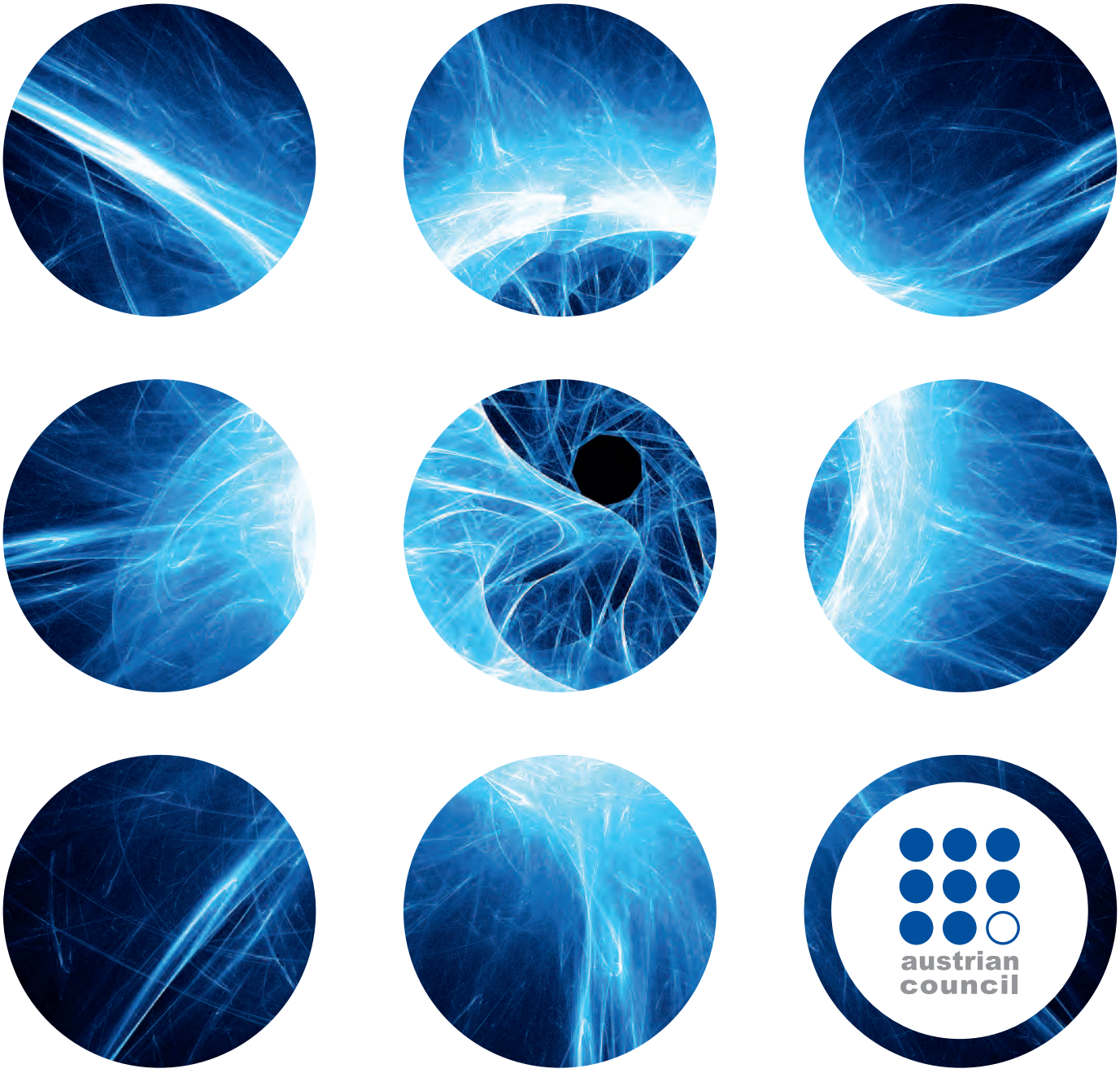

Report on Austria's Scientific and Technological Capability

2016

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preamble

The Austrian Federal Government initiated an ambitious project with the adoption of its Strategy for Research, Technology and Innovation in March 2011. The RTI strategy was compiled with the participation of six ministries coordinated via the Federal Chancellery. Its declared goal: Austria must join the leading innovation nations, or the "Innovation Leaders", by 2020. The strategy will also continue to serve as an RTI policy orientation framework for the work programme of the Austrian Federal Government from 2013 to 2018. The Austrian Council also considers the strategy an important milestone of Austrian RTI policy. It has expressed this several times, both in its statement on the RTI strategy and in its previous reports on Austria's scientific and technological performance.

In addition to a status analysis of the Austrian research and innovation landscape, one of the specific subject matters and goals of this report is to document the implementation status of the RTI strategy in its individual measures. The following issues in particular will be broached for this purpose.

How is implementation of the RTI strategy progressing? Where does the Austrian RTI system stand today? Will the goals set out in the RTI strategy be achieved? Will Austria be an innovation leader in 2020? Also critical here, however, is the answer to the question of how much energy and resources are required to truly achieve this goal. This undertaking is consistent with the task given to the Austrian Council by the cabinet of strategically monitoring the implementation of the RTI strategy and evaluating its goal orientation. The Council is also very much concerned with both pointing out positive developments and clearly addressing any failures or shortcomings encountered.

The report on Austria's scientific and technological performance is intended to inject new energy into the innovation policy agenda. The Austrian Council believes this also includes specification and quantification of the objectives of the RTI strategy, with the implementation of which the Council will be a committed partner for the Federal Government.

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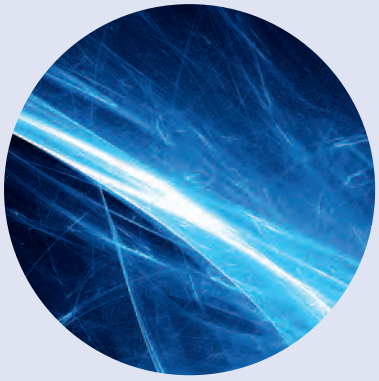

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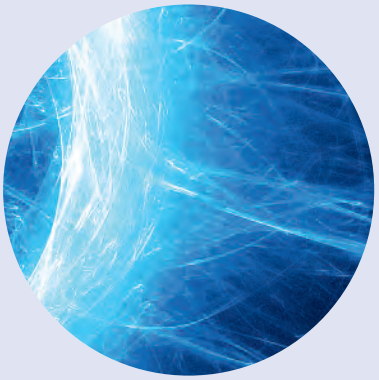


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Executive Summary

executive summary

The fifth report on Austria's scientific and technological performance and the first after the major mid-term review of the previous year presents a series of innovations.

For the first time, not all areas of action and objectives behind them are consequently dealt with completely by the Research, Technology and Innovation Strategy adopted by the Federal Government in 2011. Instead, the focus is on the main points identified as special priority with the mid-term review. These were in particular (1) performance of the education system that did not meet expectations, (2) financing for basic research that is not competitive in international terms, (3) insufficient start-up dynamic or inadequate growth dynamic of start-ups with parallel absence of appropriate investment capital, (4) a basically too low private financing share in R&D and (5) weaknesses in the governance of the RTI system.

In these five areas, the current status of the Austrian RTI system was analysed on the basis of the developments since 2010 in this report; strengths and weaknesses were illustrated and proposals for action were worked out as recommendations.

Education System

Even if a series of positive changes have been made in recent years, developments in the education system have been sluggish at best. The announced reform in particular has only been implemented in small partial steps. The inheritance of education and autonomy of schools continue to be key weaknesses in the Austrian education system. These have consequently been conceded a series of freedoms as part of the "autonomy package", but there are still significant restrictions with staff selection. The most important criticism of the autonomy package is, however, the fact that the reform paper does not contain any information, such as how the new opportunities the autonomy of the schools offers are actually to be financed.

In the area of tertiary education, inadequate student place management continues to result in overflowing universities and, connected with this, in international terms in an extremely unfavourable supervisor-student ratio. An essential step towards improving study conditions and the ability to plan the necessary resources would be the implementation of the planned capacity-oriented study place financing and university financing. Seen as a whole, the financing of universities is below target. Spending would have to increase to approx. EUR 8 billion to achieve the targeted university expenditure quota of 2 per cent by 2020. Achieving this goal appears unrealistic on the basis of the current budget planning.

The Austrian Council recommends

- Measures for **early childhood development**
- An **increase in the number** of qualified and above all multilingual **educators** in the early childhood area
- The **modernisation of education system structures**, in particular with further measures to intensify school autonomy and for still outstanding adjustment of the competencies between federal government and the states
- **Overcoming early social selection** in the education system with commitment to the joint, whole-day school in the area of secondary level I with simultaneous performance differentiation and talent development, as well as appropriate implementation with suitable measures
- Swift introduction of study place financing, coupled with **capacity-oriented study place management**
- Adjustment of the autonomy of universities to the existing framework conditions vis-à-vis capacity-oriented studies access
- Increase in **basic financing** for universities to improve the teaching and research conditions by at least EUR 1.4 billion for the 2019–2021 performance agreement period
- The emphatic pursuit of an **increase in professors** or suitable positions illustrated in the all-Austria university development plan

Basic Research

The expenditure for basic research in Austria rose between 2002 and 2013 from 17 to 19 per cent of all R&D expenditure. With a quota of 0.56 per cent of GDP, Austria is therefore also included in the top mid-field of research-intense nations. An improvement in the share of competitively awarded research funding has not yet been possible. In combination with the less than adequate university financing, this has a long-term inhibiting effect on scientific output factors. An increase in the competitive financing percentage for funding basic research is therefore urgently required.

There also continues to be major catch-up requirement with the conversion of traditional doctoral studies to modern PhD studies. Initiatives begun at the universities should therefore be extended and supported.

The Austrian Council recommends

- Resources for **competitive funding**
- Increasing basic research by providing resources of the FWF (Austrian Science Fund) to the volume of the average funds provided by the Innovation Leaders for this purpose (by at least EUR 400 million for 2017-2020)
- Increasing the resources for **memberships in international programmes** and for participations in European research infrastructures by EUR 100 million
- Guaranteeing financial provision for the **development of career opportunities** and structured doctoral programmes
- Securing budgets for the **continuance of the excellence initiative** in basic research (SFB) and applied research (COMET).

Innovative Start-ups

Despite the increased importance of start-ups in political awareness, the start-up dynamic in Austria is still behind the Federal Government's targets. The core reasons for this in particular include the insufficient availability of private financing forms, such as risk capital or crowdfunding, 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) must in particular be emphasized here.
Added to this is the fact that the Austrian funding system for innovative start-ups in international terms is comparably very comprehensive, but it is characterised by a high level of complexity and a lack of clarity. A streamlining and restructuring would be urgently required here to make access to the system easier for potential entrepreneurs.

The Austrian Council recommends, among others

- A **compact**, **well-coordinated set of measures** for the start-up area, which provides support and consultancy services in particular across and beyond the start-up period, and does not overload the target group with the variety and lack of clarity of the measures offered.
- The set-up of a central and clearly visible **contact point** for innovative entrepreneurs for each region. The existing information centres (e.g. AplusB centres, Austrian Federal Economic Chamber start-up service centres) in particular should be used and qualitatively increased in value here.
- Swift adoption of the new **insolvency law** outstanding since 2012, with which the recommendations of the SBA action plan will be implemented to further reduce debt relief after the insolvency and the liquidation times for honest entrepreneurs.
- Appropriate **tax relief and support with social security funds** for start-up companies in the first years Furthermore, the regulations for work and residence permits for start-up employees must be organised so that people interested in start-up companies can come to Austria without major expense.

- A specific **public sector procurement policy**, which in particular supports young, innovative companies, e.g. with emphasis of the IÖB service centre of the BBG on supporting young innovative companies.
- The development of further **private financing opportunities** for innovative young entrepreneurs and SMEs. The range of crowdfunding including peer-to-peer lending and crowdinvesting should consequently be promoted as a supplementary financing element with an effective and efficient legal framework and the creation of a business-angel allowance should be planned for equity capital reinforcement.
- A rethinking of mechanisms such as **tax breaks for investments in young companies**, accompanied by corresponding legal framework conditions to increase equity capital intensity on the private side.

Governance

RTI-relevant policies are currently coordinated via the RTI Task Force based at the Federal Chancellery with the participation of the BMWFW, BMVIT, BMBF and BMF. Due to the multifaceted research and innovation-relevant tasks of other ministries, an inter-ministerial coordination going beyond this group and performed by the Federal Government would be urgently required. Addressed here in particular are the specialist areas of BMASK, BML-FUW and BMG.

At the tools level an extensive harmonisation of the activities of federal government and the states is still wanting, which is also reflected in the content-related implementation of the individual strategy areas. The funding system is, contrary to the targeted improvements, still partially fragmented and heavily segmented. Critical masses are therefore only rarely achieved, redundancies continue to dominate, and target groups are confronted with complex and confusing systems. Added to this is the fact that the current funding system prolongs increased dependency of funding recipients on public sector resources, so they often find it extremely difficult to survive in the competition for private financing.

The governance area could benefit from more positive awareness of science and research in Austrian society. This could be achieved with appropriate alignment of the policy with the RTI topic without significant added expense. In relation to public sector-financed awareness measures, the weaknesses in the coordination and structuring at federal government and state level are, however, critical.

The Austrian Council recommends

- Intensive **inter-ministerial coordination**, which goes beyond the departments represented in the RTI Task Force. Focus points based on clearly defined social and economic challenges serve to orientate and coordinate the respective research, innovation and specific policies. To achieve clear responsibilities, the strategic alignments of federal government and the states must be further harmonised and the structures in the different hierarchy levels must be standardised.
- For the **National Foundation**, an adjustment of the current financing logic with regard to an annual minimum pay-out for maintaining quality in the programmes.
- A significant **expansion of dialogue activities** with parallel clear structuring and strong focus. Initiatives such as Citizen Science, Open Innovation and Responsible Research and Innovation (RRI) are essential elements for dialogue in this respect.

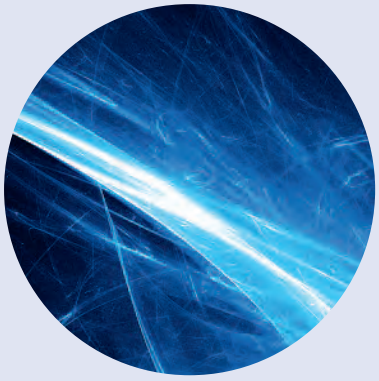
executive summary

Financing

The image of R&D financing has hardly changed during the course of past performance reports. The current development trajectory of the R&D quota will under no circumstances achieve the 3.76 per cent goal set for 2020 with the current budget planning, even with a very conservatively estimated GDP development.
With regard to the private R&D expenditure goal of at least 30 per cent, with a current ratio of private to public financing of 40 to 60 we are still significantly behind target.

The Austrian Council recommends, among others

- A continued concentration of public sector resources and tools on increasing the leverage effect to **increase the incentive effect on private R&D expenditure** and to increase the private financing percentage. In addition to the mechanisms of direct research funding, with which substantial additionality effects have already been achieved, the promotion of a higher leverage effect in particular also influences indirect **research funding**.
- Achievement of the set goals of the RTI strategy by 2020 in terms of secured financing of the second five-year period; in addition to the implementations already performed, the swift adoption of the planned research financing act.
- The immediate implementation of the announced and required measures to **achieve both quota targets** – 2 per cent for the tertiary area and an R&D quota of 3.76 per cent by 2020.
- The **remuneration of the Austria Fund (Österreich-Fonds)** from other and additional income and taxation sources. This could be either via extended income taxation or with the cancellation of exceptions in the Income Tax Act.

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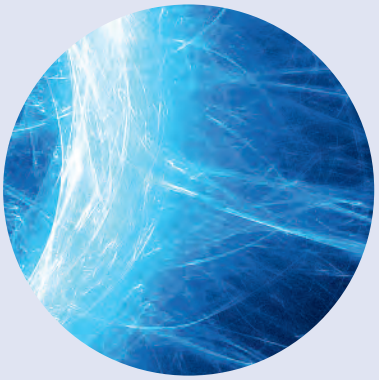



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On 31 August 2009 the cabinet ministers agreed to set up an inter-departmental working group to formulate a Strategy for Research, Technology and Innovation (RTI) in a process that would be politically coordinated by the chancellor and vice chancellor. The goal was to define "strategic goals and measures for Austrian RTI policy for the period up to 2020, based on the results of the evaluation of the research funding system, the Research Dialogue and the RTI recommendations submitted by the Austrian Council."[1] During 30 meetings held over several months, five working groups, each with its own thematic focus, developed strategic goals and a package of measures for each chapter of the strategy document. The RTI strategy was completed in August 2010 and adopted by the cabinet on 8 March 2011.

At the same time, the Austrian Council was also commissioned with regular monitoring of the implementation progress on the basis of Austria's scientific and technological performance, as carried out within the scope of this report since 2012. A set of indicators, which is the basis of this status review, was worked out, adapted and enhanced for this purpose in cooperation with WIFO and with the inclusion of experts from the Austrian RTI community.

While the previous reports have concentrated on all RTI strategy areas of activity, this year's report is primarily dedicated to the five areas of action identified last year in the mid-term review as particularly relevant: (1) education, (2) basic research, (3) start-ups, (4) governance and (5) financing.

The reason for this is an especially in-depth analysis of all strategy areas that was performed as part of the mid-term review for the half-time period of the RTI strategy in 2015. There is also the fact that the underlying indicators show no major annual changes, and therefore do not permit any significant reinterpretations from report to report. On one hand, this is due to the nature of the phenomena they record, and on the other hand to the survey which in many cases is not performed annually.

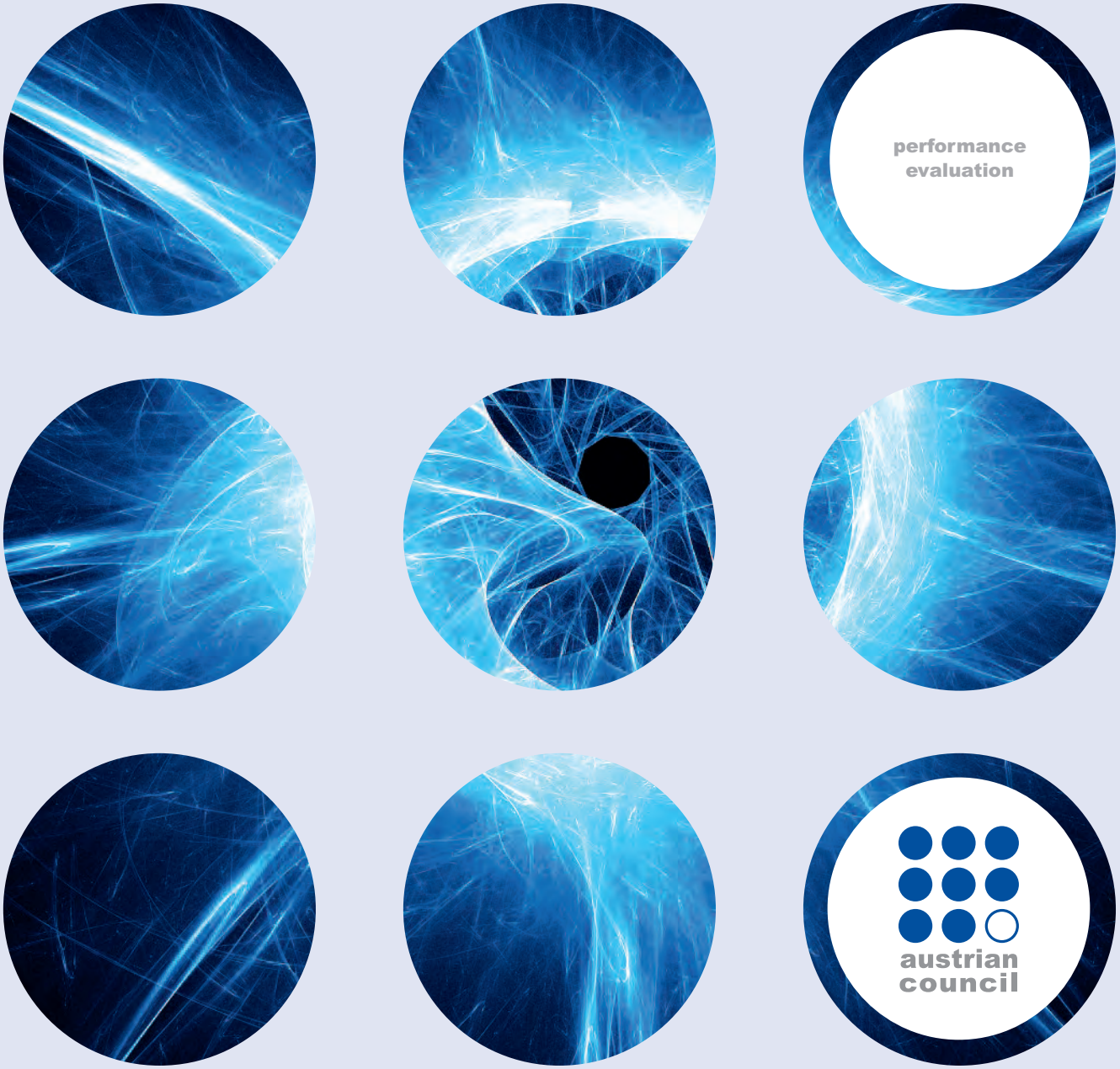
In addition to the quantitative evaluation of the RTI strategy's level of goal achievement, on the basis of data series from the period 2010–2016, there will be a much more qualitative focus on evaluation and a primarily descriptive analysis this year. The cuboid graphics on the prospect of goal achievement and goal distance from the innovation leaders or from the respective national goal, provided as they are, will serve here as a reminder of the status already determined, illustrate possibly already achieved changes in the trend and provide a bridge to the qualitative analysis.

Besides, the Global Innovation Monitor will once again be part of this year's Report. It was presented by the Austrian Council at the Alpbach Technology Forum in 2014. The Global Innovation Monitor compares selected Austrian statistical parameters with those of the leading innovation nations outside the EU. Such a comparison on both the European and global levels should help shed light on Austria's performance in the context of worldwide trends.

This report follows the same methodology as previous reports – details are provided in Appendix and on the Austrian Council's website under the menu item "Performance Reports"[2]. As well as information about the report and a range of download options, the site offers an interactive depiction of the indicator sets, which makes it possible to retrieve detailed information about the status quo and developments in individual areas interactively.

1 Presentation to the cabinet on 3 February 2010, p. 1.

2 http://www.rat-fte.at/performance-report



Performance of the Austrian Innovation System in the Priority Objective Fields

priority objectives

RTI Strategy Objectives

- *Join the ranks of the leading innovation nations in the EU by 2020*
- *Strengthen the competitiveness of the Austrian economy*
- *Enhance social prosperity*
- *Overcome the major social and economic challenges of the future*

On the basis of the indicator-supported evaluation of the performance of the Austrian RTI system from the previous year, the Austrian Council has identified five priority areas of action, which will be analysed in-depth in the current report.

1. Education System (including tertiary education)

Intensifying the reform of the education system.

2. Basic Research

Increasing competitively allocated financing for basic research.

3. Start-ups and growth of innovative early-stage companies

Further optimising the legal and financial framework for business start-ups and their growth.

4. Private-sector R&D Financing

Promoting measures to increase the private-sector share of R&D funding.

5. Governance Structures

Improving governance structures for the implementation of the RTI strategy.

The Austrian Council believes there is a primary requirement in these areas for greater efforts to increase the performance of the Austrian innovation system as a whole.

An RTI policy strategy must not be measurable on the level of achievement of its detailed goals alone, but rather on the whole on the superordinate effects that the RTI activities can develop. For this reason, the effect of the activities in the priority areas of action will also always be evaluated on the basis of the **overriding objectives** of the RTI strategy.

The socio-economic level and innovation performance are addressed here. Against this background, a comprehensive insight into the different effects of RTI activities can then be guaranteed.

Education System

education system

According to the findings of the Federal Government's RTI strategy, the education system is the foundation of knowledge-based economies and makes an essential contribution to the social and economic development of our society.[3] Consequently the promotion of the talents of people at all education levels is also explicitly given as an important goal.[4] For countries at their technological limits, pursuing the goal of joining the leading innovation nations, the education system in particular is critically important as the foundation of the entire innovation system.

Education System (without tertiary education)

In this chapter, we will consider those indicators that affect the developments in the primary and secondary education area. The focus here

1. in the pre-school and primary area is on the range of the education area (participation in early childhood education) and on the availability of staff and supervision places (ratio of children/students to educators/teachers)
2. is on the quality and quantity of the secondary area (PISA results, early school leavers and proximity to the labour market) as well as the social selectivity of the school system (education inheritance).

In summary it can be said that, apart from the few goals that have already been achieved (e.g. the rate of school leavers, which has been approx. 7 per cent since 2014), almost all indicators in figure 1 concerning the development of recent years show a positive, but insufficiently dynamic development. Excepted here is the group of those indicators that is currently above the 100 value with the prospect of goal achievement by 2020. Basically, however, the findings are maintained, whereby most objectives of the RTI strategy for the education area are not (cannot be) achieved, if developments continue as they have in the past.[5] Despite improvements, the goal distance continues to be too great and development dynamic too low, even if it must be conceded that measures in the education area require several years before they can actually show any effect. We must therefore also wait, for example, to see in what form or to what degree the introduction of what is referred to as "pre-university work" at AHS and "thesis" at BHS will have an effect on the interest of young adolescents in research and innovation. Among the goals that are not expected to be achieved by 2020, the "education inheritance" indicator is especially problematic. An education system must be permeable and accessible, as well as equitable in particular, so that it can perform its basic task, i.e. the education and training of all children and young people, regardless of their origin, gender, socio-economic background, etc. Only then can the skills and talents of all young people, which will later contribute to the successful life of each and every individual, and in their entirety form the basis of the economic and cultural development of a country and its economy, truly find complete expression.

This is where the most acute problems of the Austrian education system become obvious. The analysis of the RTI strategy shows that the education system in its existing form, "(splits pupils) very early on into education and training strands and (selects) education access very much according to social strata"[6]; in other words: Education in Austria is still very often "inherited". Only in the BHS area is it impos-

RTI Strategy Objectives

- *We want to promote the talents of people in all levels of education, awaken their passion for research, and facilitate the best possible training for business dealings and scientific research. This should guarantee universities, research institutions and firms a sufficient pool of highly-qualified researchers.*
- *To do this, the entire education system must be optimised, from the early childhood phase to models of lifelong learning.*
- *These reforms attempt to mitigate social selectivity, to improve permeability between education courses and tracks, to implement thorough quality improvements in (…) instruction [and] to better integrate immigrants,*
- *The proportion of drop-outs should be reduced to 9.5 percent by 2020.*
- *The proportion of pupils graduating from secondary school for an age cohort should be raised to 55 percent by 2020.*
- *Among the pupils whose first language is not German, the share of those who do complete upper secondary school should increase from 40 percent to 60 percent.*

3 RTI Strategy 2011, p. 14.

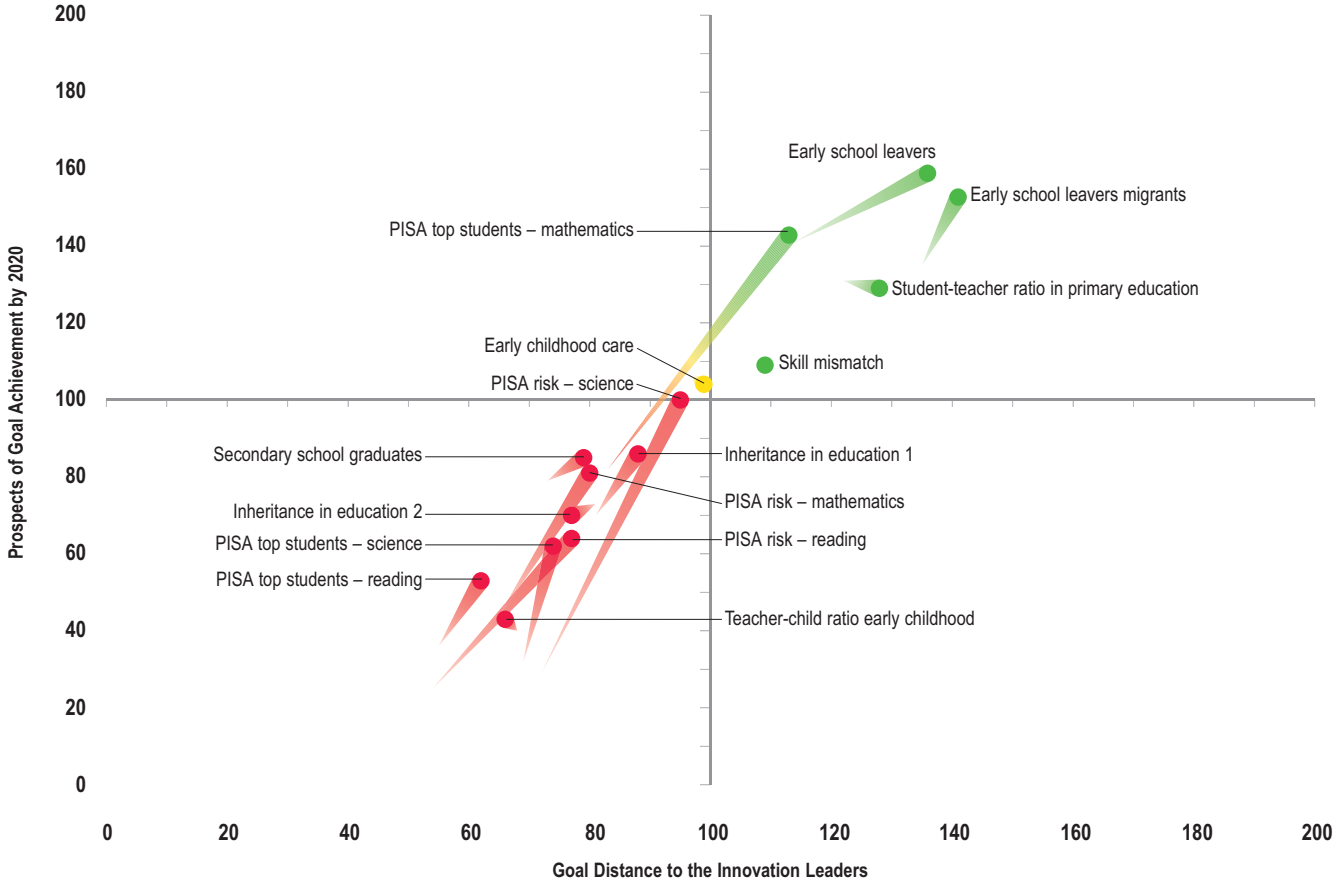
4 RTI Strategy 2011, p. 16.

