





printing information

Publisher and Media Owner | © **austrian council**

Austrian Council for Research and Technology Development | 1010 Vienna | Pestalozzigasse 4

Translation | Dr. Billaudelle & Partner | Munich

Design and Production | Grafikatelier Heuberger | Vienna

Photo Credits | RFTE | Graschopf | Poller | Stockhammer | Zinner | Archiv |
| Pinter | istockphoto.com | NicoElNino

contents

4 __ **foreword**

5 __ **editorial**

7 __ **outlook**

11 __ **the austrian council recommends**

Recommendations 2017 _____ 12

Statements 2017 _____ 63

96 __ **creating knowledge**

Accomplishments _____ 70

Reports and Studies 2017 _____ 75

International Activities _____ 97

99 __ **events**

105 __ **the austrian council**

Review 2017, Outlook 2018 _____ 106

Members of the Austrian Council _____ 108

Secretariat _____ 109

110 __ **contact**

foreword

Austria is doing well. Thanks to long years of growth, the research quota is now at 3.14 percent of GDP, and considerable improvements in the system have also been achieved in recent years.

Nevertheless, much remains to be done, tasks must be completed and reforms implemented. These requirements are based on the fact that science, research and innovation funding is an absolute must in the age of globalization, digitalization and robotization. Only by providing it can Austria survive as a business location and secure the prosperity of its citizens.

Established in 2000 and on the basis of its legally defined tasks, the Austrian Council has contributed decisively to Austria's catch-up process in the areas of science, research and innovation.

This report on the Austrian Council's activities and its numerous recommendations and statements in 2017 therefore also demonstrate the

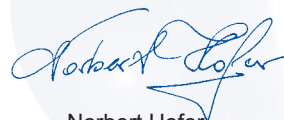
immense dedication of its members to the Austria research and innovation location.

The new Federal Government is well aware of the imperative importance of science, research and innovation – this awareness is also clearly visible in the government programme. The projects formulated in the government programme range from effective university management and improved framework conditions for studying, to updating the research strategy and the optimisation of governance structures, through to the creation of a modern infrastructure as the foundation of digitalisation. The objective competent consultancy for which the Austrian Council has been renowned for almost two decades now, will accompany the implementation of these projects.

We therefore wish the Austrian Council the very best in the completion of its valuable tasks for the Austrian innovation system and very much look forward to the forthcoming cooperation.



Dr. Heinz Faßmann
Federal Minister for
Education, Science, Research



Norbert Hofer
Federal Minister for
Transport, Innovation and Technology



Hartwig Löger
Federal Minister of
Finance



Dr. Margarete Schramböck
Federal Minister for
Digital and Economic Affairs

We live in times of dramatic change with unsure consequences. The age of digitalisation has dawned and will affect and change practically every area of life. The increasing robotization of many work areas, combined with rapid developments in the area of artificial intelligence, fuels complex fears, which are quite often expressed in anti-technological attitudes. And globalisation with its rapid proliferation and compacting of cross-border economic and social interactions also increasingly awakens the resistance of all those that considered themselves losers where these developments are concerned – or actually are.

Fear for one's job, uncertainty in the face of dissolving certainties and recourse to outdated concepts are frequent consequences and an expression of the outlined upheavals. And yet in precisely such times of rapid economic and technological change we will not secure our prosperity by holding fast to the status quo – this will only be possible by courageously determining the shape of our future. Science, research and innovation are critically important here. They enable both technological developments and the elaboration of solutions to meet social challenges. The financial resources applied here are therefore investments in the future, which are pivotal for the success of both the business location and society as a whole.

With this in mind, the Austrian Government set itself the goal in its RTI Strategy of 2011 of increasing the research quota by 2020 to 3.76 percent of GDP to join the European leaders. Financial resources were indeed actually increased continuously in recent years; the European target of an R&D quota of 3 percent was already achieved in 2015. Austria has therefore worked its way into the top league in an impressive catch-up process over the years, as with a research quota of 3.06 percent, it is currently in second place in the EU behind Sweden, a third higher than the EU28 average (2.0 percent), and among the 5 best-placed countries worldwide. Only Israel and South Korea with an

R&D quota of approximately 4.2 percent, Japan (4 percent) and Sweden (3.3 percent) are ahead of Austria.

By contrast however, Austria's position in the most important international rankings for innovation performance, competitiveness, etc. At best, Austria often is in the forward midfield – so it is not in a lead position in the area of R&D expenditures. If we also consider the development over recent years, on the whole a stagnating or even declining trend with the rankings can be seen.

The European Innovation Scoreboard (EIS), on which the RTI Strategy and its overriding objective are oriented, illustrates this well. According to the EIS, Austria is currently ranked number 7 in the EU (or 9 when non-EU members such as Switzerland and Iceland are also included), and therefore recently once again took the lead in the “Strong Innovators” group. With its return to the head of the chasing pack, Austria is however at exactly the same position it was ranked at nine years ago when the RTI Strategy was being worked out. In these nine years it has evidently not succeeded in getting closer to the strategic objective and securing places, let alone moving up into the group of leading innovation nations, as planned in the RTI Strategy. The gap to the innovation leaders today, following years of decline or stagnation, is once again at the 2009 level.

The past decade, as we all know, was characterized by a drastic slowdown in the global economy as a result of the financial crisis that commenced in 2008. The weak economic development had already been declared the “new normality”; fears of a secular phase of stagnation, possibly even deflation, were spread far and wide.

The global economy has since shifted back into gear, with strong growth in 2017 and optimistic forecasts for 2018 and beyond. The economic situation in Austria hasn't been this good

editorial



Hannes Androsch
Chairman
of the Austrian Council



Markus Hengstschläger
Deputy Chairman
of the Austrian Council

editorial

for some ten years either. This currently positive economic situation should be utilised to once again ensure the required dynamic in the area of education, research and innovation.

And indeed the Science and Research sections of the Federal Government's estimated budget presented on 21 March 2018 are insofar an expression of this setting of priorities, as in contrast to almost all other policy areas of the RTI topic, budget cuts were excluded here. According to the Austrian Council's calculations

and opinion, the fixed increases in R&D expenditures will nevertheless be insufficient to achieve the funding and strategy goals set by the government itself.

But when the wind of change blows the order is always to set sail, and not flee to the deceptive comfort of a sheltered cove.

In this spirit we thank all those that accompanied our work last year and supported in the most diverse ways, and very much look forward to continued successful cooperation in the future.



The Council

from left to right standing:

Hermann Hauser,
Markus Hengstschläger,
Klara Sekanina,
Hannes Androsch,
Jakob Edler

From left to right sitting:

Sabine Herlitschka,
Helga Nowotny,
Sylvia Schwaag-Serger



Actively shaping digital change

European positions are urgently required

Sabine Herlitschka, Member of the Austrian Council

Terms lose their effectiveness with inflationary use, which also applies to the term, “digitalisation”. The dynamics of change brought with the digital transformation can scarcely be underestimated here. The change we are currently observing in its infancy will certainly envelope all areas of society, economy and life in general. And it is essentially driven by the requirements and wishes of the consumer. Products, and services, processes and decisions, but business models in particular, will all be digitalised. “Digital disruption” is the snazzy catchphrase for this development. We are well on the way towards the “internet of everything” – even if only one percent of all “things” that in the future will interact in networks are currently connected.^{1*} What the term “Industry 4.0” actually entails is illustrated by the immense potential of the digital transformation in industrial production. Research and development are closely connected here with production, in order to accelerate innovation, increase flexibility and improve productivity and quality. In a study McKinsey assumes up to five percent productivity increases and up to 50 percent faster product launch times (“time to market”).^{2*} As a key element of Industry 4.0 the “smart factory” becomes an integrated part of a smart environment in which the entire value creation chain optimises itself in real-time. New requirements such as changing customer wishes or changing raw material availability are automatically incorporated.

Wanted: The best brains

The high speed of the change is undisputed, as is the fact that existing forms of work and activities will change significantly. An OECD study estimates approximately 12 percent of jobs in Austria and Germany are threatened by automation.^{3*} This fear-driven view of the topic is opposed by positive job effects caused by new job profiles, a higher level of qualification, increasing productivity and the development of new markets. The competencies of the future will be characterised by swift decisions within flat organisations, cross-process automation of routines and continuous flexibilisation of activities and content. Expertise in the areas of technology, IT and digitalisation is just as much in demand as aptly named “soft skills” and leadership competencies are. A “culture of learning”, in which digital formats for qualification and further training are used, is fundamental in this work environment. It then becomes clear that the best brains and not the nimblest fingers are required.

This development can be met with fear and uncertainty, but these reaction patterns are as understandable as they are wrong. On the contrary: In Europe proactive creative drive is required to survive globally as a competitive knowledge society and knowledge economy. This requires courage and determination with positive views that formulate digitalisation as a “desired future”, with which tangible changes become reality.

1* Contrast Ernst & Young Consulting GmbH, 2016/17.

2* McKinsey: Industry 4.0 How to navigate digitization of the manufacturing sector, 2015.

3* Arntz, M. / Gregory, T. / Zierahn, U.: The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis, 2016.

Competition of economic regions

Research, innovation and industrial production have become strategic geopolitical factors. China and the USA are massively committed to both maintaining these key competencies and further reinforcing them. This dynamic can be illustrated on the example of the development and production of semiconductors – in addition to “advanced manufacturing systems”, one of six key technologies of the European Commission defined in 2009. Microchips act as connectors between the real and the digital world and are “enablers” for global mega trends: from the Internet of Things to e-mobility, autonomous driving and energy efficiency, through to the healthcare sector.

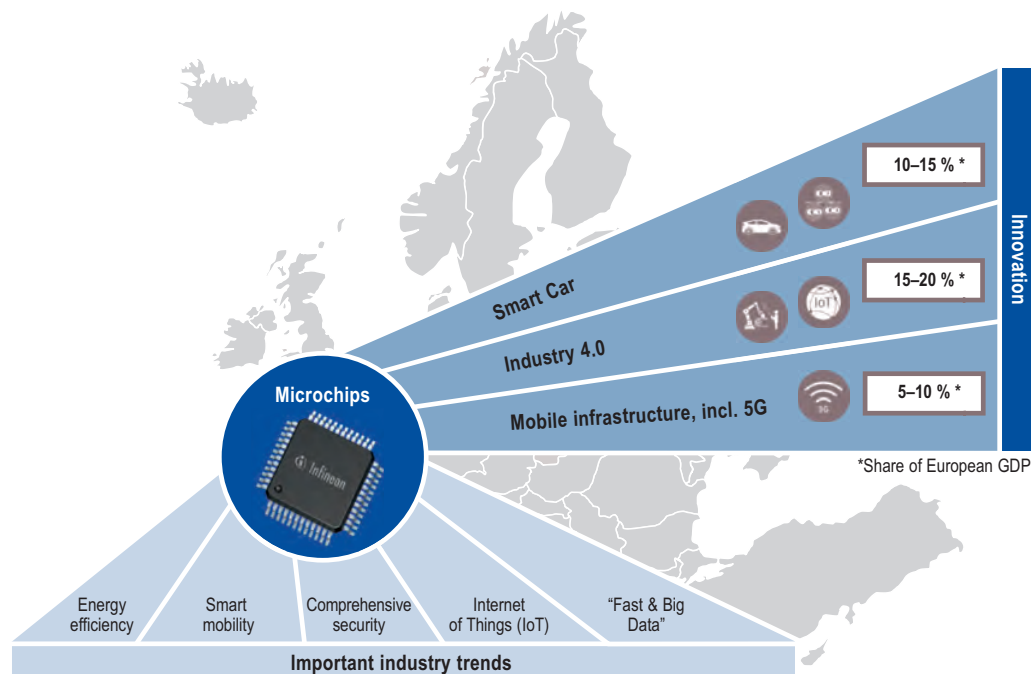
The sales volume of the global semiconductor market for 2018 is estimated at approximately USD 430 billion. Due their leverage effect, since 1985 microchips have enabled up to 45 percent of the productivity increases within the OECD, as well as 80 percent of innovation in the automotive sector.^{4*}

Accelerating European industrial policy

According to current estimates (see graphic), the semiconductor industry in 2020 will already contribute 30 to 45 percent of European GDP.^{5*} It also shows, however, that Europe runs the risk, due to market consolidations, of falling behind because of geopolitical developments. Since 2013 China has been importing more semiconduc-

outlook

Semiconductors will enable 30 to 45 percent of European GDP in 2020



Source: IFX, IHS Markit 2017.

^{4*} DECISION, ESIA, Future Horizons, IMF, WSTS 2015, AUDI, OECD Factbook 2013.

^{5*} Infineon, IHS Markit 2017.



outlook

tors than crude oil, and intends to become the global leader in the semiconductor industry by 2030, while the USA increases its focus on protectionism. In the comparison here, European industrial policy and research funding appear to focus too little on strategic European competencies and interests in the key technologies.

In view of the goal of increasing the share of European industry in GDP by 2020 to 20 percent, an active European industrial policy would have to pursue two goals in particular: the adoption of effective European takeover protection strategies, combined with clear executive pow-

ers of attorney, similar to the US American Committee for Foreign Investment (CFIUS), and the implementation of effective initiatives for investment stimulation, within the scope of the Important Project of Common European Interest (IPCEI), for example.

We are all Europe, and it is therefore critical that the opportunities of digitalisation be exploited with courage and the right political strategy – in an active interplay between the member states and the European institutions. Because anyone claiming to compete in global competition must think big and act big with research, development and technology.



Recommendations 2017

Priorities for awarding the funds of the National Foundation 2018 for RTD –

Recommendation dated 9 March 2017

The National Foundation for RTD plays a very important role in the Austrian RTI system as an additional financing source for long-term strategic measures. The Council therefore once again regretfully acknowledges that the funds provided to the National Foundation has steadily decreased in recent years, and on average is already significantly below the amount proposed in the annotations on the law.

We therefore wish to make clear once again that a sufficient and sustainable allocation of funds

is necessary for the National Foundation to perform its functions.

Following detailed discussion and on the basis of the priority areas of action identified in the Report on Austria's Scientific and Technological Capability, the Council Board recommends the following content-relevant orientation for awarding funds in 2018 in descending priority: The orientation here follows the principle of the National Foundation's long-term planning ability and continuity.

Following detailed discussion and on the basis of the priority areas of action identified in the Report on Austria's Scientific and Technological Capability, the Council Board recommends the following content-relevant orientation for awarding funds in 2018 in descending priority:

(Recommendation of the Austrian Council in March 2017)

- Reinforcing of the research infrastructure by focusing on initiatives with corresponding critical variables and risk potential
- Coordination and harmonisation of regional and federal RTI activities
- Reinforcing of the national human potential basis
- Reinforcing funding in competition in basic and applied research
- Reinforcing innovation potential with "Open Innovation"
- Risk capital reinforcement
- Measures to strengthen Austria as a location for research-active companies

Recommendation for more risk in research funding – Recommendation dated 9 March 2017

Starting situation

The funding system in Austria across and beyond basic research primarily promotes innovations. This means the emphasis is on development results that aid implementation on the market. What's missing, however, is the promotion of inventions, of the inventive idea at the beginning of the innovation process, before it even has any specific market orientation.

The past has shown that the actual application of an invention, so its benefit, is usually a different one to that originally intended by the inventor. A predetermination or acceleration of the application in a specific direction would have cut off the latitude for innovation in this early phase of the innovation process. What Austria needs in the funding landscape is support at the begin-

ning of the innovation process, where it is not yet about implementation. The enterprising risk for the entrepreneur at this point is still too great to bear the burden of such a project. Application-free scope to experiment should therefore be allowed for in the respective funding, to avoid inventions that might not be very promising, and whose benefits are still unknown. The risk of research and innovation activities is an argument for state intervention in the shape of RTI funding. The right balance between the presence of risk as the basis for justifying funding and accountability to the tax payer must, however, also be ensured. Riskier projects must also have a chance of funding. Risk can entail failure. In Austria the funding system in the application-oriented area tends to be characterised by a conservative, risk-averse attitude.

Within the scope of a comprehensive work group process, together with the BMWWF and the funding agencies (FWF, FFG and awfs), among others, the Austrian Council got to grips with the question of how to create more risk and therefore more latitude for pioneering, that is, disruptive or radical innovations in the Austrian RTI funding system. This process was accompanied by a study by Technopolis, which examined international best practices and their suitability for Austria.

Frontier Research

The work group process tackled basic and application-oriented research on an equal level. As was seen with the former, “Frontier Research” now already exhibits high potential for more risk and radicality in basic research. This can be attributed to the following, among others:

1. By virtue of its nature and long-term orientation, Frontier Research is high in risk per se and afflicted with uncertainty. Economic effects of basic research cannot be reliably assessed ex ante.
 2. Frontier Research is becoming increasingly more important for the innovation process, as the interaction between basic research and the corporate and application area become increasingly more direct.
 3. Scientific breakthroughs from Frontier Research are often the basis of radical effects.
- The significance the Austrian Council attributes to the Austrian research and innovation system is illustrated in the recommendations¹ briefly outlined in the following, and has been clearly manifested time and again in its past recommendation work.

This potential, which basic research offers for more exploration and risk, is for the most part also already used or will be leveraged in Austria in the near future. Appropriate projects of the Science Fund (FWF) in particular are currently under way or are being prepared.

The **Wittgenstein Award**, now already presented annually, therefore offers scientists the highest level of freedom and flexibility in the performance of their research work.

With the **1,000 Ideas Programme** it will also be possible to implement new and therefore especially high-risk research ideas, which can be of high scientific and social relevance. The Austrian science and research landscape will also be significantly reinforced by the creation of an additional 200 **future professorships** over the

recommendations

¹ Recommendation on setting budgetary priorities in Austria of 19 Dec. 2016.

Austrian Council recommendation for funding education, research and development in Austria of 5 September 2016;

Austrian Council recommendation for funding research and development in Austria of 30 May 2016;

Austrian Council recommendation on funding universities and public sector research and development in Austria in the federal funding framework 2017 to 2020, chapter, “Science and Research” of 5 February 2016.

recommendations

next eight years. This will also create additional scope for action and thinking. Austria consequently positions itself with considerably more emphasis internationally.

The **Partnership in Research** programme will support projects within the framework of basic research, which result in partnerships with companies, where there was previously no cooperation. Via the FWF this will then open up potential for the sciences – and as a result new forms of cooperative research can then also emerge. But with its **“Research, Science and Society” innovation fund** in place since 2015, the Austrian Academy of Sciences (ÖAW) also offers a framework for supporting excellent innovative projects. The goal is to open up new paradigms and break new methodical ground for funding research projects and initiatives.

The Austrian Council also recommended the introduction of a mechanism for funding Top-End **Blue Sky Research** on 2 December 2016.² As part of a strategic initiative, researchers and/or research groups identified as excellent from all disciplines will be afforded additional latitude and freedom for their research work. This mechanism will be worked out under the guidance of the FWF with the integration of all relevant stakeholders.

It's now clear that much is already happening in the area of basic research to allow for more risk and autonomy. For this reason the following recommendation in particular applies to applied research funding.

Recommendation

Based on the results of the work group process and the results of the study, there is a requirement for experimental incubation systems without evaluation according to purely economic criteria. Experimental means open-outcome,

without goals. It is therefore about promoting the beginning of the innovation process. Being able to spend half a year on experimental work, without any financial relevance – such opportunities do not currently exist in Austria. People and their ideas should be promoted, not projects. There are many enthusiastic people with good ideas, who have also been able to push these forward, but who draw the short straw in the competition for written applications and against, “application professionals”.

The Austrian Council recommends

- the introduction of **low threshold experimental spaces** as the breeding ground for inventions with potential for big innovative leaps. Such **experimental incubation systems** should be characterised by the following items:
 - **Funding of inventions**, that is, the inventive idea without specific market orientation. The focus should be on innovative content here and the originality of the idea, instead of the specific implementation perspectives and market opportunities of the project.
- **Application phase**
 - Applicants without the restriction of background (individual researchers, research institutes, companies, universities, TCs, etc.).
 - “Experimental space without written applications” (short presentations and videos, which illustrate the motivation for the project, [in part] instead of written applications).
- **Innovative selection procedure**, heterogeneously composed panels, for example, evaluation by the community (Crowd Evaluation).
 - Simplified **selection criteria**; in selecting the projects there should be a **separation according to innovation content and quality**. Innovative applications usually compete

² Austrian Council recommendation to set up a mechanism to enforce Blue Sky Research of 2 December 2016.

directly with other high quality applications with low innovative content. The opportunities for funding a more innovative and riskier approach are increased by first evaluating the innovative content of an application.³

- The **definition** of a successful project should be made via ecosystems and not via products (project-specific vs. systematic factors). Innovations develop in **ecosystems**, in which, in addition to the quality and innovative value of the idea, many other factors also play a role (interdependencies).
 - The briefing and adjudication of the jurors should play a key role in the evaluation by jury-like panels – really it is about taking this evaluation from the usual evaluation logics to the modified intention of the measure.
 - **Process**
 - A two-tier process is recommended, in which the inventive ideas are specified and further developed from stage to stage.
- First financing round** (budgeted low): Formal check for plausibility and level of innovation, then selection (from about 20 projects) with community-based Crowd Evaluation (for example, decision makers, inventors, investors, media representatives, invited general public⁴).
- Between the two tiers, **accompanying coaching** must be provided with the further development of the inventions by the processing funding agency.
- Second financing round** (low volume): Evaluation by jurors, possibly combined with community.

- **Interdisciplinary and transdisciplinary procedure** in the further process, possibly to find new uses (technology spill-over). As part of the coaching in particular and also with the jury composition, where it makes sense, it must therefore be ensured that different groupings of players from different disciplines, sectors, industries, life areas or similar meet and interact with one another.

• **Implementation**

- Implementation is recommended on the basis of the nature as experimental incubation systems with the **application-oriented funding agencies** and FFG or corresponding equivalents at state level with the best possible use of existing structures, for example, programme lines or modules in existing related programme strands, in which successful projects from the experimental space can be passed on for further support after their further development.
- For a **pilot** at federal level **EUR 1 million** in funding volume is assumed to be able to fund an average of 20 projects.

The Austrian Council also recommends,

- the items listed above be generally expanded on and implemented more with the shaping of the funding system.

General

Risk must be exemplified and inherent in the system itself so it can be accepted and internalised by target groups as system players, and to achieve a sustainable attitude and behaviour change here.

recommendations

³ Such a subdivision of the selection criteria according to innovative content and scientific quality and accompanying use of different evaluation scales of the decision-making process has been proven to be expedient, for example, with the Research Council of Norway (source: Radical innovations – More latitude for innovative and riskier research. Final report, technopolis group, October 2016).

⁴ See also <http://www.ideenkanal.com/de/ablauf>.

recommendations

The Austrian Council therefore recommends

- the responsible specialised departments allow the **funding agencies more risk assumption**. Risk-averse behaviour should not be rewarded in the incentive systems.
- the agencies be granted freedom **to try out new selection formats and mechanisms** (for example in the form of pilot tenders, as the RCN has done with selection procedures such as “Sandpit” for instance⁵). At the administration end framework conditions for more courage to dare must be provided.
- not focusing with the effectiveness monitoring of funding measures on short-term impact quantitative output goals, but rather giving **priority to medium-term, mostly qualitative**

outcome and effect goals. This would, however, require a change in the measures accompanying data collections, right through to the increased recording of qualitative indicators. With a view to the future it will nonetheless be about anchoring inventive spirit and creativity more in the national mentality and overcoming the risk aversion of Austrian society. The basis for an attitude change must be installed here in training and further training in particular. Other measures are also conceivable, which enable “more good inventions” away from research funding, for example, mechanisms such as “innovation leave” or similar. If appreciation of inventive spirit is promoted more here, it changes society and therefore the ecosystem in which inventions must assert their value as well.

Recommendation Regarding the Use of the Funding Provided by the National Foundation for RTD – Recommendation dated 30 May 2017

Preamble

At the invitation of the Austrian Council, in accordance with § 11 para. 1 item 1 of the National Foundation for RTD Act, on 28 November 2016 the Austrian Council submitted a recommendation on the use of the Foundation’s funds for 2017.

The volume applied for by the institutions in 2017 is **EUR 169,335,000**. With regard to the approved EUR 100 million from bank levies the Austrian Council structured its recommendation in line with three possible scenarios for potentially available Foundation funds:

1. EUR 10 million
2. EUR 35 million
3. EUR 60 million

Should the worst case scenario of EUR 10 million occur, the Austrian Council recommended no allocation be made to the beneficiaries and

the funds be held over to 2018 instead. In the event of a figure above EUR 10 million but below EUR 35 million with the allocation of funds of the National Foundation, the Austrian Council recommended reappraisal.

On the basis of a current realistic estimate, a maximum of EUR 14.5 million in Foundation funds would be available for 2017. In order not to postpone the awarding of funds indefinitely, the Foundation Council said it would award the Foundation funds available for 2017 in the Foundation Council meeting on 13 June 2017. As a result the Austrian Council was invited in the Foundation Council’s letter of 12 May 2017 to submit a recommendation by the end of May 2017 on the use of the funds available to the Foundation for 2017 of **EUR 14.5 million**.

⁵ See, Radical innovations – More latitude for innovative and riskier research. Final report, technopolis group, October 2016.

Recommendation

With the reconsideration only those applications that were provided for in the preceding Recommendation dated 28 November 2016 were evaluated for funding. On the basis of the now lower financing volume expected for 2017, some projects had to be disregarded with the funding. The Austrian Council still believes

these are important, but they do not have the same chronological urgency as those with favoured status.

The qualitative evaluation of the initiatives has not changed and is based in the reasons and comments of the Austrian Council Recommendation dated 28 November 2016.

recommendations

Institution	Title	Total applied for in EUR m	Recommendation in EUR m
FFG	Bridge building programme / BRIDGE	10.00	5.0
FFG	Research partnerships – industry-related dissertations	2.00	0.0
FFG	2 nd R&D tender – infrastructure funding	20.00	0.0
FWF	Special research areas and DPs	35.26	1.5
FWF	Matching Funds – an innovative governance model for Austrian research locations	8.00	3.0
CDG	12 CD labs	17.10	0.0
LBG	Development, set-up, operation & evaluation of an OIS-enabled research institution	3.001	3.0
ÖAW	Austrian High Performance Data Analysis Center	3.00	0.0
aws	aws First – from idea to entrepreneurship	5.633	2.0
Total			14.5

Recommendation Regarding the Use of the Funding from the Austria Fund 2017 –

Recommendation dated 30 May 2017

Preamble

As part of the Tax Reform Act 2015/2016, Federal Law Gazette I no. 118/2015, the legal basis for a new funding mechanism in the Austrian RTI system was laid. According to article 12 of this act the RTD National Foundation was allocated an additional EUR 33.7 million in 2017 by way of the “Austria Fund”.

The funds from the “Austria Fund” were allocated on the basis of the RTD National Foundation

Act, similar to the previous allocation of funds from the National Foundation through the Foundation Council with consideration of the recommendation by the Austrian Council. The applications must differ from the applications of the institutes for National Foundation funds.

The funds of the “Austria Fund” will be used according to § 3 para. 2 of the RTD National Foundation Act to fund basic research and ap-

recommendations

plied research, as well as to fund the development of technology and innovation.

Based on the invitation of the Founda-

tion Council of 11 April 2017, the Austrian Council makes the following recommendation on awarding the EUR 33.7 million available to the Austria Fund 2017.

Recommendation

Institution	Title	Total applied for in EUR m	Recommendation in EUR m
FFG	Fronrunner Programme	15	7
FFG	Ideas Lab 4.0 Programme	8	4
FWF	doc.funds Pilot Programme	10	6
FWF	Lise Meitner Programme	8.73	0
CDG	Life Sciences in 4 CDLs	5.981	2
LBG	Health 4.0 – LBI for Digital Health	13.224	0
ÖAW	go!digital Next Generation	4	0
aws	Industry 4.0	10	3
aws	Translational Research Center for Life Sciences	6.8	5.7
ÖAW/FWF	Young Independent Researcher Groups	16	6
Total		97.74	33.7

On the basis of the sharp over-subscription of the Austria Fund with EUR 97.74 million compared with the available EUR 33.7 million, unfortunately it is not possible to recommend full funding for all applications.

On the basis of the allocation allowed for in the explanations on Article 13 of the Tax Reform Act – 50 percent funding for basic and applied research (column 1) and 50 percent for the research and development of basic industrial technologies in the programmes, production of the future, mobility of the future, energy of the future and information and communication technologies of the future (column 2) – a corresponding grading of the funding percentages

was therefore performed, as documented in the table.

The Austrian Council also determined that the content-related prioritisation allowed for in the Act was only conditionally complied with by the applicants. This is in particular shown for the second column, where the thematic focus was scarcely considered.

The **Fronrunner Package** of the **FFG** only reflects the content-related focus points allowed for by the Act within limits (e. g. town, production, mobility of the future). An increased headquarters focus is far more evident. The Austrian Council recommends the Fronrunner Package be supported with **EUR 7 million**, where-

by those models that thematically approximate the legal provisions in particular will be supported.

With **Ideas Lab 4.0** qualified and innovative ideas for research projects will be implemented across and beyond industries, sectors, disciplines and organizations. The Austrian Council believes the use of innovative formats, with which the **FFG** is breaking new ground here, is especially welcome. The Austrian Council recommends the project be supported with **EUR 4 million**.

To be emphasized here as particularly positive is the intensive addressing of young talent funding, as it is explicitly quoted by law for the first column, by the **FWF** with its **doc.funds** applications and the **Lise Meitner** programme.

The **doc.funds** in particular are an important and beneficial revised restructuring of the previous doctoral colleges. The Austrian Council welcomes the autonomy this provides the institutions in shaping the doctoral programmes. The Austrian Council therefore recommends **doc.funds** be supported with **EUR 6 million**.

The **Lise Meitner Programme** is an important mechanism for young talent funding. On the basis of the scarcity of available funds, however, the Austrian Council believes it would be more goal-specific to bundle funds and only support a human resources project, however with correspondingly higher allocation, instead of distributing the funds subcritically to several projects. On the basis of the funding of **doc.funds** with EUR 6 million the **Lise Meitner** programme for 2017 will not be awarded any funds from the National Foundation.

The **CDG** addresses the important and legally explicitly defined Life Science area with its structures proven in applied research. In view of the scarcity of funds the Austrian Council recommends funding a **CD lab** with **EUR 2 million**.

The Austrian council believes **Gesundheit 4.0 (Health 4.0)**, founded by **Ludwig Boltzmann Institutes for Digital Health**, is a valuable mech-

anism for reinforcing the future area of Digital Health. Although this application was evaluated as good, it will not be recommended for financing in this round on the basis of the framework conditions the Austrian Council has since become aware of. The basis for this is the sharp over-subscription of the Austria Fund for 2017 and the fact that the **BMWWF** has set a strong and important priority in this area with its latest Open Innovation strategy. For this reason preference will be given to the corresponding application of the **Ludwig Boltzmann Society** with the reconsideration with the applications to the National Foundation for 2017. The Austrian Council recommends, however, the financing of **Gesundheit 4.0** be sought with other institutions or submitted once again to the Austria Fund.

The **go!digital Next Generation programme** submitted by the **ÖAW** basically deals with an important area, the digitalisation of the humanities, however it only marginally meets the funding criteria set out with the Austria Fund. The Austrian Council therefore recommends the project not be funded.

The **Industry 4.0 funding programme** from **aws** makes a valuable contribution to supporting the Austrian economy with the introduction and implementation of Industry 4.0. The Austrian Council recommends this project be supported with **EUR 3 million**.

The setting up of a **Translational Research Centre for Life Sciences** submitted by **aws** to the Austria Fund is an important step in the transferring of existing structures and already invested public sector funds to a sustainable and long-term concept. The existing thematic science transfer centre for Life Sciences will expire shortly and the funds invested here in recent years by both the public sector and industry can therefore be logically pursued once more. In addition to the support by the Austria Fund, the Austrian Council also believes it is important to invest department funds and EU funds in the

recommendations

recommendations

project and to increase corporate accountability. As an initial stimulus the Austrian Council recommends the project be funded with EUR 5.7 million from the Austria Fund.

The Austrian Council believes the **Young Independent Researcher Groups** close the existing gap in training young researchers by offering post-doctoral researchers, who perform with special excellence, the opportunity to drive for-

ward autonomous and open-theme original and new research ideas in interdisciplinary projects. Especially welcome is the cooperation of two institutions with the application and performance of this project, the **FWF** and the **ÖAW**, who integrate their bundled competencies in the best possible way here. The Austrian Council therefore recommends the Young Independent Researcher Groups be supported with **EUR 6 million**.

Recommendation for the Further Development of the Technical Colleges in the Austrian Education and Science System – Recommendation dated 30 May 2017

A structural change in the Austrian university system requires the cooperation of numerous stakeholders. The ongoing “Zukunft Hochschule” (Future University) coordination process between the BMWF and the universities has started this. The goal of developing a differentiated education system with clear training profiles of universities and technical colleges as well as a complementary structured study programme with high permeability was consequently tackled here.

The Austrian Council would like to support this process with its recommendation for the development of the technical colleges sector in the Austrian education and science system.

Talks were held in a discussion process at technical colleges with numerous higher education experts on the topics of HE expansion, HR development, diversification, permeability and research potential, and possible development scenarios were derived from them.

The speed and intensity of a structural change that the university system in Austria will experi-

ence depends significantly on the cooperation between the stakeholders and a clear higher education policy strategy. In any case it is urgently necessary to implement measures that allow flexible control and therefore meet the requirement for medium to long-term financing and HR planning, both at the universities and the technical colleges, and drive forward structural changes.

Background

Technical colleges and higher education development/higher education expansion

The technical colleges were legally anchored in Austria in October 1993 with the parliamentary adoption of the Fachhochschul-Studiengesetz (FHStG – Technical Colleges Studies Act). The “framework legislature” passed herein offers the option of a relatively free operative shaping of the offered studies and courses with the goal of training a growing number of students at higher education level. The focus of the technical colleges here is on career-oriented university-type and scientific-based training⁶.

⁶ FHStG (Technical College Studies Act) § 3. Objectives and guiding principles of technical college study programmes; p. 8, accreditation requirements

The technical colleges sector is growing continuously.

