

Report on Austria's Scientific  
and Technological Capability  
**2012**



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preamble

In the cabinet presentation of 9 September 2010 on the appointment of the members of the Austrian Council for the new term of office, the Federal Government specified and extended the Council's tasks for research and technology development. One of these tasks is to draw up a yearly report on Austria's scientific and technological capability, which in future is to be submitted to Parliament together with the Research and Technology Report.

The Austrian Council will keep under continuous review the challenges that have to be overcome if Austria is to achieve the goal set by the Government of rising to join the ranks of the leading innovation nations. The Austrian Council sees its task as being to monitor developments in these areas and to assess their importance for the RTI system.

Finally, the Austrian Council will strategically monitor the implementation of the Government's RTI Strategy and evaluate the measures that have been put in place, as well as their goal orientation. The results will provide further evidence on which the report can draw.

The report has an independent structure of its own, but takes account of the structure of the RTI Strategy in order to facilitate a comparison between the key challenges and fields of action. The chapter "General Assessment of the Performance of the Austrian RTI System in an

International Comparison" examines the strengths and weaknesses of the domestic RTI system as seen by the Austrian Council. It is based upon national analyses and studies, as well as global ranking tables and international comparative data.

The chapter "Evaluation of the Implementation of the Objectives and Measures from the RTI Strategy" will analyse the implementation of the RTI strategy and subject it to a qualitative evaluation. In this chapter the Austrian Council assesses whether the implemented measures are suitable for achieving the objectives of the RTI Strategy and the Vision for Austria 2020. In addition, possible options for improving individual strategy elements are recommended. Finally, there will be a summative evaluation of the degree to which the measures have been implemented.

The next chapter evaluates elements that are not contained in the RTI Strategy, but which in the opinion of the Austrian Council are important for improving the performance of the Austrian RTI system. Here too, specific possibilities for optimisation will be identified and recommended.

The final chapter summarises what the Austrian Council considers to be the most urgent findings of the implementation monitoring and contains recommendations for the further development of the RTI Strategy and the RTI system.

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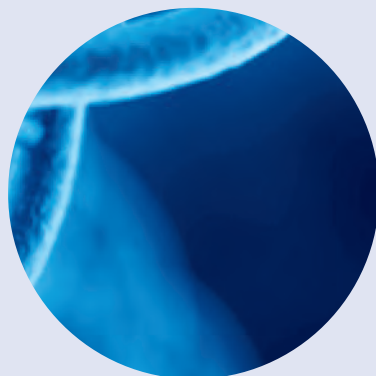
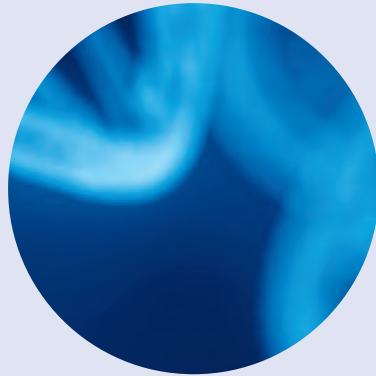
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General Assessment of the Performance  
of the Austrian RTI System in an International Comparison

**general  
assessment**

Austria's economic competitiveness has in the past decade improved in a number of areas. This is attributable above all to the dynamism of the many successful small and medium-sized companies, as well as to internationally competitive industry and tourist sectors. In the last ten years, Austria's economic

growth has been consistently above the EU average. Compared to other countries, Austria boasts a high rate of employment and rising levels of prosperity. In terms of per capita income, Austria is currently ranked fourth in the EU and in the top ten worldwide.<sup>1</sup> One reason for this positive development is that Austria has steadily increased its scientific

**Table 1: Comparison of Innovation Performance by Country**

	DIW	IUS <sup>2</sup>	EIU	BCG	ITIF	WEF	IMD	INSEAD
Switzerland	1	–	2	–	3	1	5	4
Singapore	2	–	16	1	1	3	3	7
Sweden	3	1	5	2	10	2	4	2
Germany	4	3	6	14	19	5	10	16
Finland	5	4	3	7	7	7	15	6
Netherlands	6	7	8	10	12	8	14	8
Norway	7	15	17	–	18	14	13	10
<b>Austria</b>	<b>8</b>	<b>8</b>	<b>12</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>18</b>	<b>21</b>
USA	9	–	4	6	8	4	1	11
Belgium	10	5	15	13	25	19	23	17
Canada	11	–	14	15	14	10	7	12
Taiwan	12	–	7	–	–	13	6	25
Denmark	13	2	10	4	11	9	12	5
France	14	11	13	11	20	15	29	22
United Kingdom	15	6	18	8	15	12	20	14
Australia	16	–	20	17	22	16	9	18
Ireland	17	10	19	12	5	29	24	19
South Korea	18	–	11	5	2	22	22	20
Japan	19	–	1	9	9	6	26	13
Spain	20	19	–	20	24	42	35	30
China	21	–	–	30	27	27	19	43
Italy	22	16	22	23	38	48	42	38
India	23	–	–	36	46	51	32	56
Russia	24	–	–	31	49	63	49	82
South Africa	25	–	–	–	34	54	51	54
Brazil	26	–	–	34	–	58	44	68
<b>Number of countries in the table</b>	<b>26</b>	<b>27</b>	<b>25</b>	<b>110</b>	<b>58</b>	<b>139</b>	<b>59</b>	<b>132</b>

