more prominent in the recent years. Most of the "Doktoratskollegien" established at an early stage have been integrating different forms of "transferable skills training". Lastly, shared forms of supervision, the thorough selection of doctoral candidates and faculty members as well as the legal obligation of the host institution to review the quality of PhD courses help assure a sufficient "quality of training".

3.2.6 HR strategy for researchers incorporating the Charter and Code

Austria is among early adopters in the assignment of the European Charter for Researchers. Until end of 2013, close to 35 (2012: 20) Austrian research institutions had signed the Charter & Code, including in particular universities (18), but also public research organisations (3) as well as funding agencies (3). Broad implementation of their principles at Austrian universities was already part of the negotiations for performance agreements 2010-12 with universities.

Regarding implementation within the human resource strategy 4 researchers framework, the medical university of Graz, as the first institution in Austria, recently has been acknowledged as "human resources excellence in research" following the EC's five stage certification process. 3 other Austrian organisations followed shortly after (FWF; University of Natural Resources and Life Sciences (BOKU) and University of Salzburg).

3.2.7 Education and training systems

Science and reading proficiency scores in Austria are below the OECD average, while Austrians at age 15 outperform the average as regards proficiency in mathematics.[83] Similarly, tertiary educational attainment among the overall adult population in Austria is increasing, but still well below the European average. More specifically, the share of graduates on doctoral level in the field of science and engineering stood at close to 50% in 2011 which is weakly above the OECD average and notably above the levels of Sweden, Denmark or Germany. However, the share of these doctorates awarded to women in these fields was among the lowest among all OECD economies. Similarly, the share of male upper secondary and vocational graduates in STEM subjects was around 60% and, again, ranged below the OECD average.[84] Furthermore, more than 60% (close to 30%) of the adult population meet the most (least) proficient levels in problem-solving capabilities in technology-rich environment which places Austria in the lower middle (upper) field of OECD countries. Only roughly 10% of Austrian adults fail in terms of ICT abilities.[85]

Gender-specific policies in Austria encompass a variety of support measures, such as human resource development measures, recruiting of female scientific personnel, and

[83] Cf. OECD (2013), Science, Technology and Industry Scoreboard 2013, PISA 2009.
[84] Cf. OECD (2012), Education at a Glance 2012.
[85] Cf. OECD (2013), Science, Technology and Industry Scoreboard 2013, PIAAC 2013.

implementation of gender monitoring, mainstreaming and budgeting. This also applies to and includes specific R&I policies on education. Accordingly, the fForte-programme supports activities on school level that encourage e.g. gender-specific teaching schemes for STEM subjects at school. These are mainly driven by the Austrian Federal Ministry for Education and Women (BMBF) as the leading ministry. Furthermore, recent educational gender initiatives include additional funding by the BMWFW until the end of 2012 aimed to strengthen general and female participation in STEM subjects, with a total extra budget of €40m.

As regards a higher quality of teachers at schools and universities, an expert group on pedagogue education was established at national level in mid-2013. Its main task is to assure quality of this specific area in the education system and to monitor progress on on-going, major reforms ("PädagogInnenbildung NEU"), e.g. obligatory university education of future school teachers.[86] The experts are jointly appointed by the BMBF and BMWFW for a five year period and will deliver reports on an annual basis. Similarly, excellence-in-teaching prizes at public universities ("Ars docendi") are awarded annually since 2013.

In general, insufficient preparation for self-employment and entrepreneurial activities are issues of current public controversy, where "the focus is still too much on the acquisition of general business knowledge, rather than on the development of entrepreneurial mindsets and skills." Entrepreneurship education activities are most likely to be found on tertiary education levels, in particular Master programmes with curriculum coverage. However, secondary technical and vocational schools play an increasing role for Entrepreneurship Education, especially secondary schools for business administration ("Handelsakademie"). They typically provide students with an integrated general business (commercial) education that qualifies them for white-collar jobs at the executive level in commercial and administrative branches and gives them access to post-secondary colleges, universities of applied sciences ("Fachhochschulen") and universities. A more recent policy initiative in this area is e.g. the certification of "entrepreneurship schools" with best practices and new concepts of entrepreneurial pedagogue. Certificates are handed out by the BMBF/federally funded impulse centre for entrepreneurship education ("Impulszentrum für Entrepreneurship-Education") located in Vienna.[87]

3.3 ERA priority 5: Optimal circulation and access to scientific knowledge

3.3.1 e-Infrastructures and researchers electronic identity

One Austrian example for e-infrastructure for large structured data is the establishment of the European bio-database at the Medical University of Graz. In total, Austrian universities hosted 16 electronic databases, according to a recent assessment based on the research infrastructure database by the BMWFW.[88] However, these are only provided to third parties to a limited extent (Open for Collaboration).

[86] https://www.ris.bka.gv.at/Dokumente/BgblAuth/BGBLA_2013_I_124/BGBLA_2013_I_124.pdf, last accessed on December 31st, 2014.
[87] http://www.eesi-impulszentrum.at/, last accessed on December 31st, 2014.
[88] Cf. Heller-Schuh and Leitner (2012).

The European e-infrastructure OpenAIRE - which the University of Vienna also participates in - can also be mentioned in this respect.[89] The aim of this research infrastructure is to create free-of-charge public access across Europe to quality-checked scientific articles via a central electronic portal.

Moreover, the Centre for Digital Humanities (ZDG) at the Austrian Academy of Sciences or the research infrastructure CLARIN and DARIAH run by the University of Graz all aim at developing specific basic services, repositories and digital research methods for research in the humanities[90].

Lastly, big data projects have also been encouraged in Austria by the FFG since 2013 under the "ICT of the future" programme umbrella.[91] The internet portal data.gv.at also offers a catalogue of open data records and services from public administration (Open Government Data). This data can be used freely, both for personal information as well as for commercial purposes.

Electronic identifiers for researchers in Austria have so far not been assigned, nor systematically collected in a national register, e.g. comparable to the Digital Author Identification (DAI) used in the Netherlands or the "Star Metrics" system in the US. For example, only one Austrian institution participates in the global "Open Researcher Contributor ID" (ORCID) initiative.[92]

3.3.2. Open Access to publications and data

Six Austrian universities, research organisations and a funding agency are institutional signatories of the original "Berlin Declaration on Open Access (OA) to Knowledge in the Sciences and Humanities" (2004), namely the University of Salzburg, University of Vienna, International Institute for Applied Systems Analysis, Universities Austria, Karl-Franzens-Universität Graz and the FWF.

To date, however, a coherent national policy framework on open access is not in place in Austria. Moreover, so far "the awareness of open access in Austrian autonomous institutions is small but growing very fast".[93] The HEIs' umbrella organisation "Universities Austria" ratified the European Universities Association's "Recommendations from the EUA Working Group on Open Access". In 2010, Universities Austria also recommended following the green road in Austria. At the same time, the University of Vienna declared officially to implement a policy. More recently (2012), the "Open Access Network Austria" was established as a joint activity under the organisational umbrella of the FWF and The Austrian Rectors' Conference (UNIKO).[94] Accordingly, there are different stakeholders taking

[89] Cf. http://openaire.univie.ac.at/, last accessed on December 31st, 2014.
[90] www.clarin-dariah.at, last accessed on December 31st, 2014
[91] https://www.ffg.at/en/ictofthefuture, last accessed on December 31st, 2014.
[92] Cf. Foley and Kochalko (2012), http://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1133&context=charleston, last accessed on December 31st, 2014.
[93] Cf. EU Commission (2012), National open access and preservation policies in Europe.
[94] http://www.oana.at/en/home/, last accessed on December 31st, 2014. This network comprises representatives of all public universities and many private universities, universities of applied sciences, non-university research institutions, and funding agencies. Its main tasks include the coordination of and recommendations for the Austrian OA-task/ activities of the research institutions, funding organisations and research policies (incl. taking into account international developments) as well as positioning towards the information providers (mainly publishing houses).

action to implement and disseminate OA in Austria, and there are already numerous measures being implemented on very different levels (by funding organisations, research societies and universities).