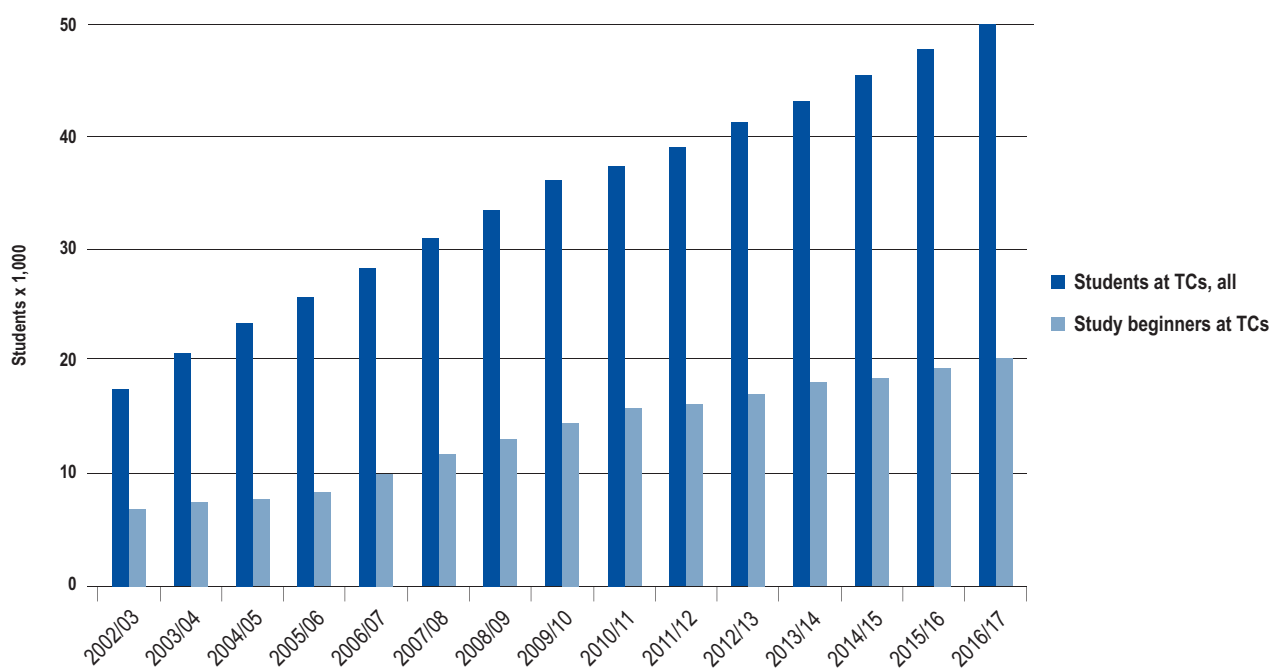
In Austria 50,009 or 13.9 percent of all students studied at 21 technical colleges in WS 2016⁷. Of these 17.2 percent come from other countries to study at a technical college in Austria. The target of 50,000 students by 2020 in the current technical colleges development and financing plan 2017/18 has therefore already been achieved. So a linear increase continues – the number increased on average since the 2002/2003

study year by approximately 2,350 annually. The number of study beginners increased for the given period from 6,488 to 19,621 and therefore on average by approximately 1,000 people annually (figure 1). The highest increase rates are seen in locations in Vienna, Lower Austria, Upper Austria and Styria.

Parallel to this the number of graduates at technical colleges in Austria also rose from 2,658 in the 2002/03 study year to 13,715 in the 2015/16

recommendations

Figure 1: Student population at technical colleges



Source: BMFWF uni:data warehouse (data extraction 16 May 2017), own presentation Austrian Council.

⁷ In 2015/2016 a total of 381,079 students registered at a public university, technical college or teacher training college (Statistik Austria, Students in Austria in WS 2015/16). Compiled on 23 August 2016).

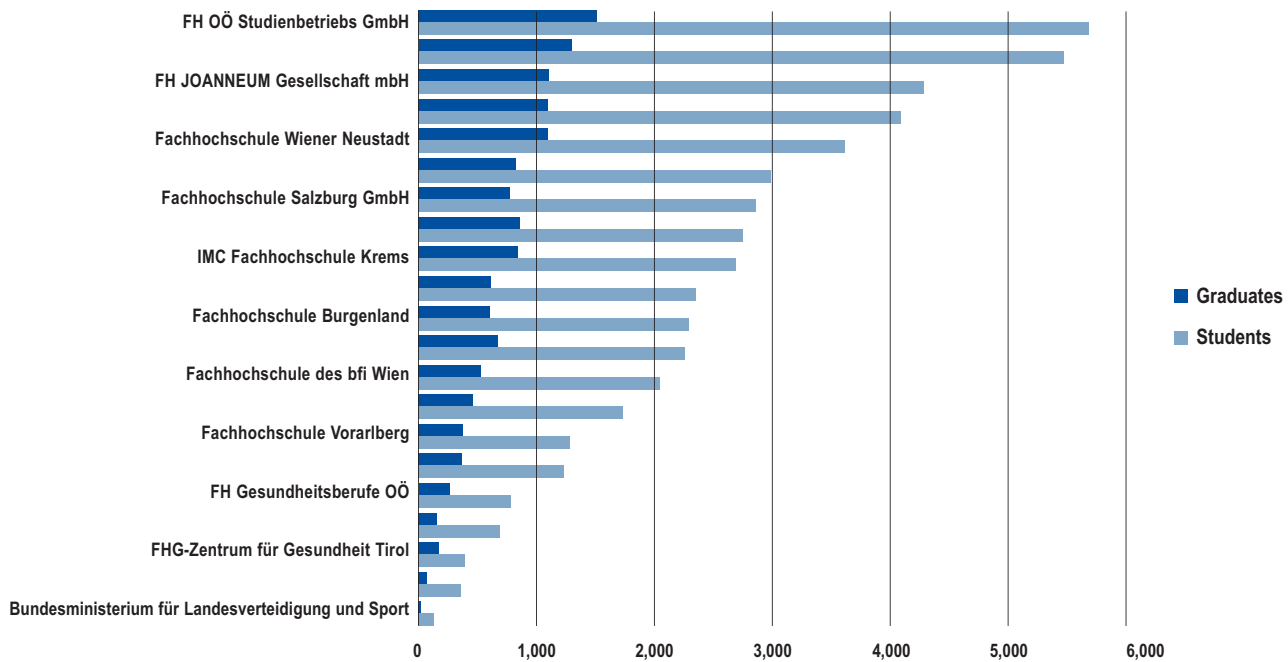
recommendations

study year (figure 2). In this study year 24.4 percent of all higher education graduates therefore obtained a tertiary level graduation at a technical college, 63.3 percent at a university, 3.7 percent at a private university and 8.3 percent at a teacher training college.⁸

Compared with countries with a similarly structured higher education landscape, the share of technical colleges in Austria is nevertheless low (figure 3) – in Switzerland, the Netherlands

and Finland technical colleges were founded at about the same time as in Austria, and even earlier in Germany⁹. The expansion of the technical colleges sector was considerably faster in these countries. A basic difference with the establishment of technical colleges in Austria and the other countries mentioned is that already existing institutions were upgraded and expanded as tertiary education facilities. In Austria by contrast the technical colleges applied as new formations.

Figure 2: Students at technical colleges according to course-providing body



Source: BMVFW uni:data warehouse (data retrieval 16 May 2017), own presentation Austrian Council.

⁸ Statistik Austria, 3 May 2017; university, technical college, private university graduates in the 2015/16 study year; teacher training college 2014/15 study year.

⁹ The Technical Colleges Acts were adopted and the technical colleges were established by the individual federal states between 1969 and 1972. The Federal Higher Education Act (HRG) of 1976 raised the technical colleges to the same legal "tertiary level" as the universities and comparable institutions.

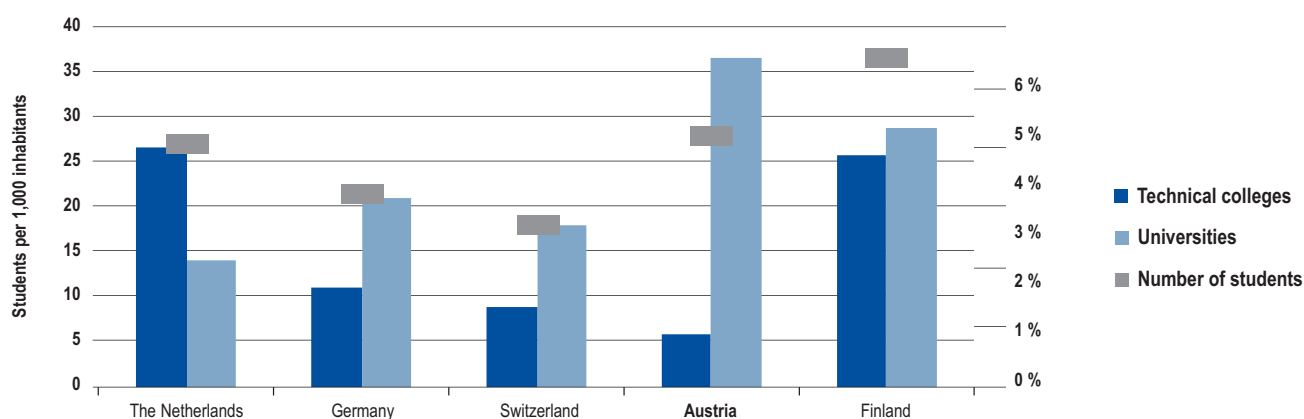
In this selection of countries the Netherlands has the highest percentage of technical college students. Approximately 60 percent study at a technical college. In Finland the growth of the TC sector practically took place in addition to the university sector. With 5.5 percent, Finland has the highest level of students, measured on the entire population. The percentage of students at technical colleges is almost 50 percent (figure 3). In Germany more than 900,000 students study at 215 technical colleges. Compared with the universities the share of approximately 26 percent in 2002 rose to 32.7 percent in 2014. In Switzerland 73,000 and therefore a third of higher education students study at one of the nine technical colleges¹⁰, which were founded in

the mid-90s. In Austria the percentage of students at technical colleges rose compared with the universities from 8.7 percent in 2002 to 15.5 percent in 2015. As figure 3 shows, the number of students of 4.21 percent is largely attributable to the sharply increased student numbers at universities. This rose from just under 200,000 in 2002 to approximately 309,000 most recently.

Staff at technical colleges

In the 2015/16 study year, 15,835 staff were employed in teaching and research at the technical colleges. Their number has therefore more than doubled since 2005, approximately 85 percent, however, are part-time in research and teaching at a technical college. Standardised to full-time equivalents this equals 5,712.5 full-

Figure 3: Distribution of student population at universities and technical colleges in countries comparison



Source: Q: NL, Centraal Bureau voor de Statistiek, DE, Statistisches Bundesamt, CH, Bundesamt für Statistik, AT, Statistik Austria, FI, Statistics Finland; data from 2015 or last available; own presentation Austrian Council¹¹.

¹⁰ The Swiss higher education landscape includes seven public and two private technical colleges.

¹¹ Student numbers = number of those studying relative to the total population.

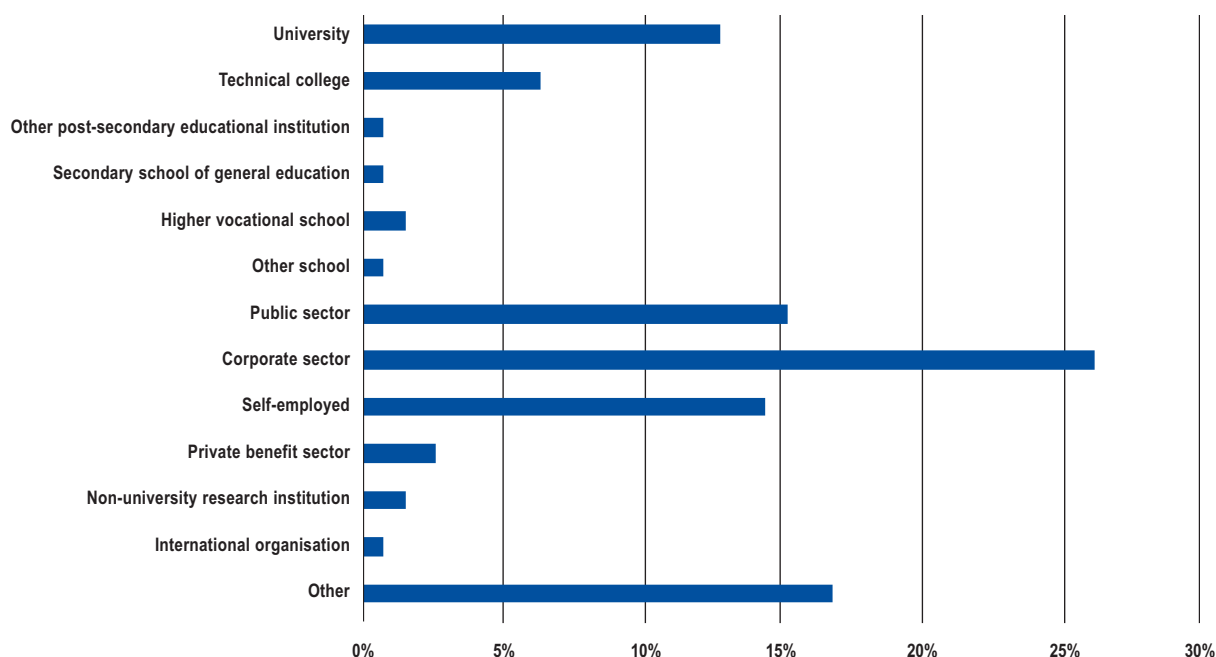
recommendations

time employees¹². A comparably good supervision ratio of teachers to students of approximately 1:8 is derived from this. It should however be noted here that many of these part-time employees only work a few hours and supervision is therefore only available to a limited degree¹³ (figure 4).

The high percentage of part-time teaching staff must be seen as entirely positive when consid-

ering the aspect of incorporating external practical knowledge into the training. Approximately one quarter of teachers work in companies; 14.4 percent are self-employed. In recent years the ratio has shifted here slightly in favour of the part-time teachers at technical colleges. With regard to the expansion of the TC sector a higher percentage of permanent staff would however be preferred. The challenge of ensuring higher quality teaching and supervision and the ex-

Figure 4: Main occupation of part-time educators at technical colleges



Source: AQ-Austria; statistical data on technical colleges.

¹² The number of FTEs has fallen by 217 since the previous year. Uni:data; staff at technical colleges (data retrieval 16 May 2017).

¹³ See § 7. (1) (2) FHStG.

pansion of applied research at the technical colleges requires qualified permanent staff.¹⁴ Figure 14 shows the main occupations of part-time teachers and their relative share in the teaching staff at technical colleges. In the 2015/16 study year, 1,725 full-time staff at universities worked part-time in teaching at technical colleges. A stronger “staffing union” between technical colleges and universities could present an option with regard to the expansion of the TC sector in particular, firstly to cover the staffing requirement, and secondly as an improved basis for further cooperations, in research projects between the educational institutes, for example.

Permeability

Improved permeability in the education system was targeted with the introduction of the technical colleges. In the career-oriented field of studies (especially for applicants with relevant professional qualifications) a possibility for higher education training and further training has basically been created, without doing a school leaving examination in an admission procedure at a technical college or graduating from a technical college study course.¹⁵ A direct transfer from dual vocational training is, however, rare (2 to 4 percent of technical college students). The group that begins a study course at a technical college via the second training path (A-levels or university entrance examination) is nonetheless significantly large. In TC full-time

studies the share is 11 percent; in extra-occupational studies it is even 21 percent. Compared to this only 7 percent of students at a university choose this route¹⁶.

With an increasing number of extra-occupational study courses, technical colleges are therefore already an attractive option for further education in terms of Lifelong Learning (LLL). As also specified in the current technical colleges development plan, the “extra-occupational and occupation-enabling” study forms will also be further expanded. The option of being able to study extra-occupational (many students are also considerably older when their studies begin), also brings about positive socio-demographic developments. With 29 percent the share of those that come from lower social levels is more than twice as high as with beginners that go directly to the higher education system.¹⁷

The permeability between technical colleges and universities is essentially a given. A tripartite structure for academic degrees was adopted in the Bologna process, which will produce more comparability between the degrees/diplomas of different countries and education sectors. A bachelor degree therefore entitles a masters course at another educational institution, for example, or even in another country. The transfer for this requires a sufficient professional qualification for the follow-on study course. The Austrian Science Council¹⁸ and the Univer-

recommendations

¹⁴ Approximately 9,800 teachers and lecturers are employed at universities in part-time positions (the average extent of employment is 17 percent), but the majority of teaching and research is performed by full-time staff at universities. The average extent of employment of scientific staff of the use categories according to Z 2.6 of Annex 1 BidokVUni is 79.5 percent (which does not include the groups: teacher[17], lecturer[18] and student employees); the average extent of employment of use groups 17 and 18 is 14.4 percent. Source: uni:data; universities staff, staff according to use, WS 2015; own calculation AC.

¹⁵ FHStG § 11 f.

¹⁶ Student Social Survey 2015, information on students' social situation 2016, graphic 6.

¹⁷ See Student Social Survey 2015, information on students' social situation 2016, chapter 2.7.

¹⁸ Austrian Science Council – „Fachhochschulen im österreichischen Hochschulsystem, Analysen, Perspektiven, Empfehlungen“; Vienna, May 2012; p.158 f.

recommendations

sity Conference¹⁹ have issued recommendations on permeability in the tertiary sector, which will specify standards for creating improved transparency. With the coming into force of a new ordinance on admission to doctoral programs for graduates of technical college study courses²⁰, transparent guidelines are provided for all graduates and for the cooperation between technical colleges and universities. Core subjects, core competencies and standards for all study courses are defined herein and contribute to the formalisation of the admission of technical college graduates to doctoral studies at universities. Additionally the University Act 2002, the Higher Education Act, the Technical Colleges Act and the Private University Act²¹ were also harmonised, which makes the creation of common curricula and the possibility of cooperation between the educational institutions easier on all education levels. In Austria in the 2015/16 study year 2,272 graduates²² of a bachelor or master study course of a technical college studied at a university. This equals approximately 0.8 percent of students at the universities. 753 graduates with first graduation at a technical college did doctoral studies at a university, the equivalent of 2.8 percent of all doctoral studies. More interfaces between the educational institutes and improved information could produce more permeability here.

Financing the technical colleges

The financing of the technical colleges is generally composed of the components: federal, state, municipal, private money providers, study fees and other smaller contributions. The lion's share here is provided in the form of federal study place financing. The applicable tariffs per study place are the result of a standard cost model and were evaluated for WS 2016²³.

To expand federal-financed study places to 40,851 by 2018 it is planned to increase the funds for this to EUR 316.4 million. Further study places will be provided by the course-providing bodies. Together with these location-financed places, more than 50,000 study places were already created at technical colleges in the 2016/17 study year.

In addition to study place financing with federal funds, contributions by the states, municipalities, companies and interest groups, study fees and revenue from research and development also provide income for the technical colleges. The available data sources²⁴ (detailed statistics on the financing shares of all course-providing bodies are not available) indicate there is a total of EUR 338.93 million in education spending; 75 percent federal funding and 24 percent state and municipal funds. The states of Upper Austria, Styria, Tyrol and Carinthia in particular must be mentioned as important players here. Data on the financing mix was provided for some locations as part of the study

19 "Recommendation of the Austrian University Conference on permeability in the tertiary sector"; Vienna, September 2013.

20 Ordinance of the Federal Minister of Science, Research and Economic Affairs on admission to doctoral programs for graduates of technical college master study courses and technical college degree study courses.

21 The federal law, with which the University Act 2002, the Technical Colleges Studies Act, the Private University Act and the University Quality Assurance Act will be amended is currently being evaluated (by 12 May 2017).

22 Source: uni:data students at universities according to school form (incl. TC bachelor study course, incl. TC-MA/TC degree study course); retrieved on 28 December 2016.

23 TC development and financing plan 2017/18; D-financing.

24 Source: Statistik Austria, education spending statistics; state education spending 2014 according to regional structuring and educational institutions; compiled on 4 March 2016.

commissioned by the Austrian Council on the financial situation of the TC sector in Austria²⁵. At the locations²⁶ used for this the federal and state funding was also around 80 percent of the available budget. In general with the technical colleges it is mixed financing, however the share of public sector funds is higher than commonly assumed. The private sector share is low.

Research at technical colleges

Application-oriented research and development is a requirement for the accreditation of technical college study courses at technical colleges. This also requires qualified teaching and research staff.²⁷ Added to this is the task of promoting graduates with career-oriented training at university level and therefore advanced academisation. The contact with research is therefore also an important component in practical occupational training at technical colleges.

The technical colleges also play an important role in the knowledge and technology transfer (KTT) with the economy in the regions. Unlike the universities, which are primarily oriented towards basic scientific findings, it is the technical colleges which, according to statutory regulations, primarily perform the application-oriented research and development, and in cooperation with SMEs contribute to implementing knowledge and KTT.

In recent years there has been a significant increase in the research volume at some technical colleges. The increased spending from 2002 to 2013 is illustrated in figure 5. For 2015 the FHK calculated a total volume of about EUR 104 million. The spending for research has

therefore more or less increased five-fold since 2002 and consequently increased about twice as fast for the total public sector education spending for the technical colleges, which increased in the same period from EUR 134.1 million to EUR 327.5 million. It should be noted that the information for R&D expenditures in relation to the overall budget can only be used with restrictions due to the scope for interpretation in the assignment of staffing, material and investment costs, similar to the calculations for the share in research at universities.

The spending for research is provided as about 57 percent federal, 27 percent state, 3 percent municipalities and 13 percent other public institutions. The corporate contribution to R&D at technical colleges in 2013 was EUR 11.6 million or 13 percent.

This share in corporate-financed research compared with other higher education areas is entirely worth mentioning. By way of comparison: For the universities, R&D expenditures in 2013 were EUR 1.8 billion²⁸, the financing share of the corporate sector is less than 5 percent here. The most important funding programmes for technical colleges are the COIN-Aufbau, COIN-Netzwerke programme lines and the Josef Ressel Centres. As the result of an evaluation of research funding for technical colleges²⁹ it was clear that the COIN-Aufbau programme line in particular has a high widespread impact. With their long-term runtime, Josef Ressel Centres have a profile-enhancing effect at the locations and are an important mainstay alongside absolute con-

recommendations

²⁵ "Die wirtschaftliche Situation des FH-Sektors in Österreich"; performed at TU Vienna, technical college bachelor study course – Entrepreneurship, 2014.

²⁶ Data was provided for the study (14) by: FH Joanneum, FH Salzburg GmbH, FH St. Pölten GmbH, MCI FH Innsbruck GmbH.

²⁷ FHStG § 8 (1) ff.

²⁸ Statistik Austria; spending and financing spending for R&D.

²⁹ "Evaluation of research funding for technical colleges in Austria", Technopolis commissioned by bmwfw, 2015.

recommendations

tract research. To date Josef Ressel Centres have been set up at 10 locations³⁰.

However further programme lines are also being run by the technical colleges.

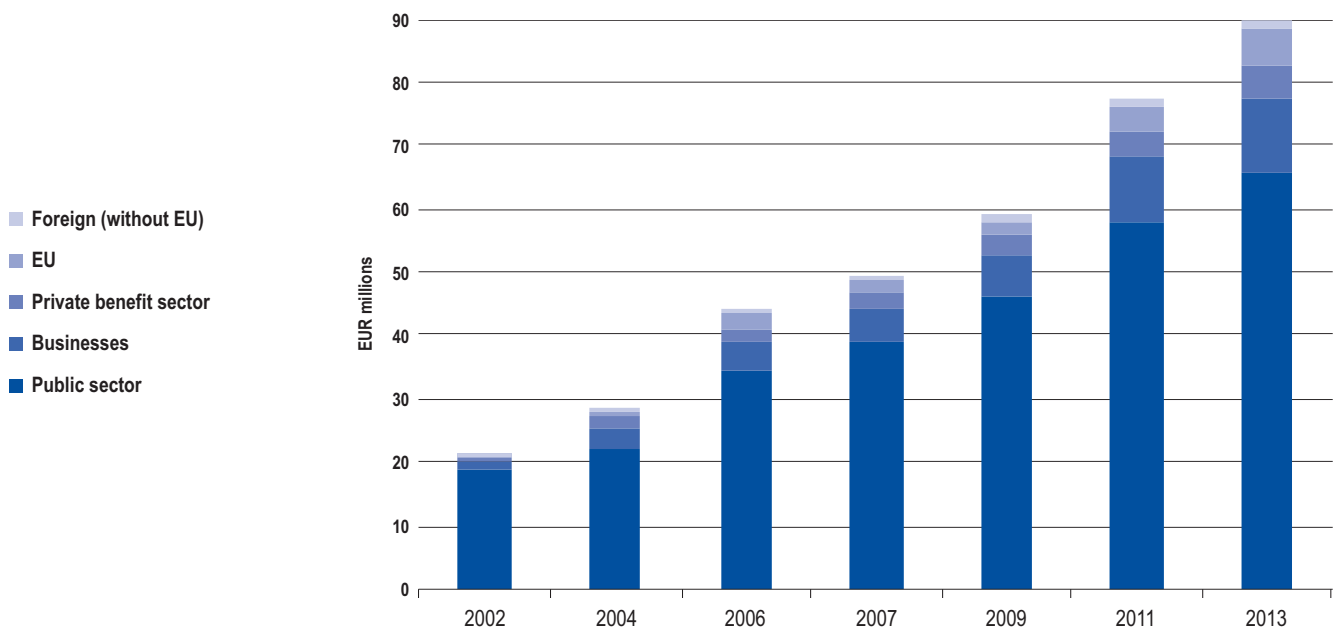
There are also a total of 57 participations by 5 technical colleges in COMET Centres. This data alone proves how the scope and quality of research at technical colleges have experienced noteworthy growth in the past 15 years. This development clearly also requires an adjustment of the existing framework conditions for research at technical colleges.

A reorganization of the Austrian higher education landscape

In the current discussion about the development of the higher education landscape in Aus-

tria, one of the goals is also a further expansion of the technical colleges sector. As already illustrated in the countries comparison, the share of students in Austria at the universities increased sharply, which resulted in part in an overburdening of the study institutions affected. Unlike the universities, which to date can only apply access regulations in specific study courses, with transparently regulated study place management the technical colleges were not affected by this. A stronger expansion of the study place offering at technical colleges could bring two benefits here. With an expansion of the study offering at technical colleges coordinated between universities and technical colleges, this can provide relief for heavily frequented fields of study

Figure 5: R&D spending at technical colleges



Source: Fachhochschulkonferenz.

³⁰ As of May 2017.

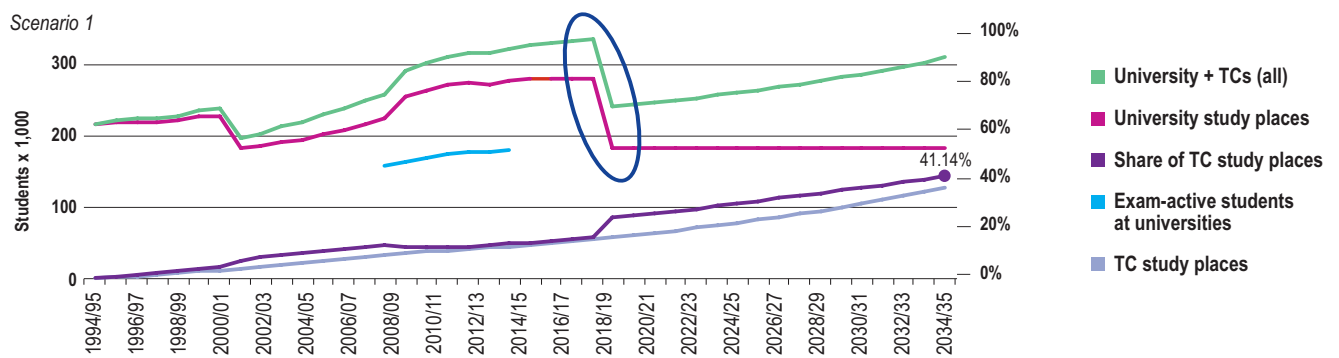
at universities. Steps in this direction were made in the “Zukunft Hochschule” (Future University) process. Secondly the share of students from underprivileged areas in technical colleges is higher, which results in an improvement in general education access. Outside urban areas and especially at research-oriented locations, technical colleges are particularly important in the regions for economic reasons. This applies both to educational and further training offers and cooperations with companies in research and development. The Austrian Council therefore supports the expansion of the technical colleges sector in Austria.

As early as 2012 the Austrian Science Council had already published a comprehensive recom-

mendation for the technical colleges, wherein it drafted three projections with different growth scenarios.³¹ The highest dynamic here is shown with projection III, in which an expansion of TC study places to 116,000 is proposed by 2029/30 and to 160,000 TC study places by 2040. A share of 40 percent is also proposed in the experts report for the university plan³². An even further-reaching quantitative reorganisation of the higher education sectors – 60 percent of students at technical colleges and 40 percent at universities – is formulated by the Austrian Science Council in its publication, “Das österreichische Hochschul- und Wissenschaftssystem – Ein Weißbuch und eine

recommendations

Figure 6: Transformation of the Austrian higher education system³³



Source: Statistik Austria, own calculation Austrian Council.

31 Austrian Science Council: „Fachhochschulen im Österreichischen Hochschulsystem – Analysen, Perspektiven, Empfehlungen“ Vienna (2012), p. 99 ff.

32 A. Loprieno / E. Menzel / A. Schenker-Wicki: „Zur Entwicklung und Dynamisierung der österreichischen Hochschul-landschaft – eine Außensicht“ (2011).

33 The development of the student numbers refers the 2014/15 study year based on the total number of students and will be continued to 2018/2019. For a better illustration of an ideal future development of study places, the calculations were performed for the 2019/20 study year on the basis of a constant number of examination-active students at universities, which produces a leap in the time series. The number of students at technical colleges was continued according to the target values (40 and 60 percent share in TC students).

recommendations

konkrete Utopie” (“The Austrian university and science system – a white paper and specific utopia”).

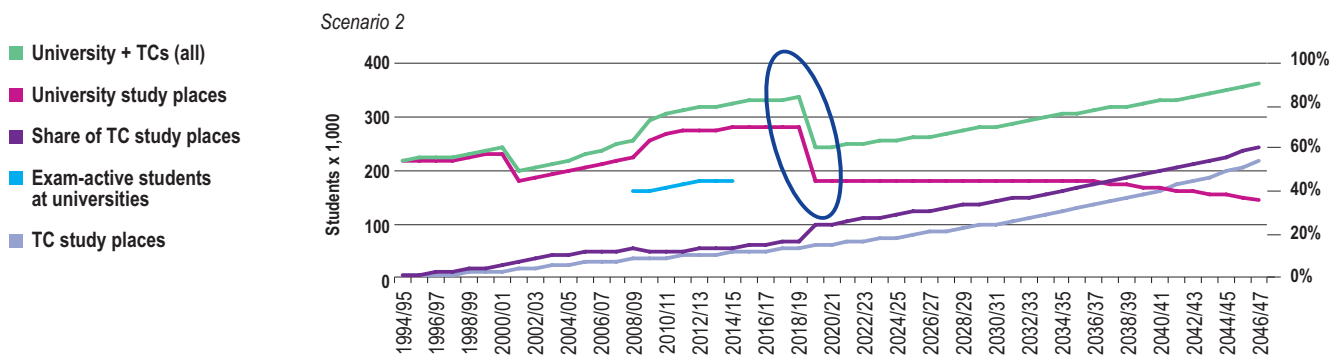
On the basis of these proposals and recommendations, as well as currently available statistics, two scenarios are illustrated here in figure 6 for the model and dynamic with which a quantitative reorganisation of the Austrian higher education system could unfold. Scenario 1 essentially reproduces the calculations of the Austrian Science Council with currently available data. Important criteria for a redistribution of students here are the introduction of a capacity-oriented study place financing and universal study place management at universities, if the share of technical college study places is to be raised similar to the comparison countries to 40 or even 60 percent. With dynamic remaining constant, in accordance with a 5 percent increase in the number

of students at technical colleges per annum and a number of examination-active students at universities assumed as constant³⁴, a transformation of the higher education landscape would be possible in about 20 years (40 percent of students at technical colleges) or 30 years (60 percent of students at technical colleges – figure 6). Medium to long-term the share of study beginners (in 2015/16 with 19,462 approximately 35 percent of students began bachelor or masters courses at one of 21 technical colleges) would have to be increased annually by 1,000 to 2,000 study places. Such a massive transformation of the Austria higher education landscape appears to be feasible over a period of about 30 years, however the requirements for this would have to be met at all levels involved.

Teaching and research staff

With a further expansion of the TC sector as illustrated above, the requirement for teaching

Figure 6: Transformation of the Austrian university system



Source: Statistik Austria, own calculation AC.

³⁴ The definition of examination-active studies in “Wissensbilanz-Kennzahl 2.A.6” is those bachelor, degree and master studies in which at least 16 ECTS points or positively evaluated academic performances are provided in a total of eight semester hours.

and research staff is correspondingly high and could develop into a limiting factor. As already mentioned earlier, the high share of short-term or employees hired with few teaching responsibilities is also an additional challenge here. An accelerated expansion of the technical colleges sector, as shown in scenario 1 (approximately 140,000 students), requires about a tripling of the required staff. Approximately 10,000 full-time equivalents would have to be created for this by 2036. On average 350 full-time equivalents are currently set up each year. This rate would therefore have to at least double. With a “full expansion” by 2046, as outlined in scenario 2, approximately four or five times today’s staffing levels would be required. To keep pace with this, together with the technical colleges, the universities are also called upon to further develop possible models, which do not enable “either-or” but rather “both-and” in teaching and research for the science staff. Suitable legal framework conditions must also be put in place for this. More flexibility in education careers will be a feature of future education systems. Changes are happening in this direction at both the technical colleges and the universities.

These manifest themselves, among other ways, in a high level of diversification in the Austrian higher education system. Public universities offered 1,076 study courses in WS 2015, technical colleges 431; at private universities and teacher training colleges an additional 148 and 97 study courses were offered. At technical colleges approximately 30 percent of the study courses are extra-occupational. This offering is

utilised by approximately 38 percent of technical college students. A further expansion of extra-occupational and occupation-enabling education programmes is provided for in the current FEP 2017/18.

On one hand this expansion is based on the need to meet new qualification requirements oriented on the respective occupational fields, and on the other hand to complete additional training options in different life phases. In this segment the share of students with delayed study start is 82 percent, and approximately 52 percent of beginners are over 26 years old³⁵. The offering for extra-occupational studies appears to be in even higher demand in the future here. According to social studies surveys, a significant number of study beginners only decide on an extra-occupational study course at a technical college some years after completing the regular school system (mostly BHS or AHS) and after some years in the workplace.³⁶ In terms of Life-long Learning (LLL) this trend appears to be even more interesting³⁷ in the future for a specific expansion of occupation-enabling educational opportunities, especially at technical colleges, and is expected to intensify in the coming years. In terms of successful tertiary level education this requires joint planning by all participating educational sectors.

Recommendations

Strategic expansion and financing of the technical colleges sector

The Austrian Council recommends

- an accelerated expansion of the study places at technical colleges with the goal of increas-

recommendations

³⁵ Data from Student Social Survey 2015, round 1, study beginners.

³⁶ See Student Social Survey 2015 2.7 Immediate and delayed study start. In total 26 percent of master’s students in the first study year started their studies more than 2 years after completing the highest regular school system or did not do an entrance examination in the regular school system and caught up with it via the 2nd education/training path.

³⁷ Extra-occupational study courses and students are not identified separately for universities. The share of students with delayed study start at universities is 18 percent.

recommendations

ing the number of students from 120,000 to 140,000 by 2040 and therefore of achieving a share of students at technical colleges of 40 percent of all higher education students. The number of all available study places would have to be increased annually by about 5 percent for this, or an average of 1,350 beginner study places (bachelors and masters). The share of federal funds for study place financing therefore increases on average by EUR 27 million each year. The funding group-specific funding rates must be reimbursed here according to the price development.