5 Cf. the 2012 to 2015 Reports on Austria's Scientific and Technological Capability.

6 RTI Strategy 2011, p. 14.

sible to determine a connection between the education level of parents and children, as BHS students come from parental homes with lower and higher status values. On the basis of the benefit of "double qualification" (professional training and university access) BHS offer the development of opportunities to rise in social environments that are actually rather far removed from an academic career. At the same time, however, this benefit is accompanied by the fact that general academic education in the AHS did not undergo an opening on a social level; as a consequence, it remains heavily "elitist" and therefore continues to serve as a tool that mirrors status.[7] Early se-

Figure 1: Development of Goal Distance and Prospect of Goal Achievement in the Education System (Without Tertiary Education)



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 actual value of the innovation leaders (average value most recent available year DE, DK, FI, SE) or to the national target;

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

7 Lassnigg, L. / Laimer, A. (2013): Berufsbildung in Österreich. Hintergrundbericht zum Nationalen Bildungsbericht 2012. Projektbericht des IHS,

lection of the performance level and the segregation of secondary school and AHS are institutionally solidified indirectly by this configuration.[8] Together with the low permeability of the education routes defined by experts, this early selection determines the education opportunities of children and young people – a factor that can scarcely be corrected later. And the objective formulated in the RTI strategy for this, whereby the reforms focus on "the removal of social selectivity" and "better permeability between education courses and paths", has clearly not been achieved to date.

In recent years, numerous measures have been implemented with the objective of decisively improving the education system. This includes, for example, the introduction of the "new secondary schools" (NMS), "apprenticeships with higher school certificates", the formulation of education standards, "NEW educators training" and the introduction of centrally compiled university qualification secondary school exams. The result of these reforms cannot yet be conclusively analysed; however, on the basis of these measures, especially with regard to the goal of the RTI strategy to reduce education inheritance, significant improvements cannot be expected.

Whether or not the "education reform package" will result here in positive developments remains to be seen for the moment, but it would also be questionable. The reform package, result of the Commission for Educational Reform, was presented on 17 November 2015 by Federal Minister Gabriele Heinisch-Hosek (BMBF) and State Secretary Harald Mahrer (BMWFW) in a presentation to the cabinet.[9] The key points named in it include:

- An elementary educational package to bolster kindergartens as educational facilities.
- A school entrance phase and elementary schools package with key focus on language development.
- An autonomy package.
- A model regions package focusing on schools for six to 14 year-olds.
- A school organisation package with the creation of a department of education
- An education innovation package.[10]

Aspects that should be rated positively include the efforts to upgrade elementary education with the introduction of a nationwide standardised education compass including continuous language status and development documentation for all children from 3.5 years, the second obligatory kindergarten year and the planned increase in training quality in the elementary education professions with the further development of educational institutions for kindergarten education (BAKIP) in higher vocational schools (BHS) with appropriate professional qualifications. With the current plans, however, we are still some distance from any kind of training comparable with other educational professions, and the question as to how the development and above all the implementation of the planned nationwide quality framework can be implemented in harmony with the states in particular also remains unanswered.

The school entrance phase and elementary schools package could bring clear improvements, and therefore is essentially positive, especially with regard to the planned increased interlinking of the last kindergarten year and the first two elementary school years, provided, however, that it actually results in closer cooperation between kindergarten and elementary school educators. The introduction of language starter courses, which would help children

8 Ibid, p. 39.

9 Setting up the Commission for Educational Reform ("Bildungsreformkommission") was agreed at the Austrian Federal States Summit on 30 September 2014. Members included Federal Minister Gabriele Heinisch-Hosek (BMBF), Federal Minister Johanna Mikl-Leitner MA (BMI), Federal Minister Dr. Josef Ostermayer (BKA, Art and Culture) and State Secretary Dr. Harald Mahrer (BMWFW) from the federal side, as well as State Governor Dr. Wilfried Haslauer (Salzburg), State Governor Dr. Michael Häupl (Vienna), State Governor Dr. Peter Kaiser (Carinthia) and State Governor Günther Platter (Tyrol) on behalf of the states.

10 Commission for Educational Reform: Presentation to the cabinet on 17 November 2015.

whose German language skills are not sufficient to follow the class, is an especially positive development.

The so-called "autonomy package", with which more educational, organisational, staffing and financial freedoms are to be created, should, on the other hand, be seen in a more critical light. It will actually be possible in the future that schools set independent focus points and deviate accordingly from the curricula (up to maximum 33 per cent). They will also be able to organise their opening hours more freely and therefore be able to offer easier whole-day offers, and in the future there will be a school management at every school as an own professional group with a time limit of five years, however only for new management positions to be occupied. Also positive here is the fact that school administrators in the future will be able to select their staff, even if only in agreement with the school authorities and only with new appointments, whereby autonomy will indeed be severely restricted. The ability to convert only 5 per cent of teaching staff into educational support staff also appears to be too low.

The most important point of criticism with the "autonomy package" is, however, the fact that the reform paper does not contain any information about how the new possibilities of providing the autonomy of schools will actually be financed, especially "all measures provided for in the education package – provided they result in additional expenditure and revenue shortfalls – (…) subject to financing".[11]

Besides, the "model region package for schools for six to 14 year-olds" and the "school organisation package" must be seen in an especially critical light. The former because it only permits the introduction of comprehensive schools in model regions, whereby only parts of a federal state may be included, and even in the model regions it is limited to maximum 15 per cent of the schools; the latter because the regional education boards will actually be removed, but they will be replaced by an "education department" in every federal state, which in the future "will exercise all powers that the regional education board or the school departments of the states perform".[12] It is suspected that ultimately this is no more than a mere renaming. Furthermore, the education departments will actually be named in the future by the responsible minister, however as proposed by the state governor, whereby the political influence of the states is maintained. On the whole, experts believe many opportunities have been squandered in these two sub-packages.

In summary the education reform package can actually be considered a first step in the right direction, especially with regard to the planned measures in the early childhood education area, at the same time however, also as a lost opportunity, as three significant problem areas – the social selectivity of the school system, the quality of the education and the school administration – were not truly addressed or resolved. From the Council's point of view, the education reform package can therefore not be the conclusion of the reform process, but rather can only be its beginning. Furthermore, in view of the fact that measures in the education area mostly require several years until their effect begins, a swifter approach is required with the development of future reform steps.

11 Commission for Educational Reform: Presentation to the cabinet on 17 November 2015, p. 2

12 Ibid, p. 16.

Recommendations of the Austrian Council for Achieving the Goals of the RTI Strategy in the Education System (without tertiary education)

education system

In view of the education selection that continues to exist in Austria, further measures for **early childhood development** and a **considerable increase** in the number of qualified and in particular multilingual **educators** are required in the early childhood area. It would also urgently require **better financial and staff provision** (keyword: support staff) for those schools that are faced with special challenges, especially with regard to the socio-economic structure of the students; the maximum 15 per cent in support staff proposed in the education reform package is too little. The Austrian Council also recommends further steps towards the **modernisation of education system structures**, in particular with further measures to intensify school autonomy and for the still outstanding adjustment of the competencies between federal government and the states.
To overcome early social selection in the education system, the Austrian Council recommends commitment to the joint, whole-day school in the area of secondary level I with simultaneous performance differentiation and talent development, as well as appropriate implementation with suitable measures. The model regions package provided for in the education reform package can only be a first step in this direction.

Tertiary Education System

The findings on goal achievement on the basis of the indicators for the tertiary education system have only changed to a small degree compared with the previous year.[13] There are still only very few indicators (those that are above the 100 value in the prospect of goal achievement) with a real chance of joining the Innovation Leaders by 2020. Measures implemented to date from the Federal Government's RTI strategy continue to show very little effect. With 12 of the 15 indicators, performance remained lower than the set goals (see fig 2).
A positive development could at least be seen in partial aspects for the indicators, "proportion of female researchers", "proportion of female scientists" and "proportion of females in technology", as well as "EU glass ceiling index". The long-standing trend shows that the proportion of women in research in Austria shows above average increases and could reach the level of technologically leading nations by 2020.
A gradual change in gender numbers is also illustrated in technical studies. According to the indicator used here the proportion of technology female graduates has risen to 21.2 per cent. In the sciences, the proportion of women since 2000 oscillates constantly between 33 and 39 per cent. On the whole, 11,872 people graduated from a natural sciences or technical study course in the 2013/2014 study year[14]. The proportion of female graduates here was 45.6 per cent. This is noteworthy, as the figure 15 years ago was only approx. 33 per cent.
The development of the "EU glass ceiling index" indicator, which reveals career opportunities with regard to gender equality, so far indicates positive goal achievement by 2020. In recent years the dynamic has, however, dimin-

RTI Strategy Objectives

- *The conditions of study at universities should be fundamentally improved, which will require establishing new financing models for higher education.*
- *The reforms attempt to implement thorough quality improvements in (…) university instruction, to better integrate immigrants.*
- *The proportion of 30- to 34-year-olds who have completed a university degree or have an equivalent education certificate should be increased to 38 percent by 2020.*

13 It should be noted that the course of development of the indicators, "University graduates", "University graduates (ISCED 6–8)", "University expenditure per student", "STEM subject graduates", "Number of female graduates in science", "Number of female graduates in technology", has changed due to a retroactive revision of the data or methodical adjustment compared with the previous year; see Appendix 1: "Indicators".

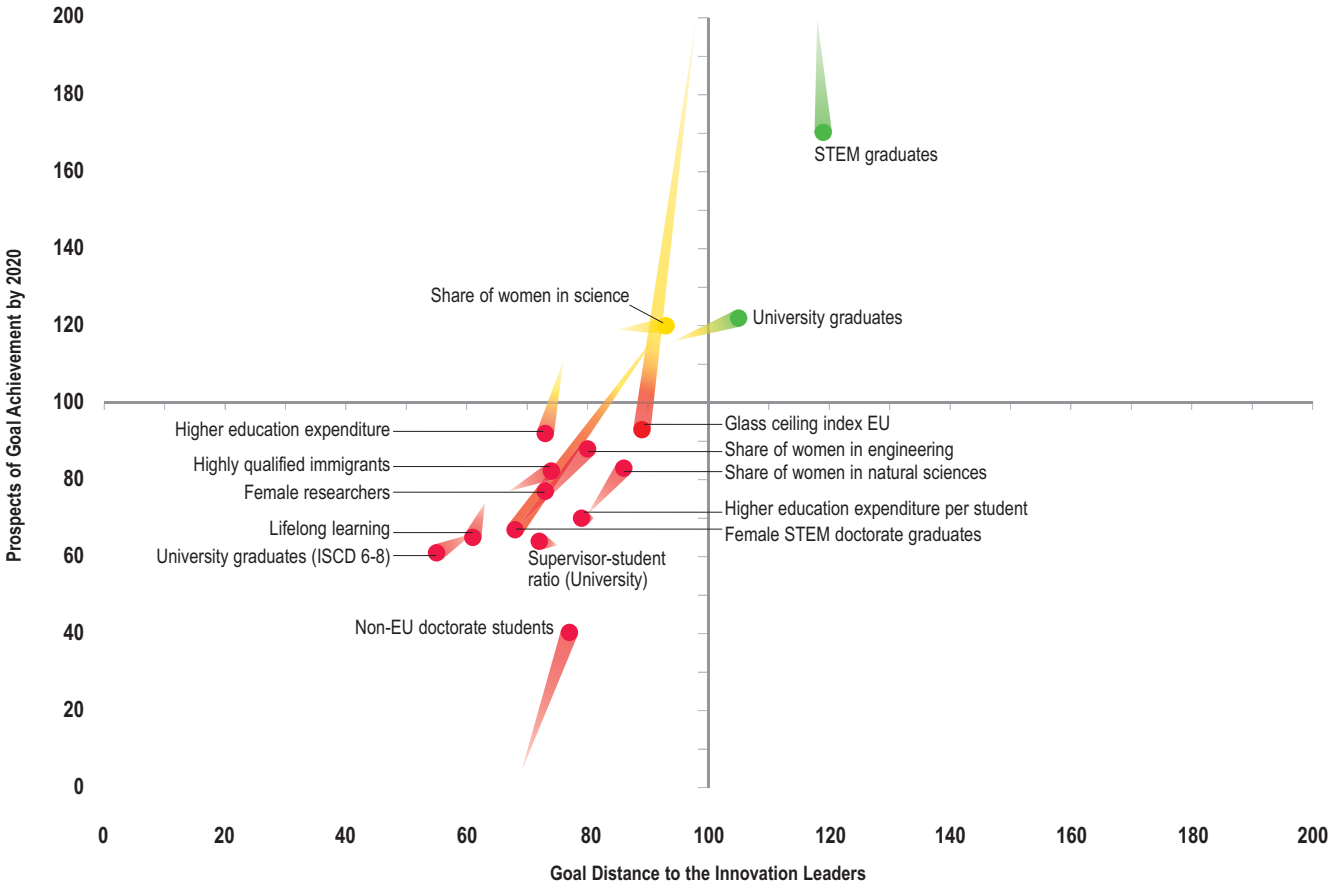
14 Austrian statistics: Ordinary degree structures at public universities 2013/2014 according to study type and main field of study.

ished significantly. The trend illustrated is currently too low to achieve the Innovation Leaders average by 2020. Austria also only ranks 37th in the Global Gender Gap Report for 2015. Measures to close the gender gap must therefore be supported and enforced on all levels.

The "higher education expenditure quota" indicator maps the distance from the Innovation Leaders for the financial resources available in the tertiary sector. The investments in the tertiary sector, low compared with the Innovation Leaders, are reflected by a declining development since 2010 (see fig. 2). This deficit therefore also (directly or indirectly) has an effect on the development of further indicators.

The achievement of a higher education expenditure quota of 2 per cent of GDP by 2020 was once again defined in the government programme 2013-2018. For 2014 the quota is 1.47

Figure 2: Development of Goal Distance and Prospect of Goal Achievement in the Tertiary Education System



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 actual value of the innovation leaders (average value most recent available year DE, DK, FI, SE) or to the national target;

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

A different scaling was chosen to make the representation easier to visualize.

per cent or EUR 4.84 billion.[15] Expenditure must increase to approx. EUR 8 billion by 2020 to achieve the 2 per cent goal. The growth rate required for this at 8.7 per cent is above the increase rate of the period 2000-2014 (6.5 per cent). Achieving this goal therefore appears unrealistic on the basis of the current budget planning. Alternative calculations of the expenditure path are also available on the basis of the new classification since the report year (ISCED 2011: 5–8 and ISCED 2011: 6–8)[16]. The current higher education expenditure quota is 1.74 per cent on the basis of these calculations. The required annual growth for goal achievement would consequently be reduced significantly (5.6 per cent). On the basis of the integration of the BHS (third level vocational school) graduates into these calculations, the 2 per cent goal for the entire tertiary sector would therefore actually be easier to achieve. However, this would not result in any improvements for teaching and research at universities, as a considerably higher number of students would have to be financed with the available budgetary resources.

These findings are also reflected in the contrary development of the indicators for "higher education graduates" and "higher education expenditure per student". On the basis of the "Higher education graduates according to ISCED 5–8" Austria is clearly ahead of the Innovation Leaders. Contingent upon this, the higher education expenditure per student falls even further, which in turn also has negative effects on study quality. A declining development can also be seen for the more narrowly defined "Higher education graduates according to ISCED 6–8" indicator relative to the Innovation Leaders. This trend is also weakened by the integration of female graduates of third level vocational schools.

15 Hranyai, K. / Janger, J. (2015): Forschungsquotenziele 2020. Study commissioned by the Austrian Council. Vienna, WIFO, p. 41.

16 Hranyai, K. / Janger, J. (2015): Forschungsquotenziele 2020. Study commissioned by the Austrian Council. Vienna, WIFO, box 3: Methodological comments.
With report year 2012 a revised version of the ISCED classification (ISCED 2011) is used, which impacts the delimitation of the higher education sector from the secondary education sector.
The ISCED 1997 classification is used up to and including 2011, which as a result of the tertiary sector incorporates the ISCED levels 5A, 5B and 6 (universities, technical colleges, teacher training colleges, university courses, trades colleges, etc.). From 2012 the ISCED 2011 classification is applied, whereby the 4th and 5th years of the vocational higher schools are assigned under ISCED level 5 to the tertiary sector. Together with ISCED level 6–8 (bachelor, master and doctoral studies are classified here), this educational area consequently now forms the tertiary sector.
Between 2011 and 2012 there is consequently a series break, which actually hardly has any effect on the closely defined tertiary sector ISCED 6–8 (higher education institutions), but does cause a significant change with the overall tertiary sector (ISCED 5–8). Education expenditure in Austria in the tertiary sector in 2011 was therefore 1.48 percent (ISCED 1997: 5A, 5B & 6) of GDP; in 2012 it was 1.74 percent (ISCED 2011: 5–8). If, however, we only consider the higher education area (ISCED 2011: 6–8), the share is now only 1.47 percent. While the different approaches with the absolute education expenditure and the share of GDP produce different results, the difference is not so great when we consider the expenditure per student. While the higher education expenditure (at purchase power parity) measured on the number of students for the entire tertiary sector in 2012 is US$ 15,549 (at purchase power parity), for the higher education area (ISCED 6–8) it is US$ 15,641 (at purchase power parity) (OECD, 2015b). This is a result of the significantly higher number of students with inclusion of the ISCED 5 graduates (see overview 17). It is therefore quite clear that the reclassification has an influence on the data considered, and this must therefore be interpreted with caution.

Contrary to this, the conversion of the ISCED classification and consequently the integration of the BHS graduates has a statistically positive effect on the number of female STEM graduates. Austria is now clearly ahead of the Innovation Leaders with regard to this indicator. The measures of the RTI strategy for boosting human potential, in particular in the STEM subjects, the "teaching" quality package in the performance agreements and the EUR 40 million provided as part of the initiative funding for the higher education area appear to further support the positive development that has been seen for some time now.

The interest in STEM subjects is not, however, reflected entirely by the indicators observed for this. After a good starting figure in 2010, the number of "female STEM doctorate graduates" has diminished in recent years and has now fallen back. This trend is possibly attributable to an increased transfer in female STEM graduates to the labour market or even to the conversion of doctoral studies to new PhD studies. Generally speaking, however, the number of doctorate graduates has also dropped.

An essential step towards improving study conditions and the ability to plan the necessary resources would be the implementation of the planned capacity-oriented study place financing and university financing. The Higher Education Area Structure Funding Ordinance does actually include components of study place financing, the available university budget and the legal framework conditions for the implementation of a new financing system for student and capacity-oriented study place financing are, however, not given. In its recommendation on financing universities and public sector research and development[17] the Austrian Council points to the increase in basic financing of at least EUR 1.4 billion required for this for the per-

Table 1: Financing Path to Achieve Target (by ISCED Classification)

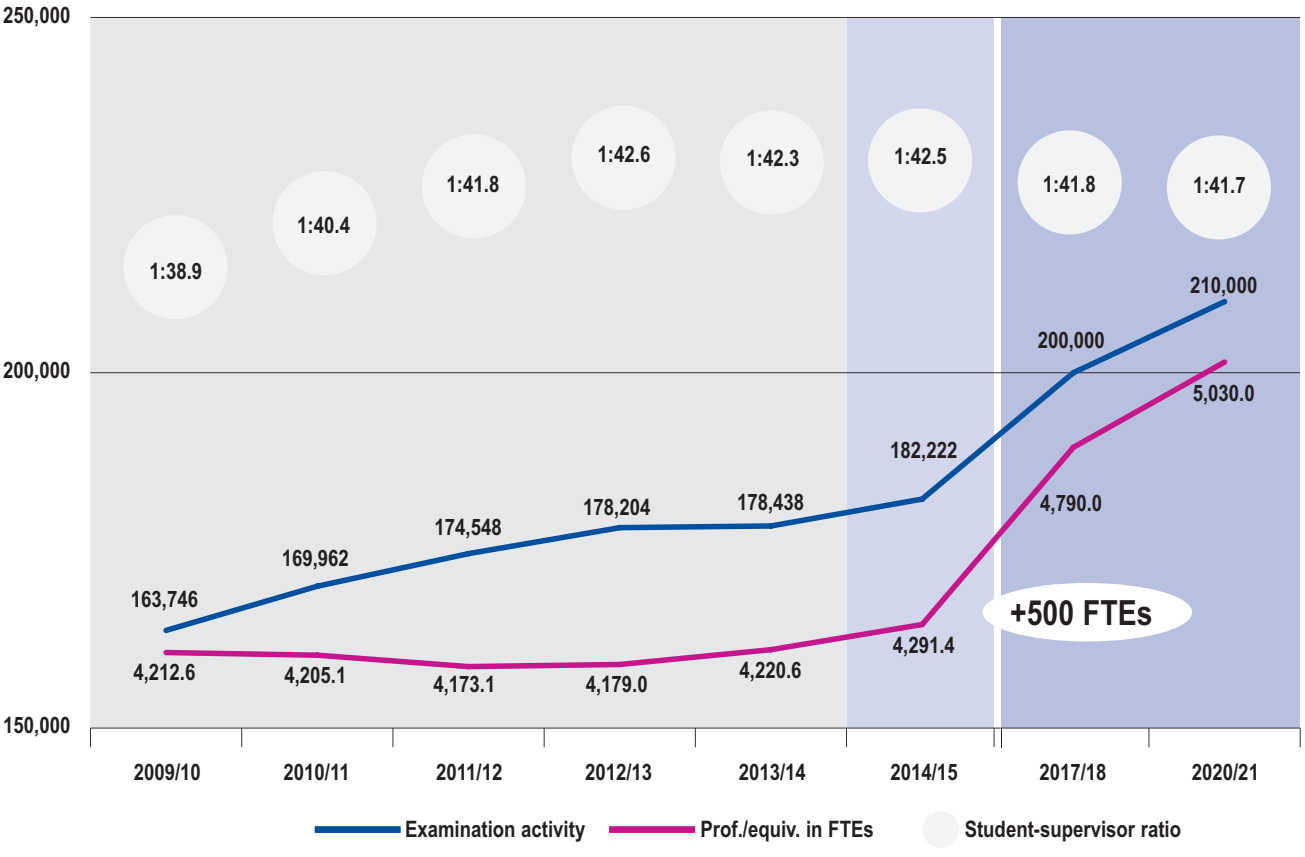
Year	Nominal GDP (in EUR m)	University rate (in %)		University expenditure (in EUR m)		University expenditure per student	
		ISCED 6–8	ISCED 5–8	ISCED 6–8	ISCED 5–8	ISCED 6–8	ISCED 5–8
2012	317,056	1.47	1.74	4,649	5,517	12,798	13,049
2013	322,878	1.47	1.75	4,759	5,646	12,873	13,262
2014	329,296	1.47	1.74	4,839	5,742	12,937	13,392
2015	338,187	1.55	1.78	5,232	6,033	13,802	13,973
2016	350,361	1.63	1.83	5,706	6,395	14,966	14,708
2017	362,274	1.71	1.87	6,211	6,765	16,237	15,451
2018	373,504	1.80	1.91	6,741	7,136	17,595	16,185
2019	385,456	1.90	1.95	7,323	7,535	19,100	16,970
2020	398,562	2.00	2.00	7,971	7,971	20,788	17,827
CAGR 2014–2020	3.2			8.7	5.6		

Sources: OECD, BMF, WIFO calculations.

17 Recommendation of the Austrian Council for financing universities and public sector research and development in Austria in the federal financing framework 2017 to 2020, Science and Research chapter, of 5 February 2016.

formance agreements 2019-2021. Parallel to this, the implementation of suitable measures in study access and study place management for the qualitative improvement of study conditions must be pursued.
A value that can be used for this is the "Universities supervisor-student ratio" indicator, which was not significantly improved in recent years despite the introduction of several initiatives. The indicator describes the ratio of student numbers to the number of scientific teaching staff, but does not specify whether or not a study is run actively, for example. To interpret the data it is therefore appropriate to analyse the supervision ratios on the basis of the number of examination-active students. The Austria-wide higher education development plan created in 2015 includes a calculation for this on the basis of the 2014 higher education forecasts. This indicates that the average supervision ratio is currently around approx. 1:42.

Figure 3: Examination-Active Studies and Professors/Equivalents, Time Series and Target Values



Sources: unidata – Datawarehouse of the BMWFW High Education area.[18]

18 Gesamtösterreichischer Universitätsentwicklungsplan (fig. 2), unidata – Datawarehouse higher education area of the BMWFW, special analysis of higher education forecasts 2014.

This is due to the fact that in the 2013/2014 study year only 65.3 per cent of students[19] were classified as examination-active[20]. In order to prevent a decline in the supervision ratios, in the coming two performance agreement periods approx. 500 full-time equivalents (FTEs) would have to be added to professors/equivalents, which, in view of the staffing development of recent years appears to be a very ambitious goal. The staff statistics data[21] show a detailed increase between 2011 and 2015 in the number of professor positions (FTEs) by approx. 5.8 per cent.

A sub-aspect of the internationalisation problematic is illustrated by the "Non-EU doctoral students" indicator. On the basis of various base values and calculation modi, the development of the indicator has actually turned around, unlike the disappointing position compared with the Innovation Leaders, which has not. A continuance of the measures and various programmes to increase the attractiveness of career positions and to raise mobility (examples here include Schrödinger scholarships, FWF doctorate colleges, CEEPUS, Fulbright, ERASMUS, etc.) is therefore without doubt an important parameter for Austria as a scientific location. The creation of an open labour market for researchers was also referred to in this respect in the action plan for a competitive research area.

Recommendations of the Austrian Council for Achieving the Goals of the RTI Strategy in the Tertiary Education System

The Austrian Council recommends implementation of the introduction of **study place financing**, coupled with a capacity-oriented study place management as quickly as possible with the use of sufficient budgetary funds. An adjustment of the autonomy of universities to the existing framework conditions with regard to a **capacity-oriented study access** and for improving study conditions should be anchored. The **basic financing** for universities to improve the teaching and research conditions must be **increased** for this by at least EUR 1.4 billion for the 2019–2021 performance agreement period.[22]

The Austrian Council recommends the **increase in professors** or appropriate positions presented in the all-Austria university development plan be actively pursued and that the budgetary funds required for this be provided.

19 Austria statistics: Higher education statistics: regular students WS 2013/2014.

20 Defined as examination-active studies in the definition of the knowledge balance indicator 2.A.6 are those bachelor, degree and masters studies in which at least 16 ECTS points or positively rated study performances must be produced in the study year over 8 semester hours.

21 unidata, as at WS 2015.

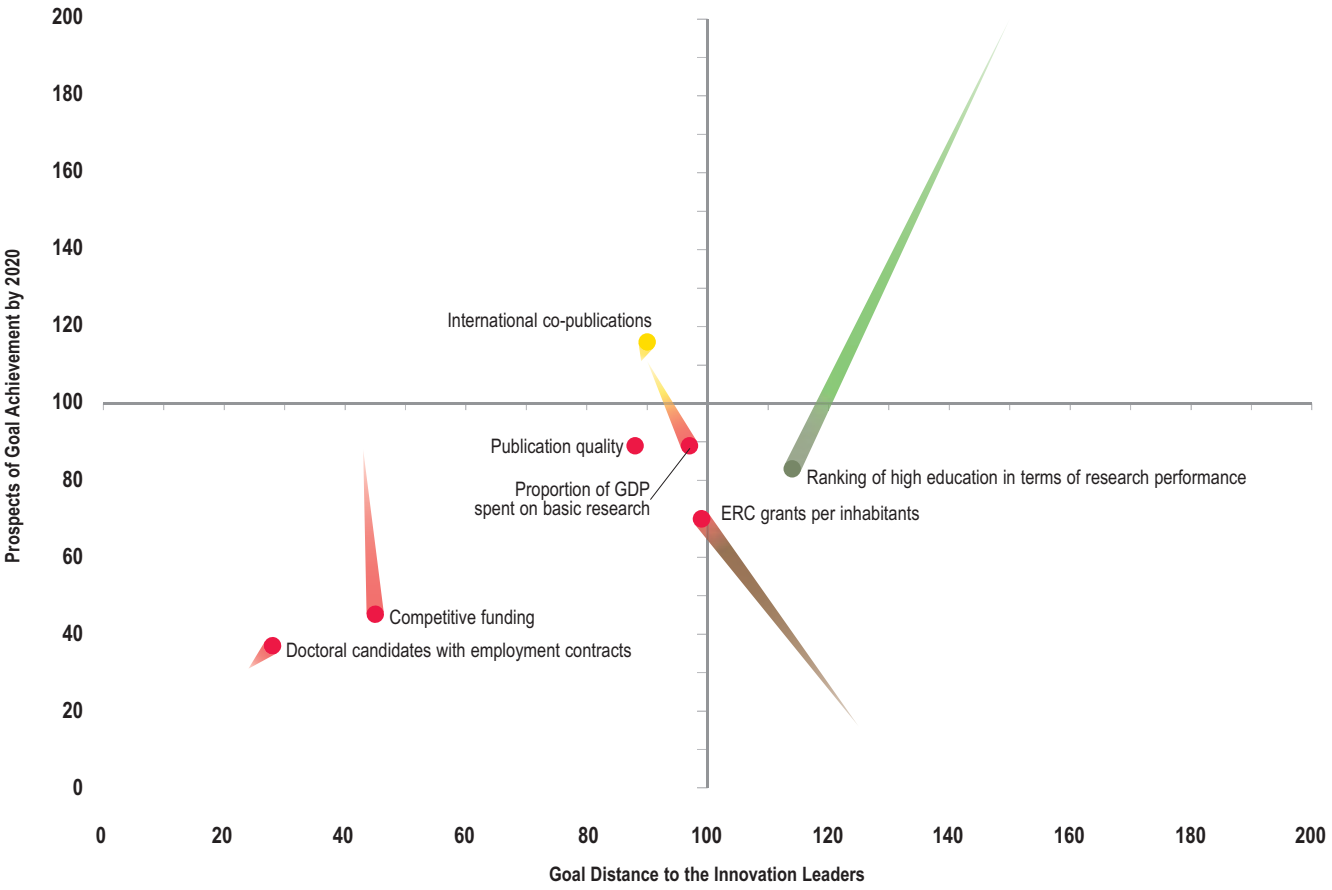
22 Recommendation of the Austrian Council for financing universities and public sector research and development in Austria in the federal financing framework 2017 to 2020, Science and Research chapter, of 5 February 2016.