In a recent study based on an international comparison of countries, 48% of all sampled papers in Austria between 2008 and 2011 were published via open access.[95] More recent and extensive data for the period from 1996 to 2013 suggests a slightly higher share of 55%.[96] Of the latter, approximately 85% were either a green or hybrid type. Roughly 15% were published via the gold route ("pure" open access). This positions Austria weakly above the EU28 average for green and hybrid OA types (37%), but on the same (average) level for the gold OA type.

The FWF as a main funder of basic research in Austria has developed an OA policy for all research programs they finance: since 2003, FWF expects the results of the research it supports to be made public and when possible published in a digital form, and to be made open access within six months (twelve in the case of books).[97] It offers money to Austrian scientific publishers so that books also can be used in OA channels if the FWF has supported the research (costs for open access publishing are covered up to three years after the end of the project). Under the gold road approach, FWF financed almost 900 journal and book publications only in 2012, with a total volume of €1.6m. Moreover, the FWF has participated in PubMed Central through UK PubMed Central. Since 2010, almost 3,000 publications from the field of life sciences have been made freely accessible due to this initiative. Together with the BMWFW, the FWF decided to launch calls for start-up financing for OA journals in the humanities and social sciences.[98] By the end of 2013, eight premium international OA journals were selected and publicly supported. Most recently, the FWF initiated a controversy about a University/Academic Press. The idea is that research locations and publishing firms create a shared publication platform that establishes the technical criteria for international standards for internationally visible publications with quality assurance processes (such as peer review, expert editing) and OA.[99]

Similarly, the Austrian Academy of Sciences (ÖAW) has developed an open access policy and created a repository.[100] The ÖAW's publishing house is a so-called green publisher; this means that journal articles can be posted online as a manuscript (yet not in the publishing layout) on the scientist's homepage or in a research institution repository before the publisher issues the publication. In this context, the 2012–2014 performance agreement between the ÖAW and the BMWFW already stipulated that the former will continue to promote its OA offers in future. Similarly, the universities have also enshrined their commitments to OA in the latest 2015-2017 performance agreement. Lastly, OA policy at the IST Austria – which uses a repository based on EPrints – is promoting the green road. However, IST Austria has also recently established a publication fund for financing the gold road.[101]

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[95] Cf. http://www.science-metrix.com/pdf/SM_EC_OA_Availability_2004-2011.pdf, last accessed on December 31st, 2014.

[96] http://science-metrix.com/files/science-metrix/publications/d_1.8_sm_ec_dg-rtd_proportion_oa_1996-2013_v11p.pdf, last accessed on December 31st, 2014.

[97] https://www.fwf.ac.at/en/research-funding/open-access-policy/, last accessed on December 31st, 2014.

[98] http://science.orf.at/stories/1729833/, last accessed on December 31st, 2014.

[99] Cf. BMWF, BMVIT and BMWFJ (2013).

[100] http://epub.oeaw.ac.at/oa/, last accessed on December 31st, 2014.

[101] https://ist.ac.at/news-media/news/news-detail/article/new-policy-encourages-open-access-publications/6/, last accessed on December 31st, 2014.

4. Innovation Union

4.1 Framework conditions

At large, Austria ranks very high in terms of its political and regulatory environment according to the latest edition of the World Economic Forum (WEF)'s Global Competitiveness Index (2013). Similarly, it ranks among the top 5 of high-income OECD economies for the ease of enforcing contracts (source: Doing Business Ranking, World Bank). However, in the same ranking, Austria positions only 21st as regards the ease of doing business and 29th for starting a business.

More specifically, Austria demonstrates a very high level of licensing complexity largely due to the high costs involved (towards public and private sector) and long duration for obtaining licenses, according to a recent EC study.[102] More concretely, e.g. it takes over 60 days to obtain all licences for starting a business; additionally, it requires an estimated (pre-) investment over €501 for public sector and private sector costs. On the other hand, the procedures per se involve a very small number of licenses (two licenses the so called 'Gewerbeanmeldung' and 'Betriebsanlagengenehmigung' embrace all required licenses) and are considered to be effective and non-discriminatory by the survey's respondents. With respect to the 'Betriebsanlagengenehmigung' license (related to premises, security, hygiene as well as waste management) the respondents stated that it is absolutely not recommended to start the application of this license without the help of specialised lawyers and consultants. The respondents recommend the introduction of one stop shops in order to further simplify licensing procedures.

Additionally, existing bankruptcy laws are not very encouraging for experimentation and potential failure among innovating firms in Austria, in particular SMEs. For details on this specific aspect of regulation, please refer to section 4.5 below.

In contrast, public sector services are (almost) 100% accessible online.[103] This implies a high quality and efficiency of public agencies in Austria. However, according to the EC's scoreboard for the public sector, there is only a relatively low level of innovative services offered at present.

Notably, in terms of the general funding system, Austria allocates a substantial amount of public money via indirect tax incentives. This can be considered a fairly cost-efficient way as regards company access to R&D funding. More precisely, companies can apply once for an assessment by the FFG at no charge that certifies eligibility of company taxes and expenditures on R&D. Application for a certificate can be submitted electronically and (in case validated) is automatically forwarded to Austrian tax authorities. Thus, this mode of funding in comparison with traditional funding activities does not require repeated application to project grant schemes or similar, which may in particular limit SME access to public funds.

Supply and demand-side policies and instruments have only been coordinated to a very limited extent. Even though demand-side policies such as innovative public procurement are increasingly being used at large, little effort is put by policies so far to fine-tune their co-evolution. One notable exception is the thematic field of green tech and support to

[102] http://ec.europa.eu/enterprise/policies/sme/business-environment/files/business_dynamics_final_report_en.pdf, last accessed on December 31st, 2014.
[103] Cf. Public Sector Innovation Scoreboard (2013).

sustainable growth. Here, green public procurement is essentially coupled with public efforts to provide additional venture capital and a variety of other supply-side activities under the roof of the Austrian climate and energy fund (please refer to sections 2.2 and 4.7 for details). Among many other things, better coordination of both sides had been recommended in the systemic evaluation already conducted in 2009.[104]

4.2 Science-based entrepreneurship

Since 2001 the publicly funded "Academia plus Business (AplusB)" programme supports spin-offs from universities, universities of applied sciences and non-university research organisations.[105] An earlier evaluation confirmed the successful conception of the AplusB programme,[106] but emphasises an increased attention towards more experienced researchers, further flexibility concerning the length of stay of business founders within the programme, increased international exchange of knowledge and an intensification of the AplusB platform among other issues.

In 2010, nine AplusB centres operated in Austria and provided awareness raising and stimulation for academic entrepreneurship, consultancy, training and assistance for a duration of 1.5 years and support through cooperation with financiers and other support structures and programmes. The centres include around 130 partners coming from different institutional background, such as foreign academic partners, domestic R&D partners, financial partners, media partners, intermediary partners such as incubators, and business partners. At the time, the target for the next couple of years was to facilitate in total around 320 academic spin-offs. Until mid-2013, already 438 spin-offs (until 2010: 289) had been founded, of which 380 now are active on markets without support.