- the expansion of the technical colleges sector be supported with a strong staffing union between the technical colleges and the universities. Flexible framework conditions will meet the requirements for this to drive forward cooperations in teaching and research between technical colleges and universities and enable new career models. Regulations for secondary employment of staff at universities must also be provided and harmonised. To guarantee the required staffing levels at the technical colleges, and in particular the increase in the share of full-time staff in teaching and research at technical colleges, the number of additional teaching and research staff must be increased annually by an average of 350 to 800 full-time equivalent employees. This massive build-up of teaching and research staff must be accompanied by quality-promoting measures at the technical colleges, in order to ensure constantly high quality in training at the technical colleges.
- the offering for extra-occupational and occupation-enabling studies, and “not” consecutively structured studies, be increased needs-oriented. An accompanying modularisation of the educational offering increasingly also requires the recognition of informally acquired knowledge as criteria for study admissions. Suitable guidelines must be worked

out due to the expected complexity for admission to studies.

- adjusting the autonomous scope for action of the universities to implement performance and capacity-oriented study place management and create the legal framework conditions this requires.
- continuing the “Zukunft Hochschule” (Future University) strategy process in the form of a permanent strategic control group for the further development of the entire higher education sector. A critical challenge here is a location development that is both research focus-dependent and regionally balanced. A needs-oriented expansion of all technical college, university and private university locations will not be driven here by individual interests, but rather will take place according to quantitative and qualitative requirements.

Permeability

The Austrian Council recommends,

- that the strengths of technical colleges and universities be further developed in a clearly differentiated higher education system – as provided for in the “Zukunft Hochschule” coordination process. The legal framework conditions for graduates of technical college study programmes to do master and doctoral studies at universities are provided in the form of more transparent admission criteria. The legal framework to create common curricula for studies and study programmes across the entire Bologna structure, from bachelor and masters through to doctoral studies, offers scope for cooperations between technical colleges and universities. For doctoral studies the legal studies assignment must remain with the universities here.
- a coordinated human resources development be ensured to increase the flexibility of educational and research careers of both higher education sectors. The range of tasks of a strategic cross-university committee responsible for this (a staff committee of the Univer-

sity Conference, for example) incorporates aspects of human resources development with regard to research, teaching and further training in equal measure.

- the share of students at technical colleges with apprenticeship diplomas, completion of a BMS master's certificate or comparable knowledge be increased with suitable measures at the applicable educational levels. A strong dual training system is a success model and a guarantee of high youth employment. The requirement therefore emerges to develop further training models, which teach young people that the model of dual teaching and an apprenticeship diploma via a master's certificate can offer attractive opportunities, such as going on to occupation-enabling university-type further education at a technical college. A cross-institution strategy with the inclusion of relevant stakeholders (BMWWF, BMB, university conference, chamber of commerce, chamber of labour) should support a sustainable process for this.

Research at technical colleges

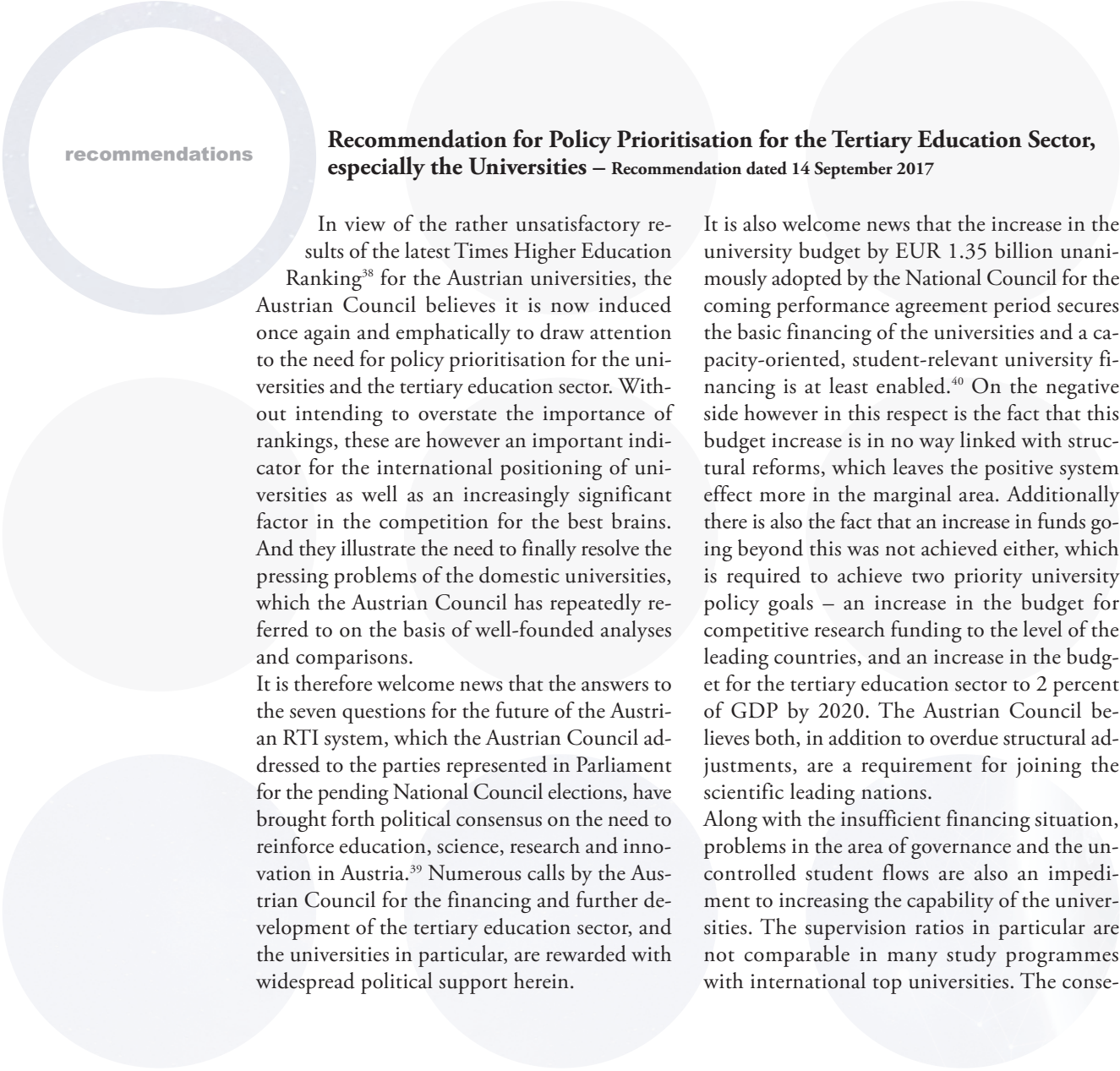
Research at technical colleges is a KTT driver between companies and the universities. However they are only equipped within limits for this, or only satisfactorily equipped at few locations. The future requirements in training and a speedier expansion of the sector therefore require new or extended framework conditions for research operations at technical colleges. To further increase the attractiveness of research at technical colleges for companies and other stakeholders and to guarantee high quality in requirements-oriented research at technical colleges, the Austrian Council recommends,

- significantly increasing the funding volume for the expansion in funds awarded in competition of specific funding mechanisms in accordance with the COIN-Aufbau and COIN-Netzwerke programmes and the Josef Ressel Centres (JRCs) and orientation on the

requirement for research cooperations by companies.

- 10 JRCs are currently operated. Where required a further expansion of one or two JRCs annually should be targeted. The additional financing requirement is approximately EUR 600,000 per year.
- The COIN-Aufbau programme line had high over-subscription in the last tender. Only 14 or about 21 percent of the 65 applications submitted were funded. Numerous projects classified as worthy of funding could not be financed. It is recommended the funding volume of COIN-Aufbau be increased to EUR 14 million per tender to therefore enable a funding quota of approximately 30 percent.
- The tender volume for the COIN-Netzwerke programme line including a share of the service initiative was EUR 4.5 million. It is recommended the volume be maintained.
- for existing and new research programmes at technical universities an overhead component be introduced and therefore the existing financing mix at research-intensive TC locations be extended. As a guide value the Austrian Council recommends a lump sum of 20 percent on the project costs (staffing, equipment and material costs as well as asset utilisation). An increasing share in third party funded projects on one hand requires a higher share in own account contributions and is only possible by introducing qualified research personnel. Purely project-financed research is prone here to heavy fluctuations and therefore restricts a successful further development of the research at technical colleges.
- funding the expansion of cooperation-promoting measures between technical colleges and universities, which can be applied for by both cooperation partners, to boost incentives for the joint development of research and research infrastructure projects (tender for dual professorships, infrastructures, etc.).

recommendations



recommendations

Recommendation for Policy Prioritisation for the Tertiary Education Sector, especially the Universities – Recommendation dated 14 September 2017

In view of the rather unsatisfactory results of the latest Times Higher Education Ranking³⁸ for the Austrian universities, the Austrian Council believes it is now induced once again and emphatically to draw attention to the need for policy prioritisation for the universities and the tertiary education sector. Without intending to overstate the importance of rankings, these are however an important indicator for the international positioning of universities as well as an increasingly significant factor in the competition for the best brains. And they illustrate the need to finally resolve the pressing problems of the domestic universities, which the Austrian Council has repeatedly referred to on the basis of well-founded analyses and comparisons.

It is therefore welcome news that the answers to the seven questions for the future of the Austrian RTI system, which the Austrian Council addressed to the parties represented in Parliament for the pending National Council elections, have brought forth political consensus on the need to reinforce education, science, research and innovation in Austria.³⁹ Numerous calls by the Austrian Council for the financing and further development of the tertiary education sector, and the universities in particular, are rewarded with widespread political support herein.

It is also welcome news that the increase in the university budget by EUR 1.35 billion unanimously adopted by the National Council for the coming performance agreement period secures the basic financing of the universities and a capacity-oriented, student-relevant university financing is at least enabled.⁴⁰ On the negative side however in this respect is the fact that this budget increase is in no way linked with structural reforms, which leaves the positive system effect more in the marginal area. Additionally there is also the fact that an increase in funds going beyond this was not achieved either, which is required to achieve two priority university policy goals – an increase in the budget for competitive research funding to the level of the leading countries, and an increase in the budget for the tertiary education sector to 2 percent of GDP by 2020. The Austrian Council believes both, in addition to overdue structural adjustments, are a requirement for joining the scientific leading nations.

Along with the insufficient financing situation, problems in the area of governance and the uncontrolled student flows are also an impediment to increasing the capability of the universities. The supervision ratios in particular are not comparable in many study programmes with international top universities. The conse-

³⁸ Three Austrian universities fell slightly again in the latest Times Higher Education World University Ranking. The University of Vienna as the best domestic university lost four places compared to the previous year and is now ranked only number 165. The Vienna University of Technology fell out of the 251–300 range, and the Johannes Kepler University Linz plummeted to the 501–600 range. The Leopold Franzens University Innsbruck improved, however, moving up into the 251–300 range. All other Austrian universities listed in the current ranking did not change their positions. See: <https://www.timeshighereducation.com/world-university-rankings>

³⁹ See “Seven questions to the body politic”; <http://www.rat-fte.at/news-reader/items/id-7-fragen-an-die-politik.html>

⁴⁰ See the Austrian Council’s recommendation on funding universities and public sector research and development in Austria in the federal funding framework 2017 to 2020, chapter, “Science and Research” of 5 February 2016; <http://www.rat-fte.at/einzelempfehlungen.html#2016>

quences are unnecessarily longer study periods and high drop-out rates. The body politic is called on here to finally create financial and structural framework conditions for the universities.

The following table illustrates the clear correlation of available budget, the number of students and professors and the output and research quality at the universities compared.

Austria's human capital is the key factor for a successful scientific, cultural and social development of the nation. It is therefore extremely important in economic terms that the average

level of education be increased permanently. All education levels in a future-oriented process must be incorporated and promoted for this. Essential requirements here are optimisation of the framework conditions for the primary and secondary education levels, as well as an improved transfer of basic competencies and new ways of thinking.⁴¹ There is special requirement in particular for a future-oriented further development of the universities, as these decisively influence Austria's future development through education and training.

recommendations

Comparison of a selection of universities in Germany, Switzerland and Austria (2016)

	Budget in EUR bn (14)	Students at universities (15/16)	Number of professors	Graduates	Rel. student/professor ratio	Funding/students	Funding/graduates EUR	Shanghai Ranking 2016	THE Ranking 2016
TU Vienna	0.332	29,159	143	2,770	204	11,403	120,034	401–500	251–300
TU Graz	0.206	13,758	126	1,845	109	14,940	111,409	–	351–400
FIT Zurich	1.595	18,744	483	4,124	39	85,106	386,813	19	9
FIT Lausanne	0.904	9,908	328	2,296	30	91,191	393,521	101–150	30
TU Munich	1.329	38,615	528	8,911	73	34,417	149,142	47	46
KIT Karlsruhe	0.861	24,432	300	5,396	81	35,232	159,526	201–300	144
TU Darmstadt	0.444	26,503	303	4,140	87	16,734	107,126	401–500	201–250
	Budget in EUR bn (14)	Students at universities	Number of professors	Graduates	Rel. student/professor ratio	Funding/students	Funding/graduates EUR	Shanghai Ranking 2016	THE Ranking 2016
Uni Vienna	0.533	94,738	416	9,719	228	5,625	54,835	151–200	161
Uni Graz	0.226	28,780	184	3,486	156	7,847	64,781	no	401–500
Uni Zurich	1.374	26,050	613	5,628	42	52,750	244,162	54	106
LMU Munich	0.655	50,481	738	9,185	68	12,975	71,312	51	30
U Frankfurt a. M.	0.603	45,379	600	5,824	76	13,279	103,468	101–150	201–250
U Heidelberg	0.706	29,813	523	5,421	57	23,694	130,308	47	43

Source: Switzerland: Data cube: finances, degrees, students, FIT Zurich staff, HR data;

Germany: Statistisches Bundesamt – universities, statistical data of selected universities;

Austria: Statistik Austria, universities; uni:data; universities' annual financial statements; Austrian Council calculations.

⁴¹ For this, see the recommendations of the Austrian Council in the Report on Austria's Scientific and Technological Capability 2017, p. 44.

recommendations

The new challenges in the age of digitalisation must be addressed more intensively than has been the case – both by the body politic and by the universities themselves. The digitalisation index of the Fraunhofer Institute shows Austria at only number 19 among the 35 countries considered.⁴² This is an alarming signal, as countries such as Denmark, Germany, Finland, the Netherlands, Sweden and Switzerland are reacting significantly better than Austria to the digital challenge. A study of the Austrian e-learning landscape⁴³ also shows an urgent need for action at the universities. Strategies for digitalisation, incentive systems for teachers and co-operation models are extensively missing.

Recommendations

The Austrian Council recommends the future government set a policy priority for the tertiary education sector, and the universities in particular. The objective of the higher education policy in the coming legislative period must be to guide the universities towards excellence. The Austrian Council has recommended the reform steps required for this to remove the existing problems time and again for many years now. The most important aspects are highlighted once again in the following.

Structural further development of the higher education area

The Austrian Council believes it is urgently necessary to accelerate measures for the structural further development of the Austrian higher education area. To this end the tasks and functions of universities and technical colleges must be strategically coordinated with one another more intensively than before. It is also essential that the accelerated expansion of the technical colleges sector be increased by the share of TC study places over the entire higher education area by 2040 to approximately 40 percent.⁴⁴

Introduction of quality-oriented study place management

To improve the study conditions at the universities⁴⁵ the Austrian Council recommends the introduction and consistent implementation of capacity and quality-oriented study place management. The implementation of fair and socially-balanced access management is indispensable with the planned establishment of capacity and student-relevant university financing⁴⁶. To select the best suited students, a cross-discipline orientation phase should open up the scope to evaluate personal motivation, commitment and talent as criteria for a chosen study course.

Expansion of human and infrastructural resources

The poor supervision ratio in many study pro-

⁴² Fraunhofer ISI / ZEW (2017): Innovation Indicator 2017. Berlin, p. 36.

⁴³ Forum neue Medien in der Lehre Austria (2016): Die österreichische Hochschul-E-Learning-Landschaft. Study to record the status quo in the e-learning landscape in the tertiary education with regard to strategy, resources, organisation and experiences. Vienna.

⁴⁴ See "Recommendation for the further development of the technical colleges sector in the Austrian education and science system"; Austrian Council, 30 May 2017; <http://www.rat-fte.at/einzelempfehlungen.html#2017>

⁴⁵ Study conditions have been suffering for some years now under constantly increasing student flows. The universities currently report approximately 308,000 students (see, uni:data students at universities) – winter semester time series (retrieved on 6 September 2017). Of these 181,657 are identified as examination-active (see uni:data, Table 2.7 Examination-active bachelor, degree and master studies at universities (2014/15 study year); retrieved on 6 September 2017). Of the examination-active in turn only about 130,000 students achieve at least 30 ECTS points per year, whereby about 60 ECTS points would be required for a standard period study course.

⁴⁶ The draft of the federal law will be evaluated until 14 September 2017.

grammes is one of the main reasons for longer study times and high drop-out numbers. The Austrian Council therefore recommends the number of scientific staff required in the study programmes affected be increased to an internationally comparable level and that appropriate positions be set up at the higher education institutes.

An expansion in the infrastructural capacities is also equally required. If more students are to be educated in terms of the formulated quality goal and the quality and quantity of the research output are to be increased, these too must also be guaranteed with a significantly higher financing basis. The Austrian Council emphatically reaffirms its recommendations in this respect.⁴⁷

Increasing competitively allocated financing for research

The continuing deficit in competitive funding of basic research compared with the leading research countries is considerable and acts as an impediment to the performance and international appeal of scientific research in Austria.⁴⁸ In order to broaden the spearhead of superb research in Austria and to improve the research conditions of Austria as a science location, the Austrian Council therefore also urgently and emphatically recommends a four-fold increase in funds awarded in competition for funding the basic research of the FWF to the level of the leading nations.

Increase in funds for the tertiary education area to 2 percent of GDP

The Austrian Council once again recommends immediate appropriate measures to achieve the goal of providing 2 percent of GDP by 2020 for the tertiary area. This is necessary because only a continuous increase in expenditure will guarantee sustainable growth in science and research. For implementation we would refer to the Austrian Council's individual recommendations in this respect.⁴⁹

Swift expansion of digital infrastructures and implementation of digital technologies

The Austrian Council emphatically recommends the measures of the Digital Roadmap Austria⁵⁰ be implemented. It also recommends the framework conditions be adapted to the higher education institutes so that the requirements of digitalisation are met. The human resources development at the higher education institutes in particular must be designed according to the new requirements, in order to perform tasks that require a higher division of work and level of teamwork (e-moderation, didactic design, supervision). Financial and human resources required for this must be provided. The required legal framework conditions for Open Educational Resources must also be shaped in the interest of the freest possible access to study and teaching material.

recommendations

⁴⁷ Austrian Council's recommendation on the development of the higher education and science system in Austria of

5 Nov. 2013; Austrian Council's recommendation on funding research and development in Austria of 7 Sept. 2015.

⁴⁸ See Report on Austria's Scientific and Technological Capability 2017; p. 48, para. 19

<http://www.rat-fte.at/leistungsberichte/articles/leistungsberichte.html>.

⁴⁹ The Austrian Council's recommendation on funding research and development in Austria of 30 May 2016; The

Austrian Council's recommendation on funding for education, research and innovation in Austria of 5 September 2016;

The Austrian Council's recommendation on budgetary priority setting in Austria of 19 December 2016.

⁵⁰ Federal Chancellery and Federal Ministry of Science, Research and Economic Affairs (2016): Digital Roadmap Austria.

Vienna. www.digitalroadmap.at

Recommendation Regarding the Use of the Funding provided by the National Foundation for RTD for 2018 – Recommendation dated 30 November 2017

Preamble

On the basis of the Foundation Council's decision of 26 September 2017 with respect to awarding funds for 2018 on 28 September 2017, the Austrian Council was invited in acc. with § 11 para. 1 item 1 of the RTD National Foundation Act to issue a recommendation on the use of the Foundation's funding for 2018. This was to be made on the basis of the applications submitted. According to the last estimate approximately EUR 107 million in Foundation funds will be available for 2018. The total application volume for 2018 is EUR 256,175,000.

The basis for the decision on awarding funds is the strategic importance and socio-political relevance of the projects submitted and their classification in the overall context of Austrian research funding. The Austrian Council also defines the following priorities for awarding funds for 2018 in descending priority:

1. Reinforcing the research infrastructure with initiatives with appropriate critical variables and risk potential
2. Coordination and harmonisation of regional and federal RTI activities
3. Reinforcing the national human potential basis
4. Reinforcing competitive funding in basic and applied research
5. Reinforcing innovation potential with "Open Innovation"
6. Risk capital reinforcement
7. Measures to strengthen location Austria for research-active companies

On this basis the Austrian Council makes the following recommendation for the expected EUR 107 million in Foundation funds for 2018.

Recommendation

Reason

Ideas Lab 4.0

This is an exciting cross-industry/sector approach focussing on digitalisation. Innovative

selection procedures, not found in the current funding landscape, will enable entry for new target groups and funding recipients into the system.

Research Partnerships

The programme complies with Austrian Council Recommendation 2.4, a dissertation programme in terms of Private Public Partnerships, to consequently reinforce the structured cooperation between industry and science.

R&D Infrastructure Funding

As the Austrian Council has already determined, an own funding mechanism for setting up research infrastructures of critical dimensions is not provided in Austria. The project enables the inter-sector financing of the research infrastructure in Austria. There are currently few other financing options for this area. This also explains the high level of requirement from the community. As part of the first tender only about 10 percent of the applied for funds were covered.

Innovation Workshops

The programme offers funding recipients access to top quality technology for pilot applications and prototypes. While the requirement in the community is given as high, content overlaps also emerge with the infrastructure funding. Project funding tends to be divided into small sections, which makes the leverage with high-tech investments questionable.

BRIDGE

BRIDGE is a long-established programme. The cooperation between science and economy is an attractive option. An allocation of the funds as high as possible is recommended according to the resources available.

Impact Innovation

This programme offers the funding of innovative projects and social innovations via crowdsourcing. It structurally addresses a sim-

ilar target group, such as comparable aws programmes in the area, even if the basic focus is different. Generally speaking a relatively broad target group is addressed, which brings the stimulation effect into question.

Quantum Research and Quantum Technology

Austria already has a good international reputation in the field of quantum technology. The programme will in par-

recommendations

Institution	Title	Volume applied for in EUR m	Recommendation in EUR m
FFG	Ideas Lab 4.0	3,000	3,000
FFG	Research Partnerships - Industry Related Dissertations	4,000	4,000
FFG	2nd R&D tender – Infrastructure Funding	25,000	12,000
FFG	2nd Innovation Workshops tender	3,300	0
FFG	BRIDGE	15,000	10,000
FFG	Impact Innovation	7,000	2,500
FFG	Quantum Research and Quantum Technology	11,900	6,000
FFG	R&D Innovation Partnerships	2,000	2,000
FFG	Laura Bassi Centres 4.0 – Women Shaping Digitalisation	7,000	2,500
FFG	Development of the Austrian Quantum Computer	5,175	5,100
FWF	Matching Funds Initiative	8,360	5,500
FWF	Research Groups (RG)	20,000	6,200
FWF	Synthesis Networks	20,000	0
FWF	TRANSFORM Pioneer Labs as Nucleus for a Nationwide Excellence Programme	10,600	5,000
FWF	SFB and DK	33,610	18,000
CDG	11 CD labs	12,313	7,000
LBG	Sustainable Establishment of the Open Innovation in Science and Research Competence Centers	4,000	3,000
LBG	Digital Health meets Social Needs – Foundation of LBI for Digital Health	13,224	6,000
ÖAW	APART-GSK	11,000	0
ÖAW	Global Eurasia – Comparison and Connectivity	2,500	0
ÖAW	go!digital NG	4,000	3,000
aws	Venture Capital Initiative (VCI)	10,693	0
aws	Licence.IP Technology Transfer to SMEs with Innovation In-Licensing	10,000	2,000
aws	aws Creative Catalyst	4,500	3,200
aws/FFG	Expansion of the Global Incubator Networks (GIN)	8,000	1,000
Total		256,175	107,000



recommendations

ticular serve the preparation for the EU FET Flagship 2018. This requires the building up of human resources in the area of quantum physics in Austria, which will be boosted by this programme. The planned close cooperation with aws and FWF as part of the initiative must be positively emphasised here.

F&E Innovation Partnerships

This programme makes Austria the frontrunner in the area of innovative public sector procurement. The procurement strategy is well set up, but it needs some very clear, meaningful, user-driven flagships. An innovation mobilisation across and beyond various political and administrative areas is also possible.

Laura Bassi Centres 4.0 – Women Shaping Digitalisation

The Laura Bassi Centres are a good complementary programme for further developing expertise in Austria. Similar programmes for promoting the work of women, excellence and cooperation with companies are at the least available in sub-areas with FWF and FFG. The Laura Bassi Centres are nonetheless established and make an important contribution.

Development of the Austrian Quantum Computer

The significance of quantum physics for Austria's future is extremely important, and the transfer of the knowledge developed in recent years especially so. The desired approach contains all the necessary parameters to implement the targeted knowledge transfer.

Matching Funds Initiative

Matching Funds is an innovative governance model that promotes an efficient interconnection of federal and state funding in the RTI area, and it in particular pursues the priorities and recommendations of the Austrian Council.

Research Groups (RG)

Research Groups (RG) are a new programme that will enable the funding of smaller research groups. For researchers at the beginning of their career in particular an approach of

this kind can promote cooperation between researchers on the right level.

Synthesis Networks

This programme serves to establish expertise for digital infrastructures. This is the continuation of the Open Research Data pilot programme. The evaluation of the forerunner initiative must be awaited before any further financing can go ahead. How much the data expertise will be integrated into the different science areas is also an open issue.

TRANSFORM – Pioneer Labs As the Nucleus for a Nationwide Excellence Programme

The project offers a modular programme structure to support the development and establishment of an Austrian excellence programme. The addressed expansion of the knowledge transfer between basic research, development and application, as well as the building up of human potential and future-oriented qualifications are all very welcome. As this is a new project, the Austria Council recommends the initiative be started first as a pilot, to gather learning experience in practice, which can then be considered in full operation. The Austrian Council also and in particular reiterates here that the results and experiences of the LBG should be allowed to flow into the open innovation area.

SFB and DK

The special research areas (German abbreviation: "SFB") are a superb funding concept with very high quality and maximum requirement for research and teaching. SFB financing is an essential factor of top-quality interdisciplinary research in Austria.

The PhD programme (German abbreviation: "DK") received a very positive evaluation in 2014 with a view to its value for training highly qualified scientists. Although the PhD courses are among the core tasks of the universities, the additional and complementary financing of the structured PhD programme by the FWF seems essential for the universities until further notice.

11 CD Labs

The CD labs are a proven mechanism in promoting the cooperation between science and economy and for promoting knowledge transfer.

Sustainable Establishment of the Open Innovation in Science and Research Competence Centre

The application clearly corresponds with the Open Innovation focus set by the Austrian Council for 2018. The Open Innovation Science Research and Competence Centre was funded in 2016 with EUR 2 million from the NFTE. EUR 6 million had been applied for. The range of tasks and the runtime subsequently had to be restricted. In 2017 the financing from the National Foundation was stopped due to the low level of available funds. The Austrian Council therefore believes financing in 2018 is appropriate.

Digital Health meets Social Needs – Founded by LBI for Digital Health

The Austrian Council recommends the financing of one of the two new LBIs to be formed, which will generate innovative research projects at the interface of healthcare, STEM and GSK via the user requirements starting point. The project will make an important contribution to the digitalisation of the Austrian healthcare system. It also provides a new, to date unexplored approach with innovative methods.

APART-GSK

Basically post-doc funding in the GSK area is an approach worth pursuing. The institutional position of the ÖAW and its alternative funding possibilities are not clearly visible in this context when considering the proposed initiative. The Austrian council believes the possibility exists of also funding individual people in other ongoing funding programmes with tenders with no thematic restrictions.

Global Eurasia – Comparison and Connectivity

The choice of Eurasia as the specific focus point is not comprehensible. This is regret-

table, as the proposed measures are good and appear to be innovative. The quality of the application exhibits optimisation potential.

goldigital NG

goldigital is a key programme for funding digitally supported research. The role of the GSK in society and the cross-discipline transfer of technologies are front and centre. The project therefore enables an increase in the quality and quantity of research work in the GSK. To be positively emphasized here is also the close connection to European research programmes such as Clarin-ERIC or DARI-AH.

Venture Capital Initiative (VCI)

The Venture Capital Initiative basically addresses a weak point of the Austrian RTI landscape. The fund's investments over recent years must now take effect in the system. The percentage of investments outside Austria is still very high. This trend must continue to be observed. Additional funds are therefore not recommended for 2018 either.

Licence.IP Technology Transfer to SMEs with Innovation In-Licensing

SMEs in Austria in particular exhibit weaknesses in the IP area, both with regard to awareness of the importance of IP and to specific know-how in its utilisation. The programme makes an important contribution here to improving the use of intellectual property by SMEs. A similar initiative is not yet available in Austria, but there is a comprehensive offering by aw's in the IP area. It must be ensured that License.IP is integrated in the best possible way into this existing offer and that it also cooperates with the ÖPA within the scope of the IP strategy.

aw's Creative Catalyst

The creative market is an important success factor for Austria as a business location. This is also confirmed by the Austrian creative market strategy. The pilot programme first of all enables the cross-industry/sector effect (trans-

recommendations

recommendations

formation power and cross-over effects) of the creative market input to be addressed.

The role of the creative market as an inherent part of innovation processes can then be supported in the best possible way.

Expansion of the Global Incubator Network (GIN)
The establishment of the Global Incubator

Network (GIN) was recommended during the course of the special tranche of the National Foundation 2015 for funding. Before this concept is further expanded, the Austrian Council believes the sustainability of the initiative's effect should first be observed. Corresponding verification should be provided by June 2018.

Recommendations on the way to the forefront of innovation –

Recommendation dated 30 November 2017

With the beginning of a new legislature period and the future Federal Government taking office, in this recommendation the Austrian Council topicalizes what it believes to be the most important areas under construction of the Austrian RTI system, which stand in the way of its further development to an innovation leader. According to its legal assignment, the Austrian Council gets to grips with the challenges of the domestic science, research, technology and innovation landscape. Key tasks here include observation of the relevant developments (international comparison included) and the evaluation of their importance for the domestic RTI system. The results of these monitorings form the basis of this recommendation. The Austrian Council believes the following 17 points in the areas of **RTI governance, universities and basic research, research funding and innovative start-ups** are highly relevant, which is why the new Federal Government should address these as high priorities:

RTI Governance

1. Working out an RTI Strategy 2030
2. Initiation of an RTI policy reform process at the highest political level
3. Development of higher level national topic management

Universities and basic research

4. Structural further development of the higher education area
5. Introduction of quality-oriented study place management

6. Expansion of human and infrastructural resources of the universities
7. Adjustment of legal data protection basics to maintain the international competitiveness of research
8. Swift set-up of digital infrastructures and technologies
9. Increase in funds for the tertiary area to 2 percent of GDP

Research funding

10. Increased efficiency and effectiveness of research funding
11. Improved access to and scientific use of federal statistics data
12. Increased competitively allocated financing for basic research to the level of the leading nations and the entire R&D expenditures for the future orientation of state spending
13. Acceleration of the measures to increase the private sector share of R&D funding
14. Making indirect research funding for young companies attractive

Innovative start-ups

15. Optimisation of the legal and financial framework conditions for start-ups
 16. Implementation of tax relief for start-ups
 17. Development of new financing possibilities for innovative young companies and SMEs
- The 17 points mentioned are listed in detail in the recommendations at the end of this document (from page 20).

Background

RTI Strategy 2020: Goal achievement unlikely

The Austrian Federal Government started an ambitious project in October 2009 – the working out of a strategy for research, technology and innovation (RTI Strategy). The RTI Strategy was hammered out with the participation of six ministries coordinated by the Federal Chancellery. Its declared goal: To rank Austria among the leading innovation nations by 2020.

The Austrian Council has defined the RTI Strategy as an important milestone for the future development of the Austrian RTI system and the superordinate objectives as ambitious. A look at the most innovative countries in Europe and the world shows that almost without exception these all have binding strategy documents. The Austrian Council has therefore repeatedly welcomed the fact that the Austrian Federal Government has followed these international good practice examples and has also anchored diverse, more specific objectives and measures as a number of other international comparison documents in its strategy.

Despite these ambitious objectives, the Austrian Council has repeatedly drawn attention in its annual reports on Austria's scientific and technological capability to the fact that the admirable political intentions only insufficiently correlate with the actual operative implementation intensity. This discrepancy between claim and reality has become a recurring motif in all the Austrian Council's reports over the years. It therefore comes as no surprise that eight years after initiation of the RTI Strategy project and shortly before reaching the time horizon, we must draw a rather sobering conclusion: It has not been possible to achieve the most important strategic objectives.

On the contrary: Austria's innovation performance has not improved on the whole since 2009 in relation to the innovation leaders. It has clearly not been able to successfully utilise

the comparably favourable starting position, which was indicated by the RTI Strategy. The main problem here is clearly the lost development dynamic, which results in Austria not being in a position to sufficiently make up for lost ground. The performance of the Austrian RTI system compared with the leading innovation nations is illustrated in figure 7. It includes all indicators for the 74 objectives of the RTI Strategy used by the Austrian Council in its Report on Austria's Scientific and Technological Capability in the comparison with the average level of the innovation leaders.

This provides a good overview of Austria's performance in all areas of the RTI strategy and in relation to the leading nations. The figure illustrates the areas in which the objectives of the RTI Strategy have been achieved and Austria's performance and development dynamic is better than that of the innovation leaders – all indicators in the right top quadrant – and in which it is behind the leading nations without a realistic chance of achieving the level of the leading nations by 2020 – so the development trends remain constant (all indicators in the left bottom quadrant).

It is quite clear that the greater part of the indicators are in the left lower quadrant of the graphic. This overall situation has not changed much since 2009. This means that Austria's catch-up dynamic is insufficient on the whole to achieve the objectives of the RTI Strategy and the level of the innovation leaders. The RTI Strategy's priority goal of becoming one of the leading innovation nations by 2020 therefore will not be achieved.