Basic Research

basic research

The lion's share of basic research takes place at universities. Together with the non-university research organisations, they are the most important basic research contributors and therefore an essential factor for Austria as a scientific, research and economic location. The attractiveness for business start-ups and relocations, especially in the high-tech sector, is influenced in a positive way by an excellent science and research environment.[23] Basic research is therefore also promoted in research-intensive countries

Figure 4: Goal Distance and Prospect of Goal Achievement in the University Sector and in Basic Research (data reflect the last year for which they were available)



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 actual value of the innovation leaders (average value most recent available year DE, DK, FI, SE) or to the national target;

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

23 Keuschnigg, C., et al. (2014): Bildung, Innovation und Strukturwandel für eine Spitzenstellung Österreichs, IHS policy letter no. 9, August 2014.
Janger, J. (2015): Business Science Links For a New Growth Path. WWWforEurope Working Paper No. 107, August 2015.

basic research

RTI Strategy Objectives

- *We want to increase investments in basic research by 2020 to the level of leading research nations.*
- *We want to improve basic research by implementing further structural reforms in the university system.*
- *The university financing model should be reformed. Research financing should become more competitive and project-based.*
- *University research financing, in the form of third-party funding from the Austrian Science Fund (FWF) via competitive applications, must be strengthened and given appropriate financing.*
- *The establishment of individual profiles of universities should be supported by creating Clusters of Excellence.*
- *The orientation of teaching and research topics at universities, and the collaboration with non-university research institutes, should be better aligned with an overall strategy.*

such as Denmark, Sweden, Finland and Germany. Research at international top level affords innovation systems (national) special resilience and also contributes to innovations in economy and society.

Universities and Basic Research

The selected indicators for monitoring the objectives formulated in the RTI strategy for basic research map input and output factors, which illustrate the quantity and quality in higher education research, as well as the career structures at universities.

Figure 4 shows the development of the corresponding indicators with regard to financing and quality, as well as international networking of research, especially basic research, for the 2010-2016 observation period. The comparison of the ERC grants acquired per inhabitant is an indicator that very clearly describes the scientific excellence in basic research and allows an objective estimation of performance over a longer observation period. With a figure of currently 2.46 grants per million inhabitants, Austria is actually solidly in the good European mid-field. However, the researchers of the Innovation Leaders (especially Denmark's) were even better on average in the comparison period than Austria's, whereby the goal distance compared with 2010 had increased.

With the goal of funding basic research as the nucleus for value creation in a high-tech country and consequently preventing economic stagnation, it is necessary to focus on sustainably secured basic research financing. A countries sample[24] that differs from the Innovation Leaders is used here for the comparison, as not all countries pursue a division into basic and applied research and experimental development according to the same criteria. It must also be noted here that the division of research types is partially based on subjective estimates by the respondents of an R&D survey, which is why the values can only be considered to be approximate. With a basic research quota of 0.56 per cent of GDP (in 2010 this figure was 0.49 per cent) Austria is in the top mid-field of a research-intensive group of countries (see fig. 5). Fig. 5 illustrates the development of the annual calculations for the basic research quota between 2002 and 2013.[25] Only Switzerland with 0.9 per cent of GDP and South Korea with 0.75 per cent of GDP are clearly ahead of Austria. The basic research expenditure in Austria also grew relatively well each year during the crisis with over 7 per cent and increased slightly in significance with a rise from 17 to 19 per cent of overall R&D expenditure. The target quota of 0.94 per cent of GDP by 2020 would, however, only be achieved with almost a doubling of basic research funding from 1.9 billion to 3.7 billion. The funds provided for in the currently applicable federal financing framework (BFR) nevertheless rule this out.[26]

The "Competitive financing" indicator is used as a second important input factor for controlling basic research. The position of this indicator compared with the comparison countries in the report period is constantly behind the Innovation Leaders, which impairs the prospect of goal achievement by 2020 is (see fig. 4). The performance provided by Switzerland, which started an initiative for basic research beginning at a

24 Switzerland, South Korea, Denmark, France, USA.

25 Hranyai, K. / Janger, J. (2015): Forschungsquotenziele 2020. Study commissioned by the Austrian Council. Vienna, WIFO, fig. 19: Basic research rates (in percentage of GDP) in international comparison, 2002–2013. WIFO, December 2015.

26 Hranyai, K. / Janger, J. (2015): Forschungsquotenziele 2020. Study commissioned by the Austrian Council. Vienna, WIFO, chapter 5, basic research rate target.

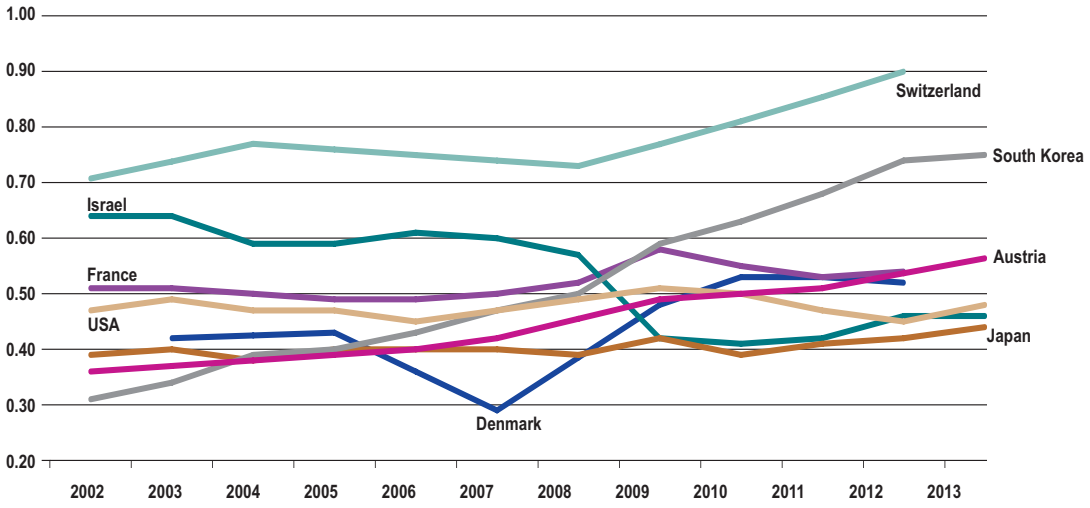
high level and ensures a top position, in particular stands out here. The political will to position Switzerland among the leading scientific and research nations while focusing on advanced technologies is clearly visible here.

Figure 6 shows a comparison of the competitive research funding per inhabitant in Switzerland, Finland, Germany and Austria. The Swiss National Fund is remunerated with CHF 849 million (2014). Basic research in Switzerland is therefore funded with more than EUR 85 per inhabitant. In Finland, the figure is approx. EUR 58, while in Germany it is approx. EUR 34. At approx. EUR 25 per inhabitant, Austria is clearly far behind. The possibility of acquiring research funding at national level is therefore restricted accordingly in Austria. This has a negative effect, among other things, on the average approval rate, which is identified by the FWF for 2014 with 20.9 per cent.[27] The Swiss National Fund had a success rate of 52 per cent for project funding in 2014[28], a massive benefit vis-à-vis efficiency, both in project application and in project appraisal.

Sufficient financing for competitive funding of basic research is therefore urgently required. In addition to a general increase in the approval rate with the FWF, adequate remuneration of the key point programmes of the FWF appears to be especially important here; the special research areas (SFB) and doctoral programmes (DKs), for example, as well as highly competitive people-related funding, such as START and Wittgenstein Awards, to further improve the international visibility and attractiveness of the Austrian research area.

The expansion of third party funding via FWF projects evaluated in competition with lump

Figure 5: Percentage of GDP Awarded to Basic Research on a Competitive Basis Relative to Number of Inhabitants, 2002-2013



Sources: OECD MSTI, Statistik Austria, WIFO calculations.

27 Approvals according to amount, without key point programmes (SFB, NFN, DK).

28 SNF: Statistiken im Überblick 2014 – Forschungsförderung in Zahlen.

sum coverage of overheads to the amount of 20 per cent is an RTI strategy measure that could not yet be implemented to the required degree[29].

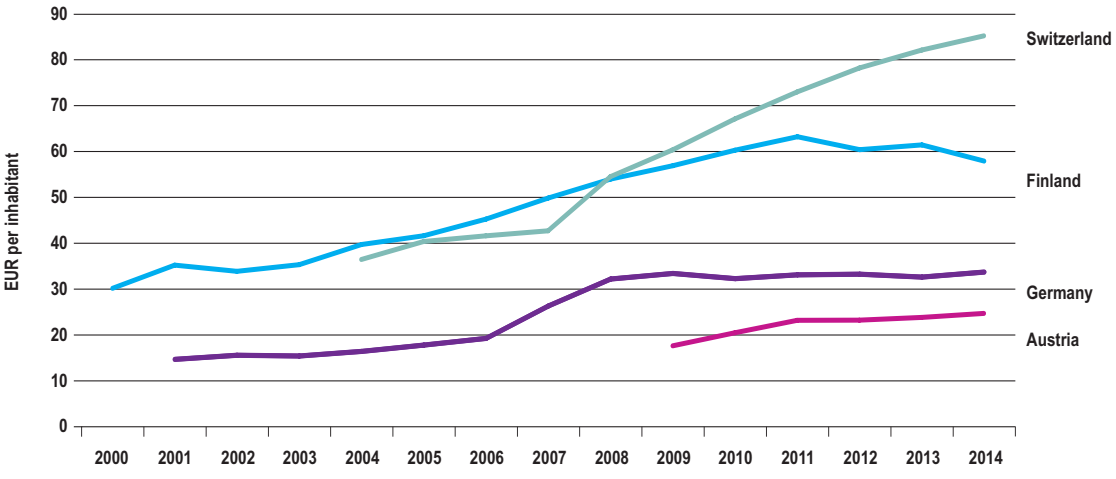
In February 2016 the Austrian Council once again indicated in its recommendation on financing universities and public sector research and development in Austria that an increase in funding in BFRG 2017 by 2020 to increase competitive funding within the framework of funding by the FWF by a total of EUR 400 million as the floor for financing basic research must be considered; without it, a structural improvement in research financing does not appear achievable.

The "publication quality" and "international co-publications" output factors are extremely good references for research in Austria. The "publication quality" indicator measures the number of publications among the 10 per cent most cited nations in the world. The last available value for Austria is in a very high performance segment.

The "international co-publications" indicator in particular illustrates the networking of the scientific community in Austria. The data point mapped in figure 4 is an excellent value in relation to the Innovation Leaders. Austria is more or less equal here with Finland and Sweden, behind Denmark, but still ahead of Germany, whereby smaller countries generally exhibit a higher international interconnection than bigger ones do.

The "higher education ranking/research performance" indicator is based on the evaluation criteria of the Leiden ranking. On the basis of an adjusted methodology a comparability with earlier years with regard to position and development of the indicator is not expedient. Although the current position of the indicator

Figure 6: Competitively Allocated Financing of Basic Research By Number of Inhabitants, 2000-2014



Sources: FWF, WIFO calculations.

29 From 2016, overhead costs for the projects funded via the FWF as part of higher education area structural resources ("knowledge transfer" indicator) will be compensated to the amount of approx. 20 percent.

for Austrian universities is thoroughly satisfying, there is the danger of falling behind the Innovation Leaders if the trend remains as it is. The negative trend is reflected by the deficits in competitive financing and the continued underfinancing of universities.
The "Doctoral staff" indicator shows only insufficient improvements and therefore enduring shortcomings with regard to the conversion of traditional doctoral studies to modern, structured PhD study courses. The initiatives started for this within the scope of the performance agreements with the universities, e.g. increased implementation of structured programme offers, should therefore be supported even more intensively.

Recommendations of the Austrian Council for Achieving the Goals of the RTI Strategy for Universities and Basic Research

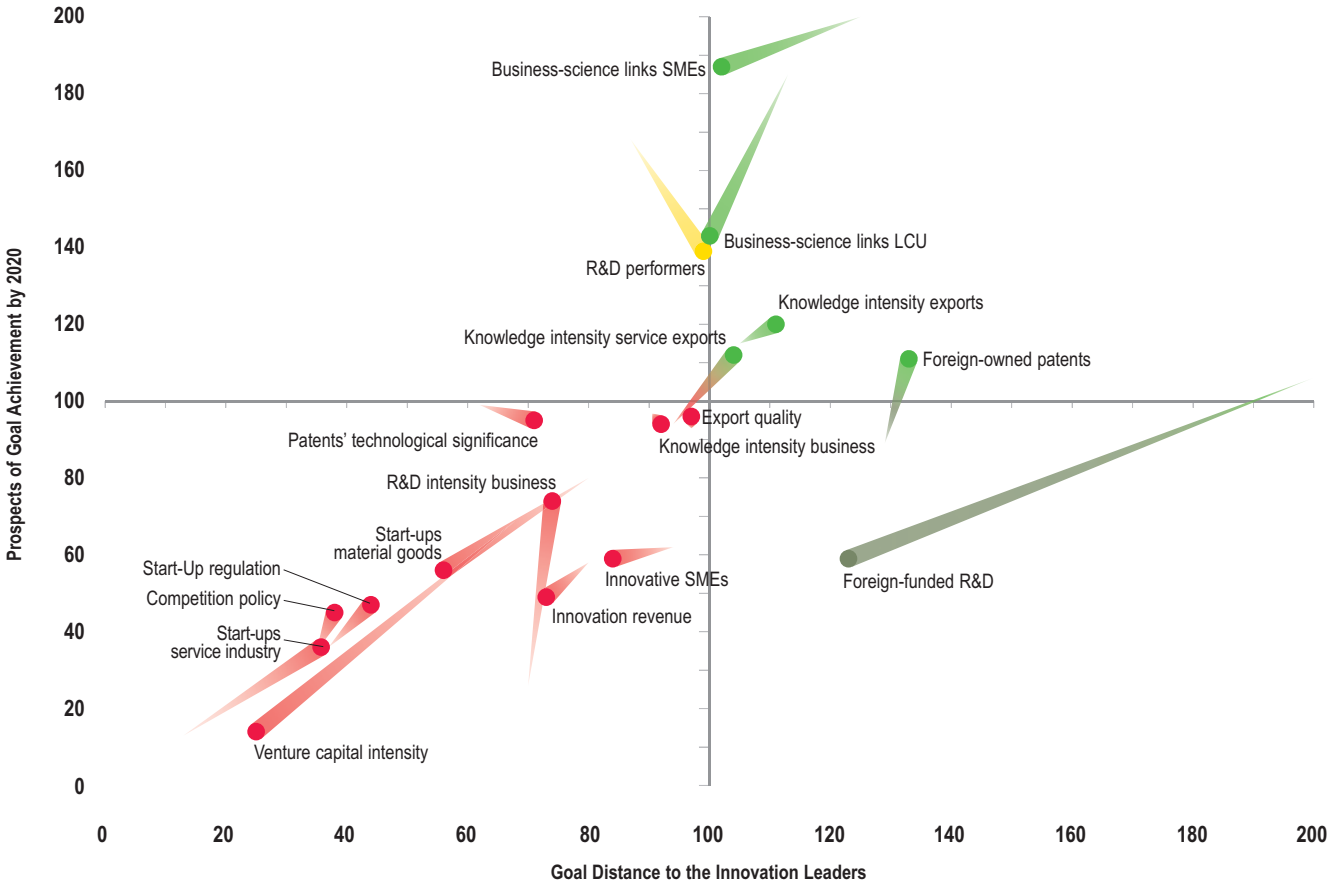
The Austrian Council confirms its recommendation to raise the funds for competitive financing of basic research within the scope of FWF funding to the volume of funds provided for this by the Innovation Leaders. An increase in funding by EUR 400 million for the years 2017 to 2020 represents a minimum value for this.
The Austrian Council recommends increasing the funds for membership in international programmes and participations in European research infrastructures by EUR 100 million and consequently strengthening Austria as a research location.
The Austria Council recommends guaranteeing the provision of finances to extend career positions and structured doctoral programmes in order to enable attractive conditions for international candidates.
The Austrian Council recommends the continuance of excellence initiatives in basic research and applied research (SFB, COMET) with the provision of sufficient budgetary funds.

Innovative Start-ups and Growth of Innovative Early-Stage Companies

innovative start-ups

Early-stage companies with innovative products or services are a particularly clear indication that the findings of (basic) research have found their way via specific application cases on to the market and therefore into society. They not only enable a specific application-related added value of the research results, but rather also have a dynamic effect in multiple ways on economy and society with their impacts on employment and growth. The development of innovative start-ups on the whole (including spin-offs from university and non-university basic research) in Austria is not a key point without good reason

Figure 7: Goal Distance and Prospect of Goal Achievement in the Area of Corporate Research



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

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– a point that the Council has made in its report on scientific and technological performance. This is also reflected in the importance that these topics take on in the Federal Government's RTI strategy. (See objectives on the right of this page.)

innovative start-ups

Start-ups

In recent years, the importance of Austrian start-ups and the requirement to act in a supporting role in this area have increasingly moved into the foreground of the political agenda. The last more significant expression of this trend is the "founding country strategy"[30] of the BMWFW.

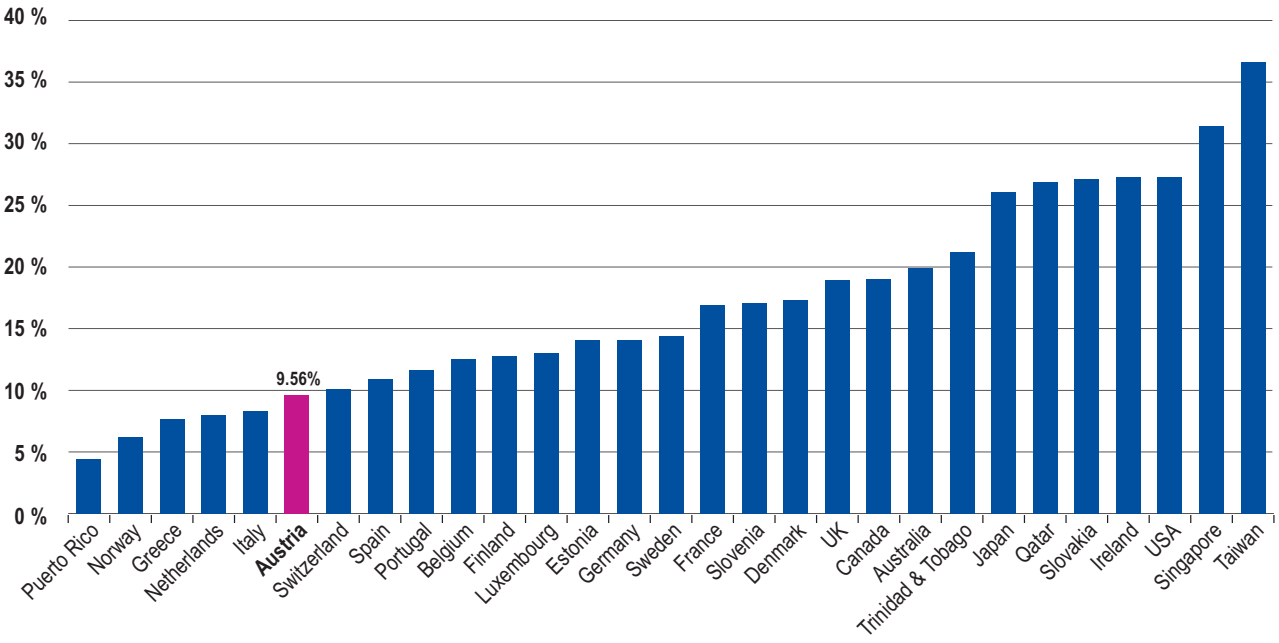
Despite this increased importance of the start-up area, the objective of the RTI strategy here, i.e. an increase in knowledge and research-intensive new start-ups, could not be achieved. Both indicators on Austrian start-ups, the company start-ups in the material goods area and in the services area, consequently continue to be significantly behind the national goal and, given the current development trend, will not achieve this by 2020 (see fig. 7). Need for action is therefore advisable here.

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

RTI Strategy Objectives

- *We want to substantially increase the intensity of private equity and venture capital in the formation of technology-based, innovative firms.*
- *The number of knowledge- and research-intensive new start-ups should climb annually by an average of 3 percent until 2020.*
- *Starting a business should be made much easier and relieved of cost burdens.*
- *The growth of innovative firms should be accelerated.*

Figure 8: Growth Expectations[31] of Young Entrepreneurs Compared to Innovation-Based Countries (in % of young entrepreneurs)



Source: GEM Austria Report 2014.

30 http://www.ots.at/presseaussendung/OTS_20150416_OTS0156/mahrer-oesterreich-soll-gruenderland-nr-1-in-europa-werden-bild

31 10 or more employees with a parallel increase in staff positions of 50 percent or more.

effects associated with them (employment, economic dynamic, competitive head start). The initial years after the start-up in particular are characterised by an especially high risk and a high number of company closures. According to the Austrian credit protection association (KSV), founded in 1870, more than one third of new start-ups do not survive the first three years. It also says the reasons for failure are mostly the absence of business expertise and insufficient planning.[32]

Funding System

The Austrian Council therefore recommends a compact, well-harmonised set of measures for the start-up area, which provides support, and consultancy services in particular, across and beyond the entire start-up period. It is important here not to burden the target group with the variety and lack of clarity of the offered measures, but rather that a select few key financial funding programmes be offered. Some 65 per cent of entrepreneurs currently feel the funding landscape is confusing.[33] The Austrian funding system basically scores quite well in international terms (see fig. 9).

New programmes, as welcome as the intention behind them might be, must be examined precisely for the presence of similarly existing initiatives and possibly rather adjusted as further programme lines of existing initiatives than considered as own measures. This would not only make target group addressing and application for the measures easier, but rather it would also keep administrative costs low and reduce the expense of the application. In 2015 in particular we saw the initiation of a series of new programmes in the start-up area, which only differed partially and marginally from already existing initiatives, and were in part an overlapping with other measures, if not even a doubling of such. The different programme ownerships often appear to make a logical merging of the measures more difficult.

A further problem with start-ups here is the fact that the remunerations for funding programmes often differ immensely both in amount and in temporal availability (see, for example, evaluation of the JITU programme[34]). This impairs the ability to plan start-up projects and therefore also their start-up prospects. One possibility to improve long-term financial planning security would be to cover start-up relevant funding mechanisms in the form of a fixed percentage from the respective ministry budget, similar to the allocations of the Small Business Innovation Research (SBIR) programme[35] in the USA. This is coupled with a fixed percentage with the budgets of the respective ministries.

Increasing the number of start-ups would therefore be of no benefit as long as they do have no access to upscaling (demonstrator development, prototypes, etc.) and to markets. Networking small companies with big corporations is also very effective in most cases.

But NB: It is also in the nature of start-ups that many will also "fail". The primary message should therefore not be to reduce the instance of failure, but rather to promote the growth of promising businesses.

32 DiePresse.com of 12 8. 2010: Jungunternehmer: Ein Drittel scheitert in ersten 3 Jahren.

33 Austrian Startup Report, SpeedInvest 2013.

34 Gassler, H. / Sellner, R. (2014): Programmevaluierung JITU: Junge, innovative technologieorientierte Unternehmen und i2 – Business Angels. IHS, Vienna.

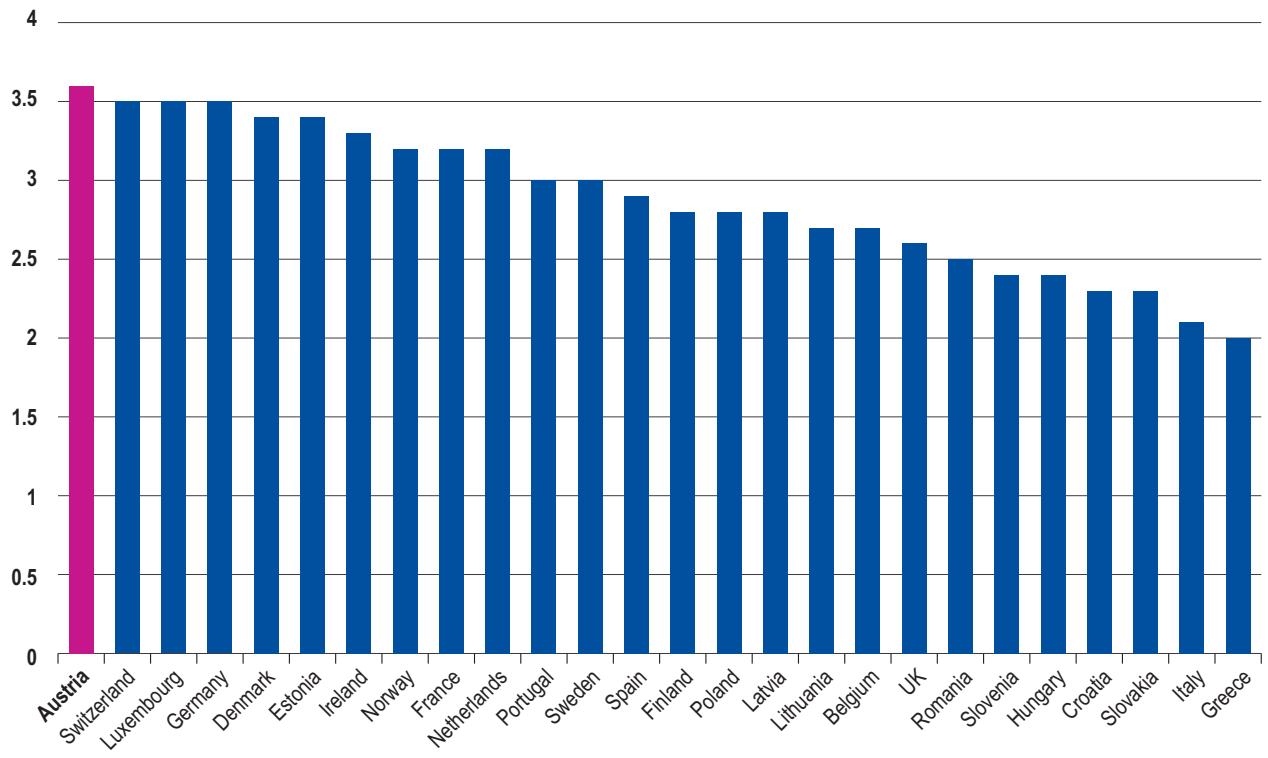
35 "Each year, federal agencies with extramural research and development (R&D) budgets that exceed $100 million are required to allocate 2.8 percent of their R&D budget to these programs." https://www.sbir.gov/about/about-sbir#sbir-program

With regard to consulting services, the Austrian Federal Economic Chamber already offers a series of services[36], the feedback of the target group is, however, divided. An independent evaluation to assess the quality of the offered services would be advisable here. Evidently, this would require more detailed measures and training offers in particular. Even if these are available, they are not always well received by the target group. In this case, more precise communication and public relations work is required. Increased harmonisation of the funding and consultancy offering in particular appears beneficial, optimally in the form of joint appearance.

The presence of a central and in particular highly visible contact point for innovative start-up entrepreneurs per region is still an important requirement for an easy to access advisory service. Unfortunately, it is still not possible to meet this requirement in this form. The expansion of the One-Stop-Agency in the 90 start-up service centres of the Austrian Federal Economic Chamber is actually welcome, but does not really meet the requirement.

innovative start-ups

Figure 9: Expert Opinion On Specific Funding Programmes (EU Comparison)



Source: GEM Austria Report 2014.

36 https://www.gruenderservice.at/

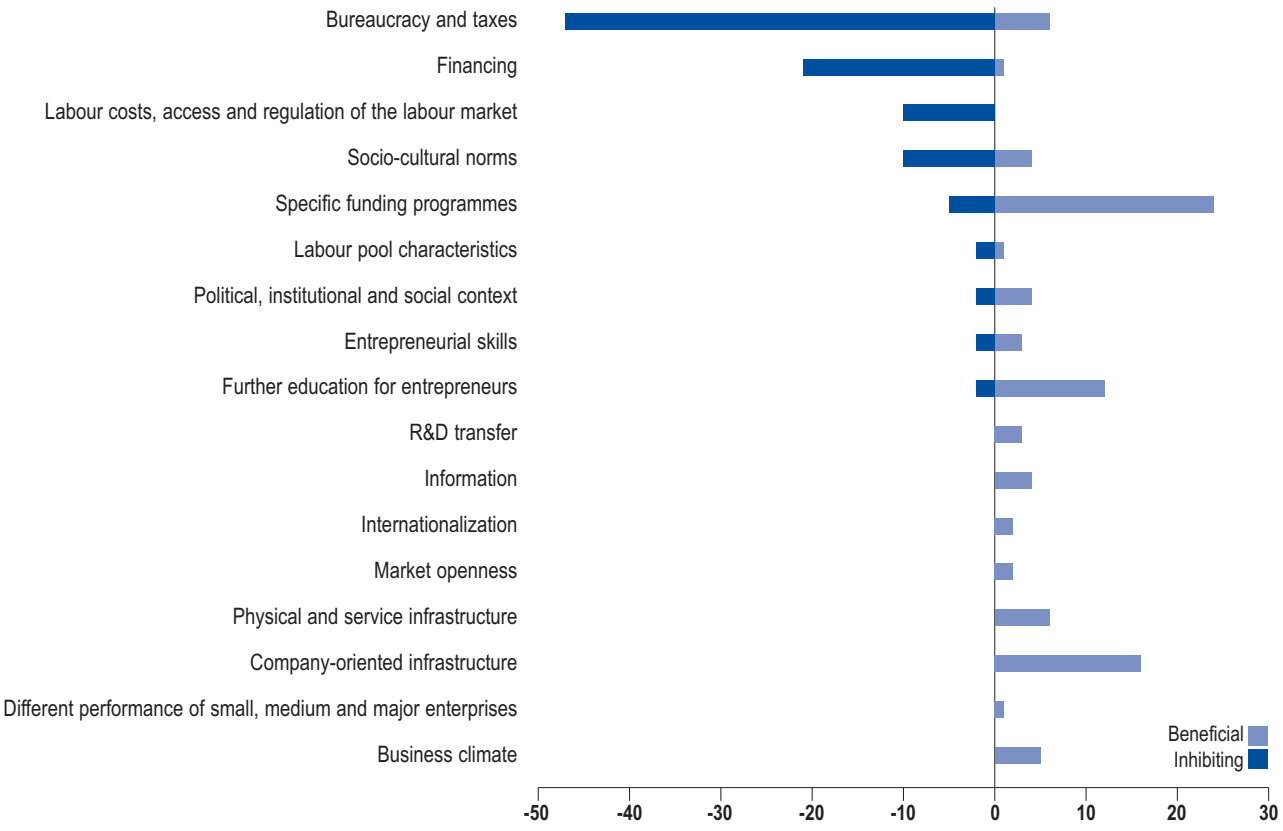
innovative start-ups

Bureaucratic and Regulatory Expense

A look at the current National Expert Study of the GEM 2014 shows that, in addition to financing, bureaucracy and regulatory provisions in particular make start-ups and the initial start-up years more difficult (see fig. 10). As part of the National Expert Study, 39 experts were surveyed, among other things, on the supporting factors and obstacles for corporate activity in Austria.