Similarly, AWS' First programme already provides comprehensive training courses and mentoring for youngsters (at ages 18 to 23) who are still at or just left school or apprenticeship.[107] The latter are only eligible for the programme, if they have not founded their business yet, but are still in a planning phase. Most recent, small-scale policies to foster start-up activities also include, among other, awards and prizes for (female) entrepreneurs, e.g. "Phönix" and "Phönix Women". The latter have been initiated by BMWFW and are managed by the AWS. Since 2012, prize winners receive up to €10,000.

Under the "uni:invent" programme, whose aim was to unlock and exploit research outputs in economic terms, 13 university transfer offices were established, 50 transfer managers were professionally trained along a dedicated job profile and more than 30 innovation scouts were established at 17 Austrian universities, which increased the performance of the TT offices.[108] Despite the termination of this programme in 2009, technology transfer offices became institutionalised elements of the university fabric in Austria, although not on each and every university. Among the many tasks these offices delivered, support and technology transfer for academic spin-off is an important one. This often included e.g.

[104] Cf. Aiginger et al. (2009): Synthesis Report, System evaluation.
[105] https://www.ffg.at/aplusb-academia-plus-business, last accessed on December 31st, 2014.
[106] Cf. Heydebreck and Petersen (2008).
[107] http://www.awsg.at/Content.Node/media/files/aws_First_Programmdokument.pdf, last accessed on December 31st, 2014.
[108] Cf. AWS (2010) and https://www.bmwfw.gv.at/Innovation/Initiativen/Documents/uniinvent%202004-2009.pdf, last accessed on December 31st, 2014.

holding equity in start-ups on behalf of the university, as stated in an ex post evaluation published in 2011.

Only very recently, the "Knowledge Transfer and Exploitation of IPR Centres" were established (launched by the BMWFW), with a total volume of €20m: By mid-2014, three regional knowledge transfer centres (in the Easter, Southern, Western part of Austria) and a life sciences knowledge transfer centre (with no regional focus) have been selected.[109] One main focus of the funding scheme are collaborative projects in the humanities, social sciences, and cultural studies. Among other things, the programme supports strategic patenting, prototype development and start-up activities at universities and public research institutions that result from the basic and applied research.

In general, the coalition agreement signed in late 2013 foresees several measures reducing red tape for Austrian entrepreneurship and general funding processes, e.g. online-registration processes of start-up businesses should be expanded and accelerated as well as general R&D funding rules for financing administrative/overhead costs will be introduced. Lastly, please note that section 4.6 below describes in great detail the availability of venture capital in Austria, also for academic spin-offs, and relevant policy measures that address this issue.

4.3 Knowledge markets

Like the majority of EU countries, Austria also addresses knowledge and IPR transfer on national level through overarching laws on the research system, obliging both research funders and public research organisations to play a full role in supporting national innovation and competitiveness (ERALAW 2011). Researchers from public organisations are entitled to patent their inventions, provided that their employer is not willing to file the patent application themselves. Austria has special regulations, based on soft law, that guide research funding organisations when supporting academic spin-offs agglomerated in special centres ("AplusB" Centres). These guidelines offer advice on a variety of relevant areas, including management, eligibility, and funding for such activities (ERALAW 2011).

However, the current role of the Austrian Patent Office (APO) as the main stakeholder of public IPR activities has been negatively assessed in 2013: The respective qualitative evaluation was based on an international comparison with other national offices and commissioned by the Austrian RTD Council.[110] It argued that the APO does not seem to work on a fully balanced cost-benefit structure and with relatively less service orientation towards customers.

With regard to public support of IP management across borders, a national contact point (NCP) has been designated in 2010.[111] The NCP's tasks include the coordination of measures regarding knowledge transfer between public research organisations and the private sector, including tackling trans-national issues, in liaison with similar contact points in other Member States. The NCP is assisted by the BMWFW, the BMVIT, and the AWS. More specifically, in order to follow up the IP Recommendation, the Austrian National Contact

[109] http://wissenschaft.bmwfw.gv.at/home/research/national/knowledge-transfer-centres-and-exploitation-of-ipr/, last accessed on December 31st, 2014.
[110] Cf. Oxfirst (2013).
[111] http://era.gv.at/directory/175, last accessed on December 31st, 2014.

Point concentrates on the following tasks: Reviewing and reporting on measures taken in Austria to implement the Recommendation and Code of Practice; analysing IP data; inspecting, cleaning and modelling data with the goal of highlighting useful information; conferences and workshops to enhance collaboration between universities and industry; and it settles legal issues (consolidation of model contracts, development of guidelines).

Notably, Austria is the first MS to ratify the Agreement on a Unified Patent Court in August 2013 and after signing the preliminary Agreement in February the same year. The "Comprehensive EU Patent Package" consists of three parts: two regulations on the EU Patent (substantive and procedural patent protection regulation and regulation concerning the translation of patents) as well as an international agreement on the creation of a unified patent jurisdiction. The Unified Patent Court will be responsible for disputes relating to future unitary patents as well as existing "classic" European patents, making it easier for inventors and companies to protect their patents. However, it is far too early to assess the impact of the Unified Patent on the Austrian science and innovation system.

As noted above, tax incentive schemes such as patent boxes have not been introduced so far, but Austria already offers a favourable tax treatment for corporate groups of firms and their headquarters, i.e. aims to large multinationals via tax incentives.

An interesting example of a private and cross-border trading platform that successfully matches IP supply from inventors and company demand in German speaking countries (Austria and Germany) is patent-net.de. All of the IP offered on this platform needs to be protected by IP rights in advance. In general, there seem to be very few IP matchmaking and trading services in place.[112] The majority of services in this context are IP Consultancies and Legal Services (2014: 24 services listed in Austria).

4.4 Knowledge transfer and open innovation

Knowledge and technology transfer is well established in Austria. There are already various policy measures in place mainly aiming at the interaction of academia and industry in the Austrian innovation system. Selected ones include e.g. COMET, COIN, BRIDGE or Christian Doppler Laboratories programmes.[113] Among the more recent support measures are the thematic programme "Leuchttürme eMobilität" (Lighthouses of E-mobility), the Josef Ressel Centres, the Laura Bassi Centres of Expertise and the Intelligent Production Initiative launched in 2011.[114] In the context of the latter initiative, industry partners collaborate with research institutions in joint application-oriented research projects. Most lately, €1.43m of funds for prototype research were distributed under the new technology transfer centre program "PRIZE" and first call winners were announced in January 2014. The program launched by BMWFW in mid-2013 supports prototype development at higher university

[112] Source: IP Industry Base, database by FhG MOEZ, http://ipib.ci.moez.fraunhofer.de/, last accessed on December 31st, 2014.
[113] https://www.cdg.ac.at/en/, last accessed on December 31st, 2014.
[114] https://www.klimafonds.gv.at/funding-programmes/current-funding-programmes/2012-en-US/leuchttuerme-der-e-mobilitaet-en-US/; https://www.ffg.at/josef-ressel-zentren-0; https://www.ffg.at/produktion and https://www.ffg.at/sites/default/files/downloads/131011_laura_bassi_broschuere_final.pdf, last accessed on December 31st, 2014.

institutions and across scientific disciplines.[115] Here, applicant projects are selected by an international jury and upon an assessment of commercialization chances.