Austria in international rankings: Stagnation to downward trend

These findings are corroborated by the most diverse analyses and Austria's positions in international rankings, in particular the European Innovation Scoreboard (EIS), on which the RTI

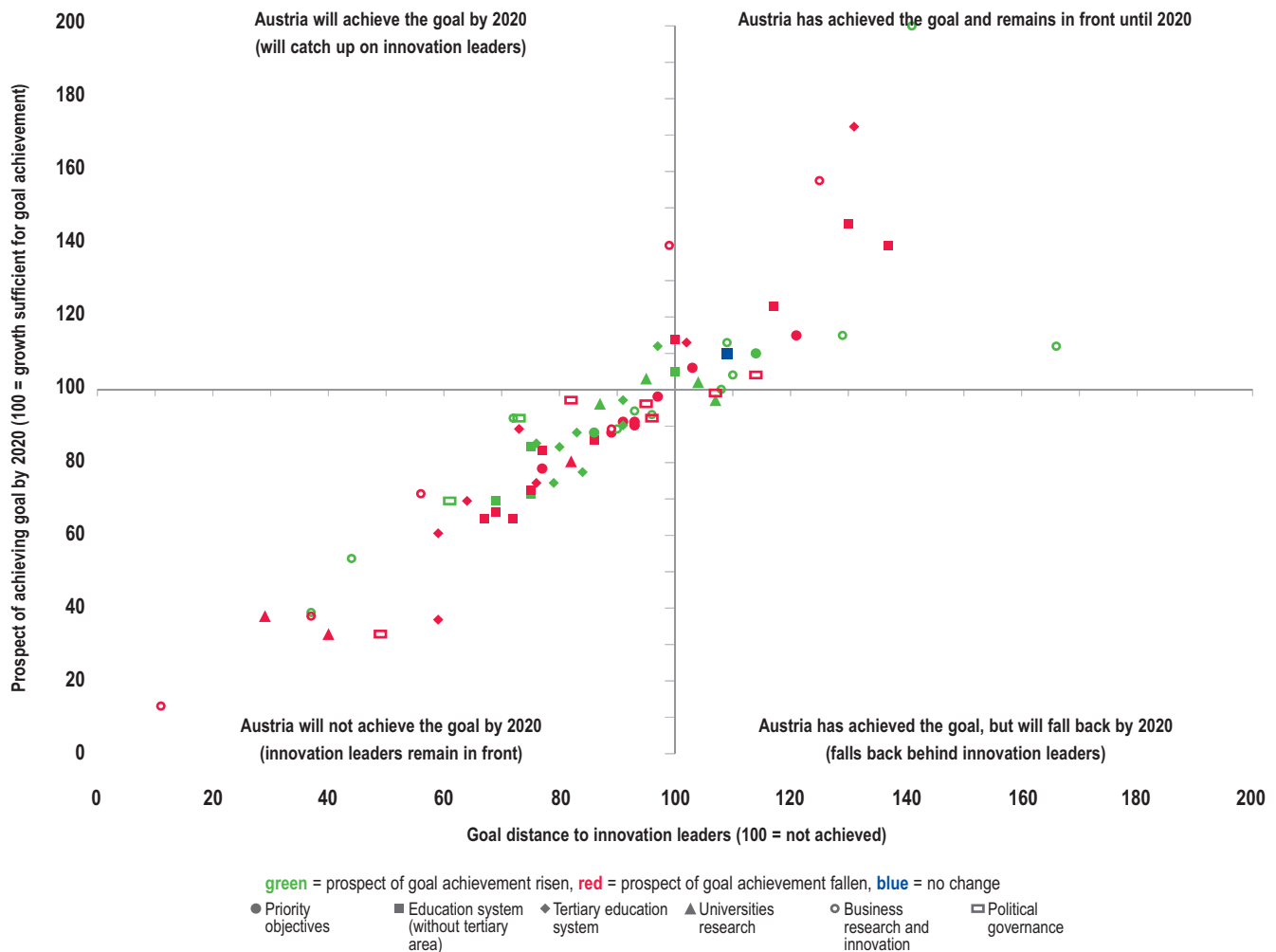
recommendations

recommendations

Strategy and its overriding objective⁵¹ are oriented. According to the EIS, Austria is currently ranked number 7 in the EU (or 9 when non-EU members such as Switzerland and Iceland are also includ-

ed), and therefore recently once again took the lead in the “Strong Innovators” group. With Austria’s return to the head of the chasing pack, it is however at exactly the same position it had eight years ago when the RTI Strategy was be-

Figure 7: Overview of Austria’s performance in all areas of the RTI strategy and in relation to the leading nations



Sources: See Appendix 1, WIFO presentation. Raw data, see Appendix 2. Explanation, see Appendix 3.

Note: Goal Distance = Austria’s actual value relative to the national target or the innovation leaders’ actual value (average value for the most recent available year for DE, DK, FI, NL, SE);

Prospect of Goal Achievement = Value projected for Austria in 2020 relative to the national goal or the value projected for the innovation leaders 2020.

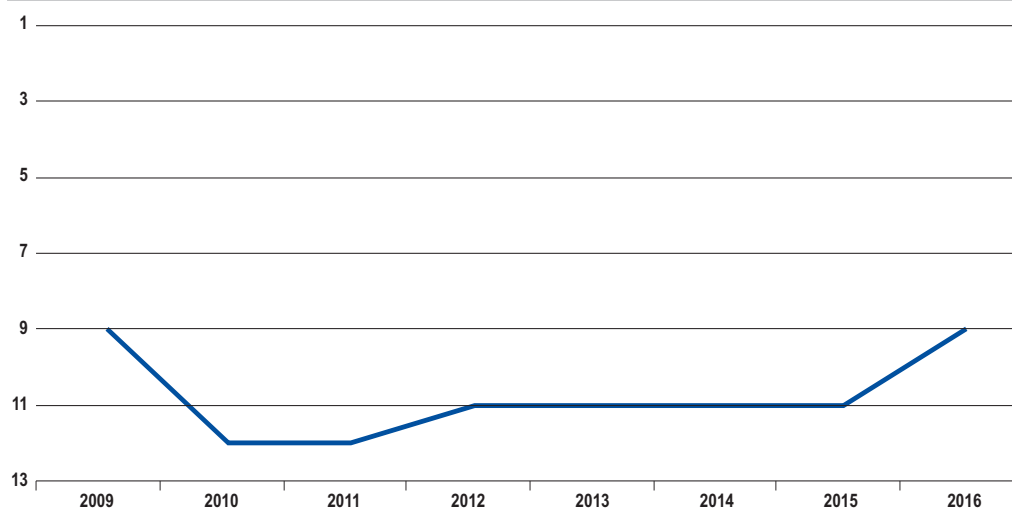
ing worked out. In these eight years it has evidently not succeeded in getting closer to the Strategy's goal and securing places, let alone moving up into the group of leading innovation nations, as planned in the RTI Strategy. The gap to the innovation leaders today, following years of decline or stagnation, is once again at the 2009 level (see figure 8).

At best we could say that Austria's performance in the areas of science, research, technology and innovation has been stagnating for some years now compared with the leading countries in

Europe. A negative trend is evident if we consider the most important international rankings for innovation performance, competitiveness, etc. over the course of recent years: Even if individual rankings, such as the Global Competitiveness Report 2017–2018 of the World Economic Forum or the EIS 2017, now show an upward trend, on the whole the trend is indeed going clearly downward (see figure 9).

This generally declining trend is also expressed in detail, for example, in relation to the posi-

Figure 8: Austria's positioning in the European Innovation Scoreboard (EIS)



Source: European Innovation Scoreboard, own presentation

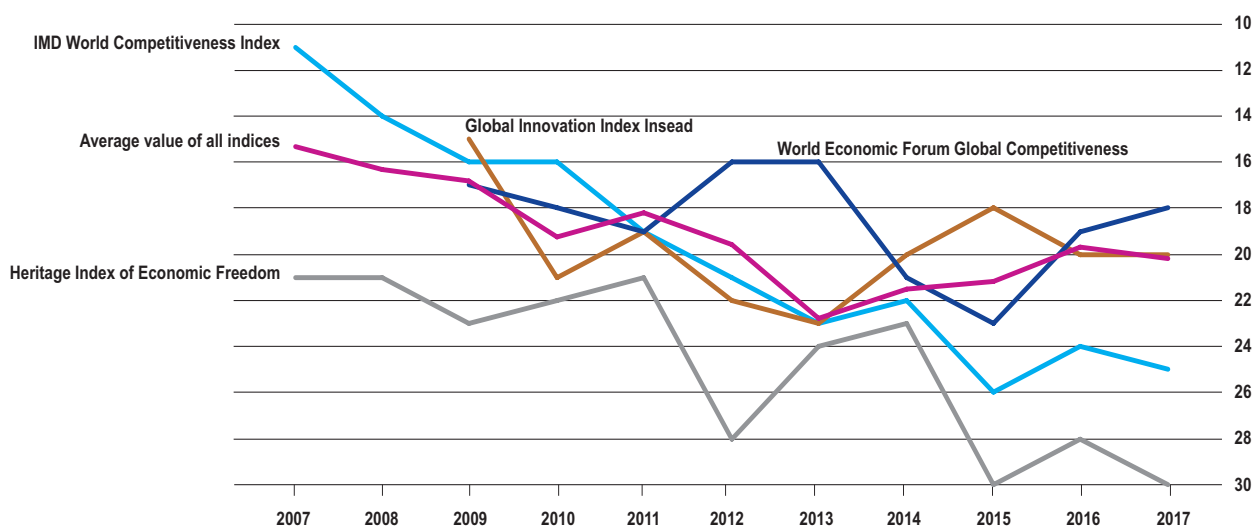
⁵¹ Bundesregierung (2011): Auf dem Weg zum Innovation Leader – Strategie für Forschung, Technologie und Innovation. Vienna, p. 4. The Austrian Council has repeatedly criticised the fact that the EIS at least partially gives a distorted view of Austria's innovation performance. In its reports on Austria's scientific and technological performance, the Austrian Council therefore assesses on the basis of a wider and more appropriate set of indicators. However, due to the importance of the EIS for the RTI Strategy and evaluating the achievement of the overriding goal of "Innovation Leader", the positioning in the EIS remains the frame of reference. See, inter alia, the statements in: Austrian Council (2014): Report on Austria's Scientific and Technological Capability 2014. Vienna, pp. 15 ff.

recommendations

tioning of the Austrian universities in the international university comparison.⁵² Three Austrian universities recently fell in the Times Higher Education World University Ranking 2017. The University of Vienna as the best domestic university lost four places compared to the previous year and is now ranked only number 165. The Vienna University of Technology fell out of the 251–300 range, and the Johannes Kepler University Linz plummeted to the 501–600 range. Only the Leopold Franzens University Innsbruck improved, moving up into the

251–300 range. All other Austrian universities listed in the current ranking did not change their positions and rank far behind.⁵³ These are just a few examples. But they certainly show how Austria runs the risk of falling significantly further back compared with the best – and in Europe this is of course Switzerland, Denmark, Sweden and the Netherlands in particular. Instead of joining the leaders, as intended by the RTI Strategy, Austria has fallen back in many areas and with a declining trend has remained stuck in the midfield, be it with innovation dynamic, competitiveness or the

Figure 9: Austria's positioning in selected international rankings



Source: IMD, World Competitiveness Yearbook 2017; Heritage Foundation, Index of Economic Freedom 2017; INSEAD, Global Innovation Index 2017; WEF, Global Competitiveness Report 2017–2018; own presentation Austrian Council.

⁵² Austrian Council (2017): Report on Austria's Scientific and Technological Capability 2017. Vienna, p. 48.

⁵³ For this, see Times Higher Education World University Ranking 2017; online at <https://www.timeshighereducation.com/world-university-rankings>.

performance of the universities. Austria's falling back and stagnation in the midfield are expressed in all relevant international rankings. The annually issued Monitoring Report of the Chamber of Commerce, which summarises Austria's performance in more than 150 international rankings, shows a clearly negative trend across and beyond all analyses and indicators.⁵⁴ On the whole these rankings and indicators only show, "... average, for a high-income country with low rankings and deterioration in many places."⁵⁵

Financing science and research: Spending at record level

These stagnating or negative trend developments in international rankings are astonishing insofar as the starting position is anything but bad. Because in the comparison of countries Austria actually excels with a high per capita GDP and comparatively low unemployment, whereby it continues to occupy a leading position in Europe and the world in these areas. Measured on per capita income, Austria is among the top 5 in the EU and worldwide it is placed 11th.⁵⁶ Both with regard to growth in real GDP and with respect to the development of per capita GDP, Austria is stable among the best performers worldwide. This growth is also accompanied by a relatively low income imbalance in the international comparison, with sub-

stantial environmental standards and high life expectancy.⁵⁷

In financial terms at least Austria is therefore positioned very well. In the area of research financing the nation has also completed a rather strenuous catch-up process in recent decades. Today it is at a record level: According to Statistik Austria's global estimate, total spending for research and development in Austria in 2017 is expected to be approximately EUR 11.33 billion.⁵⁸ Considered as a whole, growth is expected in all financing sectors, so that R&D expenditures in Austria will reach a new highest level by the end of the year. The research quota – that is, gross domestic spending for R&D in relation to gross domestic product – will therefore most likely be approximately 3.14 percent. Over the years Austria has therefore continuously worked its way up into the top of the pack in an impressive catch-up process (see figure 10). In its RTI Strategy, the Austrian Government set itself the goal of increasing the research quota in order to move up from ninth place in the EU at the time to join the European leaders by 2020.⁵⁹ This goal and the European target of an R&D quota of 3 percent was achieved in 2015. Austria is today at second place in the EU behind Sweden, a third higher than the EU28 average (2.0 percent), and among the five best-placed

recommendations

⁵⁴ Austrian Federal Economic Chamber (2016): Monitoring Report 2016 – Austria in International Rankings. Vienna, pp. 14 ff.

⁵⁵ Tichy, Gunther (2017): Mangelnde Effizienz als Erfolgsbremse. In: WIFO-Monatsberichte, 2017, 90(9), pp. 677–699, pp. 690.

⁵⁶ World Bank Open Data: <https://data.worldbank.org/>

⁵⁷ See Austrian Council (2017): Report on Austria's Scientific and Technological Capability 2017. Vienna, p. 21 ff. The report analyses Austria's economic and ecological capability, innovation performance and performance in the social area compared with the leading countries, Denmark, Germany, Finland, Sweden, the Netherlands and Switzerland. Austria scores very well in the global comparison, however it is behind the leading countries in all these areas.

⁵⁸ Bundesregierung (2017): Österreichischer Forschungs- und Technologiebericht 2017. Vienna, p. 15.

⁵⁹ Bundesregierung (2011): Auf dem Weg zum Innovation Leader – Strategie für Forschung, Technologie und Innovation. Vienna, pp. 44 ff.

recommendations

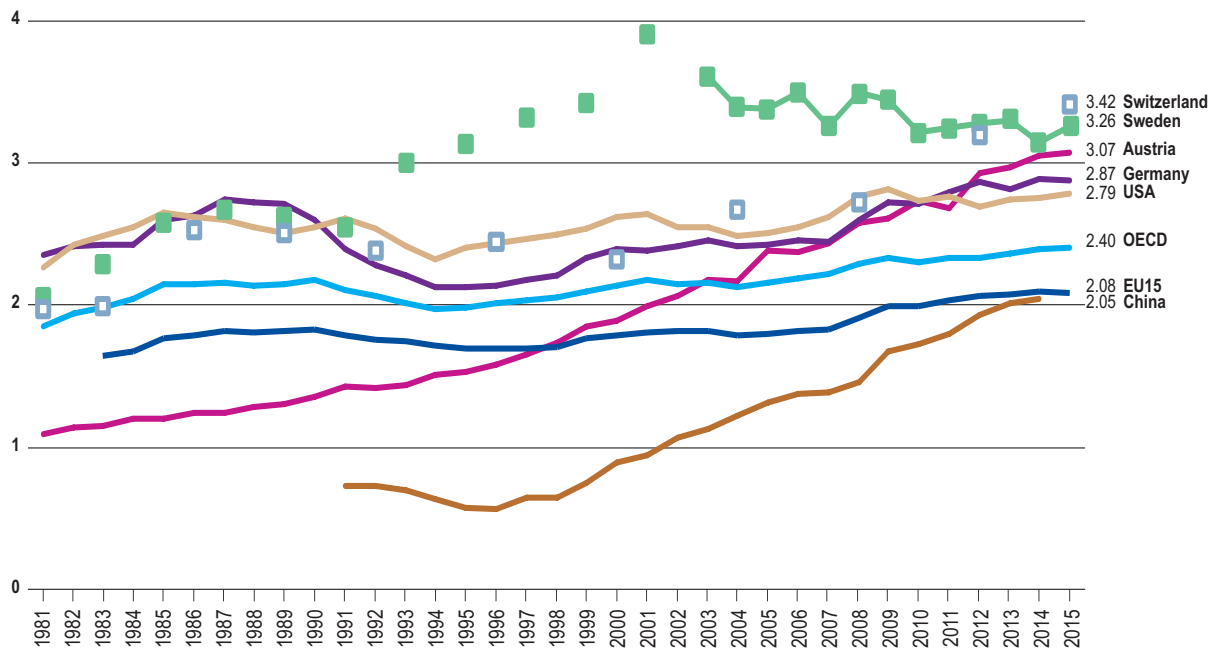
countries worldwide.⁶⁰ Only Israel and South Korea with an R&D quota of approximately 4.2 percent, Japan (4 percent) and Sweden (3.3 percent) are ahead of Austria.

Innovation efficiency – high input, moderate output

If we now compare the high (in particular financial) input with the output or outcome generated from it, it becomes evident that the Austrian RTI system suffers from considerable in-

efficiencies. Innovation efficiency can be calculated as part of a statistical efficiency analysis, by comparing key input indicators with the relevant output or outcome indicators. The most efficient countries are determined on the input, output and outcome ratio of the innovation indicators of the EU countries. These are those that operate at what's known as the "efficiency limit". They must not be the strongest innovation nations, as the level of efficiency is determined by the amount of output and outcome that can be generated with the given input re-

Figure 10: Development of research quotas in the international comparison in % of GDP



Source: OECD Main Science and Technology Indicators Database, own presentation Austrian Council.

⁶⁰ Bundesregierung (2017): Österreichischer Forschungs- und Technologiebericht 2017. Vienna, p. 19.

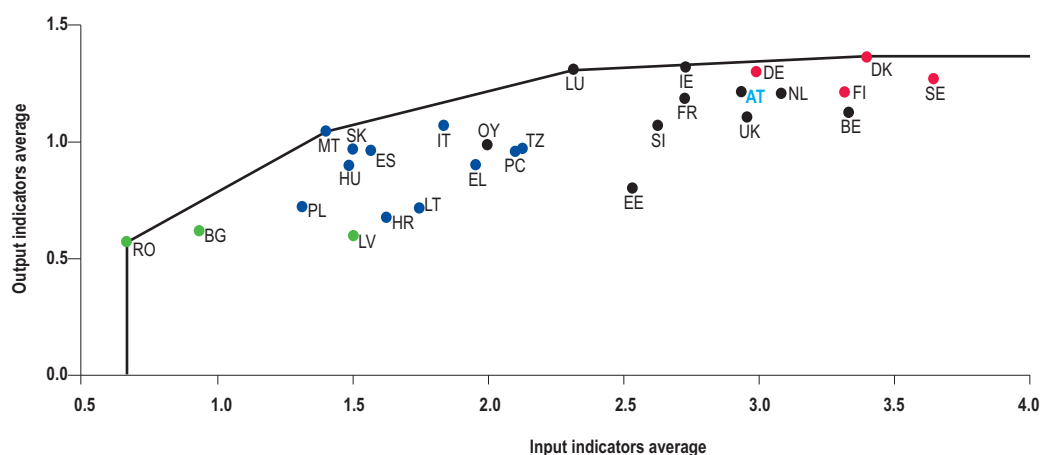
sources. Figure 15 shows the calculated efficiency frontier for the 28 EU countries with the assumption of variable returns to scale in acc. with the WIFO method.⁶¹ It is evident that, not only in the comparison with that of the leading nations, Austria's position shows real improvement potential, which could simply be exploited via efficiency increases.

It is quite obvious that among the innovation leaders, Germany and Denmark are the most efficient in converting input into output and outcome. However, the most efficient countries also include less innovative ones, such as Spain, Hungary, Ireland and Italy, which generate comparatively high output with relatively little

input.⁶² Austria is in the forward mid-field, just ahead of Sweden and ahead of Finland and the Netherlands. But even with a cautious interpretation, the data indicates that Austria can still improve with regard to innovation efficiency.

According to the European Innovation Scoreboard 2017, Austria is in particular well placed with the input indicators, with which on the whole it is placed number eight in the EU and even at number two with regard to the R&D quota. Compared with this the country now only scores rather more moderately with important output indicators such as publications and patents, which is expressed by the ranking at

Figure 11: Innovation efficiency in the EU: Input to output ratio



Source: Eurostat, EIS, WIFO Calculations. See also: Austrian Council (2017): Report on Austria's Scientific and Technological Capability 2017. Vienna, p. 39.

⁶¹ See Austrian Council (2017): Report on Austria's Scientific and Technological Capability 2017. Vienna, p. 39 f.

⁶² This suggests that countries with lower efficiency can also become innovation leaders, if correspondingly more is invested in inputs. The calculations also show that it is becoming increasingly more difficult at the technological frontier to generate more output per additional unit of input. This diminishing frontier benefit can also be attributed to the fact that at the frontier it is not possible to simply transfer the results from overseas, but rather that more own innovation power is required. For detailed explanations, however, the countries would have to be analysed individually.

recommendations

number 11 in this area. Its ranking is even worse in the area of the economic effects of innovation work. Austria ranks number 15 here.

Key areas under construction in this context are on one hand in the area of higher education, especially the universities, and on the other hand in the area of research funding and ultimately in the area of start-up activity. It must be noted, however, that not only will structural reforms for an increase in efficiency be required in all three areas, but that the financial input will also be insufficient. The universities are under-funded in comparison with those of the leading countries. Research funding, at least that awarded directly and in com-

petition, has stagnated for years at a low level relative to the innovation leaders, and from an international point of view there is still too little funding available for start-up activities. The Austrian Council has already referred in all three cases to the existing needs for reform.⁶³

Efficiency barriers in the higher education area

In the higher education area, in addition to the insufficient funding situation⁶⁴ relative to the leading countries, problems in the area of governance and the uncontrolled student flows in particular present an obstacle to increased performance. The imbalance connected with student access to universities and technical colleges in particular is a serious efficiency barrier.

Comparison of a selection of universities in Germany, Switzerland and Austria (2016)

	Budget in EUR bn (14)	Students at universities (15/16)	Number of professors	Graduates	Rel. student/ professor ratio	Funding/ students	Funding/ graduates EUR	Shanghai Ranking 2016	THE Ranking 2016
TU Vienna	0.332	29,159	143	2,770	204	11,403	120,034	401–500	251–300
TU Graz	0.206	13,758	126	1,845	109	14,940	111,409	–	351–400
FIT Zurich	1.595	18,744	483	4,124	39	85,106	386,813	19	9
FIT Lausanne	0.904	9,908	328	2,296	30	91,191	393,521	101–150	30
TU Munich	1.329	38,615	528	8,911	73	34,417	149,142	47	46
KIT Karlsruhe	0.861	24,432	300	5,396	81	35,232	159,526	201–300	144
TU Darmstadt	0.444	26,503	303	4,140	87	16,734	107,126	401–500	201–250
	Budget in EUR bn (14)	Students at universities	Number of professors	Graduates	Rel. student/ professor ratio	Funding/ students	Funding/ graduates EUR	Shanghai Ranking 2016	THE Ranking 2016
Uni Vienna	0.533	94,738	416	9,719	228	5,625	54,835	151–200	161
Uni Graz	0.226	28,780	184	3,486	156	7,847	64,781	no	401–500
Uni Zurich	1.374	26,050	613	5,628	42	52,750	244,162	54	106
LMU Munich	0.655	50,481	738	9,185	68	12,975	71,312	51	30
U Frankfurt a. M.	0.603	45,379	600	5,824	76	13,279	103,468	101–150	201–250
U Heidelberg	0.706	29,813	523	5,421	57	23,694	130,308	47	43

Source: Switzerland: Data cube: finances, degrees, students, FIT Zurich staff, HR data;

Germany: Statistisches Bundesamt – universities, statistical data of selected universities;

Austria: Statistik Austria, universities; uni:data; universities' annual financial statements; AC calculations.

er. The share of students at public universities in Austria is approximately 78 percent. The costs per student here are about twice as high as in the technical college sector, whose share of the overall number of students is approximately 15 percent.⁶⁵ A look at the innovation leaders shows that considerably more students are trained at technical colleges in those countries.⁶⁶ The supervision ratios in many study programmes are not competitive compared with international top universities either. This is illustrated in table 1 in the brown lines on the example of Graz and Heidelberg Universities: Approximately the same number of students are inscribed at both universities. However while

Heidelberg University has 523 professorships, Graz University must manage the same number of students with only one third of the professorships and one third of the financial resources. The consequences are high drop-out rates and unnecessarily longer study periods – and not just in Graz, but rather in all Austrian universities. This is also exacerbated in places by a high number of students in work.⁶⁷ The burdening of the universities with the relatively high number of students and the comparably low financial and human resources is immense. It is little wonder then that research performance also suffers here, as a dispropor-

recommendations

⁶³ See Austrian Council (2013): Weißbuch zur Steuerung von Forschung, Technologie und Innovation in Österreich. Vienna; Austrian Council (2015): Recommendation for governance and management structures at the universities of 3 March 2015; Austrian Council (2017): Recommendation for policy prioritisation for the tertiary education sector, especially the universities of 14 September 2017; Austrian Council (2014): Recommendation on the amendment to the Alternative Investment Fund Manager Act (AIFMG) of 6 March 2014; Austrian Council (2012): Recommendation to optimize RTI-related start-up activity of 19 November 2012; Austrian Council (2011): Recommendation on the efficient implementation of research results in innovations of 24 November 2011; Austrian Council (2011): Recommendation to create suitable framework conditions for private equity of 24 November 2011; Austrian Council (2011): Recommendation on the introduction of a tax exempt participation amount of 24 November 2011.

⁶⁴ Because even if the public responsibilities for universities and technical colleges are in the top area on a global level, Austria is significantly behind Switzerland, for example, which is one of the leading countries in the higher education area worldwide. This in particular applies to the level of funding for higher education research: According to the Main Science and Technology indicators of the OECD, in Switzerland (and in Denmark) approximately 1 percent of GDP is spent on research at the universities, in Sweden it is approximately 0.9 percent, but in Austria it is only 0.7 percent.

⁶⁵ The rest is distributed across teacher training colleges and private universities.

⁶⁶ The share of students at technical colleges in the Netherlands is approximately 60 percent, in Finland it is approximately 50 percent and in Switzerland and Germany it is at least 30 percent. See, Austrian Council (2017): Recommendation for the further development of the technical colleges sector in the Austrian education and science system of 30 May 2017.

⁶⁷ According to the Student Social Survey in the 2015 summer semester 61 percent of the students were continuously or occasionally in work. Of these 18 percent had a full-time position. For 75 percent of students a job is necessary to cover their living expenses. The quota of study grant recipients is 19.9 percent. Only 7.4 percent here receive a maintenance grant of an average EUR 678 per month. 12.3 percent receive a conventional study grant of EUR 307. The share of students that receive a conventional study grants is continuously falling here: from 18 percent in the 2009 summer semester to 12 percent in the 2015 summer semester. This can be attributed to the fact that the limits of study funding were not increased since 2008. For this, see the “Studierenden-Sozialerhebung” (Student Social Survey) 2015: Report: Materialien zur sozialen Lage der Studierenden 2016, chapter 10, “Erwerbstätigkeit“, pp. 60 ff.; chapter 14, “Beihilfen“ p. 71 ff.



recommendations

tionately high volume of resources are tied up in administrative work, and in coping with over-stressed teaching in particular. Firstly diverse reporting obligations and surveys of numerous indicators required for this (knowledge balances, university reports, higher education statistics, annual reports, development planning, etc.) burden the university administrations, and secondly the scientific capacities required to guarantee appropriate research performance are absent in traditionally heavily frequented fields of study. Teaching is still also impaired on multiple levels by insufficiently structured, overloaded curricula, less efficient study programmes and a lack of studies management.⁶⁸ Suitable access management at universities in combination with a corresponding expansion of the capacities at the technical colleges should therefore guide the required further expansion of the higher education sector. To do this the problem of chronic under-financing of the higher education sector must be resolved to finance the required human and infrastructural resources.

The expansion of appropriate career models for young scientists is a key element here in human resources development at universities. An important quality criteria in staffing career positions and professorships is a transparent and performance-oriented selection procedure based on an evaluation concept according to international standards. Continuous, quality-oriented evaluation procedures should be the goal here

for staffing all scientific positions – both professorships and career positions. Transparency in recruiting is also indispensable to remove the mostly negative connotation from the term, “tenure track position”. The goal must be to improve the insufficient supervision ratios at Austrian universities, as illustrated by way of example in table 1, and to effectuate a further professionalization of the appointment procedure.⁶⁹ The performance of the universities could in particular be increased by increasing the funds for competitive research as opposed to global resource allocations. The increase in the university budget by EUR 1.35 billion unanimously adopted by the National Council for the coming performance agreement period did indeed recently secure the basic financing of the universities and therefore their subsistence level, and it at least enables a capacity-oriented, student-relevant university financing, however it allows for absolutely no substantial further development.⁷⁰ Also on the negative side in this respect is the fact that this budget increase is in no way linked with structural reforms, which leaves the positive system effect more in the marginal area. Additionally there is also the fact that an increase in funds going beyond this was not achieved either, to increase the budget for the tertiary education sector by 2020 to two percent of GDP – in addition to overdue structure adjustments, a priority higher education policy goal, which the Austrian Council believes is a requirement for joining the scientific leading nations.

⁶⁸ Tichy, Gunther (2017): Mangelnde Effizienz als Erfolgsbremse. In: WIFO-Monatsberichte, 2017, 90(9), pp. 677–699, pp. 687.

⁶⁹ See Austrian Council (2015): Statement on the amendment to the University Act 2002 and the Research Organisation Act of 20 August 2015.

⁷⁰ See Austrian Council (2016): Recommendation on funding universities and public sector research and development in Austria in the federal funding framework 2017 to 2020, chapter, “Science and Research” of 5 February 2016.

The applicable immigration legislation is also a hindering factor for the further development of the universities. The amendments to immigration legislation that recently took effect will also make it more difficult for professors and scientists from non-EU states to apply for positions, which means the expansion of a successful internationalisation of the Austrian universities will suffer even further⁷¹ – and this although Austria is today already ranked far below the level of the innovation leaders with regard to the number of doctoral students from non-EU countries.⁷²

A hindering factor for academic research activity in Austria is the applicable data protection regime. The Data Protection Amendment Act 2018 presents a massive restriction for research, in particular due to the regulations for processing personal data. This in particular affects medical research, which is especially important for improving the treatment of patients and therefore clearly in the interest of the general public.⁷³

Finally, attention must also be drawn to the fact that the universities in Austria to date have not reacted with sufficient efficiency to the challenges of digitalisation. These must be addressed

more intensively than has previously been the case – both by the universities and the body politic. The digitalisation index of the Fraunhofer Institute shows Austria at only number 19 among the 35 countries considered.⁷⁴ This is an alarming signal, as countries such as Denmark, Germany, Finland, the Netherlands, Sweden and Switzerland are reacting significantly more efficiently than Austria to the digital challenge. The universities in particular are called upon in this context, as they play an important role for successfully managing the digital change.⁷⁵ A study of the Austrian e-learning landscape also shows an urgent need for action at the universities.⁷⁶ Strategies for digitalisation, incentive systems for teachers and cooperation models are extensively missing.

Efficiency barriers in the research funding area

An extremely complex system of how federal government funding flows from the ministries via the agencies down to the individual research institutes has emerged over the years in the area of research funding. On closer consideration signs of over-regulation, fragmentation, unclear responsibilities and a complex, non-harmonised set of rules for individual mechanisms become

recommendations

71 Artists, researchers and special cases of employed occupation can now apply for a residence permit, whereby this person can then apply for permanent residence status in the EU after five years, but must meet the granting prerequisites that govern the relocation of researchers and their dependants from third party countries, such as “proof of sufficient resources”.

72 Austrian Council (2017): Report on Austria’s Scientific and Technological Capability 2017. Vienna, pp. 45 ff.

73 See Austrian Council (2017): Statement by the Austrian Council on the government draft for the Data Protection Amendment Act 2018.

74 Fraunhofer ISI / ZEW (2017): Innovation Indicator 2017. Berlin, p. 36.

75 Androsch, Hannes / Gadner, Johannes / Grashopf, Anton (2017): Die Universitäten im digitalen Zeitalter: Von der mittelalterlichen universitas zum globalen knowledge network hub. In: Austrian Council: Zukunft und Aufgaben der Hochschulen: Digitalisierung – Internationalisierung – Differenzierung. LIT Verlag, Vienna, p. 207–226.

76 Forum neue Medien in der Lehre Austria (2016): Die österreichische Hochschul-E-Learning-Landschaft. Study to record the status quo in the e-learning landscape in the tertiary education with regard to strategy, resources, organisation and experiences. Vienna.



recommendations

evident.⁷⁷ On the basis of an extensive analysis, the Court of Auditors recently determined that the structures of public sector research funding are characterised by a high lack of transparency and inefficiency.⁷⁸ The overlapping multiple structures are primarily responsible for this. In addition to numerous involved organisational units at federal and state level, there are also another 24 funding agencies that are entrusted with R&D affairs.

While the lion's share of funds flows at federal level via three funding agencies (FWF, FFG and AWS), the comparatively low funding at state level with significantly higher administration expense is administered via 14 state-specific legal entities. The number of mechanisms has also grown in recent years, which is largely due to the fact that once established, structures are practically impossible to remove. The result is a "jungle of programmes" with 136 research programmes by Federal Government and the states with different research goals.⁷⁹

811 people (full-time equivalents) are employed in the administration of these structures. The staffing expenditure for this administration alone is approximately EUR 58 million. Nor is there any overall overview of the research funding, the financing structures and the actual cash flows here. The multitude of research funding databases at federal and state level does not of-

fer a transparent overall overview of the high complexity of the general structure either.⁸⁰

A further example of complex national funding structures was also seen in the past in the context of excessive testing and the insufficient legal certainty with regard to the use of resources of the European Fund for Regional Development (EFRD). The intransparent national regulations and their interpretation with the testing of projects led to uncertainty and the withdrawal to some degree of researchers from the programme. For the remaining financing period, targeted reforms and simplifications regardless of adjusted responsibilities of the funding bodies are therefore indispensable. For future programmes, further improvements in terms of the reform agenda with the inclusion of the stakeholders must be driven forward in good time in a transparent process. A holistic consideration of the funding structures and framework conditions of European mechanisms from national to regional level will bring forward programmes that complement each other well without producing any redundancies.

In this context it must also be pointed out that the systematic evaluation of the functionality and modes of action of research funding in Austria are subjected to narrow boundaries. The reason for this is the fact that access to statistical data for scientific analyses is sub-optimal and far below the level offered by the leading

77 Austrian Council (2013): Weißbuch zur Steuerung von Forschung, Technologie und Innovation in Österreich. Vienna, p. 11 ff.; Filz, Wolfgang (2013): FTI-Governance: Projektergebnisse. Study commissioned by the Austrian Council. Vienna, pp. 18 ff., pp. 25 ff.

78 Rechnungshof (2016): Forschungsfinanzierung in Österreich. Vienna 2016/8, p. 209 f.

79 Rechnungshof (2016): Forschungsfinanzierung in Österreich. Vienna 2016/8, p. 210.

80 A detailed and complex overall overview of the structures and cash flows of research funding in Austria is provided in annex 8 in: Rechnungshof (2016): Forschungsfinanzierung in Österreich. Vienna 2016/8, p. 333.

countries, such as Denmark, the Netherlands or Sweden, for example. This is because access to and linking of microdata in Austria is extremely restrictive in its regulation. This applies in particular to corporate microdata. The result is extremely inefficient use of available and expensive statistical resources, with which relevant insights into the efficiency and effectiveness of the domestic funding landscape and the mechanisms used could be gained.⁸¹

In addition to the complexity and lack of transparency of research funding with the resulting friction losses, the result is also divergent development trends with regard to the public and private financing shares on one hand, and the funding of basic research and applied research on the other. The resulting imbalances must also be identified as significant efficiency barriers for the RTI system.