The high taxation burden and considerable administrative expense in the start-up process and thereafter were also a topic in the interviews with start-up companies in the high-technologies area in the scope of the JITU evaluation[37]. The Austrian Federal Economic Chamber has also specified that important areas of activity must be identified in the areas of legislation and regulation, public sector administration, and in the area of production and labour costs

Figure 10: Inhibiting and Beneficial Factors for Start-Ups in Austria



Source: National Expert Survey of the GEM 2014. 1 = do not agree at all; 5 = agree totally.

37 Gassler, H. / Sellner, R. (2014): Programmevaluierung JITU: Junge, innovative technologieorientierte Unternehmen und i2 – Business Angels. Vienna, IHS.

in particular. Austria has reached a degree of regulation in the start-up area that is detrimental to dynamic economic development. Costs and the time taken to set up a limited liability company (GmbH) must in particular be emphasized. A first step towards cost reduction would certainly be the discussed omission of the notary's office obligation for start-ups.

A look at figure 7 shows that the removal of administrative and regulatory hurdles has not resulted in any significant successes. The "Start-up regulation" indicator in recent years was far behind the average value of the Innovation Leaders and only marginally reduced the distance. At the same time, the prospect of goal achievement also declined slightly. The time taken to grant approvals and licenses is a particular weak point here. On an international level, the Austrian start-up landscape is characterised by heavy regulation and bureaucratisation. An adjustment of the Commercial Code to the adjusted social framework conditions and the introduction of on-line business registration must be highlighted here as initial steps.[38]

As we know, the fear of failure is one of the most important start-up impediments. The ability to overcome corporate crises by insolvency law is currently not optimally regulated. Failure must be allowed and should not be subject to civil liability. Failed entrepreneurs, who have braved the risks of self-employment, must therefore receive a second chance quicker than before. Acceptance of the new insolvency law, with which the recommendations of the SBA action plan will be implemented to further reduce debt relief after the insolvency and the liquidation times for honest entrepreneurs, has, however, been outstanding since 2012.[39]

A change in the law to "GmbH light" was enforced on 1 July 2013. This in particular affects a reduction in the minimum capital for new start-up founders. Initial indications point to a positive development. The Austrian Council does, however, recommend monitoring the development of "GmbH light", as well as examining other legal forms in more detail over time. The constant adaptations of "GmbH light" have unsettled the affected entrepreneurs, and consequently have not contributed to an optimum implementation of the concept. A stable legal framework and the legal certainty connected with it must always be ensured in the sensitive area of start-up regulation.

As the overview of inhibiting and motivating start-up factors of GEM 2014 shows (see fig. 10), in addition to bureaucracy and regulation and the insufficient financing options, labour costs and access to the labour market in particular have a negative effect on company start-ups in Austria. In addition to the pressure to quickly make the business idea ready for the market and generate turnover, there is also the key challenge of paying and managing additional personnel. The Austrian start-up association "Junge Wirtschaft" therefore advocates significant tax relief and support with social security funds. Incidental wage costs for a start-up entrepreneur's first employee would consequently be eliminated in the first year. For the second employee only half the incidental wage costs would be due in the first year. The Austrian Council supports these requirements of "Junge Wirtschaft" as effective and economical measures. On the basis of the high employment effect of company start-ups, the money used for tax savings could be compensated by the creation of new jobs.

Start-up companies, that cannot financially afford the necessary key employees, often try to motivate these with stock options. A further simplification would therefore be provided by easy-to-administer and legally watertight employee participation models.

38 Work programme of the Austrian Federal Government 2013–2018 (2014).

39 European Commission (2014): Enterprise and Industry, SBA Fact Sheet 2014, Austria (http://ec.europa.eu/growth/smes/business-friendly-environment/performance-review/index_en.htm#sba-fact-sheets).

Team responsibilities are also an important success factor of innovative company start-ups. On one hand, talent would have to be educated for this, but on the other hand, suitable personnel would have to be brought to Austria and to the start-ups, and kept in the respective start-up companies. The regulations for work and residency permits for start-up employees must be organised so that start-up interested people can come to Austria without major expense. One possibility, for example, would be a start-up visa similar to the arrangement in the USA[40].
The working time requirements in a start-up company fluctuate intensively. This applies to both the start-up team and the first employees. At the same time, employees must comply with the applicable Working Hours Act, for which the management bears liability. This often also entails difficult to overcome tensions between the requirements of reality and statutory specifications. A more flexible Working Hours Act for start-up companies could defuse these tensions and free up unused potential.
Within the scope of the GEM 2014 National Expert Study, demand-driven measures were also considered effective tools for start-up support. A specific procurement policy of the public sector, which in particular supports young and innovative companies, could spark additional impulses here.[41]

Financing Innovative Start-Ups
As already stated in the report for 2015 and simultaneously mid-term review of the implementation of the RTI strategy, the indicators for company start-ups and risk capital in Austria are far behind the figures of the Innovation Leaders and the nationally set goals. This in particular applies for risk capital intensity. There are scarcely any prospects to catch up with the Innovation Leaders by 2020 with the current development dynamic. Both the probability of goal achievement and the distance from the set goals have deteriorated further (see "Risk capital intensity" indicator, fig. 7).
Despite the specific measures of the public sector (e.g. the *Start-up Fund, the Business Angel Fund* and the *Venture Capital Initiative* managed by AWS) to counteract the supply problem, Austria's position in international terms could not be improved, and it has in fact even deteriorated. As already mentioned several times, there is a particular lack of internationally competitive framework conditions, which would be a requirement for winning over institutional investors for "location" Austria.[42] Scarcely any progress over the previous year has been seen here. An own private equity legal framework is still not planned.
During the course of dealing with the crisis of the past five years, numerous new regulations, such as higher own equity capital resources and stricter testing criteria, were introduced with a focus on additional stabilisation of the financial sector at European level. A granting of credit fails against this background due to the lack of reliable forecasts and on the basis of the required securities, often right in the early phase of the company financing. In this phase in particular, many young and small companies, however, require swift and uncomplicated financing (project). This requires the availability of a diversified range of equity capital financing mechanisms, which is under-developed in both Aus-

40 https://en.wikipedia.org/wiki/Startup_Visa

41 FH JOANNEUM Gesellschaft mbH (2015): GLOBAL ENTREPRENEURSHIP MONITOR: Bericht zur Lage des Unternehmertums in Österreich 2014. Graz.

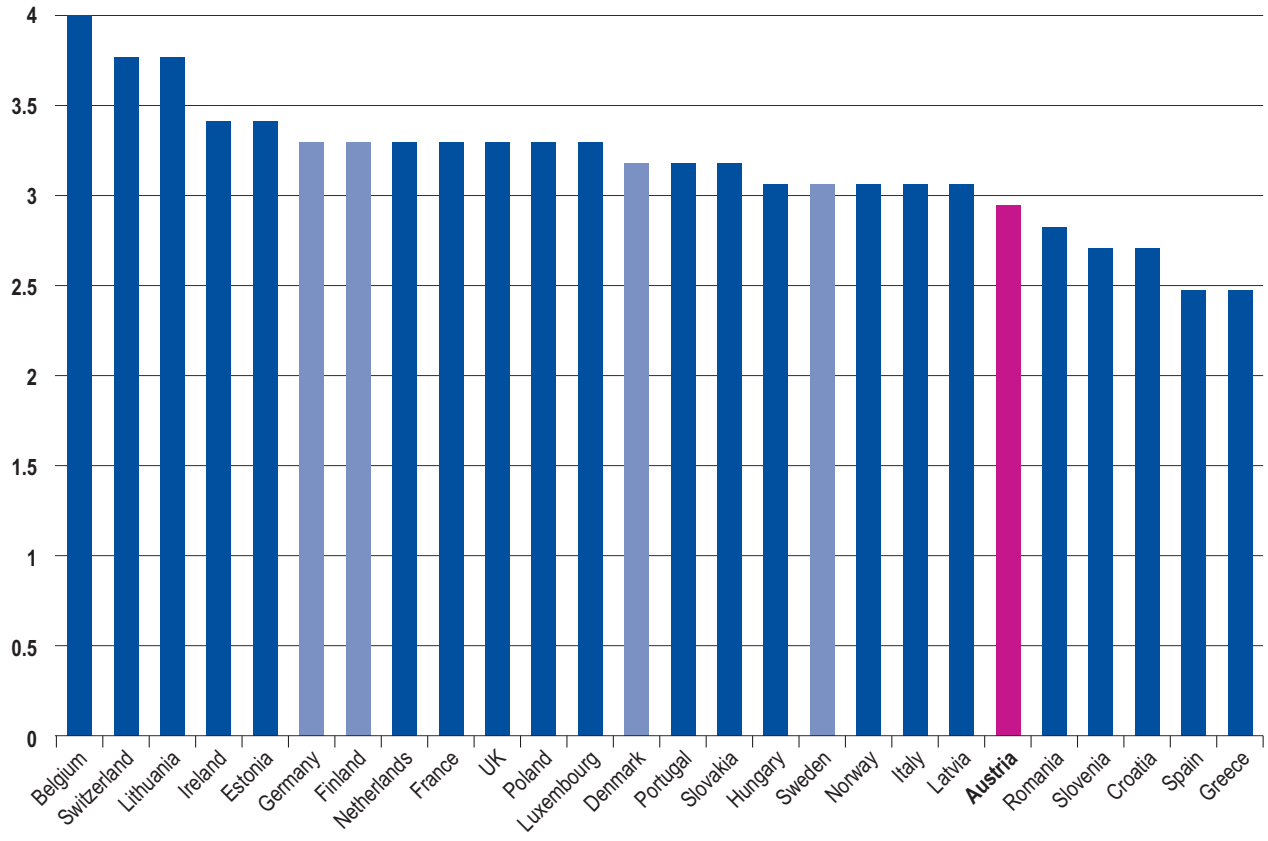
42 Jud, T. (2013): Funktionsmodell und Rahmenbedingung der Risikokapitalfinanzierung. In: WIFO-Monatsberichte, 2013, 86(8), p. 663–672.

tria and Europe. The Alternative Financing Act (AltFG) has succeeded in making some changes here in recent years – current figures from the Austrian Federal Economic Chamber consequently illustrate how from 2014 to 2015 the AltFG managed to increase the financing volume of crowdfunding projects by 335 per cent. The fact that the overall volume can be increased further is, however, not in dispute. The AltFG does indeed represent the starting signal for even higher dynamic in this area.

This is also confirmed by the results of the GEM's Austria Report of 2014. The surveyed experts believe Austria is in the lower ranking of comparable European countries with regard to the financial environment for company start-ups. Only Romania, Slovenia, Croatia, Spain and Greece exhibit worse conditions (see fig. 11).

The Austrian Federal Government has promised to kick start a new wave of start-ups with several initiatives in its current work programme: More risk capital is to be made available by expanding the measures of the AWS and with sufficient financing of the start-up fund. The Austrian Council welcomes these initiatives, even if specific support programmes cannot fully counteract market failure

Figure 11: Expert Opinion on Financial Environment of Start-Ups in Austria



Source: GEM National Expert Survey 2014.

in the private investments and initiatives area. The system must be developed further in the future, especially with additions and expansions in the activation and creation of incentives for private investments.

In addition to bank financing, which has reached its limits, further options for start-ups must therefore also be created in the financing area. In the area of financing innovative young entrepreneurs and SMEs, the wide range of crowdfunding, including peer-to-peer lending and crowdinvesting, should also be supported as a supplementary financing element with an effective and efficient legal framework, and integrated into a competitive overall strategy for corporate growth.[43] In addition to the alternative financing mechanisms of the AltFG,[44] the creation of a business-angel allowance should also be planned for equity capital reinforcement. Innovative funding models, which support acceptance of guarantees with conventional early phase programmes, are also welcome.[45]

Tax breaks for investments in young companies could also be provided to further increase the equity capital intensity on the private side, and to compensate for the weak risk capital market. This also applies to the improvement of legal framework conditions in these areas.

It should be pointed out here that within the scope of Horizon-2020 tenders from 2015/2016, support will be increased even further for measures to expand risk financing and to support innovative SMEs. The Austrian Council recommends the responsible agencies and authorities increase their promotion of these tenders, in order to increase Austrian participation in these kinds of European programmes.

EXCURSUS: Social Business

The current social challenges, which will certainly occupy us even more in the future, necessitate a rethinking of both political prioritisation and economic activity parameters. Innovation and progress will no longer be measured on their immediate, mostly economic outputs alone, but rather increasingly also on their indirect social effects, which can also have a bearing on the actual production process itself. We are talking here about so-called social innovations, of which the general public is increasingly aware in Europe in particular. As part of the Europa-2020 strategy, the European Commission explicitly set itself the goal of boosting "Social Business" and the "Social Economy", and promoting the creation of social innovations. With the foundation of the European Commission's Social Business Initiative in 2011,[46] an important first step was taken towards discussing appropriate key measures to achieve these targets.

One of the signals of the growing importance of this area is the increased presence of socially aligned enterprises, or aptly name "Social Businesses". Due to their very specific and even heterogeneous characteristics, these require sup-

43 Willfort, R. / Mayr, P. / Weber, C. (2015): Crowdfunding und Crowdsourcing: Potenzial für den österreichischen Innovationsstandort. Study commissioned by the Austrian Council.

44 http://www.bmwfw.gv.at/Presse/AktuellePresseMeldungen/Documents/Crowdfunding_Potenzial-1.pdf
http://www.bmwfw.gv.at/Presse/AktuellePresseMeldungen/Documents/Crowdfunding_Vergleich_AT_DE-1.pdf

45 AWS Double Equity Funds – Guarantee acceptance of up to 80 percent for a credit of up to EUR 2,500,000.

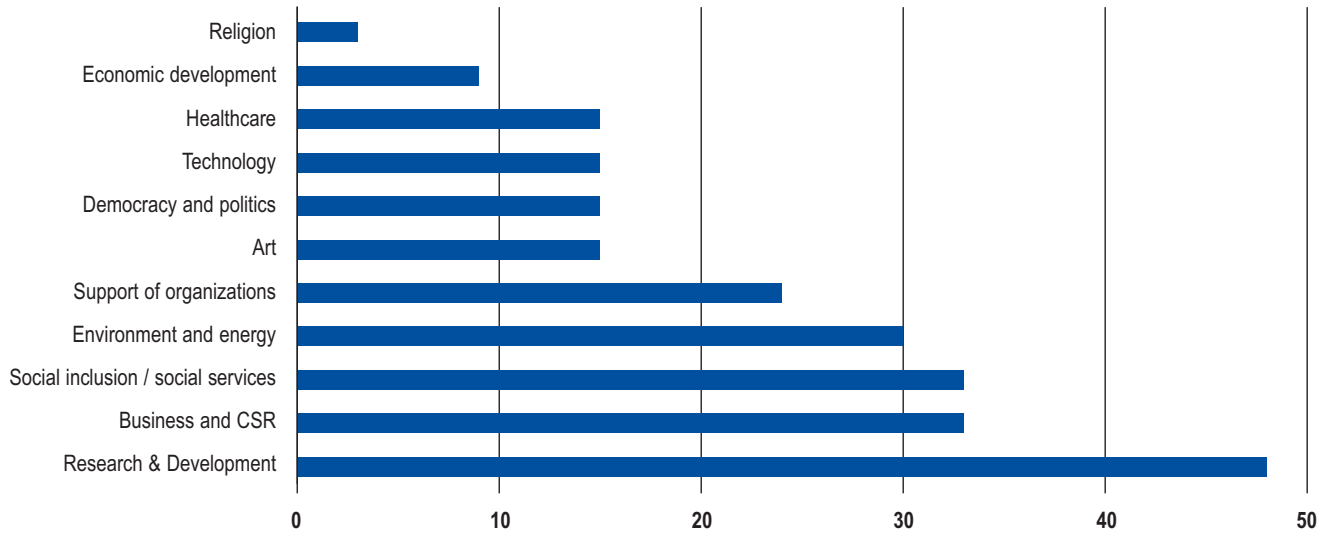
46 http://ec.europa.eu/internal_market/publications/docs/sbi-brochure/sbi-brochure-web_en.pdf

port services tailored to their needs, and in their early days in particular. In addition to financing services for social businesses focusing on incubation and financing of social start-ups, this is also about education and further training services in the start-up and innovation-relevant topic areas, such as marketing, financing, communication, networking or business modelling, as well as setting up suitable legal framework conditions, such as adjustment of the public benefit and foundation law and the establishment of an own legal form for this area. The Austrian Council refers in this context to its recommendation on social business in Austria of 30 July 2015.[47]

As fig. 12 shows, research and education in particular grow in importance within the sphere of social business. Innovative solutions are generally suitable for achieving higher social effects. For interventions that target social business support, it therefore appears promising to consider innovation as a criterion. Social businesses can then also make a contribution to the "Innovation Lead" targeted by Austria by 2020.[48]

innovative start-ups

Figure 12: Activities of Social Businesses in Austria With a Focus on Start-Ups and Early-Stage Companies



Source: Vandoor, Social Business Study, 2014.[49]

47 Recommendation of the Austrian Council on Social Business in Austria of 30 July 2015.

48 Vandor, P. et al. (2014): Das Potential von Social Business in Österreich, Wirtschaftsuniversität Wien, NPO & SE Kompetenzzentrum, Vienna, July 2015.

49 Vandor, P. et al. (2014): Das Potential von Social Business in Österreich, Wirtschaftsuniversität Wien, NPO & SE Kompetenzzentrum, Vienna, July 2015.

innovative start-ups

Recommendations of the Austrian Council for Achieving the Goals of the RTI Strategy for Research and Innovation in the Corporate Sector

Start-Ups

The Austrian Council's individual recommendations in this respect are referred to for implementation.[50]

The setting up of a robust data monitoring system for RTI-related start-ups is an important point in this context. Positive effects of political and regulatory measures on the start-up activity can only be evaluated on the basis of a comprehensive data situation. The Austrian Council welcomes Austria's participation in this context in the Global Entrepreneurship Monitor (GEM) 2014 and the considerations on the introduction of a regular start-up monitor in line with the Swiss or German model.

Funding System

The Austrian Council recommends a compact, well-harmonised set of measures be provided for the start-up area, which provides support and consultancy services in particular across and beyond the start-up period. It must be ensured here that the target group is not burdened by the variety and lack of clarity of the offered measures, but rather that a select few key financial funding programmes be offered. New programmes must be examined precisely for the presence of similar existing initiatives and not considered suitable measures, but rather adjusted as further programme lines of existing initiatives.

The Austrian Council recommends the financing and coverage of start-up relevant support tools, which are defined in the legal framework as a fixed percentage of the respective ministry budget, to improve the financing situation in terms of easier planning capability and therefore increase start-up opportunities.

The Austrian Council recommends an independent evaluation to determine the quality of the offered consultancy services of the Austrian Federal Economic Chamber, as well as more extensive measures and training services. More intensive communication and public relations work for existing services is also required, as is increased harmonisation of the support and consultancy offering, optimally in the form of a joint appearance.

The Austrian Council recommends the set-up of a central and highly visible contact point for innovative entrepreneurs for each region. The existing information centres (e.g. AplusB centres, Austrian Federal Economic Chamber start-up service centres) in particular should be used and qualitatively increased in value here.

Bureaucratic and Regulatory Expense

The Austrian Council recommends the continuous improvement of the corresponding framework conditions to support start-up activity in the knowledge and technology-intensive area.

The Austrian Council supports the swift acceptance of the new insolvency act outstanding since 2012, with which the recommendations of the SBA action plan will be implemented to further reduce debt relief after the insolvency and the liquidation times for honest entrepre-

50 Recommendation of the Austrian Council on the amendment of the alternative investment funds manager act (AIFMA) of 6 March 2014; recommendation of the Austrian Council on the optimisation of the RTI-related start-ups of 19 November 2012; recommendation of the Austrian Council on the efficient implementation of research results in innovations, for the creation of suitable framework conditions for private equity and the introduction of a participation allowance (all 24 November 2011).

neurs[51], so that unsuccessful entrepreneurs who have braved the risks of self-employment, receive a second chance quicker than before.
Labour costs and access to the labour market have a negative effect on company start-ups in Austria. The Austrian Council therefore recommends appropriate tax relief and support with social security funds. Incidental wage costs for a start-up entrepreneur's first employee should consequently be eliminated in the first year, and those for the second employee should be halved. The regulations for work and residency permits for start-up employees must be organised so that start-up interested people can come to Austria without major expense. Furthermore, administrable and legally watertight employee participation models are also required to be able to cost-effectively win over the required key employees.
The working time requirements in a start-up company fluctuate intensively. This applies to both the start-up team and the first employees. The Austrian Council therefore recommends a more flexible Working Hours Act for start-up companies.
Demand-driven measures will be increasingly considered as effective tools for start-up support. The Austrian Council therefore recommends a specific public sector procurement policy, which supports young and innovative companies in particular. The IÖB service centre of the BBG could, for example, focus even more on supporting young companies.

Financing Innovative Start-Ups
The main financial bottleneck here is in the early company phase. The objective must therefore be to increase the capital flow to companies in the starting phase, to better establish equity capital financing in the early phases of a company's development, and at the same time to make the general public more aware of the topic.
The Austrian Council recommends, as already in 2015, that, in addition to bank financing, further financing options for innovative young entrepreneurs and SMEs also be developed. The range of crowdfunding including peer-to-peer lending and crowdinvesting should also be supported as a supplementary financing element with an effective and efficient legal framework, and integrated into a competitive overall strategy for corporate growth. In this context the Austrian Council welcomes the crowdfunding initiatives of the BMWFW resulting from an internal discussion of the government, especially the Alternative Financing Act. Furthermore, the creation of a business-angel allowance should also be planned for equity capital reinforcement.
Mechanisms such as tax breaks for investments in young companies, accompanied by appropriate legal framework conditions, should also be provided to further increase equity capital intensity on the private side, and to compensate for the weak risk capital market.
The Austrian Council once again recommends an examination of the applicability of international models of tax breaks for young knowledge and technology-based companies for Austria, which focus on the innovation content and research performance of recently set up and early-stage companies.

51 European Commission (2014): Enterprise and Industry, SBA Fact Sheet 2014, Austria (http://ec.europa.eu/growth/smes/business-friendly-environment/performance-review/index_en.htm#sba-fact-sheets).

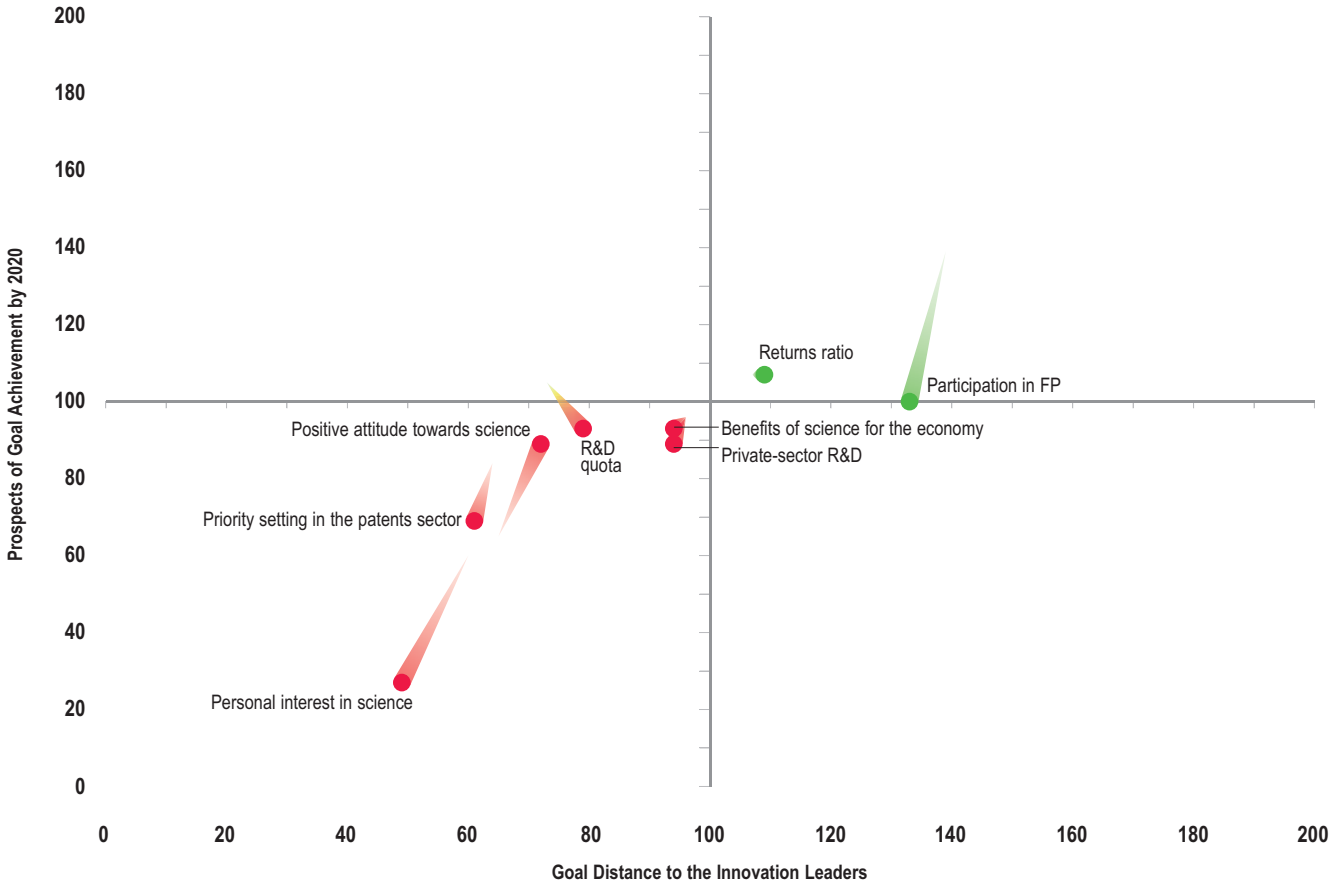
political governance

Innovative Governance – Political Governance of the RTI System

In this section, the strategy in particular names the intensified harmonisation of the responsible players and coordination, responsibilities and system effectiveness as clear objectives. Some aspects that the Austrian Council believe to be especially important are addressed in detail in this report.

The political control and political will to change are an important factor in the further shaping of the Austrian RTI landscape. The goal of joining the Innovation Leaders and achieving different quantified targets can ultimately be attributed to the political declaration of intention of the participating ministries while compiling the strategy. In this context, the RTI strategy is

Figure 13: Goal Distance and Prospect of Goal Achievement in the Area of Providing Governance (data reflect the last year for which they were available)



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 actual value of the innovation leaders (average value most recent available year DE, DK, FI, SE) or to the national target;

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

an important foundation of the inter-ministerial cooperation in the science and research area. The RTI Task Force is an essential committee at operative level, and with the work groups enables intensive handling of current issues. These structures and activities are to be evaluated positively.

The operational implementation of the goals, however, has returned to a large degree to activities within department or section limits after more than half the strategy horizon. The RTI landscape in Austria is not only characterised by the hierarchical structures, which in addition to the levels of federal government, the states and regions, also include numerous intermediary systems. The historical development of research financing has also created a very comprehensive and closely-knit support system. The fragmentation and complex responsibilities of some support mechanisms mean that the general control of the system is extremely sluggish, and characterised by numerous internal resistances with restructurings and changes. The increase in effectiveness and efficiency in RTI governance will also be one of the major challenges in the second half of the strategy lifetime – and this regardless of whether and to what degree the budgetary increases requested by the Austrian Council for research and development will be implemented.[52]

The indicators with which governance and its adjustment are measured in this report can, of course, only conditionally map the efficiency and effectiveness of the processes and structures of governance. They are, however, helpful as background elements. These background indicators for the most part indicate deteriorations and stagnation in this area. Particularly conspicuous here is the "Personal interest in science" indicator, which has deteriorated further after what was a bad starting value anyway. This parameter, however, not only reflects the declining interest of the general public. On the basis of numerous other challenges in the political arena (e.g. refugee crisis, economic crisis, banking crisis, etc.), the importance of research-related activities in government work can be considered to be declining. To put it another way: RTI-related topics are pushed into the background in the daily political discussion.