Most measures were established during the last decade and are considered effective and have led to a high level of transfer activities. Austria ranks 3rd among OECD countries and 4th in the WEF Competitiveness Report in this respect. Maybe due to the "saturation" of this set of policies, only few new initiatives have been introduced in the last three years. Notwithstanding the existing variety of instruments in place and related to knowledge circulation, the transfer topic remains, however, high on the policy agenda. This is testified by the establishment (2011) of an inter-ministerial working group "knowledge transfer and start-ups" in the course of the national R&I strategy implementation, and according to an assessment of this strategy by the Austrian RTD Council (2012) that identified a policy emphasis on "innovation capacity of firms", in particular knowledge and technology transfer.[116] The assessment of the council was mainly based on two indicators for science-business-linkages, namely the share of companies (population: total number of firms in Austria) cooperating with universities and other research organisations, the specific share of SMEs (population: total number of SMEs) cooperating with universities and other research organisations as well as the number of international patent applied for via the Patent Cooperation Treaty (PCT) track.

However, technology and knowledge transfer involving SMEs and respective, recently evaluated programmes and schemes (e.g. Josef Ressel and Laura Bassi Centres) still leave room for improvement and require evidence-based modifications or strategic reorientation (e.g. COMET). In addition, notwithstanding a positive evaluation, the temporary budget halt for the BRIDGE programme was a step in the wrong direction. The programme "bridges" the gap between basic and applied science. It therefore addresses an important, early phase of technology and knowledge transfer.

In 2013, Austrian universities held 8,665 formally contracted and active co-operations with external partners.[117] Total numbers have been increasing in the last three years in this respect (2011: 7,840). Among the partners in 2013, 13% were businesses, 57% were other universities and universities of applied sciences and 8% were (non-university) public research organisations. The share of co-operations involving firms has been relatively stable when compared to the data in 2011 (14%). Of the total 705 patents (aggregated) held by Austrian universities 57 were granted in 2013. More specifically, 11 patents helped launch an academic start-up, 21 licensing contracts were signed and 37 patents were sold in 2013. Contracting parties are mostly companies (more than 60%), but also PROs. The largest number of patents is currently held by the Technical University of Vienna. Current national statistics do not cover invention disclosures at universities nor comprehensive data on transfer activities involving PROs.

Inter-sectoral mobility as another important transfer mechanism in Austria is still relatively low, although no hard factors restrict mobility of researchers between the public and the private sector. Researchers employed in the public sector are allowed to work for industry on a part-time, consultancy or other basis, provided that their contracts do not include

[115] http://www.awsg.at/Content.Node/innovation-investition/patentservice/foerderungen/98014.php, last accessed on December 31st, 2014.
[116] http://www.rat-fte.at/tl_files/uploads/Leistungsberichte/Leistungsbericht2012_engl.pdf, last accessed on December 31st, 2014.
[117] Source: Uni:data warehouse, http://wissenschaft.bmwfw.gv.at/bmwfw/wissenschaft-hochschulen/universitaeten/statistiken/, last accessed on December 31st, 2014.

competition clauses which prohibit such arrangements. Through the gradual abolishment of civil servants status at universities and the introduction of private law-based labour contracts further mobility obstacles have been removed.

However, different soft factor still aggravate the inter-sectoral mobility. For instance, the number and quality of publications becomes increasingly central to access an academic position as well as for career promotion, which is a systemic inter-sectoral mobility dilemma, because industry researchers are less stimulated or even not allowed to publish results of their work. To foster inter-sectoral mobility between academia and business enterprises which do not have an own research unit, the 'young experts'-programme has been launched, under whose framework master theses and PhD theses, which are firmly embedded in the R&D work of a company, can be supported for up to one year.[118] The programme has been recently extended towards the co-financing of post-doc and junior researcher positions employed at companies.

Two indicators can help further assess the amount of inter-sectoral mobility observed in Austria, both, from the public to the private sector and vice versa: First, academic and teaching staff at universities of applied sciences account for 28% of the total academic and teaching staff at Austrian HEIs in 2013, equal to 14,803 academics, typically with an industry background of at least 5 years.[119] The latter, i.e. several years of experience outside the HEI sector, is a common selection criterion in recruitment processes of universities of applied sciences. Second, more than 38% of all doctorate holders in Austria, i.e. 4,032 persons on ISCED 6 levels, worked in the private sector in 2011 (2009: 37%).[120]

As regards open innovation, Austrian companies can either exploit knowledge from internal or external sources. Data from the Community Innovation Survey in 2012 suggests that these companies spent roughly 10% of their total expenditure on R&D on contracts to external sources. Interestingly, smaller firms typically spent much less on external sources than larger (more than 250 employees) companies in Austria. Firms cooperating with others most commonly partner with their suppliers (close to 60%), universities or universities of applied sciences (50%) or clients and contractors (close to 50%). Again, larger companies partner more frequently than SMEs (less than 250 employees) with universities (77% versus 55%).

4.5 Innovation framework for SMEs

In 2011, Austrian companies with less than 50 employees spent 12% of the total R&D invested by the business sector. Another 20% was invested by SMEs with more than 50 but less than 250 employees. Compared to the official statistics in 2009, this constitutes a weak increase in shares (11% and 18%, respectively) and thus less (high) concentration of investments among large companies in Austria. The total (absolute) number of innovating SMEs was close to 3,000 entities in 2011. Between 2010 and 2012, roughly one third of all SMEs in Austria held contracts with public authorities, of the latter roughly one quarter were explicitly targeting R&I activities.[121]

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[118] https://www.ffg.at/getdownload.php?id=3234, last accessed on December 31st, 2014.
[119] Source: Uni:data warehouse, http://wissenschaft.bmwfw.gv.at/bmwfw/wissenschaft-hochschulen/universitaeten/statistiken/, last accessed on December 31st, 2014.
[120] Latest available data on UNESCO stats.
[121] Source: Statistik Austria and CIS 2012.

In general, funding support well-tailored to the needs of SMEs is in place: A major component of Austrian total funding is "indirect" funding and, thus, allocating funds to innovative firms broadly/non-selective (i.e. independent of firm size), using a common system of R&D tax credit ("research premium").[122] The system itself keeps bureaucracy in Austria to a minimum, compared to selection processes associated with direct funding effort, both for the public administration as well as for companies applying for funds. The ceiling of this research premium for the acquisition of R&D has recently been increased from € 100,000 to €1m, effective as of 2012, while eligibility criteria have been tightened.

Like many other EU countries, Austria also offers innovation cheques to support innovation at SMEs resident in Austria.[123] There are basically two different voucher schemes available which are distributed by the AWS and funded by FFG: vouchers of up to €5,000 and vouchers of up to €10,000 can be granted when SMEs partner with a publicly financed research institution. For the latter scheme, SMEs need to share part of the costs with a self-contribution €2,500. Since mid-2014, applicants can submit their applications electronically and the scheme can be easily accessed. A third voucher scheme, as noted above, is the VINCI "Vouchers in Creative Industries".[124] It supports SME activities that specifically target and involve partners in the creative industries in Austria, often SMEs themselves. The voucher schemes are also part of a wider support package for Austrian SMEs, also including other FFG funded measures such "Feasibilty-Studie" (feasibility study grants up to €30,000), "Projekt.Start" (individual project grant of up to €10,000) or "Markt.Start" (loans of up to €1m).[125]

An important research facilitator for SME innovation is also the Austrian Cooperative Research (ACR), i.e. the association of the so-called 'Cooperative Research Institutes' in Austria. It has a strong focus on SME support. ACR has 17 full members and six non-regular members as well as two associated members.[126] The ACR institutes perform measurement & testing, contracted R&D and technology & knowledge transfer, again, mainly for small and medium-sized companies in Austria. In 2011, all ACR full members together had 602 employees and a turnover of €52.9m. In 2011, their R&D activities account for 30% of turnover. ACR is supported by the BMWFW through a dedicated funding programme.