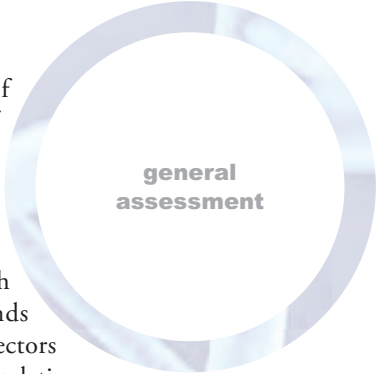
Source: Innovation Indicator 2011, based on: Proinno (Innovation Union Scoreboard)<sup>3</sup>, German Institute for Economic Research (DIW Innovation Indicator)<sup>4</sup>, Economist Intelligence Unit (EIU Innovation Ranking)<sup>5</sup>, Boston Consulting Group (BCG International Innovation Index)<sup>6</sup>, World Economic Forum (WEF Global Competitiveness Report)<sup>7</sup>, IMD World Competitiveness Center (IMD World Competitiveness Scoreboard)<sup>8</sup>, INSEAD (INSEAD Global Innovation Index)<sup>9</sup>, Information Technology and Innovation Foundation (ITIF Indicator)<sup>10</sup>

<sup>1</sup> Eurostat; IMF (2011): World Economic Outlook; Strategy for Research, Technology and Innovation of the Austrian Federal Government (hereafter abbreviated to Federal Government RTI Strategy), p. 4

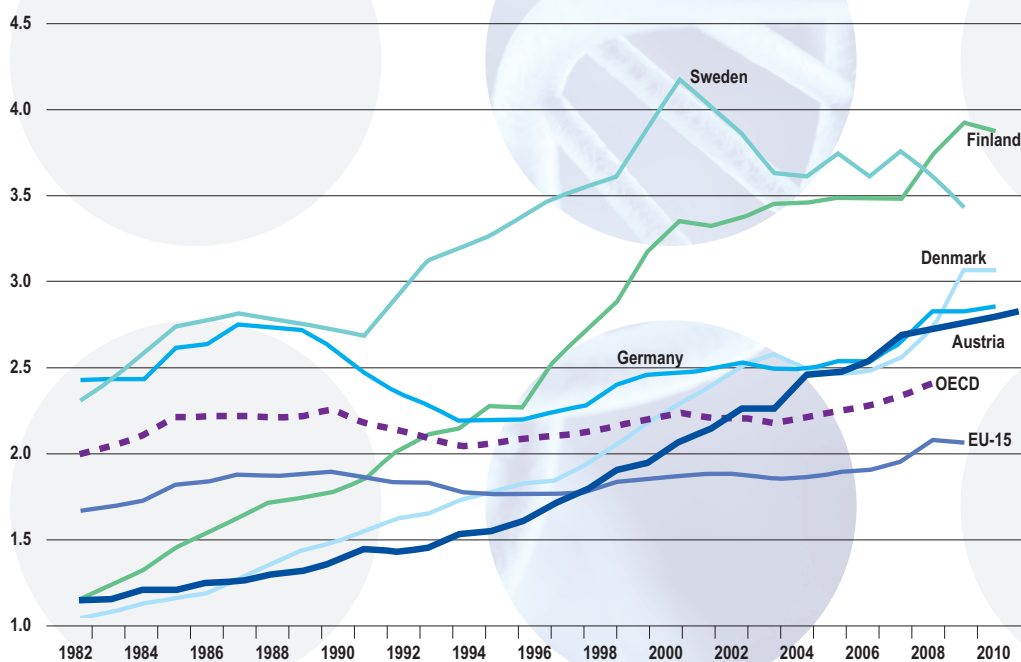
<sup>2</sup> EU-27 only

and technological capability since the 1980s. Numerous analyses confirm that the performance of the Austrian RTI system has been consistently improving. Yet it must be noted that this positive dynamic faltered in the crisis year in 2009 and has subsequently not been regained. A comparison of all relevant country rankings shows that Austria's development has been stagnating in the last three years. Today, Austria holds a good mid-table position (see Table 1). In order to compensate for the fre-

quently limited informative value of individual rankings a large number of comparisons have been used. The development dynamic of Austria's GERD as a percentage of GDP in the last two decades has been particularly impressive in international comparison, with a growing application of research funds (input) from the public and private sectors resulting in a rapid catching-up process relative to the rest of the OECD and the EU (see Fig. 1).