Governance Structures

The Austrian Council referred at the beginning to the need for inter-ministerial coordination. The departments represented in the RTI Task Force cover essential parts of the RTI system. Other specialised departments in sub-areas would have been required due to the thematic overlaps. For this reason, the Austrian Council welcomes every initiative that includes the integration of the entire Federal Government in future issues. A regular coordination of all specialised ministries and the compilation of a joint future agenda would also contribute to the formation of positive awareness of education, research and innovation. As a general goal, the shifting of budgets out of various, specialised departments not dealing directly with R&D into the area of future issues should be targeted. A number of topics, e.g. health, social, agriculture, sports, etc., could be highlighted via a scientific approach in another form of public discussion and a strategically oriented, innovative implementation. Such a future vision must be created from the strengths of both research and users, and a new dynamic in all social areas should be created with the respective inter-ministerial cooperation. The massive global trends, such as digitalisation, sustainable energy forms, social changes in society, etc., represent the con-

RTI Strategy Objectives

- *We want to coordinate the competencies of the responsible ministries in a clear way. To do this, efficient co-ordination mechanisms should be established among the responsible ministries.*
- *Task distribution among the ministries and funding agencies should be optimised by granting higher operational independence to the agencies and simultaneously strengthening strategic management by the ministries.*
- *At the funding agency level, task administration should be tidied up to remove duplicate efforts.*
- *The system's effectiveness and intelligence should be increased by augmented management of objectives and outputs.*

52 The ERA Council Forum Austria also refers in recommendation no. 2 to structural problems. "Das gegenwärtige System ist nicht tauglich, Österreich an die Spitze zu führen." https://era.gv.at/object/event/1799/attach/ERA_Council_ Empfehlungen_-_DRUCK-VORLAGE.pdf

nection of science and research with the specialised departments. The general awareness of research topics is consequently also generated in other political areas, which are indispensable for the positive development of future topics.

But inter-ministerial coordination at federal level is not the only key challenge; the harmonisation of measures and strategic alignments between federal government and the states also reveals much unused potential. Within the federal states there are sometimes very different structures and responsibilities, so that a content-compliant and agreed procedure across and beyond state borders is practically impossible. In addition to the fragmentation in the regional department affiliation, which ranges from business agencies, culture departments, own science departments, right through to the agendas of the state governor, state-internal interconnections of different organisations must also be considered an obstacle to the implementation of strategic goals. Individual state organisational units responsible for sub-areas of science and research have no corresponding counterpart at federal level, whereby Austria's effectiveness is restricted in international terms from a holistic point of view. The debundling of state-internal holding structures and the splintering of responsibilities while considering nationwide structures would be helpful for harmonisation. A significant simplification for the funding applicant, a significant reduction in administrative differences, joint guidelines and numerous other positive effects can consequently be achieved here. Cross-state coordination and cooperation would be an important step towards removing piecemeal structures and redundancies. In conjunction with a joint funding database, transparency and a basis for well-founded effect analyses can also be created. Existing strategic documents, which support and meet this requirement (as is the case with Smart Specialisation, for example), must be continuously further developed and adapted in this context.

RTI Strategy Objectives

- *We want to establish an overall policy approach in the funding system that applies the most efficient bundle of measures in a coordinated way in each context.*
- *Direct research funding should be further developed as regards the use of an adequate mix of instruments.*
- *The regulatory basis for research funding should be streamlined.*
- *The principle of competition-based allocation should be strengthened.*

Funding System

The Austrian funding system can be described as well differentiated, but also overburdened. In the White Paper on controlling research, technology and innovation in Austria (Austrian Council, 2013), it was illustrated that Austria does indeed have a comprehensive research landscape, but this is often extremely fragmented. In addition to the in part extremely low funding levels, this fragmentation also applies to existing redundancies and the control of agencies by the ministries, which is generally performed via individual programmes or framework contracts. This situation results in a multitude of individual and complex coordination processes, and consequently makes holistic RTI planning more difficult.

The situation has also changed in recent years, so that Austria is confronted with the paradoxical situation of a comprehensive funding portfolio, with insufficient resources in the relevant areas.[53] The Austrian Council has called at various points for both the simplification of the framework conditions and an increase in efficiency and a stable basis in the form of a research financing act. Numerous aspects of the budgetary reform, which are a start in this direction, are generally speaking very welcome, but there is still the need for an own research financing act (see chapter 3.5).

Specific obstacles can also be identified, which cannot be simply explained away as budgetary problems or federalist structures. It is, for exam-

53 The target value for the basic research quota, for example, is 0.94 percent of GDP by 2020. According to current calculations Hranyai, K. / Janger, J. (2015): Forschungsquotenziele 2020. Study commissioned by the Austrian Council. WIFO, Vienna) the basic research funding would have to almost double for this from EUR 1.9 billion to EUR 3.7 billion. Multiple oversubscriptions in the applied research area present a similar picture at both regional and European level (e.g. FFG, Horizon 2020).

ple, incomprehensible that the compilation and revision of national eligibility guidelines, which, among other things, are a basis for funding from the European structural funds, have still not been completed despite extreme urgency[54]. Other challenges in the domestic research funding system already noted in previous years have not been basically improved either. Intensively increasing application volumes with FWF projects with parallel stagnating budgets continue as before in basic research. The oversubscription emerging here and dismissal of high-quality projects connected with it will continue to increase dramatically if there is no increase in the FWF budget. In addition to frustration for project applicants, this also results in excellent researchers leaving Austria and a reduction in the probability of goal achievement for basic research compared with the Innovation Leaders. It also contradicts the goal of financing the research system in Austria in a more competition-oriented way. The omission of overheads with individual projects and PEEK for reasons of budgetary feasibility[55] is a further negative signal for researchers. The Austrian Council considers a reversal of the trend to be extremely urgent[56].

Research and Society

The strategy has already illustrated numerous deficits in 2011 in the area of dialogue, society and science. These findings are also underscored by the corresponding indicators (see fig. 13). These critical results were intensified further in the BMWFW's action plan of 2015. The key statement of both strategic documents, which is logically also found in other surveys, is the lack of integration, but also the lack of trust and interest of the general public in scientific topics.

The goals set in the strategy have been accepted into some measures of the public sector, both at federal and state level. These measures, as important as they are for the scientific system, do, however, represent rather selective interventions. The greatest success in the area of scientific communication is the establishment of a recurring, biennial Long Night of Research. The cooperation between federal ministries and state organisations is very efficient, despite the size of the event, and invested resources achieve the greatest possible effect[57]. Continuity of structures, responsibilities and budgeting is, however, still not ensured with this example, with the result that potential currently cannot be freed up to its full extent. The Austrian Council believes long-term planning security should be guaranteed. To be praised here are the children's universities and their contribution to the mobilisation of the early school stages, as well as the initiatives such as Sparkling Science or Young Science that set examples in the European and international context.

Other measures, which should improve the general interest of the general public, have only achieved the set goal under certain conditions. With the Year of Research 2015 only a small part of the possible potential was consequently activated, and awareness was reduced to individual activities connected with university anniversaries. A concerted presence of the participating

RTI Strategy Objectives

- *We want a culture of appreciation for research, technology, and innovation, and to promote an understanding of how this field makes an essential contribution to increasing the quality of life and societal prosperity.*
- *To do this, we must establish a stable infrastructural environment for multiple forms of dialogue between science and society, along the lines of a "scientific citizenship".*
- *Responsibility and integrity in science should be strengthened via institutional processes.*

54 As of April 2016.

55 https://www.fwf.ac.at/de/news-presse/news/nachricht/nid/20150323-2113/

56 Recommendation of the Austrian Council for financing universities and public sector research and development in Austria in the federal financing framework 2017 to 2020, Science and Research chapter, of 5 February 2016.

57 Rat für Forschung und Technologieentwicklung RFTE (2015): "LANGE NACHT der FORSCHUNG 2008 bis 2014. Geschichte|Analyse|Potenziale".
http://www.rat-fte.at/tl_files/uploads/Studien/11092015_LNFProzent20Imactanalyse.pdf

universities and more intensive measures to leverage the image of science and research among the general public would have had presented opportunities in the context of a Year of Research. The setting up of a central location for the science and society dialogue named in the strategy should be interpreted more in terms of the competencies and independent responsibility for the topic, than a building or installation as intended here. The absence of a controlling coordination of dialogue campaigns since 2006 is named in the strategy. This deficit continues and the requirement can only be confirmed once again. A superordinate institution, detached from structures, in line with the Swiss or German model, would create synergies and generate a critical mass. The integration of the players responsible for passing on knowledge, including that of the education policy and that of the museums, which play an essential role in this issue, must result in a new image for science in society, which is also supported by all participants. This also includes the currently emerging initiatives for Citizen Science, Open Innovation and Responsible Research Innovation (RRI), which have high aspirations for cultural change in this area.

In conclusion, it should be noted that the science and society dialogue has already been dealt with in detail in the previous annual report, and on the basis of the already mentioned prioritisation only handled here in a more concise manner.

Recommendations of the Austrian Council for Achieving the Goals of the RTI Strategy for Political Governance

Governance Structures

The reform agenda recommended by the Austrian Council in recent years must continue to be considered an important objective. In this context, the Austrian Council recommends an intensive inter-ministerial coordination, which also goes beyond the scope of the departments represented in the RTI Task Force, and enables focus points to be compiled on the basis of clearly defined social and economic challenges, so that research, innovation and specialised policies will be oriented and coordinated more intensively on such focus points. To set up clear responsibilities, the strategic alignments of federal government and the states must be further harmonised and the structures on the different hierarchy levels must be standardised. The reduction of redundancies and increase in transparency in conjunction with the distribution of tasks at federal, state and intermediary level must continue to be top priorities.

Funding System

The Austrian Council reaffirms its call for a budgetary increase in basic research, especially for the FWF, and refers in this respect to Council recommendations, which continue, as before, to be valid in content terms[58]. An adjustment of the current financing logic with regard to an annual minimum pay-out for maintaining the quality in the programmes would be required for the National Foundation.

Research and Society

The Austrian Council recommends a significant expansion of the dialogue activities with parallel clear structuring and focusing, and considers initiatives such as Citizen Science, Open Innovation and Responsible Research Innovation (RRI) to be essential elements for the dialogue. The Council believes all participating movers and shakers in the science system are required to contribute to a cultural change in order to generate a positive solid image for science and research at all levels of social strata.

58 Recommendation of the Austrian Council for financing universities and public sector research and development in Austria in the federal financing framework 2017 to 2020, Science and Research chapter, of 5 February 2016.

Financing of Research, Technology and Innovation

financing

The financing of research, technology and innovation is an important cornerstone for achieving the objectives of the RTI strategy. Two objectives are especially relevant in this context: an increase in the research quota by 2020 to 3.76 per cent of GDP and raising the private financing share to at least 66 per cent, however where possible to 70 per cent of overall R&D expenditure.

As shown in figure 13, the dynamic with both key financing indicators (R&D quota, R&D private) is declining with regard to the target year 2020. With the rate the goal distance has actually been reduced somewhat since 2010, the prospect of achieving goals compared with 2010 is, however, significantly lower. With the private financing share both the goal distance and the prospect of achieving goals have declined compared with 2010. The dynamic of both indicators therefore implies that the goal defined in the RTI strategy most probably cannot be achieved.

This observation is confirmed by the results of a study commissioned by the Austrian Council with WIFO, in which the required path to achieve the goal of having a research quota of 3.76 per cent by 2020 was calculated.[59] The R&D expenditure of EUR 10.1 billion at the moment would have to be raised for this to approx. EUR 15 billion by 2020 (see fig. 14). The current distance from the goal value, which is the result of a uniform increase in expenditure since 2011 to achieve targets in 2020, amounted in 2015 to 0.22 percentage points, the equivalent of EUR 746 million or 7 per cent of the estimated global expenditure in 2015.

By assuming two different scenarios (pessimistic/optimistic), the WIFO concludes that the quota in 2020 will be between 2.97 per cent (pessimistic scenario) and 3.35 per cent (optimistic scenario). The financing shortfall for the target in 2020 here is between approx. EUR 1.6 billion (optimistic scenario) and EUR 3.1 billion (pessimistic scenario).

In conclusion, it should also be noted that the private share of R&D financing would primarily have to increase massively to achieve the research quota goal.

RTI Strategy Objectives

- *We want to increase research intensity by one percentage point, from 2.76 percent to 3.76 percent of GDP, by 2020.*
- *Of this investment amount, at least 66 percent, but 70 percent if possible, should come from the private sector.*
- *Firms should be stimulated on a broad front (including an improved regulatory situation and sufficient incentive structures) to perform more research and innovation. The number of firms conducting research and development should be increased.*
- *Allocation of public funds should follow in line with the increased output and impact orientation of the innovation system.*
- *Innovation system actors should be guaranteed the greatest possible planning security.*

R&D Financing: Effects of the Tax Reform 2015/2016 on the Austria Fund (Österreich-Fonds)

It is no secret that resources of the Austria Fund (Österreich-Fonds) must address two pillars of the Austrian research and innovation policy in equal parts.[60] The funds should be used to 50 per cent in each case for financing basic and applied research and for research and development of basic industrial technologies in the programmes of: Production of the Future, Mobility of the Future, Energy of the Future and Information and Communication Technologies of the Future.

The funds from the higher revenue resulting from the increase in the marginal tax quota from 50 to 55 per cent for top incomes over EUR one million limited to five years (so until 2020) are to be fed in. The additional revenue is estimated at EUR 50 million.[61] According to the Ministry, the resources from the Austria Fund (Österreich-Fonds) will be distributed during the course of an application procedure by the National Foundation for Research, Technology and Development (RTD) in accordance with §

59 Hranyai, K. / Janger, J. (2015): Forschungsquotenziele 2020. Study commissioned by the Austrian Council. Vienna, WIFO.

60 Article 13 Steuerreformgesetz 2015/2016. FTE-Nationalstiftungsgesetz.

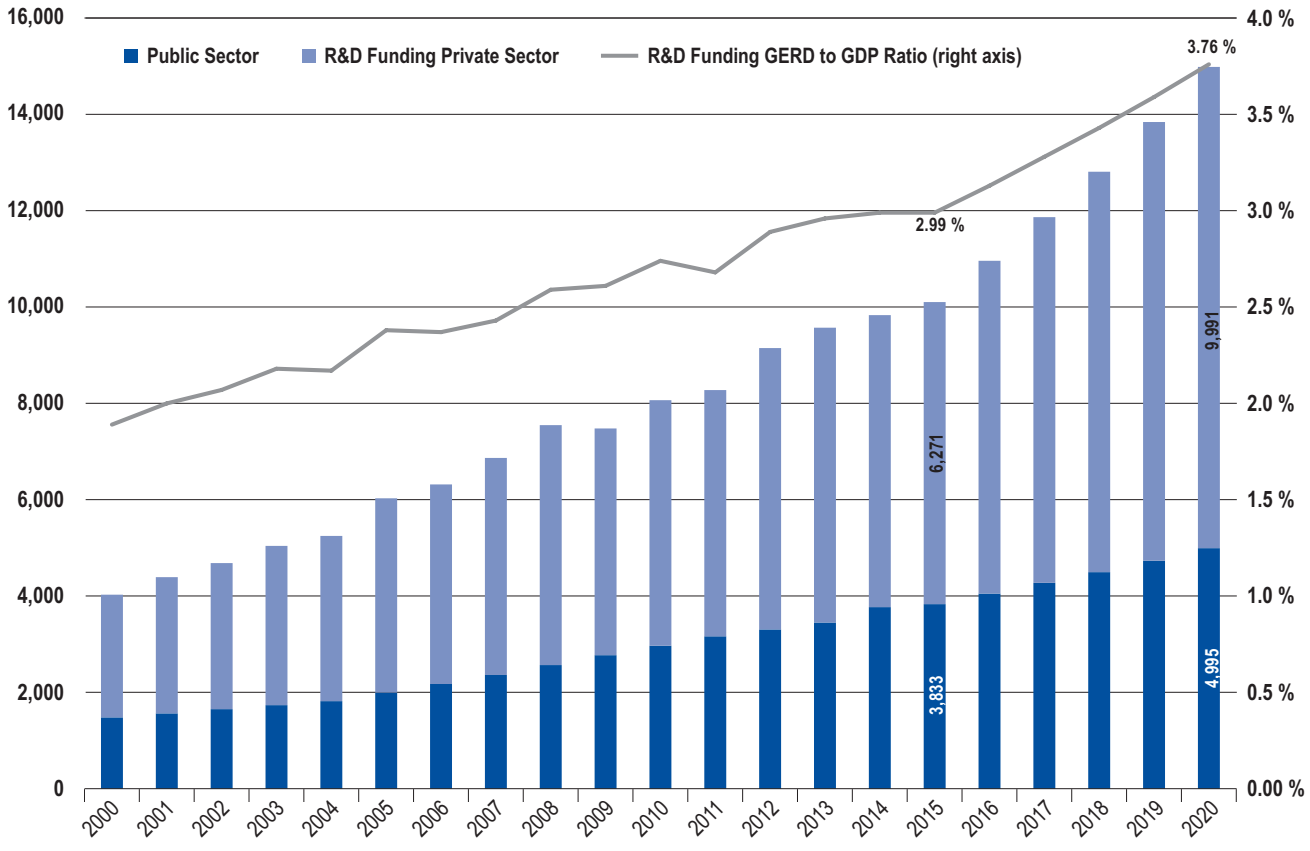
61 See § 9 Para. 2 Z 4 Finanzausgleichsgesetz 2008. In a parliamentary query response the ministry named EUR 33 million. The EUR 33.7 million corresponds with the Federal Government's share of income.

financing

3 RTD National Foundation Act to the funding institutions carried by the Federal Government, whereby according to the Ministry, existing and proven structures will be utilised and the setting up of new organisational structures will be avoided.[62]

The amount named in the Fiscal Equalisation Act from the increase in the top taxation rate appears to be afflicted with higher uncertainty. For this reason, the appropriate financing should be secured from other sources with constant increases, in order to be able to secure this part of the research financing.

Figure 14: Trajectory of Funding to Achieve the Target GERD-to-GDP Ratio of 3.76 Percent in 2020 (in EUR m)



Source: WIFO Forschungsquotenziele (Research Rate Targets) 2020.

62 For this, see parliamentary query response 6430/AB to query 6640/J (Mittelverwendung aus dem Österreichfonds). Applicants are the beneficiaries of the National Foundation, i.e. FFG, FWF, ÖAW, Christian Doppler Forschungsgesellschaft, LBG and AWS.

Recommendations of the Austrian Council for Achieving the Goals of the RTI Strategy for RTI Financing

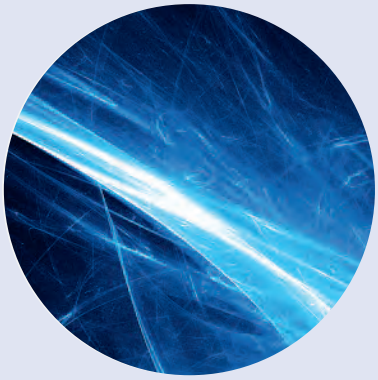
The Austrian Council recommends continued concentration of public sector resources and mechanisms on increasing the leverage effect to increase the incentive effect on private R&D expenditure and to increase the private financing share. In addition to the mechanisms of direct research funding, with which substantial additionality effects have already been achieved, the promotion of a higher leverage effect in particular also affects indirect research funding.

In this context, the Austrian Council welcomes the initiatives to increase the private financing share, such as the public benefit package, for example, the crowdfunding initiatives and the change in taxation law to reinforce public benefit institutions.

The RTI strategy explicitly specifies the requirement of a stable and secure financing environment to generate private research and development financing. Medium-term financing methods, target formulations in an effect and output-oriented innovation system and therefore improved planning capability and more security for a sustainable financing strategy should be defined in a research financing act, which is still not in place. The Austrian Council recommends achievement of the set goals of the RTI strategy by 2020 in terms of secured financing of the second five-year period; in addition to the implementations already performed, the swift adoption of the planned research financing act.

The Austrian Council recommends the immediate implementation of the announced and required measures for achieving both quota goals – 2 per cent for the tertiary area and an R&D quota of 3.76 per cent by 2020. This is required because only a continuous increase in expenditure can guarantee sustainable growth in science and research.

The Austrian Council recommends the remuneration of the Austria Fund (Österreich-Fonds) from other and additional income and taxation sources. This could be either via extended income taxation or with the cancellation of exceptions in the Income Tax Act.



summary





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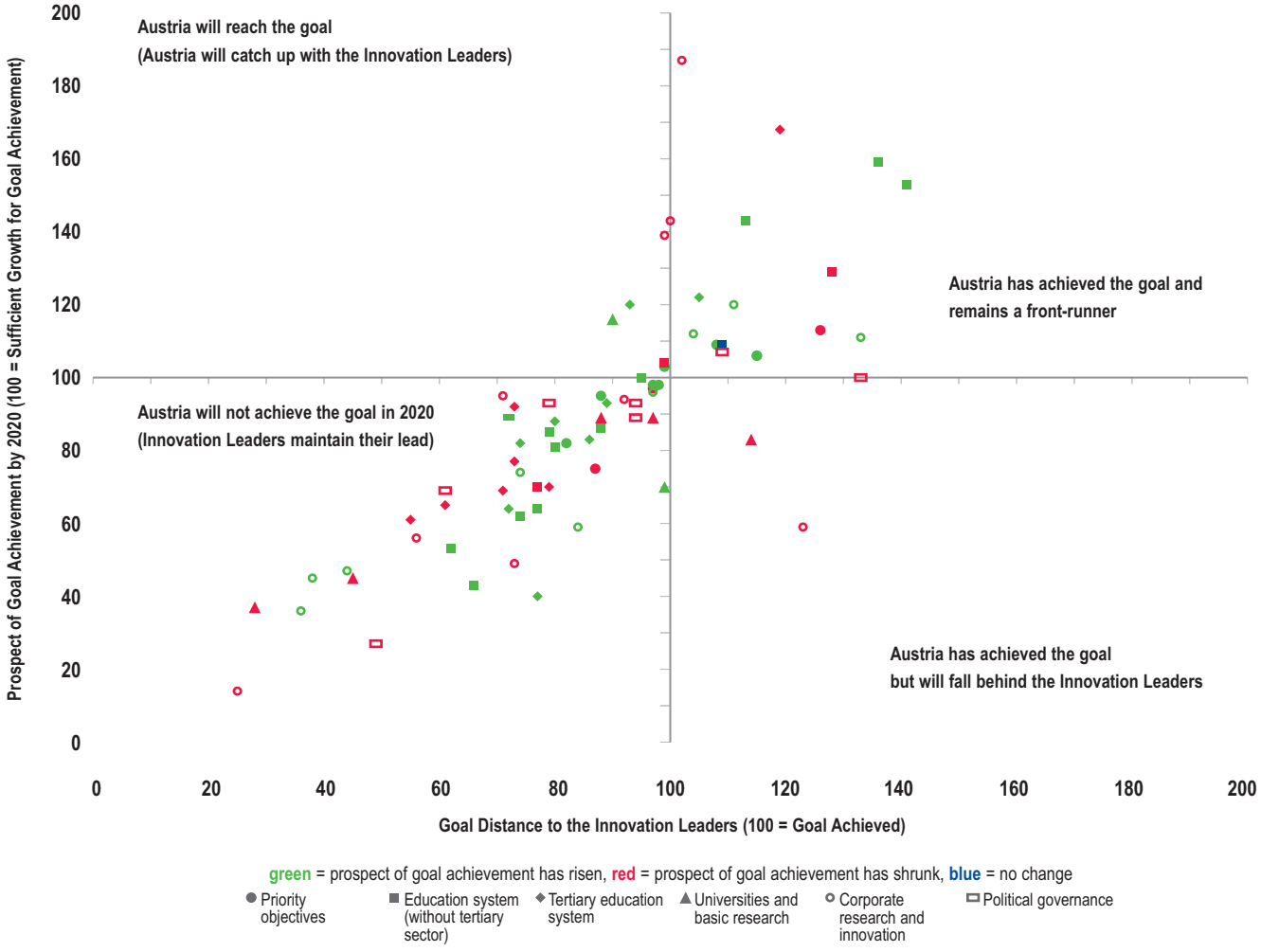
summary

Summary

Key Results

The results of the implementing of the RTI strategy can be summarised on the basis of the indicator-supported analysis and evaluation of the Austrian RTI system in figure 15 and in table 2. This provides us with a good overview of Austria's performance in all areas of the RTI strategy and in relation to the leading nations. Also illustrated are the areas in which the goals of the RTI strategy have already been achieved and where Austria's performance is ahead of that of the Innovation Leaders. Figure 15 and table 2,

Figure 15: Overview of Austria's Performance in all Areas of the RTI Strategy Relative to that of the Innovation Leaders



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 Innovation Leaders' actual value (average value most recently available year DE, DK, FI, SE); prospect of Goal Achievement = Value projected for Austria in 2020 relative to the national goal or the value projected for the Innovation Leaders in 2020.

however, also show the areas in which Austria's performance is behind that of the leading nations and how high the probability of catching up with the Innovation Leaders by 2020 is (prospect of goal achievement).
If we consider the development dynamic as a whole, we can see that the greater part of the indicators remains in the left bottom quadrant of figure 15. This means that the catch-up dynamic on the whole is insufficient to achieve the goals of the RTI strategy and the level of the Innovation Leaders.
Target areas, which according to the current status will not achieve their objectives by 2020, predominantly relate to the problem areas of the Austrian innovation system already addressed several times by the Austrian Council, such as education aspects from the early childhood level to the higher education area, the insufficient start-up dynamic and innovation spearheads ("radical innovation"), for example, as well as financing factors in the area of higher education expenditure, R&D expenditure and private financing.
The overview in table 2 illustrates the insufficient level of goal achievement with regard to the objectives of the RTI strategy. On the whole, positive trends can only be seen in about half of the target areas, i.e. only just under 50 per cent of the indicators show an improvement in the goal distance and prospect of goal achievement. Across and beyond all areas the average goal distance (85) from the Innovation Leaders (100) compared with 2010 is almost unchanged below the dynamic required for goal achievement. It is therefore clear that the development process of all indicators is currently insufficient and there is still catch-up requirement for Austria's overall innovation performance.

summary

Table 2: Overview of Average Goal Distances and Prospects of Goal Achievement and Changes Compared to 2010

	Average Goal Distance GD	Average Prospect of Goal Achievement PGA	Goal Achievement (2016): Percentage of Indicators	Goal Achievement (2020): Percentage of Indicators	Increase of GD/PGA (in %)	Decrease of GD/PGA (in %)
Total	**87**	**89**	**25 %**	**30 %**	**51 %**	**47 %**
Priority Objectives	99	97	30 %	40 %	70 %	30 %
Education System	95	102	33 %	33 %	73 %	20 %
Tertiary Education	81	88	13 %	27 %	47 %	53 %
Basic Research	81	75	14 %	14 %	43 %	43 %
Corporate Innovations	81	85	28 %	33 %	44 %	56 %
Financing	85	84	25 %	25 %	13 %	88 %

Sources: see Appendix 1, Raw Data see Appendix 2, Average Innovation Leaders (IL) =100. Average Goal Distance (GD): what is Austria's current position compared to the IL? Average Prospect of Goal Achievement (PGA): based on past developments, what will Austria's position in 2020 compared to the IL? Goal achievement (2016): which percentage of the goals has already been reached? Goal achievement (2020): which percentage of the goals will probably be reached in 2020?

The overall results have deteriorated once again compared with the previous year. Comparably positive developments can only be seen in two areas of the RTI strategy: for the education system (without tertiary area) and for the "priority objectives" outlined in chapter 3. Goal distance and prospect of goal achievement have risen in these areas since 2010 with 73 and 70 per cent respectively. On the whole, only 30 per cent of all objectives will be achieved by 2020

when considering the current prospect of goal achievement. The distance from the leading nations continues to be high in the "universities and basic research" area in particular, and the dynamic for goal achievement by 2020 is insufficient. In this year, there is no area in which both goal distance and prospect of goal achievement are above the average level of the Innovation Leaders, as was the case in the previous year, with the priority objectives, for example.

The area of "education system (without tertiary area)" on the whole shows the most positive development of all indicators and indicates that goal achievement by 2020 may be possible. The "tertiary education system" area is, on the other hand, far removed from the objectives; the dynamic is sufficient to catch up with the Innovation Leaders by 2020 with only approx. a quarter of the indicators.

The "universities and basic research" area scores the worst with regard to the average prospect of goal achievement compared with 2010. The average goal distance is also too high, which increases the negative dynamic of the average adjustment of goal distance and prospect of goal achievement. For this reason, the prospect of goal achievement by 2020 must be classified as very low in this area. As things currently stand, only 14 per cent of all objectives will be achieved by 2020.

The "corporate research and innovation" area on the whole exhibits a weak dynamic for prospect of goal achievement. This means goal achievement by 2020 is unlikely. Many indicators develop negatively here, with the result that achievement of objectives in this area is improbable. The performance of essential sub-areas compared with the leading nations continues to be very weak, as in start-up and growth of innovation-intensive new companies or risk capital intensity.

The "political control" area with especially negative performance is particularly noticeable with regard to the change in goal distance compared with the strategy's base year. In 88 per cent of cases this had the most indicators, with which the goal distance and prospect of goal achievement has fallen. This area is, however, only represented extremely incomplete by the indicators available to date. It should also be noted that the negative performance can in particular be attributed to downward trends of the individual indicators, such as the low interest of the general public in science and research. Politicians do not afford this policy area the required attention in Austria, evidently due to its limited suitability for the mobilisation of votes.

Summary and Priority Fields of Action

The overall findings of the Austrian Council have not changed very much compared with the previous year. The superordinate goal of the Federal Government to join the leading innovation nations by 2020 will not be achieved from today's point of view. Very little has changed in the implementation intensity of the RTI strategy of recent years. In its previous reports on scientific and technological performance, the Austrian Council has repeatedly emphasised that the strategy's measures require more specification and emphasis to be able to genuinely achieve the objectives specified in the strategy in the intended form by 2020.

The Austrian Council believes a new phase of policy-making, which pursues a more holistic consideration, is required to achieve the goal of becoming an "Innovation Leader". A consistent package of reform steps harmonised with the overall RTI system must be put to together to replace the previous fragmented individual measures. Stronger political commitment and more political energy are required for this purpose, and this indeed by the entire Federal Government and not only those departments that are directly responsible for individual RTI components. Movement towards the future will always remain fragmented as long as those involved are pulling in different directions. The Austrian Council believes the goal of Austria joining the leading innovation nations by 2020 will be clearly missed if there is no focus on the aforementioned areas of the future.

The Council therefore recently proposed the

initiation of an active and comprehensive RTI policy reform process to drive forward the implementation of the strategy in a more decisive way.[63] This must be performed at the highest political level. The Austrian Council believes an "RTI reform agenda" managed by the Federal Chancellery and the Vice Chancellery, in cooperation with all ministries responsible for RTI, is required for this very purpose. This must be anchored in the government programme and furnished with binding political objective specifications and clear assignments for the RTI Task Force.