In general, Austrian bankruptcy laws originate from German civil laws. They are an important ingredient of framework conditions for SMEs, in particular for those with innovative and risky practices. According to a recent EC study on second-chances-regulation for businesses, the bankruptcy system's effectiveness as an early warning system is relatively low in Austria.[127] Unfortunately, this also applies to the efficiency of out-of-court settlements in Austria. The debtor friendly system features and favours, however, reorganization of businesses rather than liquidation after insolvency.

To sum up, the overall trend suggests that the share of innovative companies among all SMEs has, nevertheless, slightly declined in Austria during the past few years and

[122] https://www.ffg.at/forschungspraemie, last accessed on December 31st, 2014.
[123] https://www.ffg.at/innovationsscheck, last accessed on December 31st, 2014.
[124] http://www.awsg.at/Content.Node/innovation-investition/kreativwirtschaft/67656_1.php, last accessed on December 31st, 2014.
[125] https://www.ffg.at/feasibility-studies-im-basisprogramm and https://www.ffg.at/projektstart, last accessed on December 31st, 2014.
[126] http://www.acr.at/en/acr/wer-wir-sind/, last accessed on December 31st, 2014.
[127] http://ec.europa.eu/enterprise/policies/sme/business-environment/files/business_dynamics_final_report_en.pdf, last accessed on December 31st, 2014.

according to the latest available data (CIS 2012: 48.7%, CIS 2010: 51%). Similarly, a systematic evaluation (forthcoming) of the tax instruments will need to provide evidence on the effectiveness and efficiency of indirect support to SME innovation in Austria, also in comparison to other alternative funding modes. Lastly, the next section partly picks up on the ease or barriers for SMEs to access risk capital and how this is currently addressed by policies.

4.6 Venture capital markets

In general, there is a significant lack of private risk capital to finance small, young enterprises with high growth potential, expected to have an effect on employment and structural economic change. According to the latest available data by country of the portfolio company (source: EVCA), the amount of venture capital available in Austria recovered to €65.1m in 2013, after a short downturn in 2012 (€42.5m, equal to roughly 1% of GDP). However, this is not yet back on the level already observed in 2011 (€93.8m). Roughly 50% of the funds were constantly allocated to high-tech sectors.

Thus, the creation of legal conditions for a crowding-in of private risk capital providers is perceived as valuable by the Austrian government, but these changes are only underway. Notably, the national government has already launched several initiatives that seek to improve financing conditions for innovation and provide newly founded businesses with sufficient venture capital, in particular innovative SMEs and high-tech start-ups.

Already in 2013, €22.5m of (public) risk capital contributed to a semi-public European Business Angel Fund fostering growth of young innovative entrepreneurs, a fund with a total budget of roughly €45m, i.e. a public private leverage ratio of 1:1[128]. Here the expected average investment amounts to €250,000 per start-up for a 10-year period. Once these start-ups are sold or have their initial public offering, the scheme foresees that (public) sales revenues will feed into additional venture capital investment. The financing scheme also provides know-how and expertise of more than 160 business angels to entrepreneurs, the former being organized by the AWS in a joint network.

Launched in 2012 and 2013, two main public funds have been established on federal level, both managed by the AWS. €110m will feed into purely public funds, mostly on the basis of equity shares in start-ups. An amount of € 65m of these funds will be provided specifically for early stage capital ("Gründerfonds") during the next 6 years and as an alternative financing instrument to purely private investment funds. Average (publicly-held) equity amounts from €100,000 up to €1m per start-up.[129]

Furthermore, the new government seeks to improve legal framework conditions of finance and SME access to capital markets. First, draft regulation for crowdfunding activities is already due beginning of 2014 as well future regulation will further encourage employee participation models in firm profits. However, such regulations have so far not been implemented.[130] Second, the coalition agreement aims to enhance equity capital formation

[128] http://www.awsg.at/Content.Node/foerderungen_alle/risikokapital/76717.php, last accessed on December 31st, 2014.
[129] http://www.awsg.at/Content.Node/risikokapital/gruenderfonds/77014.php, last accessed on December 31st, 2014.
[130] http://www.ots.at/presseaussendung/OTS_20141031_OTS0079/jw-jungunternehmer-warten-noch-immer-auf-bessere-rahmenbedingungen-fuer-crowdfunding, last accessed on December 31st, 2014.

via the abolition of corporate income taxes by 2016, and establishment of a coordination platform focused on equity formation and financial literacy of Austrian SMEs. Third, new activities of the AWS will ease access and expand (credit) guarantees for innovative companies, in particular SMEs, e.g. existing guarantee caps are likely to increase in the future as well as acceptance of guarantees with higher risk profile.[131] Fourth, future regulation also aims to simplify IPO and public listing of Austrian SMEs, and, hence, provide easier access to capital on stock markets. Fifth, legal changes will further attempt to incentivize private co-finance of science and innovation (e.g. endowment and public trust regulation as well as creation of favourable (tax) framework conditions for private equity investors).

4.7 Innovative public procurement

Innovation-oriented public procurement policies in Austria were substantially activated by European deliberations and initiatives. Even though procurement guidelines reflecting the EC's handbook and good practices of state-owned enterprises have been issued, the Austrian approach towards innovation-oriented public procurement is mission-oriented (and frequently also geared towards lead-markets), but rather based on voluntary standards, i.e. still being in an experimental policy phase. In general, overall estimates suggest that Austrian authorities procure goods and services for roughly €40b per year.

However, a few initiatives and strategic documents have been launched in the meantime.[132] One initiative addressed green procurement in 2010, i.e. the "Austrian Action plan for Sustainable Public Procurement" initiated by the Federal government and coordinated by the Federal Ministry of Agriculture, Forestry, Environment and Water Management.[133] The most important measures of this plan are: the establishment of expert groups for the development of social core criteria and for dismantling budgetary barriers; extending the knowledge base regarding the effects of sustainable procurement; diffusion of the latter and information sharing; monitoring and evaluation of the plan. Interestingly, the plan also highlights piloting of green procurement activities by a centralized procurement agency in one of Austria's regions (namely, Vorarlberg).

Additionally, 2013 also saw the "greening" of some of the existing national procurement regulation. Since this year procurers on federal level are obliged by national laws to account for EC regulation on energy efficiency.[134] Note further that Austrian agencies with a focus on green procurement also cooperate with institutions in several other MS (among others, Sweden and Germany) in the context of the ECOPOL project funded under FP7.[135] In order to accelerate eco- innovation policies and to implement concrete policy measures on innovative green public procurement, the ECOPOL project makes recommendations for the deployment of eco- innovative policies and the consumer behaviour of public authorities.

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[131] http://www.awsg.at/Content.Node/innovation-investition/nationale-finanzierung/garantien/48277.php, last accessed on December 31st, 2014.

[132] Another, most recent example is Vienna's Win platform (http://www.wienwin.at/initiative, last accessed on December 31st, 2014). The project won the prize for best practises in public procurement of innovation in 2014.

[133] Cf. BMLFUW (2010) http://www.nachhaltigebeschaffung.at/sites/default/files/naBe-Kurzfassung_0.pdf, last accessed on December 31st, 2014.

[134] National law: BVergG, §80a; EC Directive on Energy Efficiency EU (2012/27/EU).

[135] Website: http://www.ecopol-project.eu/en/about, last accessed on December 31st, 2014.

Similarly, Austrian funding agencies have also engaged in pre-commercial procurement in the field of mobility, i.e. the "Transport Infrastructure Research Pilot Initiative VIF" launched in 2011, with a total budget of €4m.[136] The initiative, supported with funds by the FFG, issued a few first calls for R&D services for road and rail infrastructure and, more specifically, in the fields of pavements and superstructures, road safety, noise control, engineering structures and bridges etc.