Firstly there is a serious imbalance with the pro rata distribution of R&D expenditures compared with the leading innovation nations. The shares in overall spending for R&D of EUR 12.3 billion have not, as intended by the RTI Strategy, developed in the direction of a private funding share towards 70 percent. Because while the public sector share of R&D expenditures has grown and is now approximately 36.5 percent, the private share has fallen slightly. Including shares from abroad, the corporate sector today contributes just under 64 percent.⁸²

Secondly there is a disproportionate imbalance in Austria in relation to the innovation leaders between fixed approved R&D basic financing and R&D funds to be applied for in competition.

The recommended structure reform at the universities for proportionately higher competitive R&D budgets and stronger profiling is therefore all the more important. Because the majority of public sector and private R&D expenditures in this country now flows into the applied research sector, which results in the funds in the basic research area relative to those for applied research stagnating for some years now. Austria has indeed joined the group of scientific leading countries in the international comparison with basic research, but as the comparison countries have developed significantly more dynamically in some places since 2009, Austria falls back in relative terms. Switzerland and South Korea in particular are some distance ahead of Austria. The target value for basic research is 0.94 percent of GDP. The Austrian basic research quota is currently just half that.⁸³

There has also been a particular catch-up requirement for some time now compared with the leading countries with regard to financing the resources awarded in competition for basic research. In Austria approx. EUR 24 is spent on this per inhabitant; with the innovation leaders

recommendations

81 See Falk, Martin / Hölzl, Werner / Oberhofer, Harald (2015): The importance of business-related individual data for empirical economic research and economic policy advice, WIFO monthly reports, 2015, 88(11), p. 845–857.

82 Bundesregierung (2017): Österreichischer Forschungs- und Technologiebericht 2017. Vienna, p. 14 f.

83 See Hofmann, Kathrin / Janger, Jürgen (2017) Forschungsquotenziele 2020 – Aktualisierung 2017. Vienna, p. 33.

While basic research in Austria is financed significantly less in relation to GDP than in the important comparison countries, the public sector funding of corporate research in Austria was considerably higher than with the innovation nations. According to the OECD in 2014 (that is, still without an increase in the research premium to 12 percent) it was 0.27 percent of GDP, while in the extreme example it hardly even exists in Switzerland, and in the leading innovation nations it is 0.07 to 0.17 percent of GDP. See, inter alia, Austrian Council (2017): Report on Austria's Scientific and Technological Capability 2017. Vienna, p. 38.



recommendations

it is an average of approx. EUR 60. Finland and Sweden are clearly ahead with EUR 75 per inhabitant, and Switzerland ranks undisputed at the top with EUR 97.⁸⁴

At the same time business spending in Austria for R&D is financed more by the public sector than in the leading innovation nations. The state-financed share of the funding of corporate research in 2013 (last available year) in Austria was 12.5 percent of GDP and therefore approximately twice as high as the EU average. Compared with this the corresponding shares with the innovation leaders – Switzerland (1.4 percent), the Netherlands (1.8 percent), Denmark (2.8 percent), Germany (3.3 percent), Finland (3.6 percent) and Sweden (6.1 percent) – are all significantly lower.⁸⁵

Efficiency barriers in the start-up activities area

Despite the increased importance of start-ups in political awareness, the start-up dynamic in Austria is still behind the targets of the RTI Strategy. The core reasons for this in particular include the insufficient availability of private financing forms, such as risk capital or crowd-funding, and the adverse bureaucratic, regulatory and taxation framework conditions that entrepreneurs have to deal with in Austria. Costs and the time taken to set up a limited liability company (GmbH), as well as its legal structure, must in particular be emphasized here (see figure 12).

Added to this is the fact that the Austrian fund-

ing system for innovative start-ups in the international comparison may be very comprehensive, but it is characterised by a high level of complexity and lack of transparency. The observable political practice of launching small, subcritical funded programmes for reasons of public perception of the costs of established, well-functioning mechanisms is problematic here. A streamlining and a re-structuring would be urgently required here to make access to the system easier for potential start-up founders.

This is, however, not only about an increase in start-up numbers, but rather also and especially about their development over the course of time, if we want to benefit from the economic effects associated with them (employment, economic dynamic, competitive head start). There is no point in increasing the number of start-ups while these start-ups still have no access to upscaling (demonstrator development, prototypes, etc.) and markets. Provision of secure, primarily private follow-up financing is also required in this respect. Location Austria's low level of activity means, however, there is a lack of private venture capital in the country.⁸⁶ The body politic is urgently required to create more attractive framework conditions here, both to bring investors to Austria, and to mobilise potential private Austrian investors, such as appropriate legislative and taxation framework conditions for private equity – with an improvement in the quality of the Austrian capital market and assessment stipulations of pension and insurance funds, for example.⁸⁷

⁸⁴ Austrian Council (2017): Report on Austria's Scientific and Technological Capability 2017. Vienna, p. 49.

⁸⁵ Data source: OECD Main Science and Technology Indicators. The figures refer to the last available year. For this, see also Deutsches Institut für Wirtschaftsforschung Berlin (2016): Funding of private research and development in OECD countries: growing, but also increasingly inefficient. DIW weekly report no. 8. 2016, p. 149–157.

⁸⁶ Der Standard (18 May 2106): Start-ups: Noch immer wenig privates Risikokapital in Österreich.

⁸⁷ See, for example, Peneder, Michael (2013): From the “dry valleys” of venture and growth funding. In: WIFO-Monatsberichte, 86 (8); pp. 637–648.

The key point remains however that it is in the nature of start-ups that many also “fail”. The essential message here should therefore not be to “try to reduce failures”, but rather to promote the growth of promising companies.

Conclusion efficiency barriers impede success

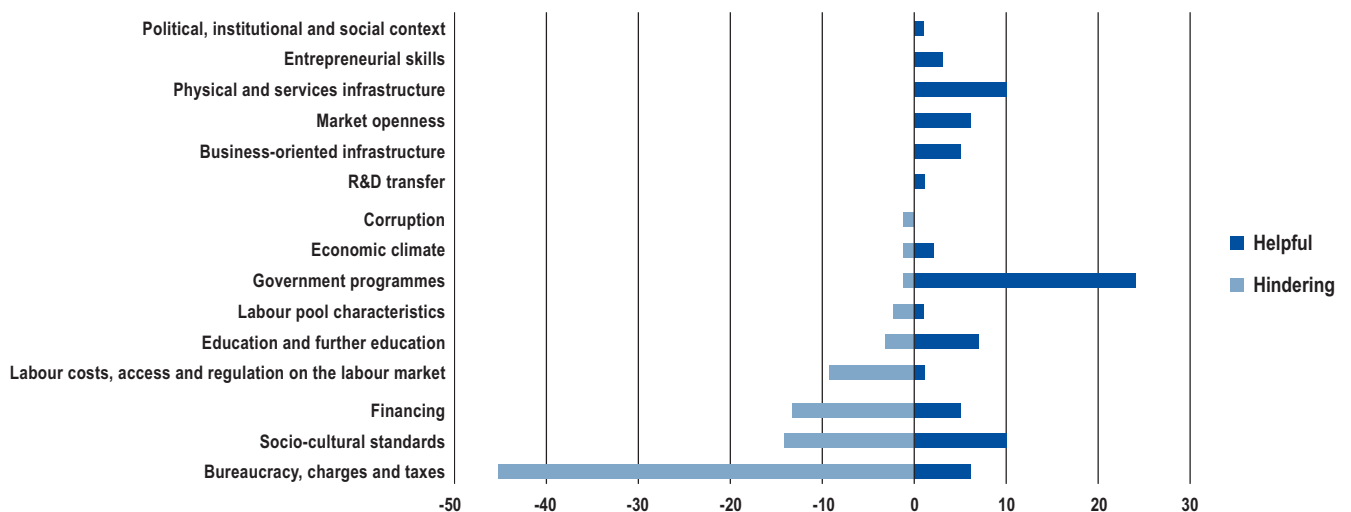
The performance of the Austrian RTI system scores quite well in the international comparison. On the whole Austria's efforts to join the leading innovation nations and consequently have ensured prosperity, quality of life and environmental protection, and have certainly triggered a positive dynamic in some areas. However it is also clear from today's point of view that Austria, contrary to the objective of the RTI Strategy, will not join the group of innovation leaders by 2020. This is primarily due to the outlined efficiency barriers and imbalances in the distribution of funds.

Austria already spends a lot on research. It is high time now to also use these funds more efficiently and effectively than before to then generate increased top performances. How this could work is demonstrated by leading innovation nations such as Switzerland, Sweden and Germany. The new National Council and the future Federal Government will in any case have to concentrate more than its predecessor on increasing the efficiency of the Austrian RTI system and on boosting the effectiveness of the funding of science and research. Otherwise the obvious efficiency barriers threaten to continue impeding the country's success, whereby Austria runs the risk of stagnating in the midfield in the future, or even falling further back.

It is therefore welcome news that the answers to the seven questions for the future of the Austrian RTI system, which the Austrian Council ad-

recommendations

Figure 12: Helpful and hindering factors for start-ups in Austria
(number of times that these aspects were mentioned)



Source: National Expert Survey of the GEM 2016.



recommendations

dressed to the parties represented in Parliament for the pending National Council elections on 15 October 2017 have brought forth political consensus on the need to reinforce education, science, research and innovation in Austria.⁸⁸

Numerous calls by the Austrian Council for the further development of the RTI system are rewarded with widespread political support herein. This allows us to hope that the future Federal Government will also dedicate more attention to the RTI area.

Recommendations

The Austrian Council recommends the National Council and the future Federal Government set a political priority on the further development of the Austrian RTI system to join the leading innovation nations in line with its potential. In addition to working out a new RTI Strategy 2030 and focusing on increased innovation efficiency, the familiar areas under construction, which the Austrian Council has drawn attention to for some years now in its reports on Austria's scientific and technological capability, must also be addressed. The most important aspects are highlighted once again in the following 17 recommendations for the four key areas of **RTI governance, universities and basic research, research funding and innovative start-ups**:

RTI Governance

1. Working out an RTI Strategy 2030

The goals of the current RTI Strategy, and in particular the superordinate objective of joining the group of leading innovation nations by 2020, cannot be achieved. As the Strategy's time horizon will shortly be reached, the Austrian Council recommends a redesigning of the strategic objectives of the RTI policy. The first

important steps for this have been introduced with the continuous analysis process of Austrian innovation performance by the OECD and the planned publication of the OECD Review of Innovation Policy for the end of 2018. For the specific strategy development the Austrian Council recommends the further increase in innovation efficiency be afforded extra special attention. The strategy should also contribute to supporting the Austrian RTI system in providing answers to the global challenges and megatrends. The Austrian Council believes the topical areas of digitalisation, decarbonisation and the demographic change of the ageing society must be addressed as priorities.

2. Initiation of an RTI policy reform process at the highest political level

The Austrian Council recommends initiating an active and comprehensive RTI policy reform process to drive forward implementation of the new RTI Strategy 2030 in a more uncompromising way. This must be supported at the highest political level. The Austrian Council believes this requires an "RTI reform agenda" under the supervision of the Federal Chancellery and in cooperation with all ministries responsible for RTI. It should be anchored in the Federal Government's plans and furnished with politically binding, specific and quantifiable targets. Clear assignments must in turn be derived from this for the RTI Task Force, which must be equipped for the RTI Strategy's implementation process with a clearly defined mandate for its control function.

3. Development of higher level national topic management

The Austrian Council recommends the development of a superordinate topic management, which focuses on existing development potential and strengths with regard to the grand challenges defined in the RTI Strategy 2030. This

⁸⁸ See Austrian Council (2017): 7 Questions to the body politic. Online at: <http://www.rat-fte.at/news-reader/items/id-7-fragen-an-die-politik.html>

should include both a systematic and continuous procedure for evaluating existing and identifying new priority issues and appropriate regional coordination. Overlapping and gaps must be prevented here. Coordination with other types of mechanisms such as open-theme and structural measures must also be ensured. A key point here is the elaboration of comprehensible heuristics of topic identification.

Universities and basic research

4. Structural further development of the higher education area

The Austrian Council believes it is urgently necessary to accelerate measures for the structural further development of the Austrian higher education area. To this end the tasks and functions of universities and technical colleges must be strategically coordinated with one another more intensively than before. It is also important that the profiling of the universities be driven forward and international visibility be increased. It is also essential that the accelerated expansion of the technical colleges sector be increased by the share of TC study places over the entire higher education area by 2040 to approximately 40 percent.⁸⁹

5. Introduction of quality-oriented study place management

To improve the study conditions at the universities⁹⁰ the Austrian Council recommends the introduction and consistent implementation of a capacity and quality-oriented study place management, which also visualises the assignment of the budgets for research, teaching and infrastructure. With the planned establishment

of a capacity and student-relevant university financing the implementation of a fair and socially-balanced access management is also indispensable. To select the best suited students, a cross-discipline orientation phase should open up the scope to evaluate personal motivation, commitment and talent as criteria for a chosen study course. At the same time appropriate and goal-oriented study funding must be established to guarantee equal opportunity and increase social permeability. The number of those receiving study grants must be significantly increased for this, which would require an increase in the funding rates and limits of study funding.

6. Expansion of human and infrastructural resources of the universities

The poor supervision ratio in many study programmes is one of the main reasons for longer study times and high drop-out numbers. The Austrian Council therefore recommends the number of scientific staff required in the study programmes affected be increased to an internationally comparable level and that appropriate positions be set up at the higher education institutes. For plannability of career path reasons, the career positions and tenure track model should be expanded for this. Performance-oriented and transparent evaluation and selection procedures must be followed for every career stage, right up to the appointment of professors. The underlying quality criteria should promote balanced internationalisation. The respective immigration legislation must also be amended for this, to facilitate the recruitment of excellent scientists from non-EU states.

recommendations

⁸⁹ See Austrian Council (2017): Recommendation for the further development of the technical colleges sector in the Austrian education and science system of 30 May 2017.

⁹⁰ Study conditions have been suffering for some years now under constantly increasing student flows. The universities currently report approximately 308,000 students (see, uni:data students at universities) – winter semester time series (retrieved on 6 September 2017). Of these 181,657 are identified as examination-active (see uni:data, Table 2.7 Examination-active bachelor, degree and master studies at universities (2014/15 study year); retrieved on 6 September 2017). Of the examination-active in turn only about 130,000 students achieve at least 30 ECTS points per year, whereby about 60 ECTS points would be required for a standard period study course.



recommendations

An expansion in the infrastructural capacities is also equally required, as a more consistent expansion of lab and seminar places increases training capacities and consequently also contributes to reduced study times. If more students are to be educated in terms of the formulated quality goal and the quality and quantity of the research output are to be increased, these too must also be guaranteed with a significantly higher financing basis. At the same time measures should also be implemented to increase the funds for research applied for in competition as opposed to global resource allocations. The Austrian Council emphatically reaffirms its recommendations in this respect.⁹¹

7. Adjustment of legal data protection basics to maintain the international competitiveness of research

To maintain the competitiveness of research location Austria in the international comparison, the Austrian Council recommends all flexibility clauses for scientific research purposes be used as part of the national implementation of the European General Data Protection Regulation (GDPR) and further hurdles beyond those of the provisions of this regulation be prevented from forming. For research in general and for medical research in particular in the interests of the general public, the Austrian Council therefore recommends the national legislators anchor a privileged exception clause in the respective legislation, such as that enabled in the

flexibility clauses of the GDPR.⁹² It must in particular be ensured here that no distortion of competition is caused.

8. Swift set-up of digital infrastructures and implementation of digital technologies

The Austrian Council emphatically recommends the measures of the Digital Roadmap Austria⁹³ be implemented. It also recommends the framework conditions be adapted to the higher education institutes so that the requirements of digitalisation are met. The human resources development at the higher education institutes in particular must be designed according to the new requirements, in order to perform tasks that require a higher division of work and level of teamwork (e-moderation, didactic design, supervision). Financial and human resources required for this must be provided. The required legal framework conditions for Open Educational Resources must also be shaped in the interest of the freest possible access to study and teaching material.

9. Increase in funds for the tertiary education area to 2 percent of GDP

The Austrian Council once again recommends immediate appropriate measures to achieve the goal of providing 2 percent of GDP by 2020 for the tertiary area. This is necessary because only a continuous increase in expenditure will guarantee sustainable growth in science and research. For implementation we would refer to the Austrian Council's individual recommendations in this respect.⁹⁴

⁹¹ Austrian Council (2013): Recommendation on the development of the university and science system in Austria of 5 November 2013; Austrian Council (2015): Recommendation for funding research and development in Austria of 7 September 2015.

⁹² See Austrian Council (2017): Statement by the Austrian Council on the government draft for the Data Protection Amendment Act 2018.

⁹³ Federal Chancellery and Federal Ministry of Science, Research and Economic Affairs (2016): Digital Roadmap Austria. Vienna. www.digitalroadmap.at

⁹⁴ The Austrian Council's recommendation on funding research and development in Austria of 30 May 2016; The Austrian Council's recommendation on funding for education, research and innovation in Austria of 5 September 2016; The Austrian Council's recommendation on budgetary priority setting in Austria of 19 December 2016.

Research funding

10. Increased efficiency and effectiveness of research funding

The increase in the efficiency and effectiveness of research funding should be afforded greater attention in the future than it has been to date. This will require the consistent removal of obvious efficiency barriers, such as overlapping multiple structures, over-regulation, fragmentations, unclear responsibilities and a complex, non-harmonised body of rules for individual mechanisms. Necessary reforms should be worked out with the inclusion of relevant stakeholders such as research institutions, industry and consumers, should target the simplification of funding structures and processes and above all guarantee legal certainty.

The holistic consideration in the interests of multi-level control will raise the potential of all mechanisms and ensure a more efficient interaction of EU level, national programmes and regional funding. A further concentration of research-specific responsibilities on fewer organisational units is also required, as is a reduction in the number of funding programmes. The practice of continuing mechanisms once they are established without restriction should be consistently questioned; programmes with weak financial effects should be bundled. A further reduction in the number of funding agencies should be reflected at state level in particular, but at federal level as well.⁹⁵

11. Improved access to and scientific use of federal statistics data

An additional measure to increase innovation efficiency might be to enable more micro-data-based evaluations of research funding (that is, the calculation of causal effects using individual, anonymous business data), as is possible, for example, in Denmark, the Netherlands or Sweden. In this respect, Statistik Austria will

check in detail which personal data in the leading nations is accessible for innovation policy measures and if and to what degree the requirement for amendments exists in the Austrian Federal Statistics Law to enable access to and the linking of anonymized federal statistics microdata for scientific purposes, while complying with all appropriate security measures. On this basis, knowledge could be gained on the areas in which research funding contributes to verifiable effects on the country's innovation performance. Funding mechanisms could then be adapted accordingly, in order to generate the desired effects, and to prevent undesired effects.

12. Increased competitively allocated financing for basic research to the level of the leading nations and the entire R&D expenditures in the interests of the future orientation of state spending

The continuing deficit in competitive funding of basic research compared with the innovation leaders is considerable and acts as an impediment to the performance and international comparability of scientific research in Austria. In order to broaden the spearhead of superb research in Austria and to improve the research conditions of Austria as a science location, the Austrian Council also recommends a significant increase in the funds awarded in competition for funding basic research (FWF) to the level of the leading nations.

Currently only 13.4 percent of all direct federal funding in Austria flows into R&D. The goal must be to increase this share over the entire innovation chain to make state spending significantly more future-oriented. The Austrian Council therefore recommends the introduction of a research funding act, which will secure the medium to long-term stability of RTI funding in Austria. In accordance with the men-

recommendations

⁹⁵ See Austrian Council (2013): Weißbuch zur Steuerung von Forschung, Technologie und Innovation in Österreich. Vienna, pp. 18 ff.

recommendations

tioned increase in the funds for the competitive financing of basic research, applied R&D funding would therefore also have to be allocated significantly higher. This in particular affects the projects evaluated as top quality in the FFG thematic and open-theme programmes.

13. Further acceleration of measures to increase the private sector share of R&D funding

The Austrian Council recommends focusing on measures to increase the private share of R&D funding. This can, for example, be achieved with improved framework conditions for philanthropic contributions and donations, for foundation law or for private risk financing. Essential here in any case is the concentration of the use of public sector funds on increasing the leverage effect to raise the incentive effect on private R&D expenditure and for raising the private financing share.

14. Making indirect research funding for young companies attractive

The Austrian Council once again recommends an examination of the practicality of international models of tax breaks for younger and smaller knowledge and technology-based companies for Austria. In terms of the evaluation made for the research premium the concept of a fictive entrepreneurs' salary in the research premium could be tested as a way of giving support to SMEs and young companies.

Innovative start-ups

15. Optimisation of the legal and financial framework conditions for start-ups

The Austrian Council recommends the funding package for start-ups be better coordinated and access for entrepreneurs be made easier. Just a

few programmes of critical financial spending should be offered. More intensive communication and publication work is also required, as is increased coordination between the funding offer service and the advisory service. A central and highly visible contact point for innovative entrepreneurs for each region should also be set up. A key point here is that the bureaucratic and regulatory framework conditions for funding start-ups must also be continuously improved.

16. Implementation of tax relief for start-ups

The Austrian Council recommends tax relief and support with social security funds in wage moderation, similar to the funding for innovative start-ups recently implemented with awts to accept or reduce incidental wage costs. This is however limited to three years and is designed as a subsidy and not as a tax break. To also contribute structural effects, these measures should be arranged for the start-up area as a permanent facilitation.

17. Development of new financing possibilities for innovative young companies and SMEs

Finally, in addition to funding by banks, the Austrian Council also recommends developing funding options for innovative entrepreneurs and SMEs. This being because the circumstance of an under-developed capital market for risk and venture capital has an especially negative effect on start-up activity. A rethinking of mechanisms such as tax breaks for investments in young companies, accompanied by corresponding legal framework conditions is therefore required to increase equity capital intensity from the private side. For implementation we would refer to the Austrian Council's individual recommendations in this respect.⁹⁶

⁹⁶ Recommendation of the Austrian Council on the amendment to the Alternative Investment Fund Manager Act (AIFMG) of 6 March 2014; Recommendation of the Austrian Council to optimize RTI-related start-ups of 19 November 2012; Recommendations of the Austrian Council for the efficient implementation of research results in innovations, to create suitable framework conditions for private equity, and to introduce a tax exempt participation amount (all of 24 November 2011).

Statements 2017

Statement on the Federal Government's Work Programme 2017/2018 –

Statement dated 9 March 2017

statements

Research quota goal still distant

The Austrian Council expressly welcomes the measures for funding research and innovation included in the government programme, as, in addition to structural reform proposals, it also includes specific budgetary measures. The goal of these pointers is to make Austria one of the

global frontrunners in future-oriented industries. If they are consistently implemented, the Austrian Council believes they will contribute to putting Austria back in the fast lane.

At the same time, however, the Austrian Council also emphasises that one of the priority goals





statements

of R&D policies is the securing of funding for research and development. But it is precisely here that the studies currently compiled by the WIFO as commissioned by the Austrian Council show that the probability of achieving the 3.76 percent research quota goal is currently very low. The Austrian Council also regrets the absence of the Research Funding Act announced for some years now. This would guarantee the long-term planning security so urgently required for research.

The same also applies for the RTD National Foundation. As an important strategic element of research funding in recent years, it was no longer capable of performing its function to any degree of satisfaction due to its difficult financial situation. The budget-independent and long-term financing of research initiatives intended with its foundation was realised in the initial years with the allocation of approximately EUR 125 million. The annual allocation in the meantime however has fallen to the lower two-digit range. The Austrian Council therefore in particular welcomes the creation of a legislative basis provided for in the Federal Government's Work Programme for the annual funding of the National Foundation over the next three years with EUR 100 million from the Jubilee Fund of the National Bank. This three-year planning could be extended further to the entire coming funding framework of four years. The Austrian Council also believes the National Foundation should also be amalgamated with the "Austria Fund" to utilise funding and administration-related synergies.

Balance of the investment between the budget allocations for universities and basic research on one hand and the increase in the research premium to 14 percent on the other

In terms of regional policies the Austrian Council basically welcomes the planned increase in the research premium. An increase, as addressed in the government programme, should only be

made after an appropriate recommendation from the currently ongoing evaluation of the research premium has been presented.

From a research policy point of view the Austrian Council would also point out that a balance between the areas of action for basic research, applied research and the location-related research premium must be established. The Austrian Council has repeatedly referred to this in its reports on Austria's scientific and technological capability in recent years.

Putting Austria's universities among the world leaders

The planned improvement in study quality requires a capacity-oriented study place management and reinforced expansion of career positions. The improvements at the universities provided for in the current government programme are therefore very welcome. As the selection and admission procedures also always have an influence on the social mix, the simultaneous improvement of the studies support system is also extremely important. The financing of both components requires strong commitment to education and research. The goal of achieving 2 percent of GDP for the tertiary sector by 2020 was already formulated in earlier government programmes. The currently applicable federal funding framework, however, exhibits big gaps with the funds that would be required to achieve this goal. Accumulated the financing gap is up to EUR 5.6 billion, assuming the share of the public sector funding continues to develop consistently. If the funding – as provided for in the current FFF up to 2020 – is not significantly increased, the university quota in 2020 could actually be only about 1.4 percent. This would even be lower than the currently low value.

In addition to the expansion in teaching capacities and an improvement in supervision ratios at the universities connected with it, the competitive research funding for basic research must also be increased, as it is seriously under-funded compared with other research nations. For this

reason, parallel to the introduction of a study place funding model, a significant increase in the direct funding for excellent research should also be introduced.

Start-ups: Excellence networks & clusters

The Austrian Council welcomes the proposed measures package for funding innovative start-ups. However, when identifying topical areas, the Austrian Council believes that this often ends in a manifestation of the status quo, which might also solidify this status and therefore inhibits the development of new areas of strength. Any definition of topical areas should therefore also leave scope for new definitions, as unexpected, mostly disruptive

innovation potential can often be revealed here in particular.

Regardless of the relevance of the planned measures, all initiatives in the start-up area will only have an effect if start-up-friendlier framework conditions are also put in place in Austria. In addition to high taxation, the present hindrances include the cost and time-intensive bureaucracy and unclear regulations and legislative liabilities, which tend to reward the representatives of certain professional groups rather than the company founders. If these are not defused, even the best packages of measures will sink without effect as if in quicksand sooner or later.

statements

Statement by the Austrian Council on the government draft for the Data Protection Amendment Act 2018 – Statement dated 19 June 2017

Preamble

Ordinance (EU) 2016/679 on the protection of individuals with regard to the processing of personal data, and on the free movement of such data and repealing Directive 95/46/EEC (General Data Protection Regulation) ABl. No. L 119 of 4 May 2016 p. 1 was adopted on 27 April 2016. The General Data Protection Regulation (GDPR) came into effect on 25 May 2018 and as of 25 May 2018 repeals Directive 95/46/EEC.⁹⁷

Objectives⁹⁸ are:

- Implementation of Ordinance (EU) 2016/679 on the protection of individuals with regard to the processing of personal data, and on the free movement of such data and repealing of Directive 95/46/EEC (General Data Protection Regulation) ABl. No. L 119 of 4 May 2016 p. 1 (GDPR).
- Implementation of Ordinance (EU) 2016/679 on the protection of individuals with regard to the processing of personal data, and on the free movement of such data and repealing of Directive 95/46/EEC (General Data Protection Regulation) ABl. No. L 119 of 4 May 2016 p. 1 (GDPR).
- Implementation of Directive (EU) 2016/680 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data by competent authorities for the purposes of the prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, and on the free movement of such data, and repealing of Council Framework Decision 2008/977/JHA, ABl. No. L 119 of 4 5. 2016, p. 89
- Consistent competence in the general issues relating to the protection of personal data
- Amended fundamental right to data protection

⁹⁷ https://www.parlament.gv.at/PAKT/VHG/XXV/II/I_01664/fname_640101.pdf

⁹⁸ https://www.parlament.gv.at/PAKT/VHG/XXV/II/I_01664/fname_640100.pdf

statements

- Data processing regulation for specific purposes
- Image processing regulation

Statement

The Austria Council believes this draft for the government bill of the GDPR represents a massive restriction for research activity in Austria. This in particular affects medical research, which is especially important for progress and therefore for improving the treatment of patients and thus clearly in the interest of the general public. Regulations on research activities should therefore be as clear as possible and easy to deal with, in the interests of progress and competitiveness and should not be hindered by legislative restrictions.

To maintain the competitiveness of research location Austria in the competition with our rivals in Europe, legislators must use all flexibility clauses for scientific research purposes and must prevent the formation of any hurdles in

addition to those posed by the regulations of the GDPR.

We would refer to § 25⁹⁹, in which no general difference is made between “conventional” scientific or statistical investigations and research in the interest of the general public: We believe, as in paragraph (3) 2.¹⁰⁰, simply creating an option to have every case checked and approved via time and resource-intensive methods is not sufficient here. A privileged exception clause (as is possible in the flexibility clauses mentioned) should be firmly established for research in general and medical research in particular in the interests of the general public.

Research should be promoted for everyone's benefit, and not hindered. Legal framework conditions must ensure security for researchers and of course for all affected. With the existing government bill for the GDPR the Austrian Council sees requirement for action to refine these framework conditions, in order to positively support research in serving the social benefit.

Statement on the draft of a federal law to amend the University Act (UA) 2002 – UA will be amended (capacity-oriented, student-relevant university financing) –

Statement dated 14 September 2017

GZ: BMWFW-52.250/0117-WF/IV/6a/2017

Position of the Austrian Council

The Austrian Council has called for the implementation of capacity-oriented, student-relevant university financing for many years now. This draft is a step in the right direction. The financing situation at the universities remains, however, unsatisfactory. According to current FFF planning the renewed goal of increasing the spending quota for universities to 2 percent of GDP already named in the government programme

2008–2013 and repeated in the subsequent documents will not be achieved by 2020 either. Approximately EUR 3.8 billion is currently required for the higher education sector.¹⁰¹ The quota is stagnant at about 1.47 percent of GDP. A basic improvement in the situation at the universities can only be expected if the next government succeeds in significantly increasing the funds for education and research in the tertiary sector. The

⁹⁹ Data processing for specific purposes – Processing for the purposes of scientific research and statistics.

¹⁰⁰ Para. (3) 2.: ‘Approval by the data protection authorities to process personal data for the purposes of scientific research or statistics must be issued at the request of those responsible for the analysis, provided there is no general public interest in the requested processing’

development of the higher education landscape also requires a socially balanced study access regulation and the expansion of the study place offering in the technical colleges sector.¹⁰²

A second focus point is on the required increase in research funding awarded in competition. The deficit in competitive funding of basic research compared with the leading research nations is considerable and acts as an impediment to the performance and international comparability of scientific research in Austria.

University financing:

The Austrian Council believes the composition of the total amount announced in this draft, consisting of the three pillars of teaching, research and development and the development of the arts, as well as infrastructure and strategic development, is basically suitable to guarantee transparent financing of the three sub-areas.

Financing teaching:

The Austrian Council believes the proposed regulation for financing teaching to use the basic indicator 1 – Number of examination-active correctly run bachelor, master and degree studies with evaluation according to subject groups with at least 16 ECTS credits or 8 positively evaluated semester hours – has been well selected for the first phase of this financing reform. To avoid

counteracting a dynamic development and a strategic management opportunity, however, the Austrian Council believes the option must be given of adjusting the minimum requirement of credits in the years that follow, including during the performance agreement periods. A realistic presentation of the ECTS assessments in the studies curricula must be ensured.

With regard to the assessment of the studies in the planned seven subject groups, the Austrian Council also believes a flexible approach must be adopted, which enables an adjustment of the provided classification according to input after the evaluation, in particular because in the future in the area of teaching there will also be an even more restricted foreseeable shift in the costs structure due to new digital technologies and today's range of courses.

Research financing:

The Austrian Council believes a dynamic regulation must be guaranteed for the future calculation of the partial amount on the basis of the minimum amount of people to be employed, agreed in the performance agreements, and the competition-oriented indicators, on the basis of largely insufficient empirical values alone. The formulation under § 12 Para. 2 Z 2 a, b and c¹⁰³ identifies a rigid regulation.

statements

101 Accumulated additional expenditure, which would have been required for 2016-2020 to achieve the target rate of 2 percent, with a 78 percent contribution from federal funding to university expenditure. Research rate targets 2020, update 2017, WIFO, as commissioned by the Austrian Council.

102 See "Recommendation for the further development of the technical colleges sector in the Austrian education and science system." Austrian Council, 30 May 2017.

103 2. Universitärer Leistungsbereich Forschung bzw. Entwicklung und Erschließung der Künste gemäß § 12 Abs. 2 Z 2:
a) Minimum amount of people to be employed Austria-wide in the individual subject groups (in FTEs) in selected use groups. Basic indicator 2 "Staff in selected use according to subject groups in FTEs" is used to determine the scope of the assessed FTEs.
b) Amount for the universities according to § 6 para. 1 Z 1 to 15 ("scientific universities"), which is calculated using at least one competition-oriented indicator.
c) Amount for the universities according to § 6 para. 1 Z 16 to 21 ("artistic universities"), which is calculated using at least one competition-oriented indicator.



statements

It must be stressed again here that in addition to a needs-based basic financing for research at universities, the Austrian Council also recommends significantly increasing competitive research funding, in particular basic research and therefore to secure the competitiveness of science and research at Austria's universities.

The consideration of infrastructure and strategic development in a joint financing source illustrates a budgetary mix, which does not appear to be appropriate. The Austrian Council therefore suggests providing a separate financing source for the two areas, whereby innovation and translation in particular must also be ensured within the scope of the strategic development.

Infrastructure financing source:

The draft gives the impression that this partial amount will be used to cover the infrastructural fixed costs such as rental and building maintenance costs, the costs for the clinical additional expenditure and to maintain research infrastructures (financial protection of the universities). It is not clear how high the pro-rata amount for teaching, research and development and development of the arts as well as "other" measures and their share in this partial amount is.

A significant allocation both for new acquisitions and the expansion of existing research infrastructures at the universities is also unclear. The Austrian Council believes this important financing share for research work is much neglected – in particular because within the scope of research infrastructure programmes the allocations are very low. Furthermore approvals for participation in European research infrastructures¹⁰⁴ are also allocated too low and can be

seen as a factor that inhibits international participation. The Austrian Council recommends the financing sources for infrastructure and national research infrastructure programmes be significantly increased and aligned with the performances of the leading research nations.

Translation and innovation financing source:

In the European comparison the financial resources available to university management for strategic further development are extremely restricted. This restriction affects topics such as funding of intra-university and inter-university interdisciplinary factors, and the important alignment with and promotion of innovation and translation.

Access to the universities:

In earlier statements and recommendations the Austrian Council has supported and called for the introduction and implementation of socially balanced access regulations at universities – a management measure required for the introduction of capacity-oriented, student-relevant study place financing.

The Austrian Council believes it should be the university management that regulates a capacity-oriented access to the respective universities in coordination with the responsible departments, ministries and the ministers. The Austrian Council has recommended a higher level of autonomy within the scope of study place financing.¹⁰⁵ The Austrian Council believes the drafting of a framework to guarantee the required number of study places and less so the intensifying of detailed study access regulations, as specified in the passages in question in §§ 51, 63 and 71, would be expedient.