On the basis of the indicator-supported analysis and evaluation of the performance of the Austrian RTI system for the five priority areas of action are

1. **Education System**
2. **Basic Research**
3. **Start-ups and Growth of Innovative Early-stage Companies**
4. **Governance Structures**
5. **Private-sector R&D Financing**

the following recommendations can be summarised as the content-related conclusion of this report.

Austrian Council Recommendations for Priority Areas of Action

Intensifying the reform of the education system
In view of the education selection that continues to exist in Austria, the Austrian Council recommends further measures for early childhood development and a significant **increase in the number** of qualified and in particular multilingual **educators in the early childhood area**. It would also urgently require better financial and staff provision (keyword: support staff) for those schools that are faced with special challenges, especially with regard to the socio-economic structure of the students; the maximum 15 per cent in support staff proposed in the education reform package is too little. The Austrian Council also recommends further steps towards the modernisation of education system structures, in particular with further measures to **intensify school autonomy** and for still outstanding adjustment of the competencies between federal government and the states.
To overcome early social selection in the education system, the Austrian Council also recommends commitment to the **joint, whole-day school** in the area of secondary level I with simultaneous performance differentiation and talent development, as well as appropriate implementation with suitable measures. The model regions package provided for in the education reform package can only be a first step in this direction.
To improve the study and teaching conditions in the tertiary education sector, the Austrian Council recommends the introduction of **capacity-oriented financing of university places**, coupled with a capacity-oriented **university place management** as quickly as possible with the use of sufficient budgetary funds. At the same time, the **autonomy of the universities** with regard to capacity-oriented study access and to improve study conditions must also be expanded. The **basic financing for universities** to improve teaching and research conditions, as

63 Rat für Forschung und Technologieentwicklung (2013): Weißbuch zur Steuerung von Forschung, Technologie und Innovation, p. 22.

presented in the Austrian Council's recommendation of Februar 5, 2016, must be increased for this purpose by at least EUR 1.4 billion for the performance agreement period 2019-2021.

Parallel to this, the Council also recommends the **number of professors or appropriate positions** presented in the all-Austria university development plan be increased by the planned amount and the budgetary coverage required for this be provided.

Increasing competitively allocated financing for basic research

The Austrian Council reaffirms its recommendation to raise the funds for **competitive financing of basic research** within the scope of FWF funding to the volume of funds provided for this by the Innovation Leaders. The Council believes an increase in funding by EUR 400 million for the years 2017 to 2020 represents a minimum value for this.

More highly qualified people will be required for this if Austria is to succeed as a research and advanced technologies nation of the future. In the global competition for the best brains, especially for young scientists, the Austrian Council recommends increasing Austria's attractiveness as a research nation with the expansion of career positions, especially **tenure track** and structured doctoral programmes, in order to create attractive conditions for international candidates.

Attractiveness is in particular generated by excellence. The conditions and a favourable competitive starting point for procuring ERC grants must be guaranteed further. The pursuance of excellence with **excellence initiatives** in both basic and applied research (e.g. SFB, COMET) is also indispensable to reinforce Austria's attractiveness in European competition.

Further optimisation of the legal and financial framework for business start-ups

For the start-up area, the Austrian Council recommends a **compact, well-coordinated** set of measures be provided, which complementarily fuses all ongoing and new planned measures, regardless of ownership in accordance with the requirements of the target group. For increased planning security and therefore improved start-up prospects, a fixed percentage of the respective ministry budget must be set aside for remunerating and covering start-up relevant funding mechanisms.

As regards **consultancy and training services** the offering can be expanded and communication with the target group in particular improved.

Improvement of the **framework conditions for start-ups** in Austria requires improved access to the labour market, a reduction in labour costs with a corresponding reduction in incidental wage costs for employees in the initial years, appropriate regulations on work and residency permits for start-up employees, tax breaks and flexibility of the working hours act to adjust to the special requirements of start-up businesses.

To ensure unsuccessful entrepreneurs get a **second chance** quicker than before, the Austrian Council recommends the swift acceptance of the new insolvency law outstanding since 2012, with which the recommendations of the SBA action plan will be implemented to further reduce debt relief after the insolvency and the liquidation times for honest entrepreneurs[64].

Demand-driven measures will be increasingly considered as effective tools for start-up support. The Austrian Council therefore recommends a specific public sector procurement policy, which supports young and innovative companies in particular. The IÖB service centre of the Federal

64 European Commission (2014): Enterprises and Industry, 2014 SMBA Fact Sheet Austria.

Procurement Agency (BBG) could, for example, focus even more on supporting young companies. The Austrian Council once again recommends an examination of the applicability of international models of **tax breaks** for young knowledge and technology-based companies for Austria.
The Austrian Council also recommends **private financing options** for innovative young entrepreneurs and SMEs be developed. The range of crowdfunding including peer-to-peer lending and crowdinvesting should also be supported as a supplementary financing element with an effective and efficient legal framework, and integrated into a competitive overall strategy for corporate growth. In this context, the Austrian Council welcomes the crowdfunding initiatives of the BMWFW resulting from committee consulting sessions, especially the Alternative Financing Act.[65]
Furthermore, the creation of a **business-angel allowance** should also be planned for equity capital reinforcement for start-ups and research-active companies. The Austrian Council also supports innovative funding models, which support acceptance of guarantees with conventional early phase programmes.

Improving governance structures for the implementation of the RTI strategy

The RTI strategy is an important foundation of the inter-ministerial cooperation in the science and research area. The reform agenda to reduce redundancies and increase transparency in conjunction with the distribution of tasks at federal, state and intermediary level must continue to be a top priority. In this context, the Austrian Council recommends intensive **inter-ministerial coordination**, which also ranges across and beyond the departments represented in the RTI Task Force. The research-relevant initiatives of the Ministry of Life in particular, but also Health and Social Affairs and others, would open up additional scope for the research system.
The Austrian Council reaffirms its call for a **budgetary increase in basic research**, especially for the FWF, and refers in this respect to Council recommendations, which continue to be valid in content-related terms. For the **National Foundation**, an annual minimum pay-out for maintaining the quality in programmes would be required.
The Council believes all participating movers and shakers in the science system are required to contribute to a **cultural change** in order to generate a **positive solid image for science and research** at all levels of social strata. The Austrian Council recommends a significant expansion in dialogue activities with clear structuring and strong focus, whereby it considers initiatives such as Citizen Science, Open Innovation and Responsible Research Innovation (RRI) to be essential elements for the dialogue.

Promoting measures to increase the private-sector share of R&D funding

With the exception of basic research financing, the Austrian Council recommends continued concentration of public sector resources and mechanisms on increasing the leverage effect **to increase the incentive effect on private R&D expenditure** and to increase the private financing share. The Austrian Council welcomes the corresponding initiatives, such as the public benefit package, for example, the crowdfunding initiatives and the change in taxation law to reinforce public benefit foundations.
The RTI strategy explicitly specifies the requirement of a stable and secure financing environment to generate private research and development financing. Medium-term financing methods, target formulations in an effect and output-

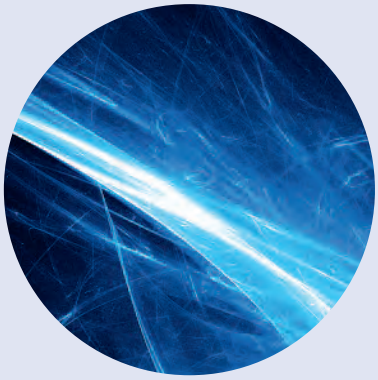
65 http://www.bmwfw.gv.at/Presse/AktuellePresseMeldungen/Documents/Crowdfunding_Potenzial-1.pdf
http://www.bmwfw.gv.at/Presse/AktuellePresseMeldungen/Documents/Crowdfunding_Vergleich_AT_DE-1.pdf

summary

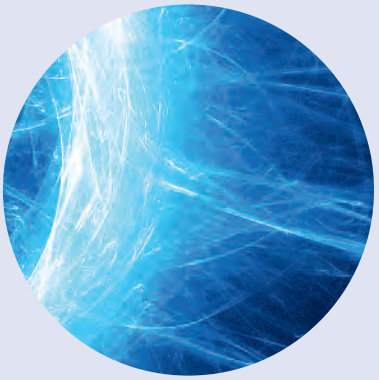
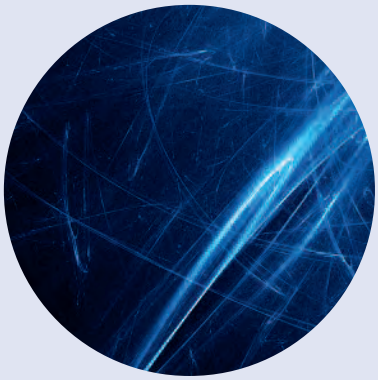
oriented innovation system and therefore improved ability to plan and more security for a sustainable financing strategy should be defined in a **research financing act**, which is still not in place. To achieve the set goals of the RTI strategy by 2020 in terms of secured financing of the second five-year period the Austrian Council recommends in addition to the implementations already performed, the swift adoption of the planned research financing act.

The Austrian Council recommends the immediate implementation of the announced and required measures for achieving both **quota targets** – 2 per cent for the tertiary area and an R&D quota of 3.76 per cent by 2020. This is required because only a continuous increase in expenditure can guarantee sustainable growth in science and research.

The Austrian Council **recommends the remuneration of the Austria Fund (Österreich-Fonds)** from other and additional income and taxation sources. This could be either via extended income taxation or with the cancellation of exceptions in the Income Tax Act.




Global
Innovation Monitor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Global
Innovation Monitor

Global Innovation Monitor

Background

Based on the indicators used in the Report on Austria's Scientific and Technological Capability, the Global Innovation Monitor compares the development of selected countries (China, Israel, the Netherlands, Switzerland, South Korea and the USA) with that of Austria in the areas of economic performance, society, the environment, education, university research and corporate research. An additional comparison at global level will also more extensively illustrate Austria's status in light of global trends.

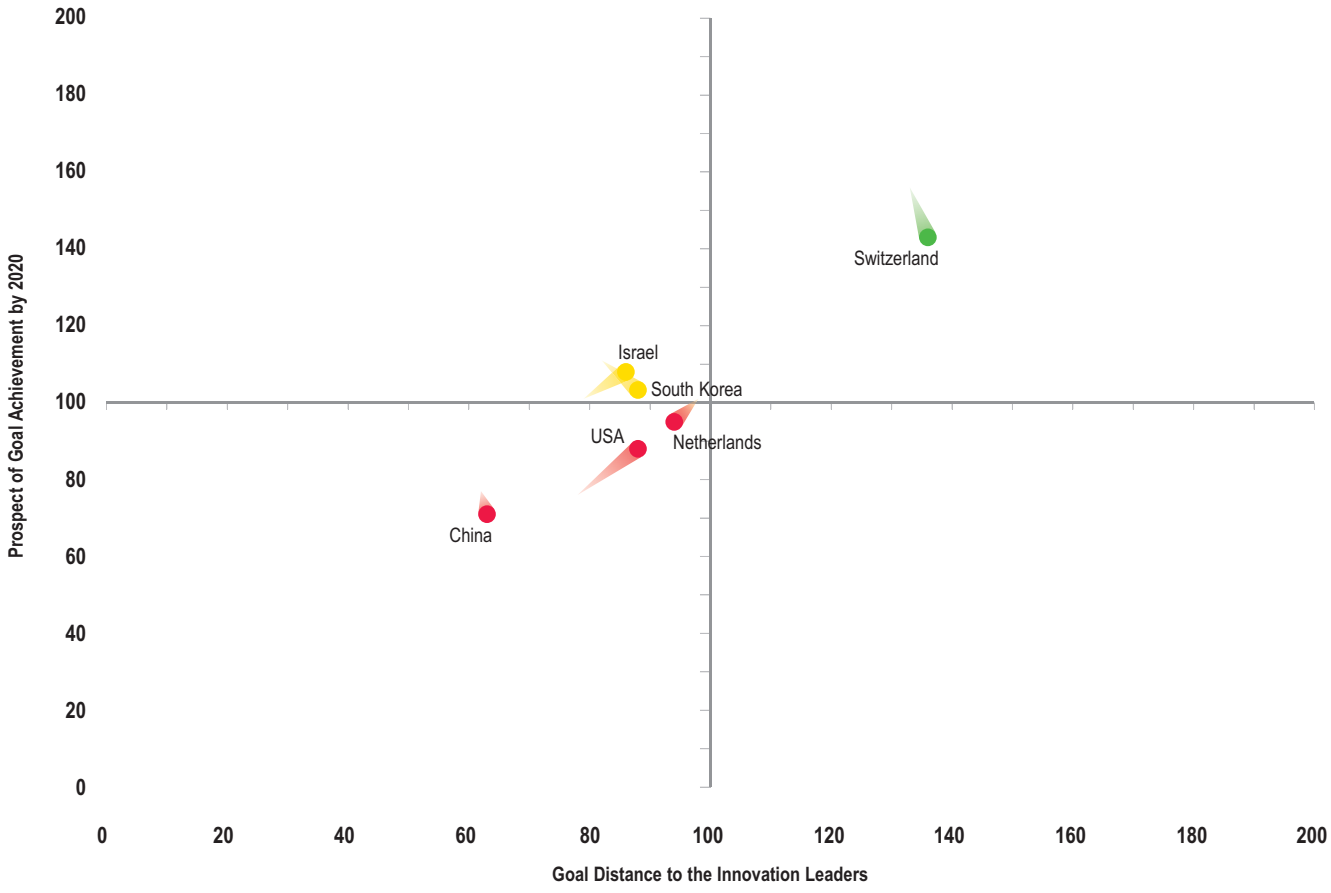
The comparison countries for the Global Innovation Monitor were chosen for a number of reasons: Firstly, they were defined as the target countries for Priorities 1 and 2 in the recommendations of the working group 7a to the RTI Task Force.[66] Secondly, the selected countries are – with the exception of China – deemed to be global innovation leaders that can serve as benchmarks due to their successful performance. China was included in the list because it has faster growth rates for spending on research, publications, patents etc. than any other country. Thirdly, members of the Austrian Council who took part in official visits to these countries were given deeper insights into the RTI systems there.

66 Beyond Europe: Die Internationalisierung Österreichs in Forschung, Technologie und Innovation über Europa hinaus. Recommendations of AG 7a to the Federal Government's Task Force (July 2013), p. 7.

Economy, Society and Environment

Figure 16 shows how Austria is relatively well positioned with regard to the economic, social and environment-relevant indicators in relation to the countries considered here. Only Switzerland currently scores better than Austria with these indicators. And with regard to development dynamic only South Korea and Israel are more or less on a par with Austria. The performance of the USA, the Netherlands and China is insufficient to catch up with Austria by 2020. With regard to the possibility of overtaking Austria by 2020, China's development trend is even slightly regressive.

Figure 16: Economy, Society and Environment in an International Comparison



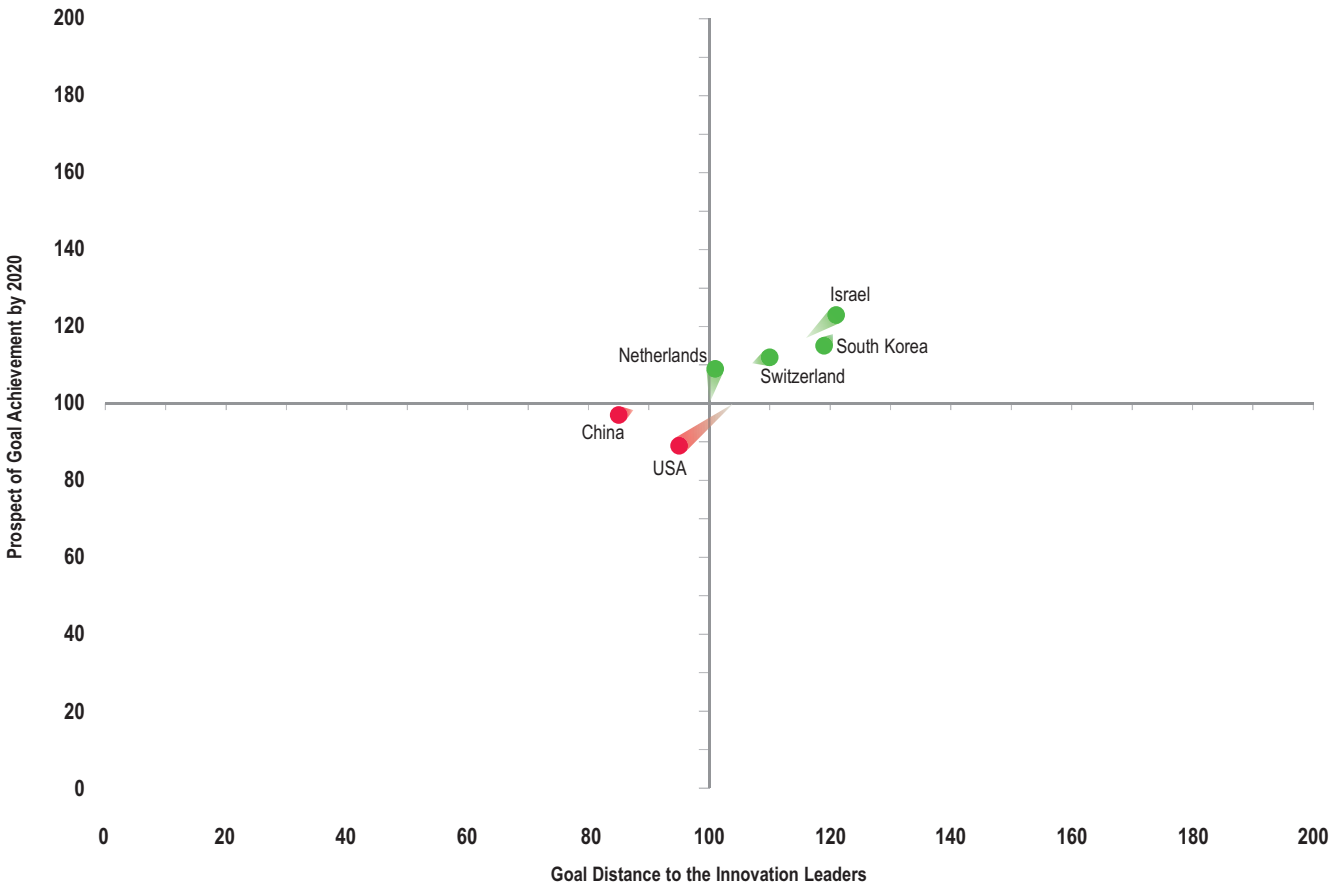
Source: see Indicators, Appendix 5, WIFO; see Appendix 6 for comments on methodology and interpretation of illustrations and indicators.

Education

The analysis of the education system presents the results of the PISA tests as output components in an aggregated form, and the expenditure in the tertiary education sector for students as input components. If we compare the current analyses, Austria's education performance is ahead of that of China and the USA, but behind that of the Netherlands, Israel, South Korea and Switzerland (see fig. 17).

With regard to the performance of education systems, the Netherlands, Switzerland, South Korea and Israel are still more or less ahead of Austria with regard to both goal distance and development dynamic. Compared with the USA, Austria is more or less on the same level, even if the USA has fallen back somewhat. China is even a little further back, but at the current increase rates could possibly catch up with Austria by 2020.

Figure 17: Education in an International Comparison

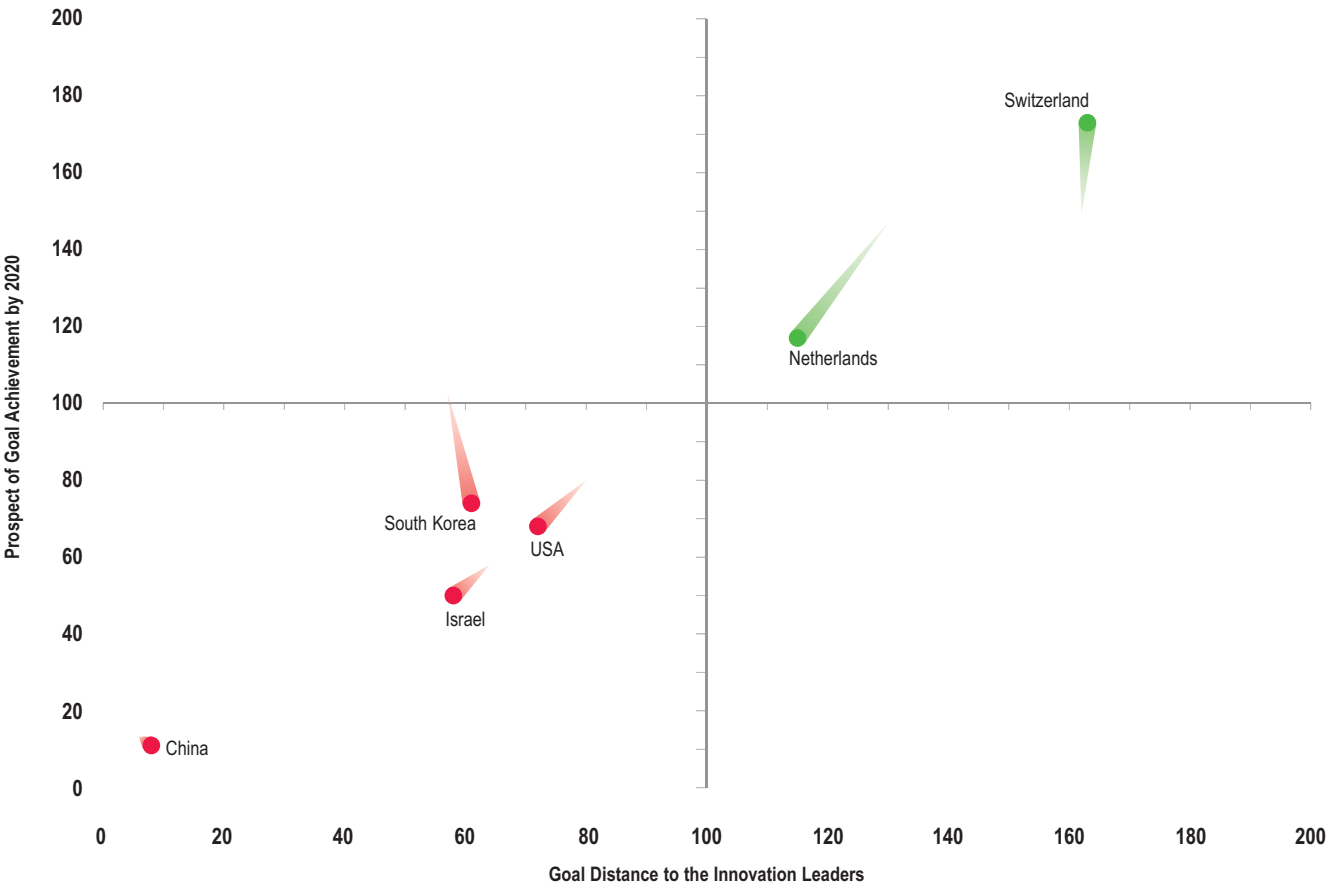


Source: see Indicators, Appendix 5, WIFO; see Appendix 6 for comments on methodology and interpretation of illustrations and indicators.

University Research

The trend in the area of university research is somewhat better than that in the education area. On the basis of the aggregated individual indicators of "University ranking", "Expenditure for basic research" and "Expenditure for tertiary education, research and development in relation to the population", Austria is behind Switzerland and the Netherlands and ahead of China, South Korea, Israel and the USA (see fig. 18).

Figure 18: University Research in an International Comparison



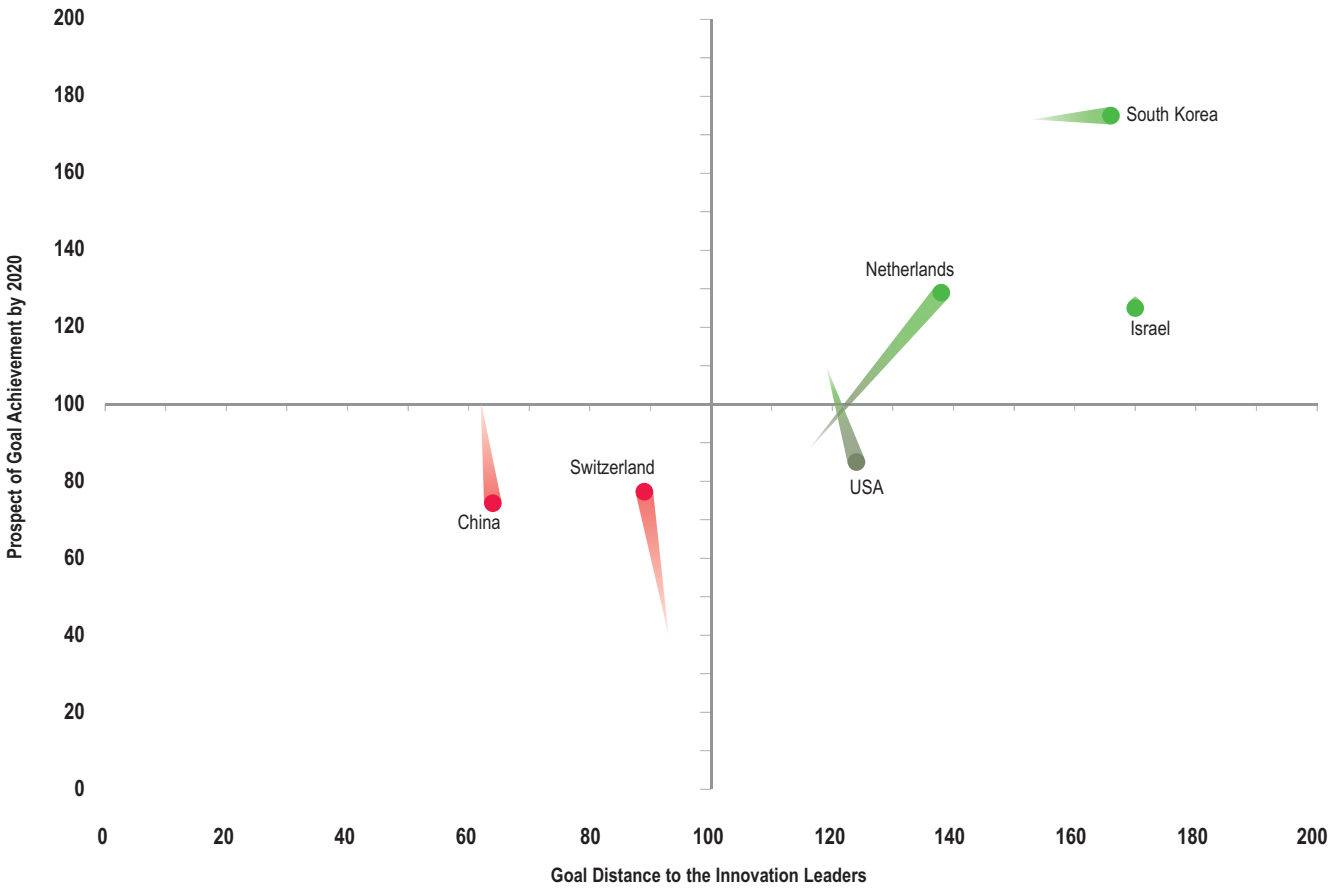
Source: see Indicators, Appendix 5, WIFO; see Appendix 6 for comments on methodology and interpretation of illustrations and indicators.

Global
Innovation Monitor

Corporate Research

Figure 19 shows a catch-up requirement for Austria with regard to performance in the indicators for corporate research and innovation, which have been summarised for this illustration. With the exception of China and Switzerland all selected countries are ahead of Austria, and three of these (South Korea, Israel and the Netherlands) will extend their lead further on the basis of their dynamic development. Austria could catch up with the USA if the trend remains as it is in the area of corporate research.

Figure 19: Corporate Research in an International Comparison

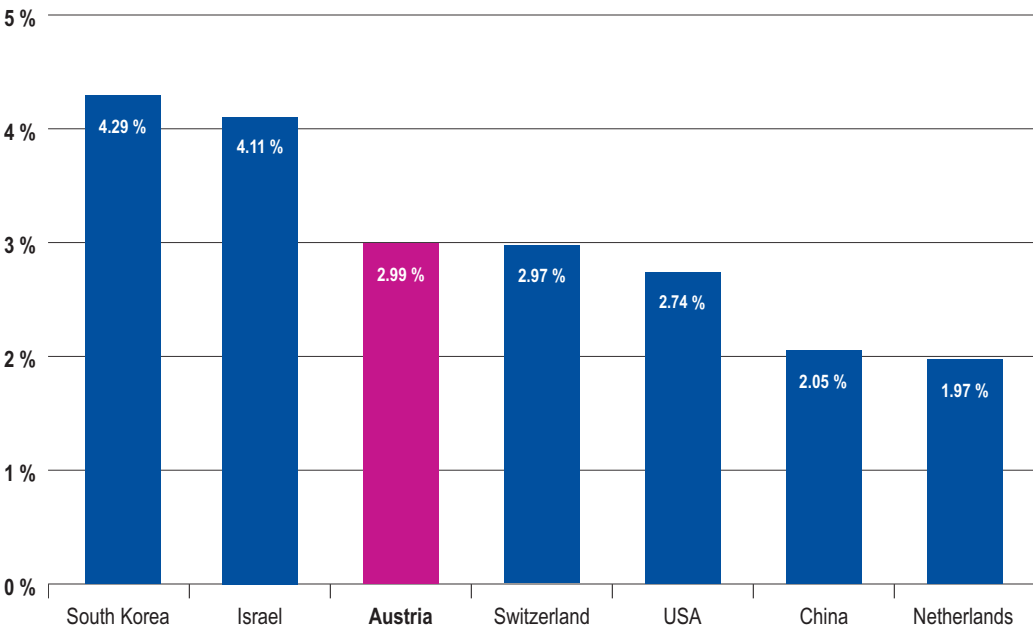


Source: see Indicators, Appendix 5, WIFO; see Appendix 6 for comments on methodology and interpretation of illustrations and indicators.