Most importantly, in late 2013, the Federal Procurement Agency (FPA) set up an innovation-friendly public procurement (IPP) service centre that serves as a first point of contact and supports pilot projects of interested agencies.[137] The service centre also partners with other institutions in this area, namely AustriaTech, Energieagentur, AWS or FFG, and offers education and training modules. Already in 2012, the federal government adopted a national IPP roadmap and, accordingly, amended the Public Procurement Act (BVergG) in mid-2013 to include innovation as a secondary procurement criterion.[138]

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136 http://www.asfinag.at/documents/10180/13369/de_Brosch%C3%BCre+Verkehrsinfrastrukturforschung+Austria.pdf/4b6bf9ff-a67d-452d-baef-945901cc3cf8, last accessed on December 31st, 2014.

137 http://www.ioeb.at/, last accessed on December 31st, 2014.

138 Cf. http://www.bmwfw.gv.at/Wirtschaftspolitik/Wirtschaftspolitik/Documents/IÖB-Leitkonzept_2012.pdf; http://www.ioeb.at/fileadmin/ioeb/dateiliste/dokumente/Downloads___Links/IOEB_-_6_-_Report_IOEB_Initiative_rev.pdf and https://www.ris.bka.gv.at/Dokumente/BgblAuth/BGBLA_2013_I_128/BGBLA_2013_I_128.pdf, last accessed on December 31st, 2014.

5. Performance of the National Research and Innovation System

5.1 Performance of the National Research and Innovation system

Results from the Innovation Union Scoreboard (2014) and earlier versions have shown that the basic order of EU Member States has largely stayed unchanged since the benchmark was introduced in 2010: the group comprising the "innovation leaders" includes four to five countries (Sweden, Denmark, Germany and Finland). Austria is positioned among a group of nine "innovation followers" (namely, Belgium, United Kingdom, Netherlands, Luxembourg, Ireland, France, Slovenia, Cyprus and Estonia), but has the policy ambition to catch-up with Innovation Leaders in long term (cf. national R&I strategy).

Austria occupied 10th place in the 2014. After ranking 9th in the two last years, it now has switched ranks with Ireland (Summary Innovation Index, SII). Thus, Austria has lost some ground and has been closing up recently with the EU average. Yet a closer look shows that great caution must be exercised when interpreting these rankings (as well as possible position changes): in terms of the SII values, the seven countries in the group of innovation followers, among other Austria, differ by only 0.14, but the index value for rank 4 (Finland) is almost 0.04 higher than the one for rank 5 (Luxembourg), i.e. the one-rank transition between the Innovation Leaders and Innovation Followers. In turn, even minor changes in the data can (and do) result in noticeable changes in the relative position within the group of innovation followers.[139] Also, not all decisive sub indicators for Austria in SII offer an annual update of statistics and capture all recent trends. Notwithstanding these methodological caveats of the IUS assessment, it must be noted that Austria has been unable to catch up with or even reduce distance to innovation leaders in the past 3 years, i.e. since the launch of the national R&I strategy. Currently, only the Netherlands and Luxemburg among follower nations seem to close up with the group of innovation leaders, partly because Finland lost some ground in the meantime.

With respect to sub indicators, Austria scores better than the average in its reference group on three indicators, namely percentage of innovative SMEs collaborating with others, community trademarks, and community designs.[140] Austria's score is well below the average of countries from the reference group on six indicators: venture capital investments, license and patent revenues from abroad, non-EU doctorate students, knowledge-intensive services exports, percentage of population having completed tertiary education, and non-R&D innovation expenditure in the business sector.

At large, this assessment, as well as the indicator overview from IUS in table 2, suggests that Austria performs above average on inputs relevant to the systems. However, it rather underperforms as regards specific output indicators, at least in its reference group as well as compared to EU's Innovation Leaders. In turn, this does not necessarily imply ineffiencies in the overall science and innovation system: Arguably, some indicators used in IUS seem to over account for performance features present in high-tech economies (e.g. exports in knowledge-intensive services etc.), whereas, again, the Austrian economy rather

[139] Cf. BMWF, BMVIT and BMWFJ (2012, 2013).

[140] The latter two indicators as well as non- EU doctorate students and non-R&D innovation expenditure in the business sector are not reported in table 2, but can be found in the IUS report (2014).

focuses on medium-tech innovation and research in applied sciences. Similarly, the IUS assessment does not fully take into account specificities in the educational system, e.g. the role of secondary education and professional training. Ultimately, this does not change the fact that Austria was unable to catch up or reduce distance to Innovation Leaders in the last three years.

On average in 2012, Austria produced 22.62 publications per 10,000 inhabitants, well above the EU-28 average (13.8). They are also internationally orientated with 58.06% of publications internationally co-published. In 2012, Austria had about 1247 international scientific co-publications per million population, which puts it at a similar level with other smaller, rich member states like Finland and Belgium. In the period 2002-2012, a bit more than 13% of the Austrian scientific publications were in the top 10% most cited publications worldwide in comparison with 11% of top scientific publications produced in the EU28 (Science Metrix, 2014)[141]. The share of public-private co-publications in Austria is 3.2% in the period 2008-2013 against 2.8% for the EU28[142].

[141] These publication data are based on Elsevier's Scopus database. ScienceMetrix, Analysis and Regular Update of Bibliometric Indicators, study conducted for DG RTD. They represent an update of the data displayed in the table below. See also http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=other-studies.

[142] Scival 2014, Scopus based publication indicators derived from Elsevier's SciVal platform, www.scival.com last accessed December 2014

Table 2 Innovation Union Scoreboard assessment of the performance of the Austrian research and innovation system, values relative to the EU28 (EU28 = 100).

1. ENABLERS	Year	AT	EU
Human resources			
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	2011	2.20	1.70
Percentage population aged 30-34 having completed tertiary education	2012	26.30	35.80
Open, excellent and attractive research systems			
International scientific co-publications per million population	2012	1,247.84	343.15
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	2009	11.07	10.95
Finance and support			
R&D expenditure in the public sector as % of GDP	2012	0.88	0.75
Venture capital (early stage, expansion and replacement) as % of GDP	2012	0.02	0.08
2. FIRM ACTIVITIES			
R&D expenditure in the business sector as % of GDP	2012	1.95	1.31
Linkages and entrepreneurship			
Public-private co-publications per million population	2011	86.42	52.84
Intellectual assets			
PCT patent applications per billion GDP (in PPS€)	2010	5.27	3.92
PCT patent applications in societal challenges per billion GDP (in PPS€) (climate change mitigation; health)	2010	1.20	0.85
3. OUTPUTS			
Economic effects			
Contribution of medium and high-tech product exports to trade balance	2012	3.55	1.27
Knowledge-intensive services exports as % total service exports	2011	23.81	45.26
License and patent revenues from abroad as % of GDP	2012	0.21	0.59

Source: European Commission, IUS Database (2014).

5.2 Structural challenges of the national R&I system

In 2010, the Austrian Institute of Economic Research listed among the supply-side structural bottlenecks for growth the following structural challenges in the system.[143] Since then, most of these challenges listed below have been addressed by policies, but, to date, not fully resolved:

1. *a weak human capital basis for innovation*, expressed by a low tertiary education rate; a low number of science and engineering graduates (especially women) and a strong concentration on traditional crafts;
2. *deficits in labour participation* concerning the labour quota of women, elderly and migrants, also limiting their participation in science and innovation processes.

[143] Cf. Ederer and Janger (2010).