¹⁰⁴ The success rate of Austrian scientists in the European research infrastructures programme is significantly lower than in the science area. See Research and Technology Report 2017; 5 Austria in the European research area, p. 130 f.

¹⁰⁵ Recommendation for governance and management structures at the universities; Austrian Council; March 2015.



Update: Accomplishments

Information exchange in the LA-AC cooperation

The cooperation between the Lower Austrian State Government and the Austrian Council has been functioning well since 2011. It enables joint reflection on current and strategic issues in the RTI system. At a meeting in the Palais Niederösterreich on 29 May 2017 in Vienna, representatives of the State of Lower Austria and the Austrian Council once again met for an information exchange: Present were State Secretary Petra Bohuslav, Kerstin Koren (regional manager for research and development), Georg Bartmann (Economy, Tourism & Technology Department / WST3), Claus Zeppelzauer (Ecoplus business agency), Sylvia Schwaag-Serger (Council Member and Deputy Vice Rector of the University of Lund / Sweden) as well as Ludovit Garzik, Constanze Stockhammer and Bettina Poller from the Austrian Council's Secretariat. State Secretary Bohuslav explained the initia-

tives of the Lower Austrian State Government in the area of "Economy 4.0" and announced the setting up of a secretariat for the "Digitalization" topic. She also provided an overview of Lower Austria's current research and location policy and the implementation of the current financing and research strategy. From the review as it stands, Petra Bohuslav drew the conclusion that jobs for highly qualified people will be created at the aptly-named Technopol locations in Lower Austria (Krems, Tulln, Wiener Neustadt and Wieselburg). This would also support the structural change for the knowledge-based economy, which can also emerge in international competition.

Sylvia Schwaag-Serger then presented the status quo of Austria's scientific and technological capability, as well as the Austrian Council's priority issues and activities.

Migration & social inclusion

The Austrian Council compiled a study on the "Education/research and migration"¹⁰⁶ topic for the first time in 2015. The study was updated at the beginning of 2017 and presented on 21 March 2017 as part of a press info meeting by Council Member Markus Hengstschläger and education psychologist Christiane Spiel (University of Vienna). Key statement: Theoretically the Austrian education system formally enables all young people to advance in education – regardless of whether they have a migrant background or not. In reality however this advance is not achieved in sufficient measure.

Children and young people with a migrant background on average do not achieve the education status of those without a migrant background. This is partially explained by a low socio-economic status. Early support – especially language support – appears to be the most important measure required to improve the educational opportunities of young people from migrant backgrounds.

Following a preliminary study on the opportunities of science communication in 2016, the Zentrum für Soziale Innovation (ZSI – Centre for Social Innovation) was commissioned with

¹⁰⁶ For this, see Austrian Council Annual Report 2015:

http://www.rat-fte.at/tl_files/uploads/Taetigkeitsberichte/Taetigkeitsbericht%202015_Web.pdf (p. 50 f.).

a more detailed study on the topic of the marginalisation of young people. It is widely known that access to education and knowledge transfer is highly influential. Education counteracts marginalisation and social exclusion as a further consequence. With this study the Austrian Council has prepared the basics and gathered evidence to work out approaches and measures for children and young people as important target groups.

The ZSI's study shows how marginalised families must be incorporated into the compilation and evaluation of offers, in order to reach them as target groups and awaken interest. Everyday-relevant

topics connected with school and the social environment have positive effects. They should therefore be offered more in future transfer formats. The trust relationship is also very prominent in working with children and young people. The job security of the intermediary must be guaranteed to be able to build long-term relationships with the target group. The staff also require regular space for reflection and appropriate training and further training offers.

The studies are available to download on the Austrian Council's website.

(<http://www.rat-fte.at/publikationen.html#2017>).

creating knowledge

“Europe 2050” Project

The Austrian Council is preparing a book as a contribution to the discussion on the realignment of the European project. It will provide input for the conceptual discourse on the further development of the European Union initiated by the EU Commission. The publication in particular focuses on education, science, research, technology and innovation. The book project is also a contribution to Austria's EU Council Presidency in the second half of 2018. Its working title is “Europe 2050”.

The idea for the book is rooted in the findings that the European Union suffers from a strategic deficit. This deficit has taken Europe into a dead end, although creativity, the ability to reinvent and overcome own boundaries were constituting moments of the united Europe. During the course of its history Europe has often demonstrated its ability to produce innovative new starts. And it needs such a new start today more than ever.

The book outlines Europe's beginnings based on its cross-border handling of new knowledge and new ideas. It aims to topicalize the Enlightenment as a true European project and illustrate its consequences: the “invention” of invention and the development of the key insti-

tutions of the knowledge society. The knowledge society unleashed the mythical figure Prometheus (who in Greek mythology brings fire to humanity and is thus punished by the Gods), and ultimately introduced the scientific and industrial revolution. In closing the book also analyses Europe's successes and problems, now subjecting the continent to a crucial test. With this project the Austrian Council aims to emphasize how intensive European integration is expedient in the face of global challenges – instead of some kind of return to nation-state relations. Europe needs new strategic thinking, perhaps even a new Utopia focusing on a knowledge-based society and economy.

The goal of “Europe 2050” as a book is to illustrate methods and strategies to establish a European knowledge society in which innovation will be reinforced as the motor of economic growth, while also boosting social cohesion and environmental protection. It delivers ideas for the social, economic and ecological renewal of the European Union. The publication also poses questions about the role education, science, research and innovation will play with this renewal.

creating knowledge

Publication: „Future and Tasks of Higher Education“

Higher education institutions, and universities in particular, are changing with the world around them. Digital technologies change research and teaching, modern communication tools and social media aid interactive information exchanges with society and accelerate international knowledge transfer. Digital media, the Internet, big data, artificial intelligence and machine learning bring up-

heaval to our society. At the same time the higher education area is changing and enabling new careers in education.

In view of global trends, classic and future responsibilities of the higher education area are increasingly being questioned, development processes are adjusted and redefined and distributed in line with global challenges.

How can the higher education sector meet these and other challenges?

In recent years the Austrian Council has tackled the more important issues of the future and tasks of the universities in the 21st century. Renowned experts were invited to develop scenarios.

A total of 46 authors wrote 29 pieces for the “Future and tasks of higher education: Digitalisation – internationalisation – differentiation”¹⁰⁷ anthology. About half of them are not from Austria, but rather from countries such as Sweden,

Switzerland, Germany, the UK, the Netherlands and the USA.

The publication addresses current national and international trends in higher education development and discusses possible scenarios for the higher education landscape in Austria. The starting point is provided by questions on the tasks of higher education institutions in technologically advanced societies and economies at the begin-

¹⁰⁷ ISBN 978-3-643-50826-3 (geb.),
ISBN 978-3-643-65826-5 (PDF).



ning of the 21st century – and what their role in meeting the global grand challenges might look like. Digitalisation, internationalisation and differentiation accompany the development process in any case.

The book is divided into four chapters. The first part – development, its importance and tasks – topicalizes the diverse positions of the higher education institutions. The individual pieces discuss the tasks today and in the future, what proves its value and what must be changed in cultural, socio-economic and socio-political terms. Changing structures are discussed and possible solutions are proposed. The framework conditions in the higher education area are illustrated in the second part – organisation, management and governance. How much autonomy does a higher education facility require and how far should or may the interests and influence of the state go?

The third part – global knowledge area and digitalisation – focuses on internationalisation. The various contributions offer an external view and position the universities in a global knowledge area, equipped with new methods for knowledge production and exchange via new digital technologies. This will change the future of teaching. The fourth part provides a differentiated and diverse view of the higher education landscape. The authors draw attention to alternative developments and necessary changes in the higher education sector.

The change in higher education is similar to the evolution of a complex organism, which, adapted to an ecosystem, is enabled through spontaneous mutations to populate new habitats. New “education systems” possibly also develop here. It will certainly be exciting to see how our tertiary education sector develops.

creating knowledge

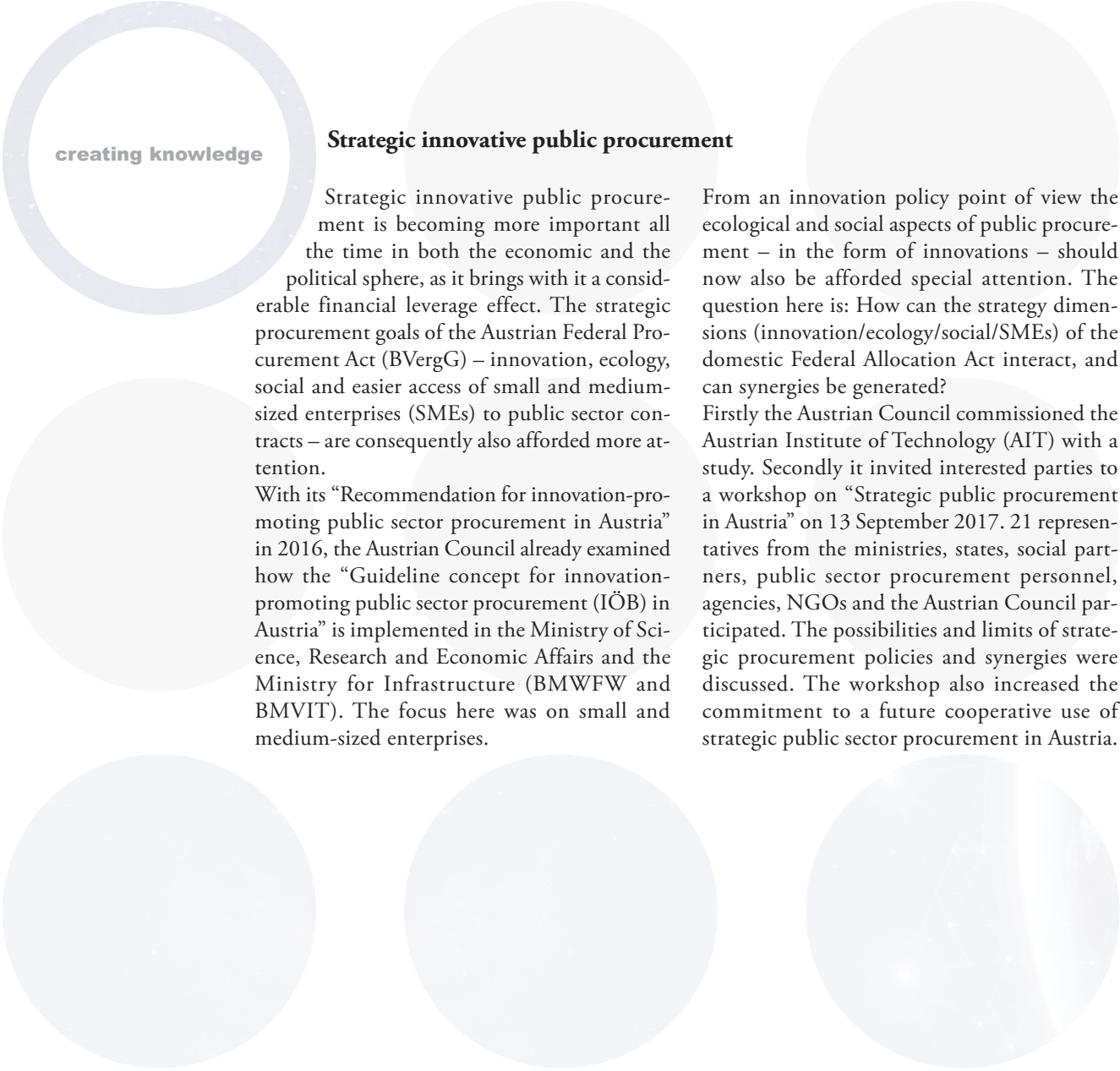
Framework conditions for innovative start-ups

Although start-ups have now been recognised as an important political area of action, the dynamic in Austria is behind the targets of the RTI Strategy. In Austria the reasons for this are in particular the lack of private financing reforms (e.g. risk capital, crowdfunding, etc.) and bureaucratic, regulatory and taxation framework conditions for start-up enthusiastic entrepreneurs. Especially prominent are the costs and the times it takes to set up a limited company (GmbH) and its legal structure (see figure 12, page 57).

The Austrian funding system for innovative start-ups in the international comparison may be very comprehensive, but it is also complex and intransparent. The political practice of promoting small, subcritical funded programmes at the expense of established, well-functioning mechanisms, in order to draw attention to them, is particularly problematic here. More transparency would simply be helpful for potential start-up founders. The funding landscape must be combed through and restructured to make access easier.

To promote start-ups the bureaucratic and regulatory framework conditions must be continuously improved. Even the best funding and financing can only develop within a functioning framework. The Austrian Council commissioned KMU Forschung Austria together with the law firm RPCK Rastegar Panchal to examine the administrative and legal start-up procedure and to find effective approaches.

The results of this analysis are described in more detail in the chapter, “Creating knowledge: Reports and studies”. They provide the basis for the Austrian Council’s 2018 recommendations. The goal is to make Austria a competitive start-up location in the international comparison. Austria will not only fund start-ups, but rather will also attract international investors. In addition to the start-up process, the limited company as the most widespread legal form must also be made more attractive for this.



creating knowledge

Strategic innovative public procurement

Strategic innovative public procurement is becoming more important all the time in both the economic and the political sphere, as it brings with it a considerable financial leverage effect. The strategic procurement goals of the Austrian Federal Procurement Act (BVerG) – innovation, ecology, social and easier access of small and medium-sized enterprises (SMEs) to public sector contracts – are consequently also afforded more attention.

With its “Recommendation for innovation-promoting public sector procurement in Austria” in 2016, the Austrian Council already examined how the “Guideline concept for innovation-promoting public sector procurement (IÖB) in Austria” is implemented in the Ministry of Science, Research and Economic Affairs and the Ministry for Infrastructure (BMWFW and BMVIT). The focus here was on small and medium-sized enterprises.

From an innovation policy point of view the ecological and social aspects of public procurement – in the form of innovations – should now also be afforded special attention. The question here is: How can the strategy dimensions (innovation/ecology/social/SMEs) of the domestic Federal Allocation Act interact, and can synergies be generated?

Firstly the Austrian Council commissioned the Austrian Institute of Technology (AIT) with a study. Secondly it invited interested parties to a workshop on “Strategic public procurement in Austria” on 13 September 2017. 21 representatives from the ministries, states, social partners, public sector procurement personnel, agencies, NGOs and the Austrian Council participated. The possibilities and limits of strategic procurement policies and synergies were discussed. The workshop also increased the commitment to a future cooperative use of strategic public sector procurement in Austria.

Basic expertise: Reports and studies 2017

creating knowledge

Report on Austria's Scientific and Technological Capability

Background

The Austrian Council has supervised the implementation of the Austrian Government's Research, Technology and Innovation Strategy since 2011. Since 2012 the Austrian Council submits its Report on Austria's Scientific and Technological Capability to the National Council. In accordance with the assignment given by the Cabinet, this also includes strategic monitoring of the implementation activities and illustration of Austria's performance compared with the leading innovation nations. The Austrian Council is concerned with both pointing out positive developments and addressing difficulties with equal clarity in the report.

The Report on Austria's Scientific and Technological Capability focuses on four priority goals of the Government's RTI Strategy:

- To advance to the group of leading innovation nations in the EU by 2020
- To boost the Austrian economy's competitiveness
- To increase social prosperity
- To meet the major social and economic challenges of the future

The priority goals refer to overriding political targets and are especially important for the country's inhabitants. It is about the country's economic capability, performance in the areas of quality of life, health, life expectancy, environmental aspects and innovation performance.

Key results of the analysis of priority objectives

- **Above average economic performance:** high per capita GDP, low unemployment
Compared with innovation leader nations such as Denmark, Germany, Finland, Sweden and (new) the Netherlands, Austria's economic performance is very high. Per capita GDP in Austria has increased slightly since 2010. This is reflected in the country's social prosperity, which

is clearly ahead of the leading innovation nations. Both with regard to growth in real GDP and with respect to the development of per capita GDP, Austria is stable among the best performers worldwide. Austria is traditionally included among the industrial countries that show a relatively low unemployment rate. Although unemployment recently rose sharply and that it is unusually high in Austrian terms, compared to the leading innovation nations it remains relatively low. Only the proportion of those in work relative to the total population has actually stagnated since 2010. There has however been a clear increase in the rate of women in employment.

- **Downward trends in social development:** Quality of life and life expectancy in good health very high, but the level of the innovation leaders rose sharper.

Indicators for social development such as quality of life, health and life expectancy are below the innovation leaders' average. While the absolute life expectancy in Austria is among the highest in the world, the proportion of years spent in good health has only been in the midfield for some years now. In the OECD comparison Austria is also in the midfield with regard to quality of life. The Scandinavian countries score above average well in the international comparison with quality of life. Sweden, Denmark, Finland and the Netherlands show distinctly higher scores with education, health, life satisfaction and work-life balance in particular.

Important approaches for better quality of life can also be found in the education area, where the RTI Strategy places great emphasis (economic competitiveness, employment and unemployment). A consistent implementation of the proposals would have a positive effect on social development and innovation success – another Strategy goal.

- **Performance in the environmental area well below average in places:** With resource productivity and greenhouse gas emissions Austria is clearly behind the leading nations, but clearly ahead in the energy intensity area.

With the environmental indicators, Austria's position in relation to the innovation leaders has scarcely changed since 2010. With energy intensity Austria is in front of the leading nations; with resource productivity and greenhouse gas emissions it is quite far behind. On the whole Austria scores rather poorly in various international rankings with climate and environmental protection. In the 2017 Climate Protection Index, which was presented in November 2016 at the UN Conference on Climate Change in Marrakesh, Austria is ranked second last among the EU member states. In the Living Planet Report 2016 by the WWF, which measures the use of resources of all countries and their ecological footprint derived from it, Austria is ranked at number 14 – ingloriously far ahead in the global ranking list of the countries with high resource consumption and especially in the Europe-wide comparison. Clearly sector-specific regulations in Austria are insufficient. The relatively low proportion of energy and environment-relevant R&D budgets of the entire public sector R&D budget must be rated unfavourably here.

- **Innovation performance solid, but insufficient to achieve the innovation leader goal:** Leading nations grow faster; the distance to Austria has increased since 2010.

Austria's innovation performance has not improved on the whole since 2010 compared with the leading countries. It has clearly not been able to successfully utilise the favourable starting position in 2010 – the year that serves as a reference point for the RTI Strategy. The main problem is clearly the declining development dynamic. It results in Austria not being able to sufficiently recover lost ground.

Austria is in a better position than that shown

in the European Innovation Scoreboard (EIS), but it is still significantly behind the leading innovation nations. The performance deficit has reduced partially since 2010. The development dynamic does not allow us to conclude that Austria is moving towards the leading nations. From today's point of view, the goal of the RTI Strategy to advance to the group of innovation leaders by 2020 is therefore not achievable.

Summary

Austria has made impressive efforts to join the leading innovation nations and therefore ultimately ensure prosperity, quality of life and environmental quality in the country. This has triggered a positive dynamic in some areas, but a very clear decline was also seen in some places. Austria has not yet achieved the Federal Government's goal of joining the group of innovation leaders. Education, science, research and innovation merit greater attention and political priority.

To successfully navigate the course foreseen by the RTI Strategy by 2020, the Austrian Council believes that the priority areas of action in the education system, in basic research, with start-ups and with the (private) financing of R&D must continue to be addressed. These were analysed in detail in the Mid-Term Review (2015) and in the 2016 Performance Report.

The Austrian Council believes this would then improve Austria's performance with regard to the priority objectives of the RTI Strategy. The quality and speed of progress in economy, health, quality of life and environment ultimately depend on how capable research in domestic universities, research institutes and businesses proves to be.

The Austrian Council believes more innovation brings several positive effects: The position of innovation leader represents good economic competitiveness, high employment and low unemployment, all important determinants of quality of life, as well as a high level of education throughout society. If the measures of the

RTI Strategy are implemented in the education area, this not only boosts innovation – it boosts the Austrian society as a whole. Research and renewal in the healthcare sector can further improve the parameters of life expectancy in good health and quality of life. Increased investments in energy and environment research in turn also have a positive effect on health and quality of life.

The analysis shows there is still room for improvement with activities for research, technology and innovation with regard to the goals of the RTI Strategy. The Austrian Council therefore considers its report and the recommendations in it to be a valuable contribution to achieving these priority objectives.

creating knowledge

Feasibility study on setting up a nationwide research funding database.

In its report on research funding in Austria published on 24 June 2016, the Court of Auditors also criticised the complexity of research funding.¹⁰⁸ According to the Court of Auditors the Federal Government and the states had a total of EUR 3.1 billion at their disposal in 2014 for research funding. However, there is still no clear overview for the actual cash flows.¹⁰⁹ There are also numerous different databases for research funding with the Federal Government, the states, funding institutions and research organisations, which also make a clear overview rather difficult.

The Court of Auditors therefore suggested setting up a standardised database to record research funding across Austria.¹¹⁰

In their reaction to the Court of Auditors report, the Federal Ministry of Transport, Innovation and Technology (BMVIT) and the Federal Ministry of Science, Research and Economic Affairs (BMWFW) asked the Austrian Council for a feasibility study on a nationwide database for research funding. Within the scope

of its Work Programme, the Austrian Council subsequently commissioned a study to examine the framework conditions, complete with cost-benefit analysis.

In coordination with BMVIT and BMWFW, the Swiss consortium Rütter Soceco, SenarcLens, Leu & Partner and Quantum Analytics were commissioned with performing the feasibility study. As part of the study heuristic, technical, legal and financial principles were outlined, relevant stakeholders in the Austrian RTI system were identified, and necessary implementation steps were proposed. The study was completed in November 2017 and published on the Austrian Council's homepage.¹¹¹

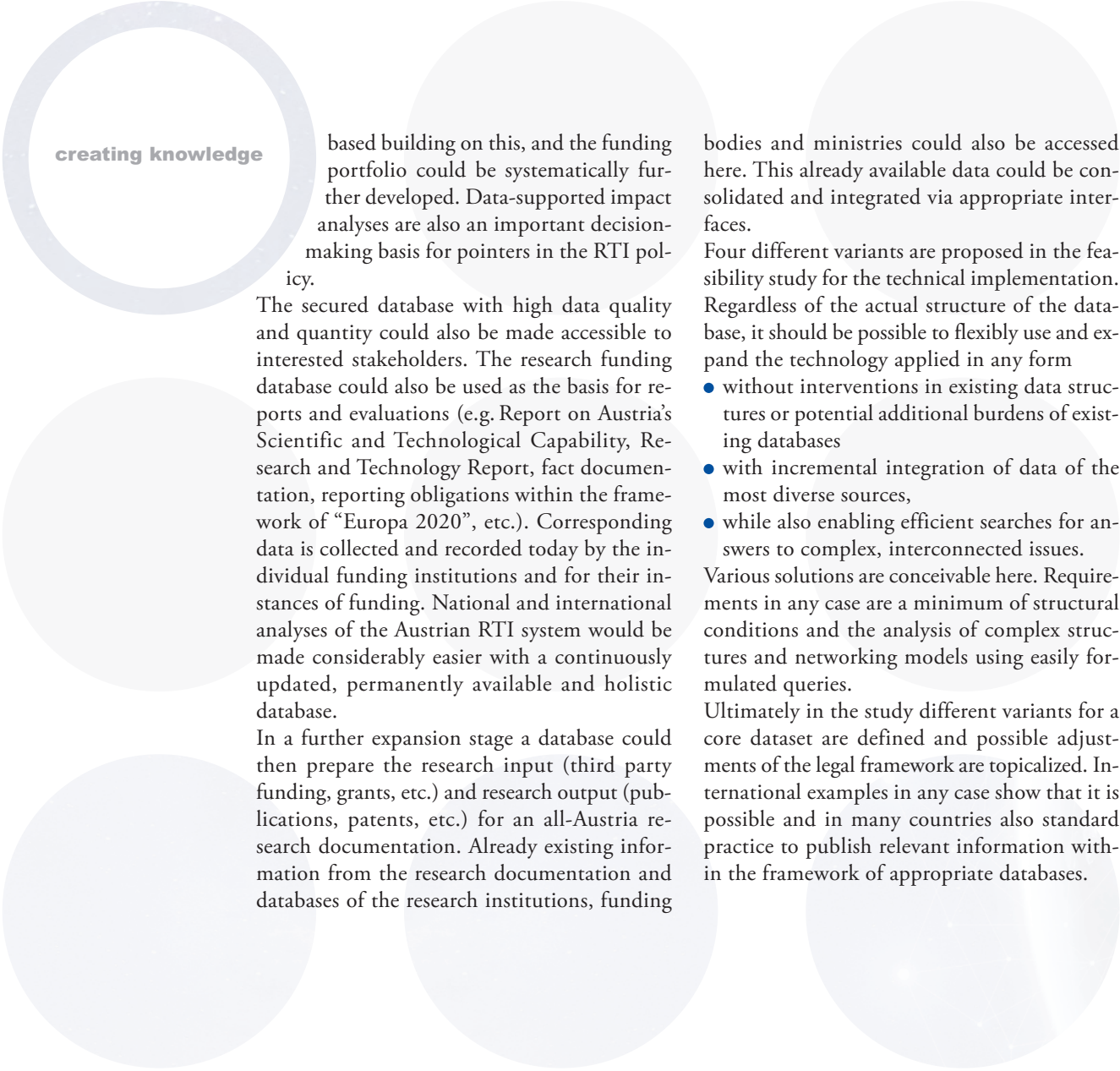
It defines several beneficial aspects of a nationwide research funding database. The RTI system could be controlled better with a holistic overview of the financing flows. The individual funding activities could be sounded out for their efficiency and effectiveness with regard to the overall system. Individual funding mechanisms could subsequently be adjusted evidence-

108 Rechnungshof (2016): Forschungsfinanzierung in Österreich. Reihe Bund 2016/4.

109 The Court of Auditors did, however, provide substantial preparation work in this respect in its report (figure 8).

110 The CREST Report in 2008 and the system evaluation in 2009 already made reference to this requirement. The adjustment of legal framework conditions for the use of existing databases is also addressed in the RTI Strategy.

111 Rütter Soceco, SenarcLens, Leu & Partner and Quantum Analytics (2017): Feasibility study on setting up a nationwide research funding database. Study commissioned by the Austrian Council. Zurich, 11 November 2017.



creating knowledge

based building on this, and the funding portfolio could be systematically further developed. Data-supported impact analyses are also an important decision-making basis for pointers in the RTI policy.

The secured database with high data quality and quantity could also be made accessible to interested stakeholders. The research funding database could also be used as the basis for reports and evaluations (e.g. Report on Austria's Scientific and Technological Capability, Research and Technology Report, fact documentation, reporting obligations within the framework of "Europa 2020", etc.). Corresponding data is collected and recorded today by the individual funding institutions and for their instances of funding. National and international analyses of the Austrian RTI system would be made considerably easier with a continuously updated, permanently available and holistic database.

In a further expansion stage a database could then prepare the research input (third party funding, grants, etc.) and research output (publications, patents, etc.) for an all-Austria research documentation. Already existing information from the research documentation and databases of the research institutions, funding

bodies and ministries could also be accessed here. This already available data could be consolidated and integrated via appropriate interfaces.

Four different variants are proposed in the feasibility study for the technical implementation. Regardless of the actual structure of the database, it should be possible to flexibly use and expand the technology applied in any form

- without interventions in existing data structures or potential additional burdens of existing databases
- with incremental integration of data of the most diverse sources,
- while also enabling efficient searches for answers to complex, interconnected issues.

Various solutions are conceivable here. Requirements in any case are a minimum of structural conditions and the analysis of complex structures and networking models using easily formulated queries.

Ultimately in the study different variants for a core dataset are defined and possible adjustments of the legal framework are topicalized. International examples in any case show that it is possible and in many countries also standard practice to publish relevant information within the framework of appropriate databases.

Strategies of active market cultivation in research. An analysis of practices at Austrian research institutions.

creating knowledge

In Austria it is more a culture of knowledge acquisition than one of knowledge transfer that has established itself to transfer knowledge to innovation. Universities in particular have excellent research, which, however, often remains unused in terms of value creation. To build a modern “culture of innovation” and to remain internationally connective the predominant “culture of knowledge” would have to be developed into a “culture of innovation”.

Attracting third-party funds for universities and non-university research institutions in international competition is also becoming more important all the time. It therefore applies that the strategies and framework conditions of Austrian research institutions must be optimised so they can actually do this. Due to the under-financing of public sector funding bodies, particular attention is paid to third party funding from companies.

The Austrian Council has examined these topics as part of the “Strategies of active market cultivation in research. An analysis of practices at Austrian research institutions” project. The goal was to provide an overview of the strategies applied by the national universities and non-university institutions to acquire third-party funding. They were illustrated in comparison with international best practice models and development potential for the future was subsequently determined.

The focus of the project was on strategies of active market cultivation by universities and research institutions – especially by researchers in the technology and natural sciences area and with the focus on “Science to Business”. Appropriate marketability is a key capability of modern, future-oriented research institutions.

The study is considered a valuable contribution to improved competitiveness in the Austrian

Overview of the more important areas of action for university management and operative units

Operative units	University management
1. Clear strategic positioning and orientation	Entrepreneurial "mind set" of university management
2. Market-oriented institute management	Personal dedication of rectors
3. Organisational anchoring of market orientation	Use of all free areas that university law offers to establish market proximity
4. Organisation routines for business development	Serious profile development with courage to consolidate. Use of relevant resources for strategic projects
5. Setting up professional interfaces	Greatest possible relief for researchers
6. Establishment of a systematic customer-relationship management with orientation on key customers	Development of organisational skills to effectively manage consolidation processes
7. Development of personal skills for systematic market cultivation	

Source: Wolfgang Filz (2017): Strategies of Active Market Cultivation in Research. An analysis of practices at Austrian research institutions. A study on behalf of the Austrian Council. Vienna, p. 29.

creating knowledge

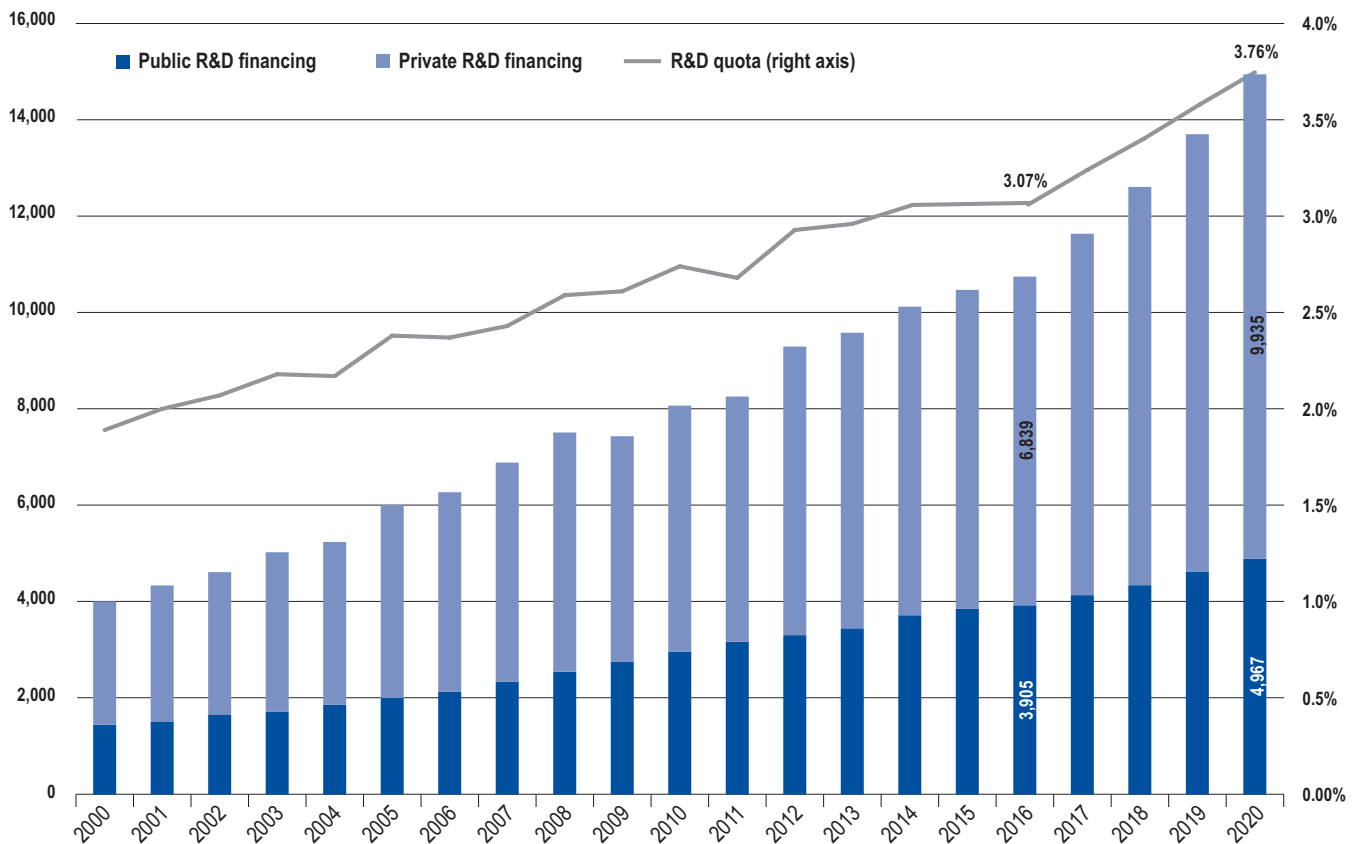
higher education sector. The development of suitable marketing strategies and an effective market cultivation apply as success factors in international competition. And their importance will continue to grow.

Key results and areas of action

The following general success strategies were named or observed by the interview partners. The order reflects how frequently the strategies were named.

1. Heavy thematic concentration.

Figure 13: Financing method to achieve the R&D quota target of 3.76 percent in 2020, in EUR millions



Source: WIFO research rate targets 2020.

2. Concentration on a few key customers / Prevention of fragmentation.
3. Business relations are considered in a long-term perspective.
4. Provision of an industry-friendly organisation culture.
5. Intentional strategic, autonomous and proactive topic development with simultaneous linking of basic and applied research.
6. Deployment of personnel according to personal strengths.

7. Development of a multiple organisational ecosystem of special purpose units (SPUs) for covering structural market requirement situations.

The analysis of the success strategies and barriers produced several key areas for the professionalization of market cultivation. These in turn produce specific areas of action for the respective university management and individual researchers or operative units.

creating knowledge

WIFO study: R&D quota goal 2020 “scarcely achievable”

The Austrian Government decided to implement the Strategy for Research, Technology and Innovation in 2011 – an important step towards improved framework conditions for domestic science and research. The goal defined in the Strategy was the achievement of an R&D quota of 3.76 percent by 2020.

The study presented annually by the Austrian Institute of Economic Research shows the ideal type of path to achieving this R&D quota. The goal was confirmed in the government programme 2017 to 2020.

WIFO 2017 conclusions.

To achieve the 3.79 percent goal (assuming a current value of 3.06 percent), R&D expenditures would have to be increased from EUR 11.3 billion at the moment by 38.5 percent to EUR 15.7 billion by 2020. To achieve the target of one third, public sector funding of R&D expenditures would have to increase from EUR 4.1 billion at the moment by 26.1 percent to EUR 5.2 billion. Private R&D expenditures would have to increase from EUR 7.2 billion by 45.7 percent to EUR 10.5 billion (see figure 13).