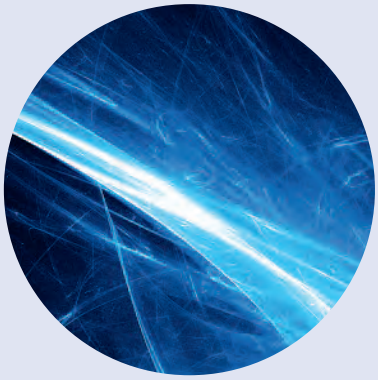
R&D Financing

Figure 20 shows a comparison of the R&D rates of the countries selected for the Global Innovation Monitor. There are scarcely any changes compared with the previous year. South Korea and Israel continue to have the by far highest research rates; Switzerland and the USA are more or less on a par with Austria. Measured in terms of overall volume, with approx. US$ 316 billion, China already ranks second behind the USA (US$ 433 billion). By comparison, Austria with approx. US$ 11 billion (at purchase power parity) in R&D expenditure in 2013 ranks 15th in the global list of countries.

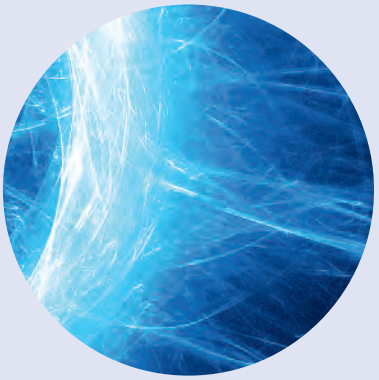
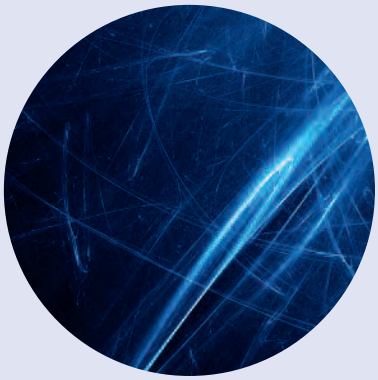
Figure 20: GERD to GDP Ratios of Selected Countries
(data reflect the last year for which they were available)



Source: OECD MSTI (2015).





Appendices
List of Abbreviations

Appendix 1: Indicator Set

Strategic Objectives	Indicator to track target achievement	Abbreviation	Numerator
Priority Objectives			
Vision: In 2020 Austria is an Innovation Leader. Objective: We want to further develop the potentials of science, research, technology and innovation in Austria to make our country one of the most innovative in the EU ...	IUS Innovation Index (Summary Innovation Indicator)	Innovation Performance (IUS)	Innovation index value (normalized 0–1)
... and thus strengthen the competitiveness of our economy and increase the wealth of our society ...	GDP per capita at purchasing power standards (PPS)	GDP/per capita	Gross domestic product (GDP) at purchasing power standards
	Employment-to-population ratio	Employment rate	Employed (20-64 years)
	Unemployment rate	Unemployment rate	Unemployed (15-74 years)
... and overcome the big social and economic challenges of the future.	OECD Better Life Index	Better Life	Better Life Index– value (0–10)
	Healthy life years: Number of years a person of a certain age can expect to live without illness/disability.	HLY (F)	Years without chronic illness/ activity limitation
		HLY (M)	
	Reduction of greenhouse gas emissions in %	Greenhouse gases	Emissions of greenhouse gases, base year 1990 Index (1990=100)
	Efficiency increase: energy intensity	Energy intensity	Gross Domestic Energy Consumption (kg. oil equivalents)
	Efficiency increase: productivity of resources	Resource productivity	GDP

	Denominator	Brief Explanation of Indicator	Source	Calculation information	ID No.
	n. a.	The innovation index of the IUS should make the innovation performance of EU member states comparable. It comprises 25 unweighted individual indicators, which refer to various innovation-relevant areas (i.e. human resources, research spending, patents, structural change).	IUS Innovation Union Scoreboard		1
	Total population	Gross Domestic Product (GDP) per capita is a measure of a country's total economic output. It is defined as the value of all newly-created goods and services, minus the value of all goods and services consumed as inputs. The underlying figures are expressed in PPS, a common currency, which balances price level differences between countries and allows significant GDP volume comparisons.	Eurostat		2
	Working-age population (20-64 years)	The employment rate complements GDP per capita as a measurement of a country's economic development. The working population comprises people who during the reference week worked in gainful employment for at least one hour or who did not work, but had a work place and were only temporarily absent.	Eurostat		3
	Persons in Employment (15-74 years)	The unemployment rate complements GDP per capita as a measure of a country's economic development. The unemployment rate is the number of people unemployed as a percentage of the labour force. The labour force is the total number of people employed plus unemployed. The figure is seasonally adjusted.	Eurostat	Inverted	4
	n. a.	The indicator measures wealth and quality of life across a wide range of factors. It covers several areas but as income, education and health overlap with other areas these are not included. The remaining areas are work-life balance, integration in social networks, participation in social/political events, personal security, environmental quality, housing and life satisfaction.	OECD Better Life Index		5
	Life expectancy	This indicator reflects the challenges of ageing populations. The number of heathy life years an individual will enjoy can be influenced by medical and technological progress and by social innovations such as new preventative healthcare models at the workplace.	Eurostat		6
					7
	n. a.	This indicator is one of Austria's Europe-2020 goals and reflects the fact that climate change can only be efficiently stemmed by a reduction in absolute terms of greenhouse gases. The target aims for a reduction and not an increase.	Eurostat; Austrian Federal Environment Agency	Inverted; national target	8
	GDP (in 1,000 €)	This indicator shows the development of energy efficiency; i.e. energy consumption required for Austria's annual economic output.	Eurostat; Statistik Austria	Inverted	9
	Domestic material consumption (kg)	This indicator measures the total amount of physical resources directly used in Austria's annual economic output.	Eurostat; Statistik Austria		10

Objective target of the strategy	Indicator to track target achievement	Abbreviation	Numerator
Educational System – Pre-Primary and Primary Education			
The educational system as a whole needs to be optimised, starting with the early childhood phase. Vision 2020: age-based, early childhood educational support has been established.	Participation in early childhood education	Early childhood care	Children (4–primary level) in institutional childcare facilities
	Ratio of students to teaching staff	Student-teacher ratio early childhood	Number of children (3 years and older) in institutional childcare facilities
	Ratio of students to teaching staff in primary education	Student-teacher ratio in primary education	Number of students in primary education
Educational System – Secondary Education			
The proportion of early school leavers should be reduced to 9.5% by 2020.	Percentage of early school leavers	Early school leavers	People aged 18-24 with lower secondary educational attainment or less
The proportion of pupils graduating with a secondary school-leaving certificate within an age cohort should be increased to 55% by 2020	Percentage of secondary school graduates	Secondary school graduates	Passed final school leaving examination
The number of students with a first language other than German, who complete the upper secondary level should increase from 40% at present to 60%. Better integration of immigrants	Number of students with a first language other than German who have completed the second level of secondary school	Early school leavers immigrants	Number of students with a first language other than German who have completed the upper secondary level of education (AHS, BHS, 3-year technical school, apprenticeship)
The reforms aim at mitigating social selectivity.	Influence of socio-economic background on reading competence	Inheritance of education 1	Influence of PISA Index for the socio-economic background on reading competence (increase in socio-economic gradient)

	Denominator	Brief explanation of indicator	Source	Calculation information	ID No.
	Population 4–5 for Austria, for other countries depending on the age at which children start school (4–6)	The percentage of the population between the age of 4 and the age at which children start school who are participating in early childhood education. This indicator is used to measure progress toward the primary goal set out in the Strategy "General and Vocational Education" of increasing the proportion of children (between the age of 4 and the age at which compulsory primary education starts) who participate in preschool education to at least 95% by 2020.	Eurostat	National target	11
	Number of qualified teachers without teaching assistants	The ratio of students to teaching staff compares the number of students (full-time equivalent) to the number of teachers (full-time equivalent and not teaching assistants) at a given level of education and in similar types of institutions.	OECD, Education at a glance	Inverted	12
	Number of teachers (full time-equivalents) at primary level	The ratio of students to teaching staff compares the number of students (full-time equivalent) to the number of teachers (full-time equivalent) at a given level of education and in similar types of institutions.	Eurostat	Inverted	13
	Total population between 18-24	This is a core target within the framework of the Europe 2020 strategy. "Early leavers from education and training" are people aged 18 to 24, who fulfill the following conditions: the highest level of education or training attained is ISCED 0,1,2 or 3c short – i.e. lower secondary level – respondents should not have received any education or training in the four weeks preceding the survey.	Eurostat	Inverted	14
	Age cohort 18-19 years	Final examination rate: students who passed final school-leaving examinations (without second or subsequent qualifications), as measured by the arithmetic mean of the population aged 18 to 19.	Statistik Austria	National target	15
	Age cohort 18-19 years with a first language other than German	The indicator shows the share of students with a first language other than German, who have attained upper secondary educational attainment level (final school leaving examination, apprenticeship, intermediate technical schools).	Statistik Austria	National target	16
	n. a.	The average difference in students' reading attainment which indicates a one unit increase in the PISA index of economic, social and cultural status is defined as an increase in the socio-economic gradient. The wider the average attainment gap, the greater the impact of students' socio-economic background on their reading skills. The socio-economic background is measured by the PISA-index of economic, social and cultural status and is based on information provided by the students on their parents' education level and occupational status and household possessions, such as a writing desk for studying and the number of books. Statistical fluctuations are taken into consideration in the assessment.	OECD PISA	Inverted	17

Objective target of the strategy	Indicator to track target achievement	Abbreviation	Numerator
Education System – Secondary Level			
		Inheritance of education 2	Influence of the PISA Index for the Socio-Economic Background on Reading Skills (strength of correlation–share of the declared variance)
The reforms aim at continuously increasing quality in education (secondary level).	Share of students with poor performance in basic skills (literacy, numeracy, science) Target: 15% at most	PISA risk students – reading	Students who at best achieve competence level 1 of the relevant PISA scale
		PISA risk students – mathematics	
		PISA risk students – science	
	Share of students who reach at least competence level 5 (in literacy, numeracy, science)	PISA top students – reading	Students who reach the competence level 5 or higher
		PISA top students – mathematics	
		PISA top students – science	
Optimum qualification for economic activity (...)	Share of graduates in employment aged 20 to 34)	Skill Mismatch	Individuals between the ages of 20 and 34 who are in employment and who graduated from an educational programme of at least secondary level II and who left the general education and vocational education system no more than three years before the reference year.

	Denominator	Brief explanation of indicator	Source	Calculation information	ID No.
	n. a.	The strength of the relationship between reading performance and socio-economic background is measured by the percentage of the variance of students' performances, which can be explained by the differences in students' socio-economic background. The higher the share of the declared variance, the greater the influence of the socio-economic background.	OECD PISA	Inverted	18
	Total number of students participating in OECD PISA	This indicator provides information about the number of students as a percentage of the total population who on the basis of their test results at best attain proficiency level 1 on the relevant PISA scale. It can be assumed that low proficiency levels in these three basic skills results in significant disadvantages in personal and social life.	OECD PISA	Inverted; national target	19
				Inverted; national target	20
				Inverted; national target	21
	Total number of students participating in OECD PISA	This indicator shows the distribution of school performance upwards, i.e. the share of students with very good results.	OECD PISA		22
					23
					24
	All individuals between the ages of 20 and 34 who graduated from an educational programme of at least secondary level II and who left the general education and vocational education system no more than three years before the reference year	This indicator attempts to reflect the mismatch between training/education and the demands of the job market. It is an official target of the European Education and Training Strategy.	Eurostat	National target; as no time series is available, the prospect of goal achievement was calculated with the goal distance	25

Objective target of the strategy	Indicator to track target achievement	Abbreviation	Numerator
Educational System – Tertiary Education			
38% of 30 to 34-year-olds have a university degree in 2020	Share of 30 to 34-year-old university graduates in the 30 to 34-year age cohort.	University Graduates	Number of 30 to 34-year-olds with a graduation in the tertiary sector (ISCED 5-8)
		University Graduates (ISCED 6–8)	Number of 30 to 34-year-olds with a graduation in the tertiary sector (ISCED 6-8)
The conditions of study at universities should be fundamentally improved, which will require establishing new financing models for higher education.	Student-to-Staff ratio	Staff-Student ratio university	Number of student
Vision: universities, universities of applied sciences and non-university research institutions work within excellent framework conditions and are sufficiently financed to optimally perform their tasks in research and teaching.	Percentage of GDP spent on higher education	Percentage of GDP spent on higher education	Expenditure for the whole tertiary sector
	University expenditure per student	University expenditure per student	Expenditure for the whole tertiary sector
This is to guarantee universities, research institutions and companies a sufficient supply of highly-qualified researchers.	Number of researchers per 1,000 employees	Researchers	Researchers according to OECD Frascati definition
	Doctors in STEM subjects per 1,000 of the population	Doctors in STEM subjects	Doctors in STEM subjects
	STEM graduates per 1,000 of the population	STEM graduates	Graduates STEM fields
The reforms are aimed at balancing the gender imbalances in research.	Women researchers as a percentage of total researchers	Percentage of female researchers	Number of female researchers (OECD Frascati definition)
	Percentage of women in Science, Technology, Engineering and Mathematics (STEM)	Share of women in science	Number of female graduates in science
		Share of women in engineering	Number of female graduates in engineering
	Glass Ceiling Index (percentage of female professors relative to the percentage of female scientific and artistic staff)	Glass Ceiling Index EU	Percentage of female professors

	Denominator	Brief explanation of indicator	Source	Calculation information	ID No.
	30 to 34-year-olds	This is an Austrian Europe 2020 core indicator and reflects successful participation in tertiary education. With the adjustment in the ISCED classification, the two last age groups of BHS are now included in the tertiary sector (ISCED 5, formerly ISCED 4a).	Eurostat, Statistik Austria Mikrozensus	National target	26
		This indicator uses a closer definition for university graduates, essentially from bachelor level (ISCED 6, formerly ISCED 5).			27
	Academic staff at universities	The indicator shows the staff-to-student ratio at universities. It is calculated, wherever possible, on the basis of full-time equivalents.	OECD, Education at a Glance	Inverted	28
	GDP	Share of expenditure on tertiary education as a percentage of GDP as a measure for funding in an international comparison. The Federal Government has set a goal of 2% in the Government programme.	OECD, Education at a Glance	National target	29
	Number of students (ISCED 2011 6-8)	The indicator university expenditure per student complements the GDP rate by considering different dimensions of the tertiary sector in different countries. A tertiary sector with a 50 % graduation rate will ceteris paribus require considerably more funds than a sector with a 25% graduation rate.	OECD, Education at a Glance		30
	Total employment	The indicator shows the number of researchers relative to total employment, i.e. the researcher-intensity in employment.	OECD MSTI		31
	25 to 34-year-olds/1,000	Tertiary degrees ISCED 6 in the sciences and technological disciplines per 1,000 of the population aged 25 to 34	Eurostat		32
	Age cohort of 20 to 29 year-olds/1,000	Tertiary education in science and technology subjects (ISCED 5–8) per 1,000 people aged 20 to 29.	Eurostat		33
	Number of female researchers (OECD Frascati definition)	This indicator measures the number of women as a percentage of research staff	OECD MSTI		34
	STEM graduates science in total	This indicator measures the percentage of women among STEM graduates (ISCED 5–8), who are frequently integrated into technological innovation processes.	Eurostat		35
	STEM graduates engineering in total	This indicator measures the percentage of women among STEM graduates (ISCED 5–8), who are frequently integrated into technological innovation processes.	Eurostat		36
	Percentage of women among scientific staff	The indicator shows how likely it is that a woman makes the leap from scientific staff to a top position at university.	European Commission	Inverted	37

Objective target of the strategy	Indicator to track target achievement	Abbreviation	Numerator
Education System – Further Education/Skill Structure Migration			
Vision: The immigration of highly-skilled people will be encouraged and utilised.	Highly-qualified immigrants as a percentage of the foreign-born population	Highly-qualified immigrants	Foreign-born, highly-qualified workers residing in Austria
	Doctoral students from non-EU countries	Number of Doctoral candidates non-EU	Doctoral students from non-EU countries
To do this, the entire education system must be optimised – to models of lifelong learning.	Participation in lifelong learning	Lifelong-learning	Participants in measures for further education aged 25 to 64
Research at Universities and Non-University Research Institutions – Basic Research and Universities			
Increase investments in basic research by 2020 to the level of leading research nations.	Basic research expenditure as a percentage of GDP	Basic research expenditure as a percentage of GDP	Expenditure on basic research as defined by the OECD Frascati Manual
Strengthening of basic research through further structural reforms of the university system. Vision: Austria is a top location for research, technology and innovation, which offers optimum working conditions and career opportunities for excellent scientists. Excellent research is a matter of course in Austria.	Publication quality	Publication quality	Number of publications among the 10% most cited publications worldwide
	International co-publications	International co-publications	Number of scientific publications with at least one foreign co-author
	ERC Grants per inhabitants in million	ERC Grants per inhabitants	ERC Grants (Starting, Advanced and Consolidator Grants)
	Positioning of Austrian universities in international research rankings.	University ranking research performance	Number of Austrian universities in broad ranking groups (1-500) of international comparisons of research performance, weighted by ranking groups and relative to the population (currently only Leiden Ranking)

	Denominator	Brief explanation of indicator	Source	Calculation information	ID No.
	All foreign-born people residing in Austria	The indicator reflects the qualification structure of immigration. It comprises foreign-born people with residence permit and at least three-month duration of stay. A university degree is the qualification criterion.	OECD		38
	All doctoral students	Doctoral students from non-EU countries as a percentage of total doctoral students.	IUS Innovation Union Scoreboard		39
	Total population 25 to 64	Participation in lifelong learning is an official target of the ET 2020 Strategy (general and vocational learning)	Eurostat		40
	GDP	The Innovation Leaders are not used for comparative purposes, as only Denmark collects data on basic research. In this case, the reference countries are the five OECD countries with the highest level of basic research expenditure as a percentage of GDP for which data is available (most recent available year: 2010: Switzerland, South Korea, Denmark, France, USA)	OECD MSTI		41
	Total number of scientific publications	The indicator is a measure for the quality of scientific publications, i.e. the quality of research.	IUS Innovation Union Scoreboard		42
	Total population	International scientific co-publications can be interpreted as an indication of the quality of scientific research, since international co-operation normally increases scientific productivity.	IUS Innovation Union Scoreboard		43
	Total population in million	The indicator reflects the success in obtaining ERC funds, which are awarded only for international top research following a strict evaluation process. The indicator is calculated on the basis of the data published annually by the ERC.	ERC or OECD MSTI		44
	n. a.	The indicator shows how Austrian universities position themselves in terms of international research performance. It shows the number of Austrian universities in broad ranking groups (1-50, 51-100, 101-200, 201-300) in international university comparisons (currently only Leiden Ranking) relative to the size of the country (number of universities per 10 million inhabitants); the number of universities is weighted with the ranking groups (the better the ranking group, the higher the weighting). This indicator also shows whether a country has only a single leading institution or a broader range. Calculated on the basis of a new methodology, in 2015 the data from the University of Leiden resulted in a significant change over 2014.	Leiden Ranking		45

Objective target of the strategy	Indicator to track target achievement	Abbreviation	Numerator
Research at Universities and Non-University Research Institutions – Basic Research and Universities			
Reform university funding (more competitive and project-related, incl. cost coverage). The funding of university research through competitive external funding from the FWF needs to be reinforced.	Budget for funds to support basic research per academic researcher	Competitive funding	Budget for funds to support basic research per academic researcher
Vision: attractive scientific careers based on international models are a common standard at Austrian universities.	Percentage of doctoral students employed at university (uni:data)	Employed doctoral candidats	Doctoral students with an employment contract at university
Research and Innovation in the Corporate Sector – Innovation and Corporate Research			
Enhance domestic value creation by encouraging research intensive industries and knowledge intensive services.	Share of knowledge-intensive sectors in employment	Knowledge-intensity economy	Employment in knowledge-intensive sectors (sectors in which more than 33 % of the employed labour force have completed tertiary education)
	Share of medium level and advanced technology products in total export	Knowledge-intensity exports	Export of medium level and advanced technology products
	Innovation-intensive sectors as a share of total services exports	Knowledge-intensity service export	Export innovation-intensive service sectors
The structure of the manufacturing and service sectors has to be improved by increasing the innovation and knowledge-intensity of firms.	R&D quota in the corporate sector, adjusted by industry structure	R&D intensity business	Corporate-sector R&D spending,adjusted by the industry-specific R&D intensities
	Export quality in technology-orientated industries	Export quality	Exports of technology-orientated industries of material goods in the highest and middle price segment

	Denominator	Brief explanation of indicator	Source	Calculation information	ID No.
	Number of researchers in the university sector according to research statistics	As a rule, funds to finance basic research allocate their resources on a project basis following a competitive procedure. The budget per academic researcher is thus an indicator of the structure of university funding.	OECD MSTI, FWF		46
	Number of doctoral students	An employment contract while studying for a doctorate is standard international practice to ensure the attractiveness of careers in science. Doctoral programmes in science can last 3 to 6 years; during this period students who have not enrolled in a doctoral programme are already working. Without employment, careers in science are therefore hardly an attractive option compared to a career in industry.	Uni:Data	National target was used	47
	Total employment	The indicator shows the weight of employment in sectors, which employ many university graduates in an international comparison and are thus regarded as particularly knowledge-intensive.	IUS Innovation Union Scoreboard		48
	Total value of all exports	The indicator measures the contribution of medium and high technology products to the trade balance and can thus also be seen as a measure of the knowledge intensity of the export structure.	IUS Innovation Union Scoreboard		49
	Total exports of services without tourism	The indicator shows the export weight of service sectors with high innovation intensity and can thus also be seen as a measure of the knowledge intensity of the export structure. Due to the specific characteristics of Austria (Alps, cultural cities) tourism accounts for a far higher share of services exports in an international comparison. Thus this sector is not taken into consideration.	EBOP, WIFO-calculations		50
	Value creation in the corporate sector	The R&D intensity can be interpreted as a measure of knowledge intensity. However, the average R&D intensities vary greatly depending on the sector and an adjustment of the industry structure is necessary in order to make an internationally comparable statement on the R&D intensity of the corporate sector. Adjustments in the economic classification (NACE 1.1 to NACE 2) resulted in extensive changes in 2015 over 2014.	OECD, WIFO-calculations		51
	Total export of technology-orientated industries for material goods	Export quality can be interpreted as a measure to improve the product structure.	Eurostat, WIFO-Calculations		52

Objective target of the strategy	Indicator to track target achievement	Abbreviation	Numerator
Research and Innovation in the Corporate-Sector – Innovation and corporate research			
The number of firms that systematically conduct research and development should be increased between 2010 and 2013 by a total of 10% from 2,700 and by a total of 25% by 2020.	Increase in the number of companies conducting systematic research and development	R&D Performers	Number of companies in Austria conducting systematic research and development
Mobilise SMEs in research and innovation performance	Share of innovative SMEs	Innovative SMEs	SMEs with product or process innovation
Further increase Austria's attractiveness as a location for research and technology intensive firms.	Foreign-funded R&D	Foreign-funded R&D	R&D funding from abroad
	Share of foreign owners (applicants) of EPO patents with the participation of inventors residing in Austria	Foreign-owned patents	Number of patents with purely foreign applicants and at least one domestic inventor
Sustainable increase in the level of innovation in companies by increasing the share of innovations, which are new to the market	Share of innovations, which are new to the market as measured by the revenue they generate	Innovation revenue	Revenue produced by innovations, which are new to the market
Research and Innovation in the Corporate Sector – Cooperation between Science and Business			
We want to increase the co-operation intensity of Austrian firms and strengthen strategically-orientated collaboration between science and business (focus on excellence and sustainability).	Share of companies with innovation co-operation with universities/research institutions	Business-Science Links LCU	Companies with innovation co-operation with universities/research institutions
Reduce barriers to, and companies' (SMEs) fears about, co-operation with science/research	Share of SMEs with innovation co-operation with universities/research institutions	Business-ScienceLinks SMEs	SMEs with innovation co-operation universities/research institutions
More firms should expand their technology leadership and attain top positions in innovation	PCT applications relative to GDP	Technological significance of patents	Number of patents applications filed under the PCT, at international phase, designating the European Patent Office (EPO).

	Denominator	Brief explanation of indicator	Source	Calculation information	ID No.
	n. a.	Survey units engaged in R&D, by performance sector (co-operative research and in-house research subsumed)	Statistik Austria	National target	53
	Total number of SMEs	The indicator describes the share of SMEs with innovation activity, i.e. a measure of innovation breadth.	IUS Innovation Union Scoreboard		54
	Gross domestic expenditure on R&D	A disproportionately large share of research spending in Austria is financed from abroad. While this is an indication of Austria's quality as a location for research, it also increases the fragility of research activity in Austria. Thus, there is no need for continued growth in the share of foreign funding, at the same, however, a dramatic fall is also undesirable.	OECD MSTI		55
	Number of all patents with the participation of at least one domestic inventor	This indicator shows the control of foreign entities over inventions made by inventors living in Austria. Consequently it demonstrates the share of patents with at least one domestic inventor and where all applicants live abroad as a percentage of total patents owned by national inventors.	PATSTAT (Autumn 2015), WIFO calculation		56
	Companies' revenues	The indicator reflects the economic significance of innovations, which are not only new to the company, but also new to the market and are therefore particularly innovative. It is thus an impact indicator for innovation	Eurostat		57
	Total population of companies	This indicator reflects the intensity of co-operation between companies and science and research	Eurostat		58
	Total population of SMEs	This indicator reflects the co-operation intensity of SMEs with science and research	Eurostat		59
	GDP at PPS	The number of patent applications can be understood as an indicator of the number of innovations	IUS Innovation Union Scoreboard		60

Objective target of the strategy	Indicator to track target achievement	Abbreviation	Numerator
Research and Innovation in the Corporate Sector – Start-Ups and Venture Capital Financing			
Substantially increase the intensity of private equity and venture capital in the formation of technology-based, innovative firms.	Venture capital intensity (market statistics)	Venture capital intensity	Venture capital invested in Austria (also through foreign funds)
Number of knowledge- and research-intensive new start-ups should climb annually by an average of 3% until 2020.	Average annual growth in the number of knowledge and research-intensive start-ups.	Start-ups material goods	Number of knowledge and research-intensive business start-up (material goods)
		Start-ups services	Number of knowledge and research-intensive start-ups (services)
Starting a business should be made much easier and relieved of cost burdens.	Ranking with respect to start-up regulations in doing business	Start-up regulation	Ranking with respect to start-up regulations in doing business
Research and Innovation in the Corporate Sector – Innovation and Competition			
Stimulate innovation via an active competition policy. To do this, institutions that monitor competition should be strengthened.	OECD indicator Competition policy	Competition policy	OECD indicator Competition policy
Political Governance of the RTI System – Setting Priorities			
Strengthen Austria's competitiveness in a wide range of cross-cutting fields in science and technology by focusing activities on units of internationally competitive size. To do this, fields in which domestic science and business are strong should be taken into account. Special attention must be paid to the competences and potentials of Austrian firms that can help implement research results for overcoming the Grand Challenges.	PCT patent applications in fields of technology that are particularly important for societal challenges	Priority: Patents	PCT patent applications in selected technological fields (climate change mitigation and health)
Political Governance of the RTI System – Funding System and International Positioning			
Increased Austrian participation in European funding programmes, for example in the Research Framework Programmes or the European Structural Funds.	Returns ratio	Returns ratio	Austria's share in funding in the 7th framework programme/ Horizon 2020 (core framework programme)
	"Utilised capacity" (participation in Framework Programme based on researchers per country)	Participation in Framework Programme	Austrian participations as a share of total participations (EU 27)in the respective Framework Programme.