**Figure 1: Trajectory of GERD as a Percentage of GDP in an EU Comparison**



Source: OECD<sup>11</sup>

<sup>3</sup> [www.proinno-europe.eu/inno-metrics/page/ius-2011](http://www.proinno-europe.eu/inno-metrics/page/ius-2011)

<sup>4</sup> [www.innovationsindikator.de/.../Innovationsindikator\\_2011.pdf](http://www.innovationsindikator.de/.../Innovationsindikator_2011.pdf)

<sup>5</sup> [graphics.eiu.com/upload/portal/CiscoInnoSmallFile.pdf](http://graphics.eiu.com/upload/portal/CiscoInnoSmallFile.pdf)

<sup>6</sup> [www.bcg.com/media/PressReleaseDetails.aspx?id=tcm:12-8040](http://www.bcg.com/media/PressReleaseDetails.aspx?id=tcm:12-8040)

<sup>7</sup> [www.weforum.org/issues/global-competitiveness](http://www.weforum.org/issues/global-competitiveness)

<sup>8</sup> [www.imd.org/research/publications/wcy/index.cfm](http://www.imd.org/research/publications/wcy/index.cfm)

<sup>9</sup> [www.globalinnovationindex.org](http://www.globalinnovationindex.org)

<sup>10</sup> [www.itif.org/](http://www.itif.org/)

<sup>11</sup> 2008 is the last year when data was available from all countries. Source: OECD Main Science and Technology Indicators.



general  
assessment

Between 1999 and 2007 the annual growth of public R&D expenditure averaged 6.9 percent. As a result of the economic crisis, the Federal Government has since 2007 achieved a higher rate of growth (9.7 percent) than the corporate sector (2.5 percent) and thus now plays the leading role with regard to the development of R&D financing in Austria. Although this public sector engagement minimised the negative dynamics of total spending on research and development in 2009, it has not succeeded in restoring the dynamism lost in the previous three years. In 2012, R&D expenditure amounted to 2.8 percent of GDP, or EUR 8.6 billion, the second time that spending has exceeded the EUR 8 billion mark. Of this, EUR 2.9 billion, (–33 percent) were attributable to the Federal Government, EUR 0.4 billion (–5 percent) to the provinces and EUR 5.2 billion (–60 percent) to the corporate sector, with approximately EUR 1.3 billion of the latter (–16 percent) coming from abroad. By comparison, R&D spending in the leading innovation nations still remains higher.<sup>12</sup> At the same time, long-term structural problems within the Austrian RTI system are becoming evident. The Austrian RTI system has to date certainly met the demands placed on it. However, given the Government's objective of catching up with the leading innovation nations, it is becoming increasingly clear that the benefits of an imitative strategy (consistent with an Innovation Follower, i.e. a country playing

catch-up) have now largely been exhausted. Through its RTI Strategy, the Federal Government has presented the first milestone towards generating the strategic foundation to enable Austria to move from Innovation Follower to Innovation Leader. The priority objectives formulated in the RTI Strategy include growth, competitiveness, sustainability and problem-solving targets as well as a general innovation performance goal. To be specific, the objectives are as follows:

- Entry into the group of leading innovation nations in the EU by 2020
- Strengthening the competitiveness of Austria's economy
- Enhancing social prosperity
- Overcoming the major social and economic challenges of the future

Of course a mere year after publication of the RTI Strategy it is too early to definitively measure the achievement of the priority objectives. However, it is already possible to use a range of indicators to undertake a comparison of Austria's performance relative to the leading innovation nations. This makes it possible to identify the central challenges and provides a basis for developing appropriate measures.

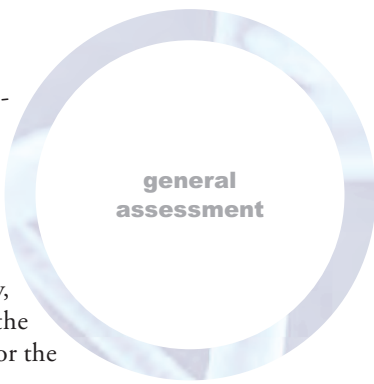
Economic development and competitiveness in an international comparison can be measured using indicators such as per capita gross domestic product (GDP) measured in purchasing power parity, the rate of unemployment and the rate of employment.<sup>13</sup> Alternative indicators for

<sup>12</sup> Sweden (2010): 3.42 percent, Finland (2010): 3.87 percent, Germany (2010): 2.82 percent, Denmark (2010): 3.06 percent