3. *deficits in R&D,* concerning a low number of research conducting enterprises, in particular SMEs, and a strong concentration of R&D expenditure on relatively few companies (MNEs); improvable quality of university research and low volume of university-based basic research;
4. *deficits in finance,* limited availability of university funding, in particular investment in basic sciences (public sources); venture capital is still relatively scarce;
5. *competition and industry dynamics bottlenecks,* expressed by a low competition intensity in certain service sectors (liberal professions, energy sector, banking and insurance sector, crafts, estate agents and property management, pharmacies, railways); sporadic limited competition in the productive sector; also, general medium rather than high-tech orientation of industries, relatively low start-up dynamics limiting the renewal of established industries and transitioning to knowledge-intensive activities in the economy;

These bottlenecks continue to limit the ability of the Austrian innovation and science system to successfully catch up with innovation leaders in the EU as outlined in the national R&I strategy (see next section). Table 3 summarizes main policy responses addressing these bottlenecks and assess their fit and ability to overcome challenges.

Table 3 Summary table

Challenges	Policy measures/actions addressing the challenge	Assessment in terms of appropriateness, efficiency and effectiveness
1. *A weak human capital basis for innovation*	- introduction of structured doctoral programmes - initiatives launched to increase quality of teacher education (e.g. "PädagogInnenbildung NEU"); - access to and support for dual training schemes widened	+ weakly increasing number of new doctorates and population share with tertiary education in the last few years +/- no systematic evaluation of educational reforms available to date, partly because too early for an assessment of effects - relatively few measures are geared towards excellence of the science system or scientific career prospects of young academics.
2. *Deficits in R&D (and innovation) on firm-level*	- indirect support via R&D tax credit system in place	- SME innovation activities reduced in ultimate years (IUS, 2013); BERD share in GERD stagnated - extensive evaluation of indirect support for R&I still not conducted + coalition agreement foresees further improvement of innovation finance conditions/regulatory framework
3. *Competition and industry dynamics bottlenecks*	- first revision of existing antitrust laws launched in 2011 - public support for start-ups via venture capital activities expanded	+/- no systematic assessment of past reforms available as regards competition and innovation impacts - current entrepreneurial dynamics in the innovation system remain low when compared to dynamics among innovation leaders and followers; venture capital availability stagnated + additional antitrust reforms and expansion of existing entrepreneurship policies (e.g. red tape reduction) foreseen by recent coalition agreement
4. *Deficits in labour participation*	- gender dimension is high priority in all key policy documents (RTDI strategy, coalition agreement), systematic policies in place - set of specific policies addressing high-skilled migration (e.g. RWR visa card scheme, but also recent introduction of (foreign) student fees)	+ women participation increased significantly in the last years, however, starting from a low basis - net migration of mobile academics close to zero (1996-2011), but loss of high quality talent and net loss of mobile inventors (2001-2010); [144] Migratory schemes will undergo revision according to coalition agreement, coherent migration strategy only underway - systematic policies as regards elderly participation are scarce

[144] Cf. EFI (2014), Chapter B2, http://e-fi.de/fileadmin/Gutachten_2014/EFI_Report_2014.pdf, last accessed on December 31st, 2014.

5.3 Meeting structural challenges

By and large these structural challenges are common knowledge. Thus, it was not surprising that many of them were openly addressed by the Austrian Federal Government's Strategy for Research, Technology and Innovation for the next decade (March, 2011). It addresses main policies to strengthen national research structures with a focus on excellence, to foster the innovative capacity of companies, enable thematic priority setting, raise the efficiency of governance, and to link research, technology and innovation to the education system. Hence, with its 2020 perspective, the national strategy is explicitly embedded in Europe's 2020 growth strategy and contributes to the implementation of the Innovation Union.

In the government's R&I strategy quite a substantial number of structural challenges are featured which the national innovation system is confronted with. Among them are several which – from a systemic R&I perspective – constitute major bottlenecks for a prosperous future R&I development, such as

- a strained university system with unfavourable student-to-teacher ratios, limited scientific career options (no sufficient tenure track), and especially a persistently low number of S&E graduates: A fact which is aggravated by a declining age cohort of pupils between 15 and 19 years of age, a definitive gender imbalance in S&E studies and, thus, low entry and high drop-out rates in tertiary education;
- a relatively narrow financial base for fundamental research, little differentiation of research profiles at and between universities and insufficient cooperation between universities and non-university research organisations, as well as between universities and universities of applied sciences; In turn, PROs and HEIs in the Austrian science system are not top-ranked in international rankings and, thus, do not largely attract global talent in R&D and science, even though being an attractive destination for students;
- a stagnating share of R&D financing from the business-enterprise sector (with increasing R&D expenditure in absolute terms), faced with a slightly but steadily declining share of corporate R&D funding from abroad (although still from a high level), partially balanced by transfer of a relatively high amount of public funds into the corporate R&D sector (compared to the EU average), well based on a developed science-industry cooperation portfolio, but with little impact on structural economic change in terms of added-value and high-tech orientation;
- low dynamics in increasing the intensity of private equity and venture capital in the formation of technology-based, innovative firms, aggravated by a deficient regulatory (VC) framework, administrative hurdles in the areas of enterprise formation and service regulations, and characterised by a relatively little developed entrepreneurship culture.

In addition, there are a number of issues which find limited attention within the strategy:[145]

- first of all, there is no roadmap with budgetary indications and responsibilities, which would be required to implement the activities proposed in the strategy;

[145] Cf. Schuch (2011, 2012); Austrian Council for RTD (2012).

- consideration of the grand and societal challenges in R&I funding is still expandable – although eventually beginning; at large, it appears that the dominant design paradigm of R&I policies in Austria continues to be a bottom-up one and thus less conducive for thematic approaches.

However, concrete policy initiatives and measures in various fields and in the last few years have proven more or less successful in challenging these bottlenecks in Austria. Notably, some valuable trends even emerged without the intervention of policy:

- Even though dedicated budget and policies address scientific excellence only to a limited extent, there is nevertheless preliminary evidence (e.g. ERC successes) on high performing research groups and fields in Austrian HEI and PRO. However, policy efforts targeting the career perspectives of younger researchers should nevertheless be expanded - elsewise these human capital/educational investments will continue to be exploited in other more attractive parts in the world.
- Notably, R&I governance in Austria has been improved step-by-step and continues to be systematically developed (e.g. implementing task forces for the national strategy); in this context, also a higher quality and impact of public sector services is envisaged and addressed more recently.
- More specifically, R&I governance interfaces with EU and international levels have been fine-tuned and related structures have become even more efficient (e.g. recently developed internationalization strategy). Importantly, updated governance structures seem to create added value in the national science and innovation system, i.e. financial and knowledge inflows. Similarly, strengthening of strategic intelligence in this area seemingly is an important step in the right direction.
- Notably, gender challenges have been successfully identified and now tackled with a coherent and strategic set of measures and new regulations. However, substantial improvements in this area will very likely take time, also because Austrian society showed a much stronger persistence of traditional gender roles than in most other OECD countries, at least in the last decade.

Other areas of Austrian R&I policies remain weak points in the system and, arguably, should attract more policy attention and a redesign of the policy mix. The most important aspects include:

- Recent public initiatives have so far had a limited effect on the overall availability of venture capital funds, but it may take more time for these impacts to unfold; similarly, measures and next steps outlined in the coalition agreement in this context should be implemented in the near future (e.g. improving the overall investment incentives and regulation for crowd-funding and private investors).
- The overall funding system seems to have lost some of its funding flexibility in times of budgetary pressures. Massive increases in indirect allocation of funds in the last few years was partly only possible at the cost of university finance and funds available for competitive project grants. Accordingly, timely policy responses to new developments have become more difficult in Austria, e.g. thematic approaches.
- Accordingly, the long-awaited evaluation of indirect funding (forthcoming in 2015) will have to provide sound and robust evidence on the effectiveness. Very

preliminary assessments suggest that indirect funding, at least, did not meet with expectations for a higher involvement of innovative SMEs.