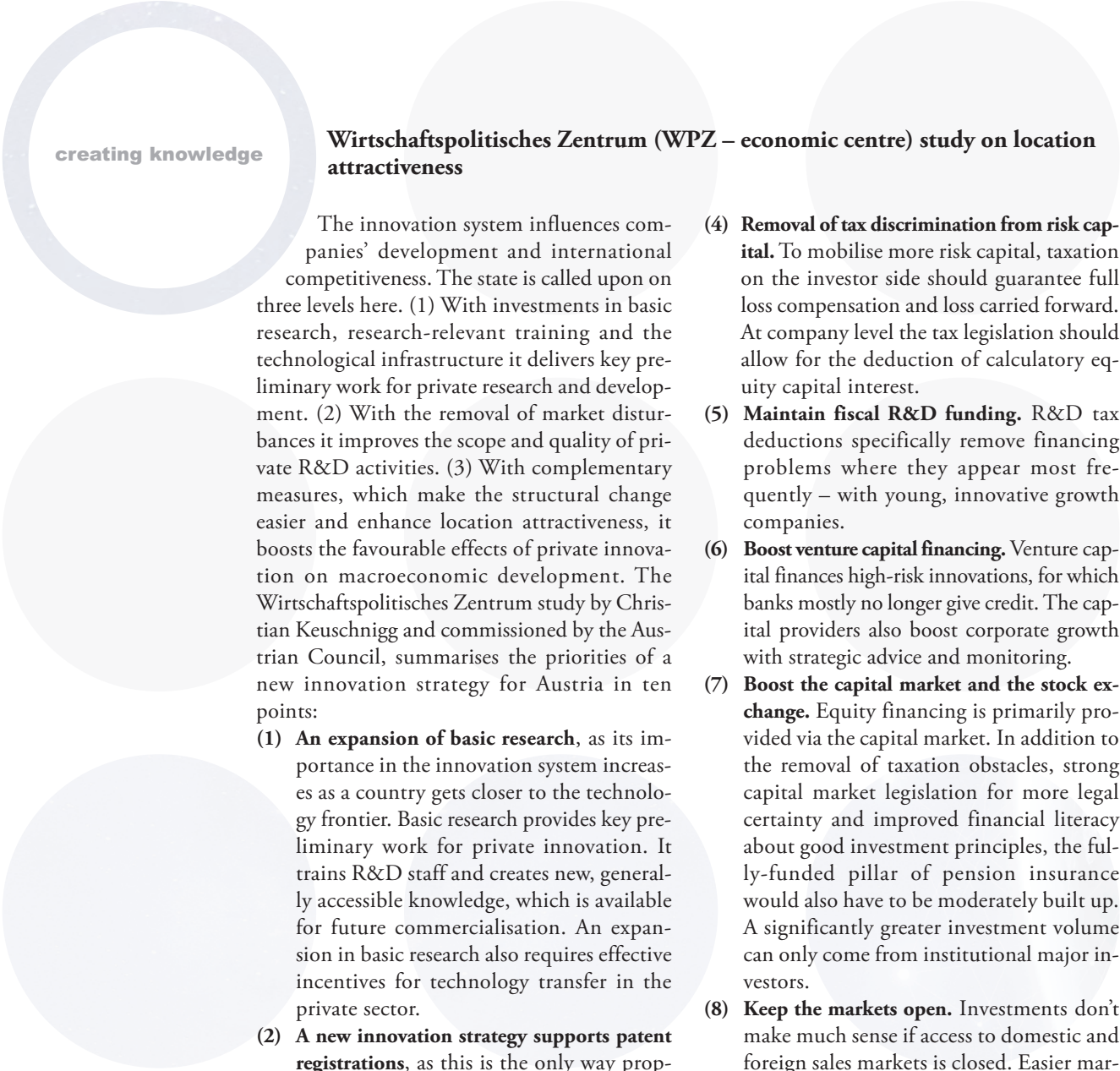
The “gap” to the target value with the R&D quota is also interesting. Currently 0.36 percentage points are required (in 2014 it was 0.05 percentage points; 2015: 0.14; 2016: 0.24). In hard figures this is EUR 1,316 million (2014: EUR 171 million; 2015: EUR 461 million;

2016: EUR 851 million) To put it another way: 7.1 percent of estimated global spending. The gap has increased further due to the nominally sharp increase in GDP in particular.

With current trends continuing as they are, the WIFO has calculated an optimistic and a pessimistic scenario. The scenarios for achieving the R&D quota in 2020 (while including the usual confidence intervals and uncertainty factors):

In the optimistic variant the R&D quota in 2020 achieves a value of 3.29 percent, 0.47 percentage points below the target value, but higher, for example, than in Germany or Denmark. In the pessimistic scenario a value of 2.98 percent is achieved, so below the starting level of 2017.

Austria’s dynamic catch-up process with R&D intensity from 1995 to 2007 has flattened out noticeably since the economic crisis began in 2008. Compared with the WIFO’s previous year’s study, it has become less likely that the targeted R&D quota will be achieved. With the given framework conditions it appears highly unlikely the goal will be achieved by 2020. The calculations provided must, however, be interpreted with caution, as they are based on assumptions about the further development of the economy and the RTI activities.



creating knowledge

Wirtschaftspolitisches Zentrum (WPZ – economic centre) study on location attractiveness

The innovation system influences companies' development and international competitiveness. The state is called upon on three levels here. (1) With investments in basic research, research-relevant training and the technological infrastructure it delivers key preliminary work for private research and development. (2) With the removal of market disturbances it improves the scope and quality of private R&D activities. (3) With complementary measures, which make the structural change easier and enhance location attractiveness, it boosts the favourable effects of private innovation on macroeconomic development. The Wirtschaftspolitisches Zentrum study by Christian Keuschnigg and commissioned by the Austrian Council, summarises the priorities of a new innovation strategy for Austria in ten points:

- (1) **An expansion of basic research**, as its importance in the innovation system increases as a country gets closer to the technology frontier. Basic research provides key preliminary work for private innovation. It trains R&D staff and creates new, generally accessible knowledge, which is available for future commercialisation. An expansion in basic research also requires effective incentives for technology transfer in the private sector.
- (2) **A new innovation strategy supports patent registrations**, as this is the only way property rights to inventions with economic potential can be protected. This produces more investment security and R&D investments yield better returns.
- (3) **Strong start-up dynamic with active entrepreneurship**, in which the risk appetite is appreciated and failing is not stigmatised. Insolvency law should actually guarantee appropriate creditors' protection, but not hinder the opportunity of a new start.

- (4) **Removal of tax discrimination from risk capital**. To mobilise more risk capital, taxation on the investor side should guarantee full loss compensation and loss carried forward. At company level the tax legislation should allow for the deduction of calculatory equity capital interest.
- (5) **Maintain fiscal R&D funding**. R&D tax deductions specifically remove financing problems where they appear most frequently – with young, innovative growth companies.
- (6) **Boost venture capital financing**. Venture capital finances high-risk innovations, for which banks mostly no longer give credit. The capital providers also boost corporate growth with strategic advice and monitoring.
- (7) **Boost the capital market and the stock exchange**. Equity financing is primarily provided via the capital market. In addition to the removal of taxation obstacles, strong capital market legislation for more legal certainty and improved financial literacy about good investment principles, the fully-funded pillar of pension insurance would also have to be moderately built up. A significantly greater investment volume can only come from institutional major investors.
- (8) **Keep the markets open**. Investments don't make much sense if access to domestic and foreign sales markets is closed. Easier market access requires strong competition legislation with a clear insolvency code, less cost-intensive regulation and a faster, un-bureaucratic processing of start-ups. The domestic market is far too small for innovative companies to grow strong. The further development of EU membership and the removal of trade barriers are therefore important components of an innovation strategy.

(9) Simplify reallocation and structural change.

Innovation causes structural change. The resulting reallocation factor (that is, resources such as labour, capital, land and raw materials for the production of goods are reallocated) accounts for about half of all productivity growth. Capital market deficits hinder this redistribution. Modest protection against dismissal and an expanded active labour market policy can be well coordinated with the change. Beginning with the reinforcing of ICT competencies in schools through to retraining/further training for older people in the workplace (in terms of lifelong learning) the education policy can support the relevant innovation processes.

(10) Secure the innovation location for multi-national companies.

Multi-national companies are especially R&D-intensive and play a key role in the innovation system. Location attractiveness becomes more important with increasing globalisation. The presence of top universities and the availability of highly educated human capital are key location benefits for the R&D departments of multi-national companies. In addition to fiscal measures, university training and basic research in particular must also be reinforced.

creating knowledge

Diverse excellence – case studies of excellent universities

In the political higher education discourse, everyone is talking about excellence – be it as an objective, requirement or solution approach. Several countries implement excellence initiatives at their higher education institutions, which are heavily oriented on the criteria of international university rankings. As commissioned by the Austrian Council, the Institute for Higher Studies (IHS) analysed case studies of excellent universities with the title “Diverse Excellence”¹¹². The authors examined the idea of excellence in higher education research with a brief historical summary. Case examples from six universities on various aspects of excellence were then presented and their transferability to the situation in Austria was discussed.

History of the excellence discussion

The term “excellence” performs the function of a catchword without specifically defined content. Excellence serves as the measuring stick for

comparisons and is differentiated here from to socio-structural seized term, “elite”. In its historical summary the IHS illustrates milestones of the international scientific excellence discourse. It becomes clear that over the course of time, alternating views of excellence have been into and out of the limelight. In the USA in the 70s the question was how disadvantaged groups or institutions could develop excellence. The discourse of the US American Commission of Excellence in particular continued in the direction of the schooling systems. The search for excellence also led to the rise of the New Public Management at US higher education institutions. The globalisation and objectivisation of excellence by rankings began internationally in 2003. The European Research Council (ERC) focuses on peer review processes to promote excellent research. The question as to how a good place in rankings can be explained resulted in standardised success factors and cri-

112 L. Lassnigg / M. Unger / D. Binder / B. Terzieva / B. Thaler: Diverse excellence – case studies of excellent universities
Institute for Higher Studies, 2017.



creating knowledge

teria for so-called world class universities. These utilise resources (in high numbers), have good governance and attract talent to perform three key functions: To produce top quality graduates, achieve excellent research results and successful technology transfers. The orientation on this “gold standard” is unsuccessful for many due to insufficient financial resources. Researchers also criticise the resulting enforced conformity of the universities. Parameters such as equality, justice and diversity have been growing in importance in the discourse since 2005. In recent years the recognition that excellence in research measured by rankings does not automatically result in excellent teaching has also pushed to the fore. The “Third Mission” catchphrase is more and more the centre of focus. The third mission (along with research and teaching) means, for example, encouraging diversity and inclusion within the higher education facility and externally targeting successful knowledge transfer in the surrounding society and economy. Because, depending on the times and focus, the term “excellence” always describes something different, “diverse excellence” is offered as a preferential choice.

The case studies

Different expressions of excellence and how they came about are prepared and explained in six case studies. **Arizona State University** was chosen as a case study because of its regional impact. It influences its immediate surroundings, in which it promotes cooperations with regional companies and institutions and focuses on practical issues in research. In addition to these applied and regional focus points, Arizona State University also strives to satisfy the ideal it has itself developed of the “New American University”, which combines the gold standard of world class universities with a more relaxed, inclusive access management.

For decades now the University of Edinburgh

has utilised its foundation funds among other things for the promotion of start-ups and technology transfers. Its long-term commitment has produced numerous sustainable successes. Several predominantly university-financed institutions take care of the multi-faceted requirements of start-ups and spin-offs.

In Scandinavia numerous universities have fused in recent years. This has contributed to better positions for Danish universities in international rankings. The example of the **University of Copenhagen** shows, however, that governance reforms (university autonomy) and changing allocation criteria for providing public sector funds were also relevant.

The **Aalto University** on the outskirts of Helsinki was only formed in 2010 with the fusion of a technical, an business and a design-oriented art university. The focus is explicitly on the production of innovations, entrepreneurship and a pronounced start-up culture. A world class innovation university is now established in Aalto, Finland. Mission and vision are not set out on paper or the university’s homepage, but rather have been specifically woven into the “design” of the new university. The campus architecture itself is a good example here; a second important feature are the “Factories”; and a third element is the integration of student activities. The university was set up as a foundation university with the appropriate start capital, it has a very rigid governance structure, concentrates on a few “fields of excellence”, and renews its professorships every few years. Recently Scandinavian universities have to some degree been affected by drastic austerity programmes (staff cuts), and it remains to be seen where the course taken will lead to in Aalto in particular.

The example of the **University of Twente** (Netherlands) shows how strong research centres, industrial cooperations and a strong profile in the competition for talent also enable success in structurally weak regions. The IHS in particular analysed the training of upcoming

scientific talent here. Dutch doctoral education has been reformed several times and restructured stronger each time in recent years. The vast majority of doctoral students now attend research and graduate schools.

The **University of Duisburg-Essen** in Germany is especially well known for its diversity efforts. The agendas are bundled in the Gender and Diversity Prorektorate and embedded as key goals in the university strategy. UDE provides an exemplary illustration of how equality and excellence do not contradict, but rather positively complement one another.

Individual initiatives for start-up funding and

diversity management in particular are transferable to the Austrian situation. Far-reaching reforms first of all require a more in-depth (scientific) discourse and key political pointers. When agreement on requirements, opportunities and the direction to take has been achieved, the case studies offer inspiring role models for specific implementation. The analysis of the objective would, however, have to encompass more than the, “at least one domestic university must be among the best 100 worldwide” rule of thumb.

The study can be downloaded in full text at <http://www.rat-fte.at/publikationen.html#2017>.

creating knowledge

create your UNiVerse – Students’ expectations for the universities of the future

Digitalisation is in full swing, and yet we are only at the beginning in terms of using it for our own benefit. Smart devices, artificial intelligence and the Internet of Things are changing our life at a speed never seen before. A digital world view must first be created and old, proven models must be re-evaluated. Technological developments, which will be available in five or ten years, are impossible to recognise today – never mind talking about a longer time horizon. But the conditions to deal with innovations correctly and successfully must be created today. Education, research and development at the highest level are without doubt essential to meet the challenges that will benefit our society.

The challenges for the education system as a whole are immense, but the focus is on the universities. As guiding social institutions they have

the responsibility to help shape this transformation process, so it may be reflected upon and scrutinised.¹¹³

Crowdsourcing with the student target group

In view of the digital and social change under way, it is also good to know what expectations and wishes today’s students have for the universities of the future. This question was therefore the focus of the “create your UNiVerse” study¹¹⁴, commissioned by the Austrian Council in 2016. It was initiated in cooperation with the Ludwig Boltzmann Society and carried out by the open innovation consultancy firm, winnovation. New ground was broken in two ways with the study. Firstly the view of the students was to be specifically brought into the university policy debate. Students are key users and shaping

¹¹³ bmwfw, GUEP 2019–2024, p. 40.

¹¹⁴ create your UNiVerse – Students’ expectations for the universities of the future. winnovation consulting gmbh, 2017. Download at <http://www.rat-fte.at/publikationen.html#2017>

creating knowledge

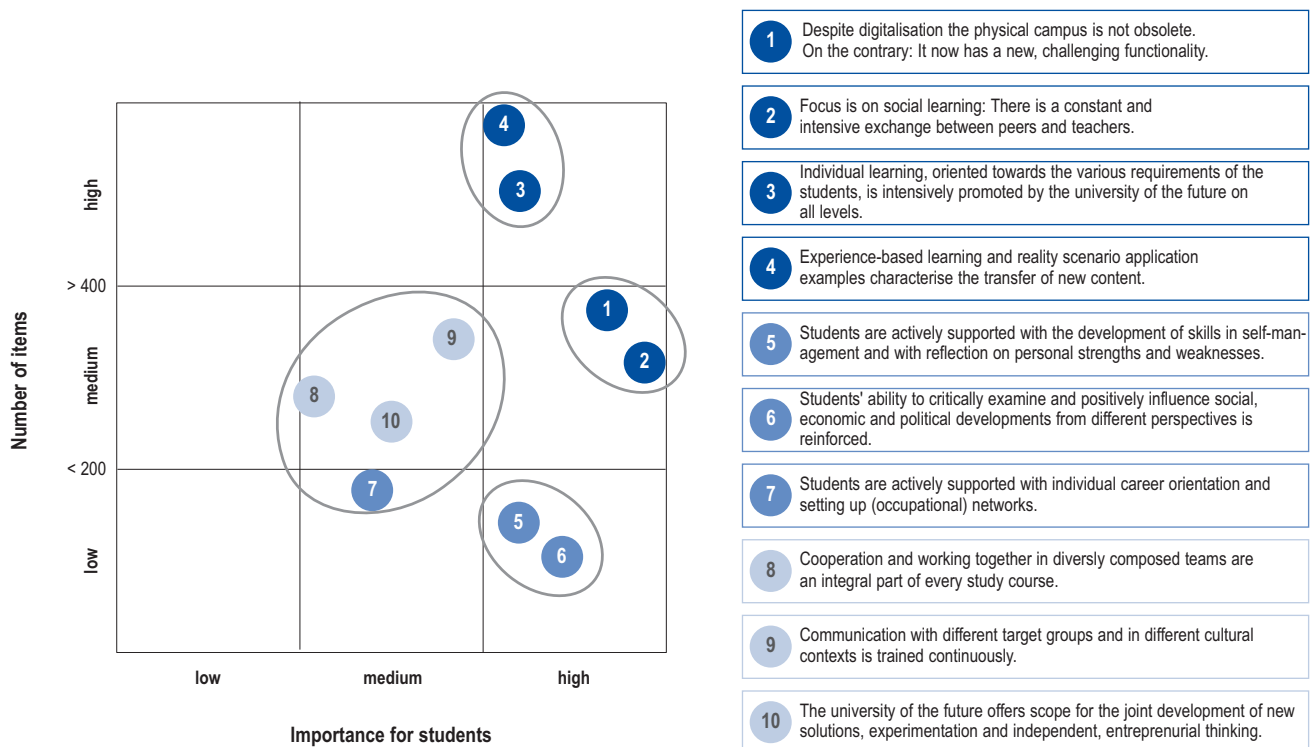
stakeholders in the tertiary education system and can therefore provide important stimuli for the further development of universities. Secondly the “Crowdsourcing in the special environment of social media” open innovation method was also experimentally implemented. Web portals are usually used for crowdsourcing projects. As students use social media intensively, it was hoped that student communities could be specifically reached. From November 2016 to February 2017 a total of 2,105 written contributions from 754

students and graduates from universities, technical colleges and teacher training colleges were submitted with create your UNiVerse and evaluated by the student authors in an inductive-deductive pattern recognition process.

It showed that students have high expectations for the further development of teaching in the digital environment, their personal further development and preparation for their working life. Measured on the status quo, the universities promote these expectations in different ways.

The analysis produced three topics and ten categories, which the students believe decisively

Figure 14: Prioritisation of expectation categories



Source: create your UNiVerse. Students' expectations for the universities of the future. winnovation consulting gmbh (2017).

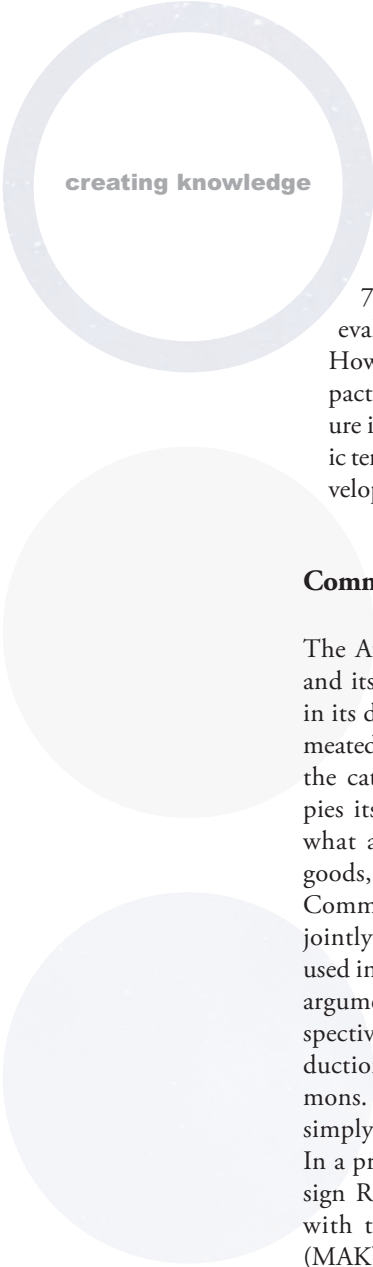
characterise the future development of the universities (see figure 14, items 1 to 4). Virtual and real learning have inseparably fused with one another at the university of the future. The combination of digital and physical teaching and learning tools enables new didactic possibilities. Different expectations and requirements of the students can be realised individually (see figure 14, items 5 to 7). The university of the future invests in the individual development and orientation of the students (see figure 14, items 8 to 10). It actively develops students' cooperation and problem solving skills and puts them at the centre of focus.

The results of the create your UNiVerse study and discussions based on them with experts from the universities, university research and university policy illustrate different areas of action. Together with the stakeholders, the Austrian Council worked out recommendations for action, which it addressed to politicians and the universities.

Recommendations for action for the future shaping of the universities

1. Expand digital infrastructures and implement digital technologies at universities: Digital technologies have the potential to fundamentally change science, teaching and learning. The requirements necessary for this are a modern digital infrastructure and teachers with experience in using digital tools in knowledge transfer, and these must first be extensively put in place and trained. The measures presented in the all-Austrian university development plan 2019–2024 for the “Digital Transformation” must be understood as a clear mission for management at the universities.
2. Utilise the potential of digitalisation for the strategic further development of the university: Universities must evaluate the current range of courses. They must then develop modern virtual and/or physical, in any case stronger interactive transfer formats. They can then meet students' expectations for modern learning environments and create new resource-relevant latitudes and scope for action.
3. Incentive systems for innovative teaching – provide more visibility in competition: When it comes to a career at a university, teaching now scarcely plays a role. What counts are research projects and publications. The awarding of funds in competition for innovative concepts in teaching and the rewarding of excellent performances in teaching (Ars-docendi-Staatspreis, Teaching Award etc.) increase their visibility and public presence. Concepts can then also be further developed in cooperation.
4. Further develop the role of the teacher at universities – from pure knowledge transfer to learning coach and mentor: Universities must further develop their staff didactically so teachers can utilise these new skills in knowledge transfer. Training activities promote openness for and knowledge about how innovative teaching and learning formats and technologies can be applied. Job descriptions in higher education teaching should be diversified with regard to digital competencies.
5. Develop structures at universities that enable lifelong learning and networking: It must be expected that students at universities in the future will have totally different life phases. The study and teaching opportunities should therefore support a lifelong learning culture. Universities should create structures and conditions in which students, alumni and teachers can also network with companies, NGOs and the public sector. They should promote knowledge transfer between science and society.
6. Set up and anchor open spaces to experiment in teaching: Universities should intensively promote exchanges by peers between one another as well as between peers and teachers. This enables students to intensively further develop themselves personally and profes-

creating knowledge



creating knowledge

sionally. This requires interactive formats in the curricula, experimental settings in courses and physical areas that are open to all students.

7. More research for digitalisation and evaluation of digital teaching (e-learning): How the use of digital tools develops/impacts and whether it results in successor failure is only insufficiently examined in scientific terms. Didactic methods must be further developed under the aspect of digitalisation and

evaluated with regard to its impact.

8. Expand and further develop national and international cooperation between universities – digital forum at university level: The universities must coordinate and cooperate at national and international level to meet the challenges of a digital and globalized society. The exchange of experiences should be expanded to other education providers (VHS, BFI among others).

Commons as design and production principle

The Austrian Council examines digitalisation and its consequences for innovation processes in its daily work. On the basis of digitally permeated production processes, encapsulated with the catchphrase “Industry 4.0”, it also occupies itself with the influences and impacts of what are now called “Commons” (common goods, so to speak) on the economy.

Commons are products and resources that are jointly produced, maintained, administered or used in autonomously organised processes. Two arguments are important from the design perspective: On one hand there are no life or production areas that cannot be shaped as Commons. On the other hand common goods don't simply “be” – they are “made”.

In a project performed by the Institute of Design Research Vienna (IDRV) in cooperation with the Austrian Museum of Applied Art (MAK), the question concerning the influences and impacts of Commons on the economy was examined in an innovative, interactive and open survey format.

As part of a study the IDRV research team analysed six international Commons products and production processes, and based on this derived five design models for future Commons-based production (Design Patterns for Future Commons-based Production”). These were determined in three research stages:

1. With the illustration and analysis of Commons logics and Commons design principles in the design context.
2. With interview rounds with representatives from economy, design, society and research to examine how these logics and design principles are perceived in society. What is the reaction to Commons-based production – appreciation, amazement, understanding, scepticism or rejection?
3. With a Design-Thinking workshop in which the corresponding scenarios and ideas were developed and discussed.

The research team used an innovative and experimental environment: As part of the of the Vienna Biennale exhibition “StadtFabrik: Neues Arbeiten. Neues Design”, the six Commons case scenarios were researched, visualised and materialised in combination with other exhibition items in the MAK. From 21 June to

1 October 2017 the upper MAK exhibition hall was used as an illustrative lab for interview rounds and the Design-Thinking workshop.

The following table compares the thinking and innovation strategies of the examined examples of the Commons-based Peer Production using the derived design patterns with the paradigms of the socio-technical regime.

This illustrates the type and way in which the dynamics between the niche innovations and

the more permanent overall framework conditions must change today and in the future, to translate Commons logics and Commons design principles via design into guiding principles

for a socially compatible and sustainable economy and therefore to change the paradigms of the socio-technical regime.

creating knowledge

	Paradigm change “Design Patterns for Future Commons-based Production”	Prevailing socio-technical regime
Initiative	New ideas emerge from own initiative, grow with enthusiasm from and through employees; new structures emerge	Market observation produces new ideas, which are implemented by existing structures
Relevance	An urgent social issue or problem is resolved – key question: What's required?	Key question: What's required and can also be sold? Revenue and profit logic, need for growth
Decentralisation	The generation of knowledge is being globalised, sharing knowledge, Open Design – production is local and regenerative within natural and technical circuits; Creative Commons	Globalised production – produced where it is the cheapest; externalisation of environmental impacts; copyrights, patents
Modularity	“Beta Version” principle, developments that are open to changes and adjustments and are repairable	Final product, which is often only short-lived, cannot be repaired accordingly and is replaced by a new product
Affordability	New work changes development and production, cost-effective high-tech industry components are transferred to new contexts, decentral high-tech self-providing with cost-effective high-tech machinery	Cost-intensive development of special components and mass production with cost-intensive means of production

Source: Institute of Design Research Vienna (2017): Commons as thinking and innovation strategy in design.
Study commissioned by the Austrian Council, Vienna.

Innovative public procurement

Procurement in public sector institutions grows in strategic importance in the discussion about supply-side innovation funding mechanisms¹¹⁵. For many years procurement only applied as an administrative support activity, which was produced by the criteria of competition, equal treatment, transparency and economic efficiency. Political interests and attention only promote infrastructure technologies, such as nuclear energy, toll systems, ICT/broadband and green power.

Compared with these, procurement today is seen as a contribution to meeting social challenges – demographic shifts, security issues, inclusion, decarbonisation or digitalisation, for example. There is greater interest here in creating awareness for this. The strategic dimensions of innovation, ecology, society and easier access of small and medium-sized enterprises (SMEs) to public sector contracts are supplemented in the catalogue of the Federal Procurement Act (BVerG).

Strategic procurement in this context is procurement which, across and beyond the direct performance of its functions¹¹⁶ and the general basics¹¹⁷, explicitly assumes one or more of the strategic dimensions of innovation, ecology, so-

ciety and access of small and medium-sized enterprises (SMEs) in the tender.

Strategic innovative public procurement is becoming more important in both the economic and the political sphere, as it can achieve a considerable financial leverage effect. Public sector procurement is 12 to 14 percent of GDP¹¹⁸ and therefore has a volume in Austria of more than EUR 40 billion¹¹⁹. Even if only a one-digit percentage of this 40 billion procurement volume is effectively for strategic procurement, it is still a considerable financial leverage effect. 2.5 percent of the procurement volume mean EUR 1 billion, for example. By way of comparison: 25 percent of the procurement volume would mean EUR 10 billion, which corresponds with Austrian gross domestic spending for R&D.¹²⁰ A study the Austrian Council commissioned the Austrian Institute of Technology (AIT) to carry out should show how well the interaction of strategy dimensions in the Federal Procurement Act develops¹²¹.

On 13 September 2017 the Austrian Council held a workshop on “Strategic innovative public procurement in Austria”, which also presented the study’s preliminary results. 21 representatives from the ministries, states, social part-

115 Apply as supply-side mechanisms in addition to public procurement, standardisation and regulation (EC-Expert-Group-Kok 2004; EC-Expert-Group-Wilkinson 2005; EC-Expert-Group-Aho 2006; Edler & Georgiou 2007; EC 2007/C/860; Aschhoff & Sofka 2009; OECD 2011; 2014; Edler & Yeow 2016).

116 Tender (construction, supply and service contracts) and contract award after determining the technically and financially better bid according to the principle of preferring the best offer (or “best bidder principle”).

117 As in “competition”, “equal treatment”, “transparency” and “economic efficiency”, for example.

118 EC 2016; OECD, 2017.

119 GDP 2015 in Austria according to Statistik Austria: EUR 339.9 billion (SA 2017); 12% = EUR 40.8 billion; 14% = EUR 47.6 billion.

120 Statistisches Jahrbuch 2017. Vienna: Statistik Austria.

121 Buchinger, Eva (2017): Strategische öffentliche Beschaffung in Österreich: Eine Bestandsaufnahme. Austrian Institute of Technology (AIT), Vienna, December 2017.

ners, public sector procurement personnel, agencies, NGOs and the Austrian Council participated. The possibilities and limits of strategic procurement policies and synergies were discussed. The goal of the workshop was to sound out the interfaces between individual procurement policies together with the stakeholders. The workshop should ultimately also promote commitment to future cooperative use, to better exploit the synergies of strategic public sector procurement.

The key results of the discussion processes were summarised by study author Eva Buchinger (AIT Centre for Innovation Systems & Policy) as follows:

- The responsible departments believe a comprehensive strategy is “conceivable and beneficial”, whereby the responsibility of the social department is still being clarified. The potential goal conflicts will be made visible and handled in a possible strategy.
- The respective others are partially considered and (where possible) integrated into the innovation-promoting public sector procurement (IÖB), sustainable procurement (naBe) and “Faire Vergaben” (fair procurement) initiatives.
- The enabling and effectiveness of the implementation of a comprehensive strategy would benefit greatly from the support of social partners.
- The question of whether or not this would be a federal or a national strategy (integration of

federal states, cities, districts) would have to be clarified. One could, however, begin at federal level.

- Those commissioned with tasks in the procurement area must be supported with the development and consistent implementation of strategic procurement. Each (additional) complication must be prevented or attenuated with suitable support measures. Quote: “A procurement case and 25 brochures are no incentive for the principal.” And: “We mustn’t overshoot the mark.” The effectiveness increase in public sector procurement must be front and centre. This applies at both public sector institution level and at the political level.
- The synergetic benefit can range far beyond the procuring entities. In addition to Total Cost of Ownership (TCO) and Life Cycle Costing (LCC), economic and socio-political benefit considerations should therefore also be integrated. Segmentations (phases of the product lifecycle, target groups, etc.) can be useful here.

Workshop conclusion: A joint strategic procedure is basically possible, but must not be an end in itself. The key synergy benefits are rooted in the fact that together greater political influence, greater economic and political effects and a simplification of the work of the public sector principal can be achieved.

creating knowledge

Framework conditions for funding innovative start-ups

The Austrian Council has repeatedly emphasised how important active start-up funding in Austria is. In December 2008 it recommended optimised framework conditions for knowledge and technology-intensive start-ups.

Recent surveys such as the Global Entrepreneurship Monitor (GEM) in 2016 point to “bureaucracy” and “high financial cost” as hurdles on the way to becoming an innovative start-up.¹²²

122 Kiendl / Schmalzer / Wenzel / Penz / Kirschner: Global Entrepreneurship Monitor 2016. Report on the entrepreneurship situation in Austria.

creating knowledge

The Austrian Council commissioned KMU Forschung Austria together with the law firm RPCK Rastegar Panchal with a study for a precise analysis¹²³.

Based on the results, recommendations for action for a start-up-friendly climate in Austria will be worked out.

The information and estimates collected confirm the results of the GEM. A start-up in Austria, especially in the international comparison, is very bureaucratic, and this significantly stresses start-up founders in both time and financial terms.

The following hurdles with starting a company and in the first growth phase of the company were determined from the survey of experts and start-up founders:

- The mandatory attestation of a notary as a formal requirement when starting a limited company appears excessive.

- Lengthy process to be entered in the commercial register.
- Inflexibility of the limited company legal form in general.
- A number of approval requirements and the financing situation in the early and growth phase.

To reduce costs, make the processes more comprehensible and improve the image of starting a company, the study's authors believe the mandatory notarial act and the notarial certification must be removed from company law or at least heavily restricted.

They also recommend the inspection obligation of the commercial register be limited and (feasible) implementation periods be provided for. The inspection should be limited to the correct publication of the required information, instead of checking the content of every liable for public disclosure entrepreneurial step.

Problem	Measures
Unnecessary costs and delays with set-up	Removal of notarial act and notarial certification with limited companies
Unnecessary costs and delays with set-up	Restriction of the content of inspection obligation of Austrian FB (Finance Book) courts, feasible achievement periods, useful instructions and service orientation
Participation of employees and investments inhibited	Liberalisation of share classes (non-voting and preferences possible)

Source: KMU Forschung Austria and RPCK Rastegar | Panchal 2017.

¹²³ Analyse der Rahmenbedingungen, Hemmnisse und Hindernisse für innovative Unternehmensgründungen in Österreich. KMU Forschung Austria and RPCK Rastegar | Panchal commissioned by the Austrian Council, November 2017.

Clearly defined deadlines (and effective sanctions) would be company-friendlier, as they oblige the court to complete the process within a specific period.

Binding public disclosed instructions on formal requirements or successful model applications would be a practical help to people starting companies and commercial registers. Instructions and press releases concerning the commercial register in English also appear pretty much a matter of course.

Whether or not the commercial court is the right place for a registration with which administration, customer orientation and service are the centre of focus, is also a very fundamental consideration. The underlying rethinking of the “sovereign authority” approach into a “service facility” would be appropriate and required in the near-term in any case.

On the whole, in a start-up process entrepreneurs must deal with a series of issues, which are not necessarily relevant for the success of their

product or service. Some requirements certainly result in them having to think about and prepare their business idea more intensively. However it must be said that, broadly speaking the reciprocal interaction of notaries and commercial register in particular stresses the time and financial resources of the company founder, without any economic added value, and sidetracks them from the actual goal of implementing the project.