	Denominator	Brief explanation of indicator	Source	Calculation information	ID No.
	GDP	This indicator measures venture capital intensity on the basis of the total sums invested in Austria, also by foreign funds (market statistics).	AVCO, EVCA		61
	n. a.	This indicator measures start-up activity in knowledge and research-intensive sectors of the material goods industry.	Statistik Austria	National target	62
	n. a.	This indicator measures start-up activity in knowledge and research-intensive industries within the service sector.	Statistik Austria	National target	63
	n. a.	The indicator compares the regulatory framework for founding an LLC (GmbH) in the different countries based on the following four criteria: number of necessary administrative steps, time, costs (% GDP per capita) and minimum capital (% GDP per capita).	World Bank	Inverted	64
	n. a.	The indicator classifies a number of rules governing competition in terms of their propensity to facilitate competition.	OECD	Inverted, normalised; break in time series (2013)	65
	GDP in PPS	This indicator measures inventive activity in fields of technology that make an important contribution to overcoming two societal challenges (climate change and the ageing population, and health).	IUS Innovation Union Scoreboard		66
	Austria's contribution to the EU budget.	The indicator shows Austria's success at obtaining EU funding relative to its total EU budget contribution, i.e. whether Austria obtains an above or below-average return in research. An above-average return indicates that Austria receives a high proportion of European grants.	PROVISO		67
	Researchers/country as a share of total researchers EU 27	This indicator shows whether a country's involvement in the FP is above or below its theoretically available capacity (potential). The indicator is calculated over the period of the relevant Framework Programme as of the census date).	PROVISO		68

Objective target of the strategy	Indicator to track target achievement	Abbreviation	Numerator
Political Governance of the RTI System – To Society Research and Society			
A culture of appreciation for research, technology, and innovation, and an understanding of how this field makes an essential contribution to increasing the quality of life and societal prosperity	Attitude towards science (personal interest, economic benefits)	Personal interest in science	Share of people with a high to medium appreciation of science in different areas
		Economic benefits of science	
		Positive attitude toward science	
Financing Research, Technology and Innovation			
Increase research intensity by one percentage point, from 2.76% today to 3.76% in 2020.	R&D intensity	R&D intensity	Gross domestic expenditure on research and development
Of this investment amount, at least 66%, but 70% if possible, should come from the private-sector. To this end, firms should be stimulated on a broad front (including an improved regulatory situation and sufficient incentive structures) to perform more research and innovation. The number of firms conducting research and development should be increased.	Share of research funding provided by the private-sector	Private-sector R&D	R&D financing from non-governmental sources

	Denominator	Brief explanation of indicator	Source	Calculation information	ID No.
	All respondents	This indicator shows the public perception of science. The questions in the Special Eurobarometer were divided into two groups. One set of questions addressed the personal benefits of, or interest in, science and technology, the other, the benefits of science and technology for the economy.	Euro-barometer		69
					70
					71
	GDP	R&D Intensity: Gross domestic expenditure as a percentage of GDP	OECD MSTI, Statistik Austria	National target	72
	Total expenditure on R&D	The share of private-sector research funding is the share of total R&D spend that is financed by business enterprises.	OECD MSTI, Statistik Austria	National target	73

Appendix 2: Indicators' Raw Data

Indicator	Current Value AT	Current Value Inno. Lead.	Goal Distance	Growth AT	Growth Inno. Lead.	Productive Growth	Prospect of Goal Achievement	Time Series	ID
IUS Index	0.59	0.67	88	1.42	-0.13	2.46	95	2006-2015	1
GDP per Capita	130.00	120.50	108	-0.05	-0.20	-1.45	109	2000-2014	2
Employment-to-Population Ratio	74.20	76.68	97	0.28	0.26	0.82	97	2000-2014	3
Unemployment Rate	5.60	7.05	126	2.62	0.38	4.67	113	2000-2014	4
Better Life	6.99	8.07	87	-2.33	0.40	3.45	75	2012-2015	5
Healthy Life Years (F)	71.80	73.00	98	-0.26	-0.30	0.01	98	2004-2013	6
Healthy Life Years (M)	76.00	78.07	97	-0.04	-0.24	0.19	98	2004-2013	7
Greenhouse Gases	102.53	84.00	82	-0.02	-1.16	-2.81	82	2000-2013	8
Energy Intensity	4.62	5.29	115	-0.27	-1.35	0.61	106	2000-2013	9
Resource Productivity	1.71	1.73	99	1.60	0.83	1.07	103	2000-2014	10
Early Childhood Care	94.00	95.00	99	0.76	1.36	0.18	104	2000-2014	11
Teacher-Child Ratio Early Childhood	13.71	8.99	66	-2.55	-28.48	-13.67	43	2002-2013	12
Student-Teacher Ratio in Primary Education	11.90	15.23	128	-1.52	-1.42	2.12	129	2001-2013	13
Early School Leavers	7.00	9.50	136	-2.65	-1.53	5.22	159	2000-2014	14
Secondary School Graduates	43.53	55.00	79	1.27	n.a.	3.97	85	2000-2014	15
Early School Leavers Migrants	84.52	60.00	141	1.44	n.a.	-5.55	153	2011-2014	16
Inheritance of Education 1	42.01	36.90	88	-0.44	-0.72	-2.26	86	2000-2012	17
Inheritance of Education 2	15.29	11.71	77	-0.69	-1.84	-5.07	70	2000-2012	18
PISA Risk – Reading	19.49	15.00	77	2.42	0.97	-3.22	64	2000-2012	19
PISA Risk – Mathematics	18.65	15.00	80	-0.07	2.70	-2.69	81	2003-2012	20
PISA Risk – Science	15.78	15.00	95	-0.58	2.73	-0.63	100	2006-2012	21
PISA Top Students – Reading	5.52	8.94	62	-3.84	-2.15	4.09	53	2000-2012	22
PISA Top Students – Mathematics	14.29	12.67	113	0.00	-4.03	-4.35	143	2003-2012	23
PISA Top Students – Science	7.85	10.58	74	-3.90	-1.62	2.10	62	2006-2012	24
Skill Mismatch	89.20	82.00	109	n.a.	n.a.	-0.76	n.a.	2009	25
University Graduates	40.00	38.00	105	2.46	1.99	3.28	122	2004-2014	26
University Graduates (ISCED 6-8)	23.42	42.62	55	1.14	0.79	10.49	61	2004-2014	27
Supervisor-Student Ratio (University)	16.88	12.18	72	2.42	0.63	-3.94	64	2002-2013	28
University Expenditure Quota	1.47	2.00	73	2.87	0.74	3.96	92	2000-2012	29
University Expenditure per Student	15,641.03	19,682.24	79	3.09	4.82	7.85	70	2000-2012	30
Researchers	9.61	13.13	73	3.47	2.52	8.17	77	2002-2014	31
Doctorate Holders STEM	0.90	1.28	71	3.17	3.35	8.84	69	2000-2013	32
STEM Graduates	21.80	18.35	119	8.90	3.55	1.11	168	2000-2013	33
Share of Female Researchers	29.59	31.81	93	3.30	-0.37	0.67	120	2002-2013	34
Share of Women in Science	33.33	38.87	86	-0.42	0.02	2.25	83	2000-2013	35
Share of Women in Engineering	21.23	26.41	80	2.76	1.35	4.70	88	2000-2013	36
EU Glass Ceiling Index	1.76	1.57	89	-3.34	-2.77	-4.31	93	2004-2013	37

Indicator	Current Value AT	Current Value Inno. Lead.	Goal Distance	Growth AT	Growth Inno. Lead.	Productive Growth	Prospect of Goal Achievement	Time Series	ID
Highly-qualified Immigrants	19.22	25.93	74	2.58	0.93	5.47	82	2000-2013	38
Doctoral Candidates Non-EU	10.86	14.15	77	0.68	7.47	14.73	40	2008-2013	39
Lifelong Learning	14.20	23.40	61	3.91	2.83	11.75	65	2000-2014	40
Basic Research (expenditure as a percentage of GDP)	0.56	0.58	97	4.10	0.00	5.84	89	2002-2013	41
Publication Quality	11.05	12.61	88	0.77	0.64	1.87	89	2000-2009	42
International Co-publications	1,313.61	1,462.59	90	10.64	7.78	8.60	116	2000-2012	43
ERC Grants per Inhabitants in Million	2.46	2.49	99	7.96	12.53	14.66	70	2009-2014	44
University Ranking Research Performance	29.48	25.84	114	-2.30	2.46	0.39	83	2009-2013	45
Competitive Funding	24.77	54.73	45	6.96	6.73	22.13	45	2009-2014	46
Doctoral Candidates with Employment Contracts	27.95	100.00	28	4.83	n.a.	23.67	37	2010-2014	47
Knowledge Intensity Business	14.70	15.95	92	0.94	0.50	1.93	94	2008-2014	48
Knowledge Intensity Exports	57.04	51.39	111	0.33	-1.61	-2.61	120	2005-2014	49
Knowledge Intensity Service Exports	70.49	67.84	104	1.57	0.99	-0.28	112	2004-2014	50
R&D Intensity Industry	0.61	0.82	74	11.21	5.92	15.38	74	2008-2012	51
Export Quality	88.98	91.72	97	-0.23	-0.09	0.42	96	1999-2014	52
R&D Performers	3326	3375	99	5.01	n.a.	0.21	139	2002-2013	53
Innovative SMEs	37.46	44.48	84	-4.00	0.41	2.60	59	2006-2012	54
Foreign-funded R&D	15.25	12.36	123	-1.87	6.99	7.07	59	2000-2014	55
Foreign-owned Patents	26.55	19.89	133	-0.47	1.85	-1.73	111	2000-2012	56
Innovation Revenue	7.30	10.00	73	0.60	-1.48	9.94	49	2004-2012	57
Business-Science Links LCU	50.60	50.67	100	4.29	-0.30	-0.29	143	2004-2012	58
Business-Science Links SMEs	25.20	24.80	102	7.81	0.22	-0.32	187	2004-2012	59
Patents' Technological Significance	5.06	7.17	71	2.31	-1.90	2.98	95	2000-2013	60
Venture Capital Intensity	0.09	0.35	25	-16.91	-8.37	16.00	14	2007-2014	61
Start-ups Material Goods	1.68	3.00	56	-11.06	n.a.	8.60	56	2010-2013	62
Start-ups Service Industry	-3.92	3.00	36	-314.44	n.a.	15.64	36	2010-2013	63
Start-up Regulation	106.00	46.25	44	4.07	4.62	-10.48	47	2006-2015	64
Competition Policy	0.35	0.13	38	-10.00	-6.51	-19.57	45	2003-2013	65
Priority Setting (Patents)	1.07	1.75	61	1.35	-0.30	6.12	69	2000-2012	66
Returns Ratio	126.32	115.60	109	1.63	0.49	0.43	107	2002-2014	67
Participation in FP	131.47	98.80	133	0.18	2.50	0.18	100	2012-2014	68
Personal Interest in Science	9.20	18.81	49	-24.06	-19.17	-8.61	27	2010-2013	69
Benefits of Science for the Economy	63.63	67.62	94	-2.16	-1.55	-0.59	89	2010-2013	70
Positive Attitude towards Science	44.52	61.90	72	2.37	-0.70	4.06	89	2010-2013	71
R&D Quota	2.99	3.76	79	3.10	0.60	4.70	93	2000-2015	72
Private-sector R&D	62.06	66.00	94	-0.12	n.a.	1.24	93	2000-2015	73

Goal Distance = actual value AT /actual value Innovation Leaders or actual value AT/target AT

Prospect of Goal Achievement = Value projected for Austria in 2020 relative to the national goal or the value projected for the Innovation Leaders in 2020

Appendix 3: Methodology and Explanatory Notes for Interpreting the Figures and Indicators

All the indicators used in this report are based on the explicit targets set out in the Austrian Government's RTI strategy. The indicators are depicted in Figures 1, 10, 11, 12, 14 and 17 according to their distance to the goal (**goal distance**) and their **goal achievement prospect**.

The goal distance on the horizontal axis indicates the Austrian actual value. It shows the relationship or the distance of the latest available Austrian value to the national goal set by the RTI strategy or the Education and Training 2020 Strategy.[67] If there is no national goal, the latest available average value of the current four innovation leaders Germany, Finland, Denmark and Sweden ("innovation leaders, actual value") is used.[68] This is because catching up with the innovation leaders has been defined as a priority objective in the RTI strategy.

All indicators are to be interpreted in the same way, i.e. values above 100 indicate that a goal has been achieved, values below 100 the distance to the goal. Values are normed as follows: The Austrian value is divided by the respective target value and multiplied by 100. If performance improvements are accompanied by a decline in the indicator values, e.g. the unemployment rate, the values are inverted, (i.e. target value in the numerator, Austrian value in the denominator) to maintain the interpretation "greater than or equal to 100 = goal achievement". The relevant indicators are shown in the List of indicators under the heading "calculation information". Values over 200 are capped at 200 in the diagrams. The goal distance provides information about the distance to the goal (i.e. about Austria's current performance) but not about the changes or the dynamics that are necessary for the goal to be achieved. Thus an indicator, which is currently just slightly below target, can deteriorate again as the result of a negative dynamic. In other words, it is not possible to predict the likelihood that a goal will be achieved by comparing goal distances only.

For this reason, the **goal achievement prospect** depicted on the vertical axis, was chosen as a second dimension of the indicator-based presentation. Depicting the value projected for Austria in 2020 – based on the average annual growth rates of the past statistical series (see Appendix 2) – relative to the target value for 2020, shows whether previous growth achieved for an indicator will suffice for target attainment. If no national target has been set, the projected value for 2020 (calculated on the basis of the average past growth rates)[69] is used instead of the innovation leaders' actual value.

A goal achievement prospect of over 100 signifies that the rate of growth achieved in the past was higher than would have been necessary to achieve the goal. The likelihood of achieving the goal in 2020 is therefore correspondingly high. If the value is below 100, the past dynamic indicates that the goal is unlikely to be achieved. Values over 200 are again capped at 200 in the diagrams.

It is important to stress that these calculations are based on past average growth rates. They are not therefore forecasts based on assumptions, but illustrate how the trend will develop in future, as-

67 At the suggestion of the then BMUKK, target values from the independent Education and Training 2020 Strategy were adopted for a number of indicators for the education system.

68 The term innovation leader refers to the countries in the EU classified as the innovation leaders by the Innovation Union Scoreboard (IUS) of the European Commission.

69 The underlying argument is that it is unlikely that the innovation leaders will stagnate at their current levels. Thus Austria's rank in the Innovation Union Scoreboard is always relative to that of other countries, i.e. it always takes into account the growth of all the other countries. Thus setting the target value at the innovation leaders' actual value would lead to excessively optimistic goal achievement prospects and might distort the assessment of which measures should be accorded priority.

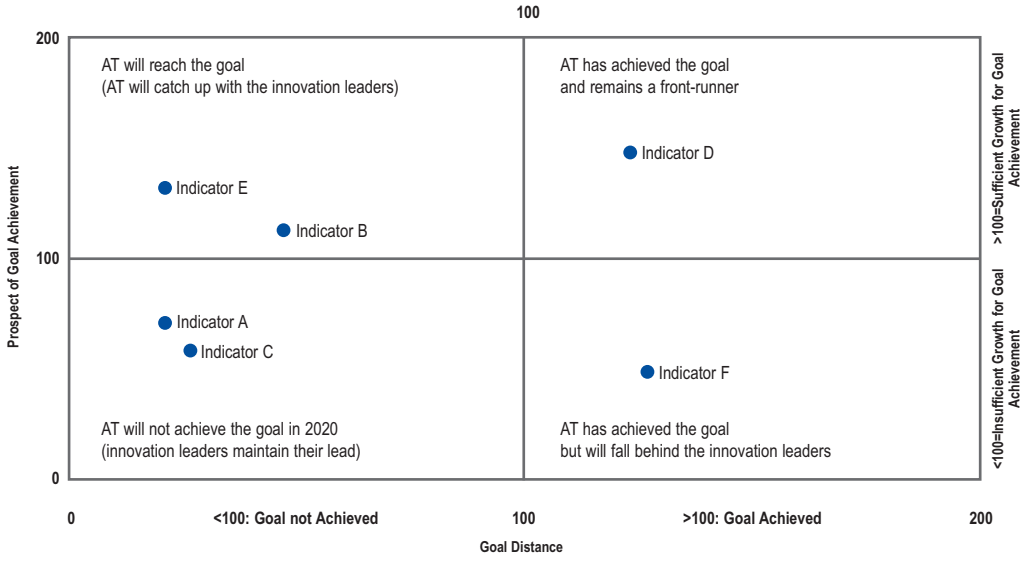
suming that things continue as in the past. The results will change in line with the rate of growth over the coming years and will be incorporated into the regular updates of the depictions. Like all calculations, they should be interpreted with caution, but they do at least provide a rough picture of the dynamics of the individual targets from which conclusions can be drawn regarding the priority fields of action.

The combination of goal distance and goal achievement prospect translates into a diagram comprising four areas, each with different implications (see Figure 21)

If an indicator is located in one of the two quadrants on the left, it means that the relevant goal has not yet been achieved. For indicators in the bottom-left quadrant this could remain the case due to low growth and a failure to take additional measures or intensify existing ones. Measures that are likely to improve indicator values in this area should therefore be accorded special priority. In the upper-left quadrant, continued development at the same rate as in the past could lead to the achievement of the goal, i.e. no further measures would be necessary, assuming that the trend continues to move in the same direction.[70]

Indicators in the two right-hand quadrants show that the relevant goals have already been achieved. Indicators in the upper-right quadrant will in all probability remain there due to the specific indicator's high level of growth, provided that the innovation leaders' growth remains within the expected limits. In the bottom-right quadrant, Austria's growth will not suffice to maintain its lead over the innovation leaders in the long term. The trends should therefore be monitored very closely so that timely counter measures can be taken if necessary.

Figure 21: Sample Illustration to Explain the Interpretation of the Indicators



Sources: see Appendix 1. Note: Goal Distance= Austria's actual value relative to the target value defined in the RTI Strategy or to the Innovation Leaders' actual value (average value most recent available year DE, DK, FI, SE); Prospect of Goal Achievement=Value projected for Austria in 2020 relative to the target value. Values over 200 cut off. Raw Data: see Appendix 2.

70 As the indicator sets are updated every year, changes in trends are captured in almost real time.

Appendix 4: Ranking of Indicators after Change in Goal Distance (GD) and Prospect of Goal Achievement (PGA)

ID	Indicator	Change in Value for RB 2015-2010 GD
23	PISA Top Students – Mathematics	29.80
21	PISA Risk – Science	23.40
63	Start-ups Service Industry	22.91
19	PISA Risk – Reading	22.57
14	Early School Leavers	21.26
20	PISA Risk – Mathematics	15.86
36	Share of Women in Engineering	12.46
26	University Graduates	11.65
53	R&D Performers	11.26
50	Knowledge Intensity Service Exports	9.61
1	IUS Index	9.08
60	Patents' Technological Significance	8.84
34	Share of Female Researchers	8.49
39	Doctoral Candidates Non-EU	7.52
17	Inheritance of Education 1	7.32
37	Glass Ceiling Index EU	7.20
38	Highly-qualified Immigrants	7.10
22	PISA Top Students – Reading	7.06
10	Resource Productivity	6.66
72	R&D Quota	6.65
15	Secondary School Graduates	6.60
71	Positive Attitude towards Science	6.52
13	Student-teacher Ratio in Primary Education	6.49
64	Start-up Regulation	6.43
41	Basic Research (expenditure as a percentage of GDP)	6.16
49	Knowledge Intensity Exports	5.86
35	Share of Women in Science	5.28
16	Early School Leavers Migrants	5.10
8	Greenhouse Gases	4.97
56	Foreign-Owned Patents	4.94
24	PISA Top Students – Science	4.92
2	GDP per Capita	4.18
47	Doctoral Candidates with Employment Contracts	4.09
51	R&D Intensity Industry	3.50
67	Returns Ratio	2.66
65	Competition Policy	2.48
46	Competitive Funding	2.25

ID	Indicator	Change in Value for RB 2015-2010 PGA
21	PISA Risk – Science	70.68
23	PISA Top Students – Mathematics	60.80
44	ERC Grants per Inhabitants in Million	53.95
51	R&D Intensity Industry	48.75
19	PISA Risk – Reading	38.49
20	PISA Risk – Mathematics	37.22
39	Doctoral Candidates Non-EU	35.69
24	PISA Top Students – Science	29.37
63	Start-Ups Service Industry	22.91
56	Foreign-Owned Patents	21.89
36	Share of Women in Engineering	20.91
14	Early School Leavers	18.82
50	Knowledge Intensity Service Exports	17.69
22	PISA Top Students – Reading	17.15
17	Inheritance of Education 1	16.36
37	EU Glass Ceiling Index	14.98
35	Share of Women in Science	12.41
64	Start-up Regulation	11.38
16	Early School Leavers Migrants	11.09
1	IUS Index	10.21
8	Greenhouse Gases	9.55
10	Resource Productivity	8.72
2	GDP Per Capita	7.02
26	University Graduates	6.30
15	Secondary School Graduates	6.05
38	Highly-qualified Immigrants	5.70
47	Doctoral Candidates with Employment Contracts	5.68
6	Healthy Life Years (F)	5.51
43	International Co-publications	5.31
7	Healthy Life Years (M)	5.11
49	Knowledge Intensity Exports	4.90
12	Teacher-child Ratio Early Childhood	2.71
9	Energy Intensity	2.56
34	Share of Female Researchers	1.19
52	Export Quality	0.76
28	Supervisor-Student Ratio (University)	0.68
42	Publication Quality	0.00

ID	Indicator	Change in Value for RB 2015-2010 GD
11	Early Childhood Care	2.00
48	Knowledge Intensity Business	1.02
31	Researchers	0.70
33	STEM Graduates	0.65
7	Healthy Life Years (M)	0.53
43	International Co-publications	0.45
42	Publication Quality	0.00
52	Export Quality	-0.16
6	Healthy Life Years (F)	-0.32
3	Employment-to-Population Ratio	-1.17
68	Participation in FP	-1.68
73	Private-Sector R&D	-1.71
70	Benefits of Science for the Economy	-1.75
30	University Expenditure per Student	-2.01
9	Energy Intensity	-2.19
12	Teacher-Child Ratio Early Childhood	-2.20
40	Lifelong Learning	-2.33
27	University Graduates (ISCED 6-8)	-2.55
66	Priority Setting (Patents)	-2.59
29	University Expenditure Quota	-2.71
28	Supervisor-Student Ratio (University)	-2.77
18	Inheritance of Education 2	-4.34
57	Innovation Revenue	-7.24
54	Innovative SMEs	-9.98
5	Better Life	-10.78
69	Personal Interest in Science	-11.23
58	Business-Science Links LCU	-13.33
32	Doctorate Holders STEM	-22.44
59	Business-Science Links SMEs	-23.20
62	Start-Ups Material Goods	-23.65
44	ERC Grants per Inhabitants in Million	-25.80
45	University Ranking Research Performance	-35.57
4	Unemployment Rate	-38.17
61	Venture Capital Intensity	-42.77
55	Foreign-Funded R&D	-144.93
25	Skill Mismatch	na

ID	Indicator	Change in Value for RB 2015-2010 PGA
30	University Expenditure per Student	-0.01
48	Knowledge Intensity Business	-1.63
11	Early Childhood Care	-2.02
13	Student-Teacher Ratio in Primary Education	-2.19
73	Private-Sector R&D	-2.25
3	Employment-to-Population Ratio	-2.47
54	Innovative SMEs	-2.95
31	Researchers	-3.34
18	Inheritance of Education 2	-3.43
60	Patents' Technological Significance	-3.58
27	University Graduates (ISCED 6-8)	-4.28
68	Participation in FP	-7.25
57	Innovation Revenue	-9.02
40	Lifelong Learning	-9.59
72	R&D Quota	-12.92
67	Returns Ratio	-14.05
66	Priority Setting (Patents)	-14.51
29	University Expenditure Quota	-18.75
41	Basic Research (expenditure as a percentage of GDP)	-22.40
62	Start-Ups Material Goods	-23.65
53	R&D Performers	-29.23
33	STEM Graduates	-31.82
58	Business-Science Links LCU	-42.23
46	Competitive Funding	-42.85
5	Better Life	-45.86
55	Foreign-Funded R&D	-47.10
32	Doctorate Holders STEM	-52.37
61	Venture Capital Intensity	-55.19
4	Unemployment Rate	-55.33
59	Business-Science Links SMEs	-100.00
45	University Ranking Research Performance	-100.00
71	Positive Attitude towards Science	n.a.
69	Personal Interest in Science	n.a.
65	Competition Policy	n.a.
70	Benefits of Science for the Economy	n.a.
25	Skill Mismatch	n.a.

Appendix 5: Indicators for the Global Innovation Monitor Including Raw Data

		Available Time Series
	Indicator	Austria
Economy, Society and Environment	Per Capita GDP at Purchasing Power Standards (PPS)	2000-2014
	Employment-to-Population Ratio	2000-2014
	Unemployment Rate	2000-2014
	Life Expectancy at Birth	2000-2013
	Efficiency Increase: Resource Productivity	2000-2013
	Efficiency Increase: Energy Intensity	2000-2014
Education	Teacher-Child Ratio Early Childhood	2002-2013
	University Expenditure per Student	2000-2012
	Average PISA Score – Reading	2000-2012
	Average PISA Score – Mathematics	2000-2012
	Average PISA Score – Science	2000-2012
	PISA Inheritance of Education	2000-2012
	University Graduates (Age Cohort 25-34 Years)	2000-2014
	STEM Graduates	2000-2013
	STEM Graduates – Women	2000-2013
University Research	University Ranking Research Performance	2009-2013
	University Expenditure for R&D/Population	2002-2014
	Basic Research (expenditure as a percentage of GDP)	2002-2013
Corporate Research	R&D Quota	2000-2014
	Private-Sector Research Funding Quota (financed by industry & abroad)	2000-2014
	Number of Researchers per 1,000 Employees	2002-2014
	PCT Patent Applications Relative to GDP	2000-2012
	Start-up Regulation	2006-2015

Available Time Series							
	China	Israel	South Korea	Netherlands	USA	Switzerland	Source
	2000-2013	2000-2014	2000-2014	2000-2014	2000-2014	2000-2014	OECD
	2000-2013	2000-2014	2000-2014	2000-2014	2000-2014	2005-2014	OECD, World Bank (Data for China)
	2000-2013	2000-2014	2000-2014	2000-2014	2000-2014	2010-2014	OECD, World Bank (Data for China)
	2000-2013	2000-2013	2000-2013	2000-2013	2000-2013	2000-2013	OECD
	2000-2013	2000-2013	2000-2013	2000-2013	2000-2013	2000-2013	IEA, Energy Balances, 2015 ed.
	2000-2013	2000-2014	2000-2014	2000-2014	2000-2014	2000-2014	IEA, Energy Balances, 2015 ed.
	2002-2013	2004-2012	2002-2012	2011-2013	2002-2013	2004-2013	OECD Education at a glance
	2007-2008	2000-2012	2000-2012	2000-2012	2000-2011	2000-2011	OECD Education at a glance
	2003-2012	2006-2012	2000-2012	2003-2012	2000-2012	2000-2012	OECD PISA
	2003-2012	2006-2012	2000-2012	2003-2012	2000-2012	2000-2012	OECD PISA
	2003-2012	2006-2012	2000-2012	2003-2012	2000-2012	2000-2012	OECD PISA
	2000-2012	2006-2012	2000-2012	2003-2012	2000-2012	2000-2012	OECD PISA
	2010-2014	2003-2014	2000-2014	2000-2014	2000-2014	2000-2014	OECD Education at a glance
	2003-2006	2000-2000	2000-2013	2000-2012	2000-2012	2000-2013	UNESCO
	2003-2006	2000-2000	2000-2013	2000-2012	2000-2012	2000-2013	UNESCO
	2009-2013	2009-2013	2009-2013	2009-2013	2009-2013	2009-2013	CWTS Leiden Ranking, WIFO Calculation
	2001-2014	2000-2014	2000-2014	2001-2014	2000-2013	2000-2012	OECD MSTI, World Bank
	2000-2014	2000-2013	2000-2014	2011-2013	2000-2013	2000-2012	OECD MSTI
	2000-2014	2000-2014	2000-2014	2000-2014	2000-2013	2000-2012	OECD MSTI
	2000-2014	2000-2013	2000-2014	2001-2014	2010-2013	2000-2012	OECD MSTI, WIFO Calculation
	2000-2014	2011-2012	2000-2014	2000-2014	2000-2012	2000-2012	OECD MSTI
	2000-2012	2000-2012	2000-2012	2000-2012	2000-2012	2000-2012	OECD
	2006-2015	2006-2015	2006-2015	2006-2015	2006-2015	2006-2015	World Bank

Appendix 6: Methodology and Notes for Interpreting the Figures and Indicators from the Global Innovation Monitor

The diagrams in the Global Innovation Monitor provide an overview of the trends in selected countries in the areas of economic performance, society and the environment, education, university research, corporate research and research financing. In each case, Austria (AT) is used as the reference point. The calculation of the distance to AT (x-axis) and the development dynamic (y-axis) are normed to Austria (=100). Those countries that currently have a better rating than Austria are shown to the right of 100. Those countries with a y-axis value >100 are developing more dynamically than Austria and are thus reducing their distance to Austria or cannot be overtaken by Austria.

List of Abbreviations

AHS Secondary School of General Education

AIFMG Alternative Investment Fund Manager Act

AIT Austrian Institute of Technology

AltFG Alternative Financing Act

AMS Public Employment Service Austria

AplusB Academia plus Business

AWS Austria Wirtschaftsservice

BAKIP Federal Institute for Kindergarten Education

BBG Federal Procurement Agency

BFR Federal Fiscal Framework

BFRG Federal Fiscal Framework Act

BHS Third-level vocational school

BKA Federal Chancellery

BMASK Federal Ministry for Labour, Social Affairs and Consumer Protection

BMBF Federal Ministry of Education and Women's Affairs

BMF Federal Ministry of Finance

BMG Federal Ministry of Health

BMLFUW Federal Ministry of Agriculture, Forestry, Environment and Water Management

BMVIT Federal Ministry for Transport, Innovation and Technology

BMWFW Federal Ministry for Science, Research and Economic Affairs

BRIC Brazil, Russia, India, China

BWB Austrian Competition Authority

CEEPUS Central European Exchange Program for University Studies

CERN Conseil Européen pour la Recherche Nucléaire (European Organization for Nuclear Research)

CF Cohesion Fund

COMET Competence Centers for Excellent Technologies

CPI Consumer Price Index

CSR Corporate Social Responsibility

CWTS Centre for Science and Technology Studies

DEA Data Envelopment Analysis

DKs Doctoral Programmes

ERDF European Regional Development Fund

EAFRD European Agricultural Fund for Rural Development

EMFF European Maritime and Fisheries Funds

EPO European Patent Office

ERC European Research Council

ESF European Social Fund

ESFRI European Strategy Forum on Research Infrastructures

EU European Union

EStG Income Tax Act

EuVECA European Venture Capital Funds Regulation

EEA European Economic Area

FFG Austrian Research Promotion Agency

FP Framework Programme (EU research framework programme)

FTE Full-Time Equivalent

FWF Austrian Science Fund

GD Goal Distance

GDP Gross Domestic Product

GEM Global Entrepreneurship Monitor

GmbH Limited Liability Company

HAK Higher Commercial College

HTL Higher Technical Institute

IÖB Innovation-stimulating Public Procurement

IPR Intellectual Property Rights

ISCED International Standard Classification of Education

IUS Innovation Union Scoreboard

JITU Programme for the promotion of young innovative technology-oriented companies

KLI.EN Climate and Energy Fund

KSV Credit Protection Agency

LCU Leading Competence Units

PA Performance Agreement

NeuFÖG Start-up Promotion Act

NFFR National Eligibility Guidelines

NMS New Secondary School

OECD Organisation for Economic Co-operation and Development

ORF Österreichischer Rundfunk (Austrian Broadcasting Corporation)

OSTA Office of Science and Technology Austria

PCT Patent Cooperation Treaty

PEEK Programme for developing and exploring the arts

PGA Prospect of Goal Achievement

PISA Programme for International Student Assessment

R&D Research & Development

RRI Responsible Research and Innovation

RTI Research, Technology and Innovation

SBA Small Business Act

SBIR Small Business Innovation Research (SBIR)

SFB Special Research Area

SG State Governor (of an Austrian Bundesland)

SME Small and medium enterprises

SNF Swiss National Fund

STEM Science, Technology, Engineering and Mathematics

STRAT.AT Partnership agreement between Austrian and the European Commission 2014–2020

TU Technical University

WIFO Austrian Institute of Economic Research

WKO Austrian Federal Economic Chamber

WS Winter Semester

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