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Annex 2 – Abbreviations

ACR	Austrian Cooperative Research
AIT	Austrian Institute of Technology
APART	Austrian Programme for Advanced Research and Technology
AplusB	Academia plus Business
APO	Austrian Patent Office
AT	Austria
AWS	*Austria Wirtschaftsservice GmbH* (Austria Business Service)
BERD	Business Expenditure for Research and Development
BHG	*Bundeshaushaltsgesetz* (Federal Budget Act)
BMBF	*Bundesministerium für Bildung und Forschung* (Austrian Federal Ministry for Education and Women)
BMeiA	*Bundesministerium für Europa, Integration und Äußeres* (Austrian Federal Ministry for European and International Affairs)
BMF	*Bundesministerium für Finanzen* (Austrian Federal Ministry of Finance)
BMJ	*Bundesministerium für Justiz* (Austrian Federal Ministry of Justice)
BMLFUW	*Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft* (Austrian Federal Ministry for Agriculture, Forestry, Environment and Water Management)
BMVIT	*Bundesministerium für Verkehr, Innovation und Technologie* (Austrian Federal Ministry of Transport, Innovation and Technology)
BMWF	Former Austrian Federal Ministry of Science and Research
BMWFJ	Former Austrian Federal Ministry of Economy, Family and Youth
BMWFW	*Bundesministerium für Wissenschaft, Forschung und Wirtschaft* (Austrian Federal Ministry of Science, Research and Economy)
BOKU	*Universität für Bodenkultur Wien* (University of Natural Resources and Life Sciences, Vienna)
BVergG	*Bundesvergabegesetz* (Public Procurement Act)
BV-G	*Bundesverfassungsgesetz* (Federal Constitutional Act)
CDG	*Christian Doppler Forschungsgesellschaft* (Christian Doppler Research Society)
CIS	Community Innovation Survey
CLARIN	Common Language Resources and Technology Infrastructure
COIN	Cooperation and Innovation Programme
COMET	Competence Centres for Excellent Technologies
CSA	Coordination and Support Action
D-A-CH	Germany, Austria and Switzerland
DAI	Digital Author Identification
DARIAH	Digital Research Infrastructure for the Arts and Humanities
DASTI	Danish Agency for Science, Technology and Innovation
DFG	*Deutsche Forschungsgemeinschaft* German Research Foundation
DK	DoktoratsKolleg
fFORTE	*Frauen in Forschung und Technologie* (Women in Research and Technology)
EC	European Commission
EPO	European Patent Office
ERA	European Research Area
ERA-NET	European Research Area Network
ERC	European Research Council
ESF	European Science Foundation

ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EU-15	European Union including 15 Member States
EU-27	European Union including 27 Member States
EU-28	European Union including 28 Member States
EUA	European University Association
EUROHORC	European Union Research Organisations Heads Of Research Council
EVCA	European Private Equity Venture Capital Association
FDI	Foreign Direct Investments
FFG	*Österreichische Forschungsförderungsgesellschaft mbH* (Austrian Research Promotion Agency)
FP	Framework Programme
FPA	Federal Procurement Agency
FTE	Full-time Equivalent
FWF	*Fonds zur Förderung der wissenschaftlichen Forschung* (Austrian Science Fund)
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GEN-AU	GENome Research in Austria
GERD	Gross Domestic Expenditure on R&D
GOVERD	Government Intramural Expenditure on R&D
GUF	General University Funds
HEI	Higher Education Institution
HERD	Higher Education Expenditure on R&D
HR	Human Resources
HRS4R	Human Resources Strategy for Researchers
HRST	Human Resources in Science and Technology
ICT	Information and Communication Technologies
IHS	*Institut für Höhere Studien* (Institute of Advanced Studies)
IP	Intellectual Property
IPP	Innovation-friendly Public Procurement
IPR	Intellectual Property Rights
IPTS	Institute for Prospective Technological Studies
ISCED	International Standard Classification of Education
IST	Institute of Science and Technology
IU	Innovation Union
JPI	Joint Programming Initiative
KIRAS	*Österreichisches Förderungsprogramm für Sicherheitsforschung* (Austrian Security Research Programme)
KORANET	Korean Scientific Cooperation with the European Research Area
MNE	Multinational Enterprises
MORE	Mobility of Researchers
MS	Member State
NRP	National Reform Programme
NWO	The Netherlands Organisation for Scientific Research
OA	Open Access
ÖAW	Österreichische Akademie der Wissenschaften (Austrian Academy of Sciences)
OeAD	*Österreichische Austauschdienst GmbH* (Austrian Agency for International Cooperation in Education and Research)
OECD	Organisation for Economic Co-operation and Development
ÖNB	*Österreichische Nationalbank* (Austrian Federal Reserve)
OpenAIRE	Open Access Infrastructure for Research in Europe
ORCID	Open Researcher Contributor ID
OSTA	Offices of Science and Technology Austria
ÖVP	*Österreichische Volkspartei* (Austrian People's Party)

PCT	Patent Cooperation Treaty
PhD	Philosophiae Doctor
PIAAC	Programme for the International Assessment of Adult Competencies
PISA	Programme for International Student Assessment
PRO	Public Research Organisation
PT TÜV	*Technischer Überwachungsverein* (Technical Inspection Association)
PT VDE-IT	*Verein Deutscher Elektrotechniker-Innovation und Technik* (Association for Electrical Engineers – Innovation and Technology)
PT VDI	*Verein Deutscher Ingenieure* (Association of German Engineers)
PT VDI-TZ	*Verein Deutscher Ingenieure - Technologiezentrum* (Association of German Engineers – Technology Centre)
PTJ	*Forschungszentrum Jülich* (German Project Funders Jülich)
R&D	Research and Development
R&I	Research and Innovation
RCN	Research Council of Norway
RCP	Regional Contact Points
RDI	Research Development and Innovation
RIS3	*Regionale Forschungs- und Innovationsstrategie für intelligente Spezialisierung* (Smart Specialisation)
RTD	Research, Technology and Development
S&T	Science and Technology
SF	Structural Funds
SME	Small and Medium Sized Enterprise
SNSF	Swiss National Science Foundation
SPÖ	*Sozialdemokratische Partei Österreichs* (Social Democratic Party of Austria)
STEM	Science, Technology, Engineering and Mathematics
STI	Science, Technology and Innovation
Tekes	*Teknologian Kehittämiskeskus* (Finnish Technology Agency)
ToR	Terms of Reference
TT	Technology Transfer
UK	United Kingdom
UNIKO	*Österreichische Universitätenkonferenz* (Austrian Rectors' Conference)
VINCI	Vouchers in Creative Industries
Vinnova	*Verket för Innovationssystem* (Swedish Agency for Innovation Systems)
WEF	World Economic Forum
WIFO	*Österreichisches Institut für Wirtschaftsforschung* (Austrian Institute of Economic Research)
WIPO	World Intellectual Property Organization
WTZ	*Wissenschaftlich-Technische Zusammenarbeit* Science and Technology Cooperation Agreements
WWTF	*Wiener Wissenschafts-, Forschungs- und Technologiefonds* Vienna Science and Technology Fund
ZDG	Centre for Digital Humanities

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