The limited company legal form creates a kind of “single-tier system”. This cannot meet the different requirements of company founders, investors and employees, who want to hold different stakes. In the international comparison the attractiveness of the Austrian limited company could also be improved with a form of liberalisation – if suitable share classes or employee participations and investors were to be created, for example. Different participation options in the company would make appointments in start-ups more attractive.

creating knowledge

GEM 2016

The Global Entrepreneurship Monitor (GEM) is the biggest international comparison study of entrepreneurship. The JOANNEUM technical college has carried out the GEM since 2005 with its Institute for International Management. This country report for 2016 analyses the dynamic of the Austrian corporate landscape and its essential framework conditions in the international comparison. Recorded are, for example, start-up activity, the attitude towards start-ups and the characteristics of the entrepreneurs themselves. The GEM report identifies appropriate recommendations for action on the basis of qualitative and quantitative findings. The research, technology and innovation (RTI) areas were examined in more detail in the GEM report 2016. Additional data on the topic of migration and entrepreneurship was also collected, and the entrepreneurial activity in older

population groups was analysed separately.

The quantitative survey of the GEM Austria is based on a representative survey in the Austrian population of 18 to 64 year-olds, the aptly named, Adult Population Survey (APS). In addition to this, in a qualitative survey experts were surveyed for the National Expert Survey (NES) and the status of the entrepreneurial ecosystem in Austria was described.

Adult Population Survey (APS)

The rate of early entrepreneurial activity (TEA) is a key indicator of the GEM. It is composed of people that are currently starting a company or whose company is not older than three and a half years old. With a rate of 9.6 percent Austria is tenth in the innovation-based countries and fifth among the participating EU countries. This corresponds with a slight increase compared with 2004 (+0.9 percentage points)

creating knowledge

and underscores the domestic start-up dynamic.

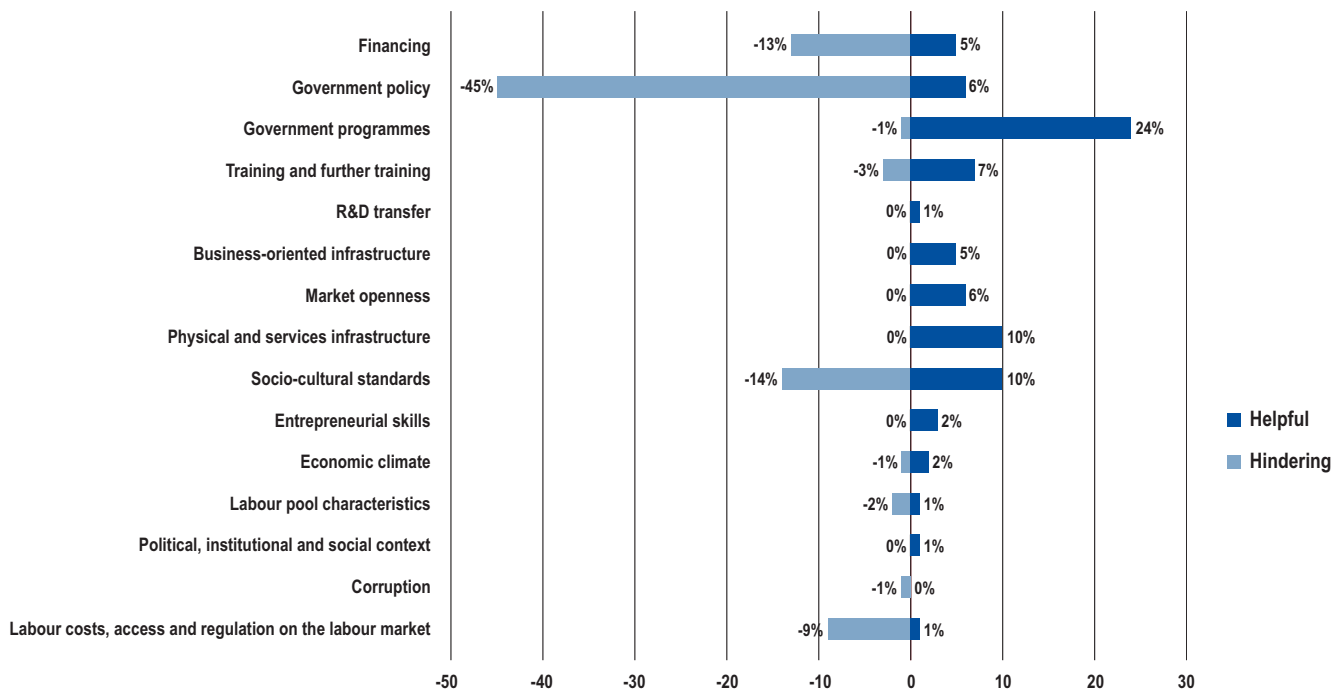
Companies that focus on research, technology and innovation (RTI companies) were recorded and analysed in 2006. A structural shift towards “research-based” and “researching” could be seen in the group of new RTI companies. Remarkable here is the fact that the share of young companies and young entrepreneurs in the sub-segment of research-based companies with 33.3 percent (2014: 29.9 percent) is significantly higher than that of the established entrepreneurs. This is currently at 20.1 percent (2014: 16 percent). Of the entrepreneurs 56.1 percent are active in a technology-based company. This high percentage illus-

trates the increasing relevance of the technological change with start-ups.

RTI companies, that is, research-based or technology-based or innovation-based companies, also exhibit a higher level of internationalism. Protection of intellectual property rights (IPR) plays an increasingly important role for 25 percent of new entrepreneurs and businesspeople. The survey found a plus of 11.5 percent compared with 2014.

On the whole the atmosphere seems better than in 2014. The appraisals of RTI-related entrepreneurs show that they rate the market, their possibilities and opportunities more optimistically. This in particular applies to RTI-intensive companies. The percentage of entrepreneurs

Figure 15: Expert opinions on helpful and hindering factors for entrepreneurship in Austria



Source: GEM National Expert Survey 2016.

that want to build up their activity has increased clearly in all areas. The strongest growth was seen in the established RTI companies. The percentage of RTI entrepreneurs that see good growth prospects, a high level of internationalism, but also good start-up possibilities, also increases significantly

National Expert Survey (NES)

The appraisals of experts as part of the National Expert Survey indicated changing framework conditions. The domestic financing situation of companies in Austria in 2016 was consequently rated better than 2014. The experts believe financing through venture capital or informal investors is developing well. The results also show more frequent use of alternative financing forms such as incubators and business angels. An increasing interest in crowdfunding can also be seen since the Alternative Financing Act came into effect in 2015. The volume of crowd investing already doubled in the first half of 2016 compared with the previous year.

Mixed results are seen with regard to **government policy**. The tax burden has worsened increasingly since 2012. This is also confirmed by international studies (World Economic Forum, 2016a, Global Competitiveness Report 2016). Steps already taken and announcements by the government on relief for start-ups are certainly positive. The surveyed experts also say the respective efforts are positive, but the first recommendation for action refers to a reduction in the tax burden and de-bureaucratisation.

As already seen in 2014, there was also a very high rating in 2016 with specific **funding programmes**. Austria once again takes the top position in the European comparison. Since 2012 the supply and quality of funding programmes and funding institutions is increasingly rated better, particularly the focus on innovative companies and start-ups. The respective experts describe the Austrian funding system as an especially helpful factor. The diversity and individuality of funding offers is emphasised.

With **entrepreneurial training and further training**

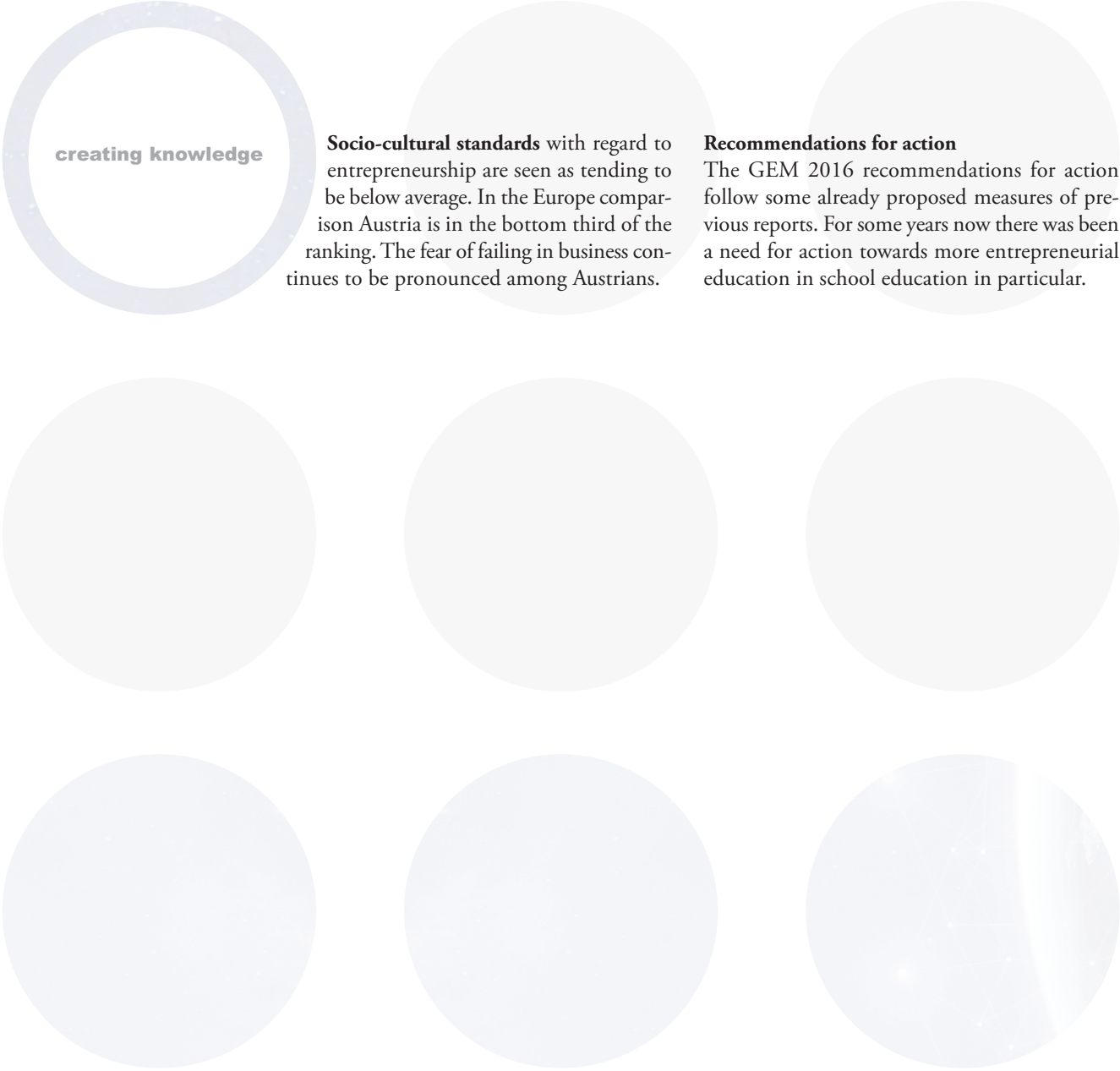
Austria's weak point continues to be in the primary and secondary level. The fact that the 2016 evaluations were lower than in previous years is problematic. This indicates a downward trend. In 2012 entrepreneurial training and further training was rated at 1.7, in 2014 with 1.7 and 2016 with 1.4, whereby on this scale 5 is the highest value, 1 the worst and 3 neutral. Austria is therefore placed last in the European GEM comparison. This problem area with need for action was already named in the GEM 2007. The experts believe more creativity, autonomy and innovative thinking could be created by focusing on cross-disciplinary competencies, project-oriented working, planning games and other reforms.

In contrast to this the experts rate **other levels of education** positively. Universities, start-up founders and incubator centres are sufficiently networked, and there are numerous offers for professional further training and more. The R&D transfer is also linked with the tertiary sector. The level here is rated as average, but stable. The **economic and service infrastructure** was rated better on the whole in 2016 than in previous years. Only the affordability of subcontractors, suppliers and advisers is criticised. Otherwise there are entirely positive evaluations. Austria is therefore ranked number two in the GEM Europe comparison.

The **openness of the market** is seen as ambivalent. Internal market hurdles are rated far better than the internal market dynamic. According to international studies (World Economic Forum, 2016b, Global Enabling Trade Report 2016), national market entry has improved significantly since 2014.

The **physical infrastructure** is a strength of the Austria start-up location that has been confirmed for some years now. Experts believe this is the highest value since 2012. A further improvement has been seen in recent years. Additional improvements are expected with the constant implementation of the broadband billion.

creating knowledge



creating knowledge

Socio-cultural standards with regard to entrepreneurship are seen as tending to be below average. In the Europe comparison Austria is in the bottom third of the ranking. The fear of failing in business continues to be pronounced among Austrians.

Recommendations for action

The GEM 2016 recommendations for action follow some already proposed measures of previous reports. For some years now there has been a need for action towards more entrepreneurial education in school education in particular.

International activities

OECD Workshops Vienna and Kazakhstan – February and March 2017

Kazakhstan is one of the biggest countries in the world and rich in natural resources. Since the fall of the Soviet Union this republic has focused heavily on Europe and takes part as a partner in a number of European programmes. Many structures of the innovation system are currently emerging and Kazakhstan's government intends to integrate experiences from other European countries into the planning of these structures. With its innovation landscape and interconnection in Europe, Austria is an interesting example and was selected by the OECD for the "Innovation Policy for Competitiveness Project" project as part of the "Eurasia Competitiveness Programme".

The first meeting with a delegation of leading representatives of Kazakhstan's ministries and officials was held in Vienna in February 2017. Questions on the innovation policy were posed, aspects of the domestic innovation landscape were presented and discussed with the delegation guests. A further workshop and numerous bilateral meetings with institutions of the innovation and research system were then held in March 2017 in Kazakhstan's capital, Astana, to develop more content and a more intensive information exchange. As the Austrian Council's representative Walter Schneider took part at the invitation of the OECD and presented details on Austrian RTI governance at the closing event.

creating knowledge

The Austrian Council visits Cambridge – 6 and 7 July 2017

In July 2017 and at the invitation of Hermann Hauser, computer entrepreneur and risk capital investor with Viennese roots, an Austrian Council delegation visited Cambridge and his research and innovation facilities together with representatives of the Ministry of Economics and Science (BMWFV), the Science Fund (FWF), the Research Promotion Agency (FFG) and the Federal Funding Bank (Austria Wirtschaftsservice GmbH).

The first day (6 July) began with a visit to Amadeus Capital, the venture capital company founded by Hermann Hauser. Next was a visit to Cambridge University's computer laboratory, the Cambridge Network (an organisation for networking economists and academics), and to Ideaspace, an incubator and accelerator. The day closed with a Cambridge Network dinner in the elite Downing College.

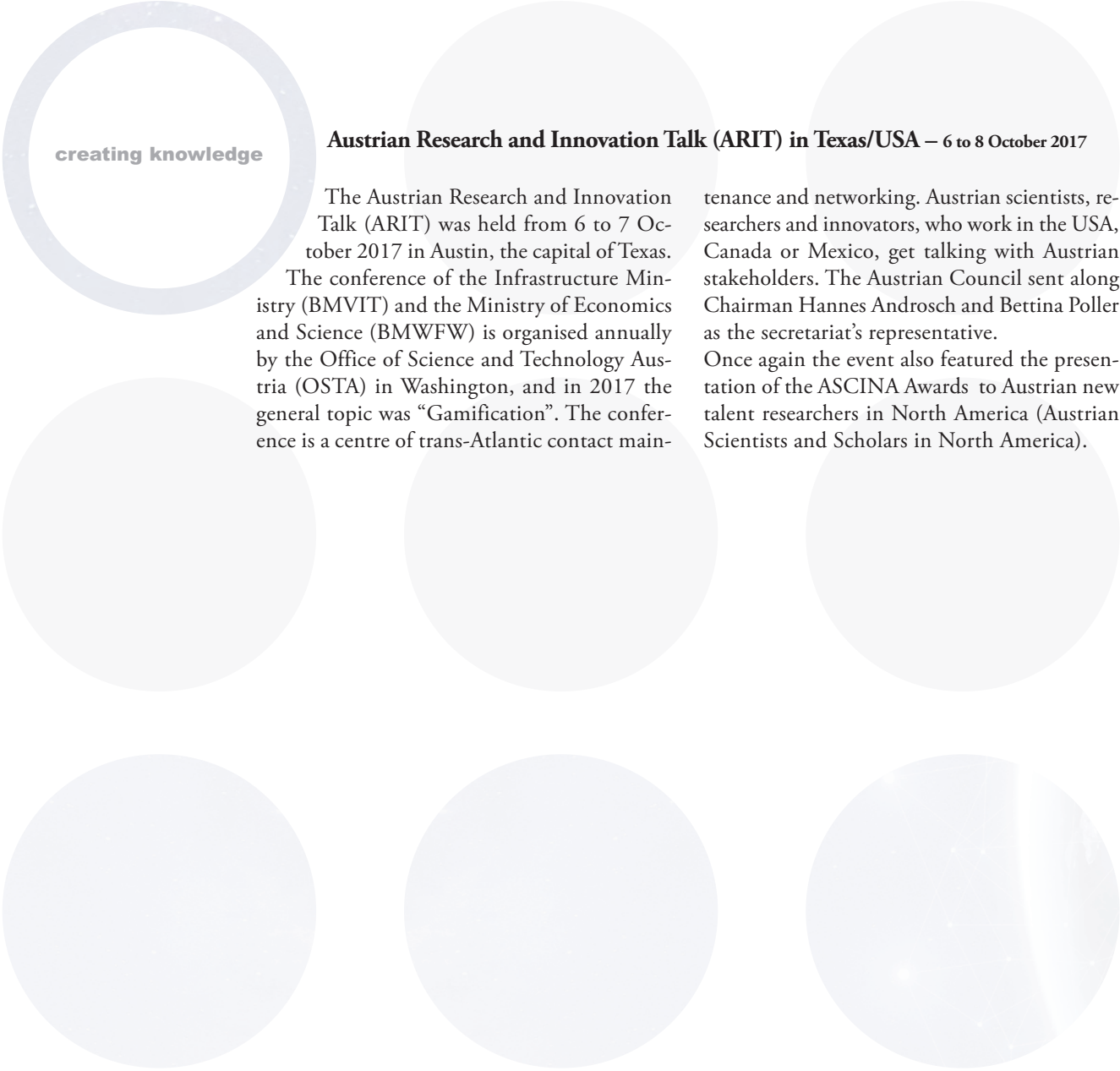
The delegation spent the morning of 7 July in the Science Park and visited Cambridge Con-

sultants and Flexenable, a manufacturer of flexible displays and sensors. In the afternoon Stephen Toope, Vice Chancellor of the University of Cambridge, received the guests for a brief lunch, before the delegation made its way back to Vienna.

Left to right:

Simone Mesner BMWFV
Christoph Schlink aws
Christina Knahr BMWFV
Klara Sekanina – Austrian Council
Andy Hopper
University of Cambridge
Helga Nowotny – Austrian Council
Hermann Hauser – Austrian Council
Jürgen Rattenberger FFG
Artemis Vakianis FWF
Ludovít Garzik – Austrian Council





creating knowledge

Austrian Research and Innovation Talk (ARIT) in Texas/USA – 6 to 8 October 2017

The Austrian Research and Innovation Talk (ARIT) was held from 6 to 7 October 2017 in Austin, the capital of Texas.

The conference of the Infrastructure Ministry (BMVIT) and the Ministry of Economics and Science (BMWF) is organised annually by the Office of Science and Technology Austria (OSTA) in Washington, and in 2017 the general topic was “Gamification”. The conference is a centre of trans-Atlantic contact main-

tenance and networking. Austrian scientists, researchers and innovators, who work in the USA, Canada or Mexico, get talking with Austrian stakeholders. The Austrian Council sent along Chairman Hannes Androsch and Bettina Poller as the secretariat’s representative.

Once again the event also featured the presentation of the ASCINA Awards to Austrian new talent researchers in North America (Austrian Scientists and Scholars in North America).



events

New Year reception – 9 January 2017



Left to right:

Hannes Androsch – Austrian Council
Harald Mahrer BMWFW
Sonja Hammerschmid BMBF
Jörg Leichtfried BMVIT
Markus Hengstschläger – Austrian Council

Performance Report presentation – 1 June 2017

Left to right:

Ludovit Garzik
Hannes Androsch
Johannes Gadner
all Austrian Council

The Report on Austria's Scientific and Technological Capability for 2017 was presented with a press conference on 1 June in the Concordia

Press Club. According to the Cabinet decision, the Austrian Council's Report must be handed over to the National Council on 1 June and at the same time or immediately after to the general public.

Austrian Council Chairman Hannes Androsch, Managing Director Ludovit Garzik and Project Manager and Deputy Managing Director Johannes Gadner outlined the most important results and conclusions and talked with and answered questions from the media representatives present.

The Austrian Council's Report is available on its homepage. On the interactive website <http://www.ratfte.at/leistungsberichte/articles/chart.htm> you'll find the set of indicators used to determine Austria's scientific and technological performance on the basis of the latest data.



RTI Platform Austria – 12/13 January 2017 and 22/23 June 2017

The RTI Platform Austria looked back in 2017 at a ten-year success story. The aim of the regular and intensive exchange of representatives from the federal states with the national funding agencies (aws, FFG, FWF and the location policy department in the BMWFW) is to improve the domestic innovation system. The Austrian Council coordinates and supports this meeting. At a platform meeting in Tyrol in mid-January 2017 the participants critically exam-

ined Austria's RTI system and identified future challenges. The participants and therefore also the Austrian Council subsequently derived important areas of action for daily work from the discussion. The second platform session was held in Vorarlberg in June, where the participants from the federal states and the agencies exchanged ideas and information on developments and experiences with social business, migration and start-ups.

events

Location attractiveness event – 27 June 2017

Together with the Wirtschaftspolitisches Zentrum (WPZ – economic centre), on 27 June 2017 the Austrian Council organised an evening on the topic of “Business development, innovation and location attractiveness”. The innovation system significantly influences companies' development and international competitiveness. The state is therefore required to simplify the structural change on several levels and ensure location attractiveness, among other things with investments in basic research, the removal of market disruptions and complementary measures. A study commissioned by the Austrian Council on the topic, which summarizes the priorities for research and innovation for Austria in ten points, was presented in the “Haus der Musik”. The study by the WPZ addresses the key challenges for the innovation system and the state. Author Christian Keuschnigg (WPZ and University of St. Gallen) gave the study's keynote. Along with Christian Keuschnigg, Ulrich Schuh (Section Head Federal

Ministry for Science, Research and Economic Affairs), Hannes Androsch (Chairman of the Austrian Council), Heinz Engl (Rector at the University of Vienna) and Philipp von Lattorff (CEO Boehringer Ingelheim) also took part in the subsequent podium discussion.

Left to right:

Christian Keuschnigg
University of St. Gallen

Hannes Androsch – Austrian Council

Karin Bauer Der Standard

Heinz Engl Vienna University

Philipp von Lattorff
Boehringer Ingelheim

Ulrich Schuh BMWFW



events

Book presentation – “Zukunft und Tasks of Higher Education” in Alpbach – 23 August 2017

Universities have been the most important education institutions for some 1,000 years now. They are often synonymous with new knowledge, new findings and their distribution. In this role they have contributed to the development of European societies and to civilisation as we know it today. The model of the European universities with the principles of the Prussian education and state reformer Wilhelm von Humboldt – the freedom and independence of research and unity of research and teaching – has spread far and wide throughout the world in the last 200 years.

With the changes brought with digitalisation, universities are, however, once again faced with immense challenges. The industrial age is being dissolved by the digital age at a breath-taking speed. Internet, big data, artificial intelligence, machine learning, robotization and all the rest are creating a cyber world that will pose major challenges for our society. Tertiary education institutions must prepare to meet them and the tasks they bring. As part of the Technology Forum on 23 August

2017 the Austrian Council presented the “Zukunft und Aufgaben der Hochschulen” (Future and tasks of higher education) publication in the Hotel Böglerhof in Alpbach, Tyrol. Many authors that worked on the publication were also present. Austrian Council Chairman Hannes Androsch, Deputy Chairman Markus Hengstschläger, Ludovit Garzik as Managing Director of the Austrian Council and Anton Graschopf, project manager and adviser with the publication, presented the discussion at the podium. Hannes Androsch emphasised the importance of universities in the development of societies for more than a 1,000 years. He appealed for them to be energetically supported and obstacles removed from their path, so they can continue to make their contribution to society's well-being and prosperity in the future. Markus Hengstschläger reiterated the four questions that the book's authors had addressed. He believes the answer to these will be extremely important for the further development of the higher education sector.

Firstly the structures of the Austrian universities



Left to right:
Ludovit Garzik
Hannes Androsch
Markus Hengstschläger
Anton Graschopf
all Austrian Council

and the higher education sector must be revised. Are governance and variables such as third level access or the tasks of the university council and senate still valid? Or should new paths be found to bring the universities into a successful future? Markus Hengstschläger believes the development of curricula will be especially important: The question as to how students and graduates must be prepared for future challenges must be front and centre here. What diversity is required and how can an efficient and permeable education system be cre-

ated? A further question was directed at research at universities. What competencies should be boosted at which universities in the future? How can corporate research results be provided better? This took Markus Hengstschläger to the perhaps most important challenge of the universities today: the Third Mission. He believes this is an increasingly more important task of the universities, for which new methods are required to use the results from science and research to help and shape society.

events

Stakeholder discussion: Create your UNiVerse – 14 September 2017

What expectations students of Austrian universities have for the university of the future was the key topic of an Austrian Council survey in cooperation with the Ludwig Boltzmann Society and the consulting firm winnovation. A crowdsourcing called “CREATE your UNiVerse” was run over a period of 14 weeks and social media was used as its forum and disseminator. In total more than 100,000 students and graduates of universities and technical colleges in Austria were reached. More than 750 participants provided about 2,100 answers to five questions and therefore enabled one of the most successful crowdsourcings in Austria. Detailed results of the study are available on the Austrian Councils website under “Create your UNiVerse – Students’ expectations for the universities of the future”.

On 14 September 2017 the study was presented by Austrian Council Member Sabine Herlitschka and discussed with experts in tertiary education policy, tertiary education and research in the Austrian Council. Christiane Spiel, Professor of Educational Psychology, Christa Schnabl, Vice Rector for Teaching at the University of Vienna, Matthias Karmasin, Professor of Media and Communication Science at Alpen-Adria University, Andreas Breinbauer, Rector of the Technical College of BFI Vienna, and the science and education spokespersons of the parlia-

mentary parties Claudia Gamon (NEOS), Sigrid Maurer (Grüne) and Lucas Weigerstorfer (ÖVP) provided their expertise. The study results were discussed with the study authors in line with the following questions:

- What strategies can universities pursue to enable real and virtual learning?
- Do we need new role models in higher education teaching?

Left to right:
Gertraud Leimüller winnovation
Sabine Herlitschka – Austrian Council
Claudia Lingner LBG



events

- What challenges emerge in the encounter with heterogeneous student groups, lifelong learning and new training goals?
- What forms of cooperation and experiment spaces do we need to prepare students for their working lives?

What transformation processes are required to optimally utilise the potential of digital technologies?

With the valuable input of the experts the Austrian Council could subsequently elaborate recommendations for action for the future shaping of the universities.

Event: “Thinking innovation further – How to realise visionary ideas” –

21 September 2017

The “Thinking innovation further – How to realise visionary ideas” event, which the Austrian Council had organised with Bank Austria, was held in Graz on 21 September 2017. Due to the huge success of the “Innovation Location Austria” events in Vienna and Graz (2016), it was decided to organise another event in Graz. The format is intended to promote public discussion of innovation, research and technology topics and to improve specific solution approaches.

Louis Palmer von WAVE Trophy (World Advanced Vehicle Expedition), the world’s biggest

rally for electric cars, gave the keynote. The solar pioneer from Lucerne explained how he realised his childhood dream to be the first person to drive a solar-driven car around the world. His story also motivates others to realise their dreams and illustrates solutions for the energy of the future.

The subsequent podium discussion included: Sabine Herlitschka (Member of the Austrian Council), Robert Zadrazil (General Director Bank Austria), Harald Kainz (Rector TU Graz) and Georg Knill (President of IV Steiermark & Managing Partner of the GAW Group).

Council meeting of the Austrian Council with the Upper Austrian Research Council

– 29 November 2017



Left to right:

Markus Hengstschläger
Austrian Council

Michael Strugl
Deputy State Governor of Upper Austria

Hannes Androsch
Austrian Council

Meinhard Lukas University of Linz

Margarethe Überwimmer
Upper Austria Science Council

Stephan Kubinger
Upper Austria Science Council

Wolfgang Eder VOEST



the austrian council

Review 2017

The Austrian Council believes 2017 was defined by the election of the National Council. Before the election the Austrian Council had put seven questions on education, science and research and on some key aspects of the future of the Austrian RTI system to the parties represented in the National Council at that time. The answers from the SPÖ, ÖVP, FPÖ, Grüne and NEOS political parties compiled in the “Seven questions to the body politic” were then presented to the research community and the general

public (<http://www.rat-fte.at/news-reader/items/id-7-fragen-an-die-politik.html>) and demonstrated a basic awareness of the importance of these topics of the future present in all parties.

The result of the National Council elections of 15 October 2017 and the subsequent formation of the government under Federal Chancellor Sebastian Kurz (Liste Kurz / ÖVP) and Vice Chancellor Heinz-Christian Strache (FPÖ) have also formed key departments in new ministries and ministers for education, science and research.



Outlook for 2018

Ludovit Garzik
Head of the Secretariat

With the start of the 25th legislature period and the inauguration of the new Federal Government, rather positive signals were sent out for the research, technology and innovation areas. The new Federal Government has also set itself quite ambitious goals for its RTI policy. The 2017–2022 government programme therefore provides a series of important pointers to continue pursuing the goal of making Austria one of the leading innovation nations. The expectation that the actual implementation will be swift and in particular that secure financing will be provided is therefore correspondingly high in the entire RTI community.

Special importance will also be afforded in the coming year to working out a new research and innovation strategy for Austria. The current RTI Strategy from 2011 will reach its time limit in about two years and has, as the Austrian Council showed in its 2018 report on Austria's scientific and technological capability, scarcely any realistic prospects of achieving the goals by 2020. A new strategy, supplemented by a coordinated implementation process, is therefore key to the further development of the research and innovation location Austria. The Austrian Council is very happy to support this process with its expertise.



the austrian council



The Members of the Austrian Council

Advisory Members

Univ.-Prof. Dr. Heinz Faßmann Federal Minister for Education, Science, Research

Norbert Hofer Federal Minister for Transport, Innovation and Technology

Hartwig Löger Federal Minister of Finance

Dr. Margarete Schramböck Federal Minister for Digital and Economic Affairs

the austrian council



**Dr.
Hannes Androsch**

Chairman of the Austrian Council is an industrialist and former minister of finance who also served as a consultant to the World Bank. He is a member of the Senate of the Austrian Academy of Sciences (ÖAW) and head of the Supervisory Board of the Austrian Institute of Technology (AIT)



**Univ.-Prof. Dr.
Markus Hengstschläger**

Deputy Chairman of the Austrian Council
Head of the Institute of Medical Genetics at the Medical University in Vienna, Vice Chairman of the Bioethics Commission at the Federal Chancellery (since 2009)



**Univ.-Prof. Dr.
Jakob Edler**

Director of the Institute of Innovation Research, Manchester Business School



**Dr.
Hermann Hauser**

Company founder, computer and risk capital businessman in the UK, Co-founder of Silicon Fen ("British Silicon Valley")



**DIⁱⁿ Dr.ⁱⁿ
Sabine Herlitschka, MBA**

CEO of Infineon Technologies Austria AG



**em. Univ.-Prof.ⁱⁿ Dr.ⁱⁿ
Helga Nowotny**

Former President of the European Research Council Board of the ERA Council Forum Austria



**Univ.-Prof.ⁱⁿ Dr.ⁱⁿ
Sylvia Schwaag-Serger**

Director of International Collaborations & Networks, Swedish Government Agency for Innovation Systems (VINNOVA)



**Dr.ⁱⁿ
Klara Sekanina**

Council member of the Swiss Federal Foundation for the Promotion of the Swiss Economy through scientific research Former Head of the Swiss Commission for Technology and Innovation (CTI)

**DI Dr.
Ludovit Garzik, MBA**
Head of the Secretariat,
management and coordination of
the secretariat's activities and
external representation
l.garzik@rat-fte.at



The Secretariat

The Secretariat supports the Austrian Council both in terms of organization and content, in particular with regard to preparing and organising the meetings of the Austrian Council and work groups, and in respect of communication both within the Council and externally. The operations of the Austrian Council are financed by the Ministry of Transport, Innovation and Technology. The Head of the Secretariat, Deputy Head of the Secretariat and, in alphabetical order, members of staff:



**Mag. Dr.
Johannes Gadner, MSc**
Deputy Head of the Secretariat, project manager for the
"Report on Austria's Scientific and Technological Capability",
coordination of strategic processes (Austrian Government
RTI Strategy, Strategy 2020, Strategy for Excellence.
j.gadner@rat-fte.at



**Dr.ⁱⁿ
Constanze Stockhammer**
Deputy Head of the Secretariat, business-oriented
research, innovative public sourcing, IPR, National
Foundation and Austria Fund, start-up and growth
financing, SME and innovation funding, social business
c.stockhammer@rat-fte.at



**Dr.
Anton Graspöck**
Universities, research infrastructure, life sciences, basic
research, international affairs and research cooperation
projects
a.graspock@rat-fte.at



**Mag.^a
Maria Husinsky**
Office Management
m.husinsky@rat-fte.at



**Mag.^a
Bettina Poller**
Science/RTI and society, human resources, humanities,
social and cultural sciences, advancement of women and
gender mainstreaming, ethics in research, public relations
and administrative support
b.poller@rat-fte.at



**Priv.-Doz. Dr.
Gerhard Reitschuler**
Compilation and processing of R&D data, macro-economic
developments and trends, output/impact (indicators),
modelling and simulation, technology flow analysis,
indirect research funding
g.reitschuler@rat-fte.at



Margarete Rohrhofer
HR and Accounting
m.rohrhofer@rat-fte.at



**DI
Walter Schneider**
Research cooperation, coordination of the Long Night of
Research, science communication, EU research and innovation
policy, EU Framework programmes for RTD, agricultural
sciences, cooperation between Austria's federal government
and its "Bundesländer", security research
w.schneider@rat-fte.at



Karin Schögggl
HR and Accounting
k.schoegggl@rat-fte.at

contact



**Federal Ministry for Transport,
Innovation and Technology**
(Supervisory Responsibility for the Austrian Council)

A-1030 Vienna, Raderzkystraße 2
Tel.: +43/1/711 62-0
www.bmvit.gv.at



**Austrian Federal Ministry of
Education, Science and Research**

A-1010 Vienna, Minoritenplatz 5,
Tel.: +43/1/53120-0
www.bmbwf.gv.at



**Federal Ministry for Digital
and Economic Affairs**

A-1010 Vienna, Stubenring 1
Tel.: +43/1/711 00-0
www.bmdw.gv.at



Federal Ministry of Finance

A-1010 Vienna, Johannesgasse 5
Tel.: +43/1/514 33-0
www.bmf.gv.at



**Austrian Council for Research
and Technology Development**

Secretariat
A-1010 Vienna, Pestalozzigasse 4/D1
Tel.: +43/1/713 14 14-0
Fax: +43/1/713 14 14-99
office@rat-fte.at
www.rat-fte.at



www.rat-fte.at