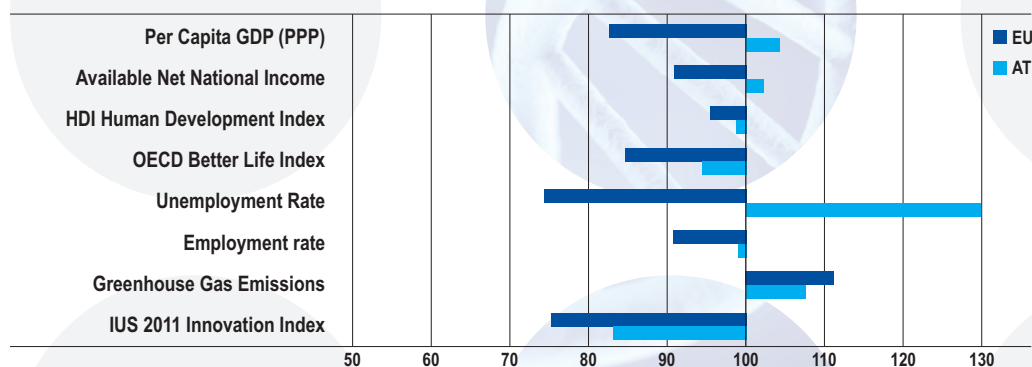
<sup>13</sup> According to WIFO the indicators for competition cited here try to provide as broad a picture possible of a country's economic performance. Classic economic policy or welfare theoretical target functions depict a country's prosperity level and indicators that reflect participation in this prosperity. A focus on the level of prosperity that does not take account of labour market indicators, such as the unemployment and employment rate, could provide a distorted view of an unbalanced economic performance. Other indicators such as the share of exports or labour unit costs only are related to welfare theoretical target functions to a limited extent. Furthermore, the share of exports is a poor indicator for international performance comparisons, because small, open economies almost always have a higher export share than do large ones. Moreover, the international fragmentation of the value creation chains limit the value of export shares as an indicator. The use of labour unit costs as an indicator for economic policy goals is also problematic. Due to measurement problems (above all in respect of deflators and measuring productivity) these are hard to calculate for levels, which is necessary if they are to be used as targets, and are therefore unsuitable for tracking absolute target figures.

measuring prosperity are available net national income (NNI)<sup>14</sup>, the UN Human Development Index (HDI)<sup>15</sup> and the OECD Better Life Index<sup>16</sup>. The OECD's Better Life Index and per capita greenhouse gas emissions are also used as indicators in connection with the mission focus of the RTI Strategy and the Grand Challenges.<sup>17</sup> Finally, Austria's general innovation performance in international comparison is depicted by reference to a composite indicator taken from the 2011 Innovation Union Scoreboard.

Acknowledging that every set of indicators will always have weaknesses, Figure 2 combines these performance indicators.<sup>18</sup> Figure 2 standardises at 100 the average of the highest-ranking countries in the Innovation Union Scoreboard, namely Denmark, Germany, Finland and Sweden and juxtaposes the score for Austria as well as the average for the EU-27.



**Figure 2: Austria's Performance in the Priority Objectives in Comparison (Innovation Leaders = 100), 2011 or most recent available year**



Source: Eurostat, UNO, OECD, WIFO, Innovation Union Scoreboard 2011

<sup>14</sup> Available NNI is a better yardstick for measuring economic prosperity, as it is adjusted for depreciation of assets and primary income or transfers from or to foreign countries (compare Scheiblecker, M. / Bock-Schappelwein, J. / Sinabell, F. (2011): A Cross-Country Comparison of Selected Results of an Extended Measurement of Prosperity. WIFO Monatsberichte, 2011, vol. 84, issue 11, pages 713–726).

<sup>15</sup> As well as per capita GDP, the UN's HDI also includes health (life expectancy) and education (university education) (compare UNO [2011]: Human Development Report: Sustainability and Equity: A Better Future for All).

<sup>16</sup> The Better Life Index measures eleven areas (Income, Health, Education, Environment, Jobs, Community, Civic Engagement, Life Satisfaction, Safety, Housing, Work-Life Balance) (compare <http://oecdbetterlifeindex.org/>).

<sup>17</sup> Kettner, C. / Kletzan-Slamanig, D. / Köppl, A. / Schinko, T. / Türk, A. (2011): ETCLIP – The Challenge of the European Carbon Market: Emission Trading, Carbon Leakage and Instruments to Stabilise the CO2 Price. Price Volatility in Carbon Markets: Why it Matters and How it Can be Managed. WIFO Working Papers, No. 409, November 2011

<sup>18</sup> Compare the summary of this discussion in the Austrian Research and Technology Report 2011, p. 29.

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In terms of the economic indicators, Austria is a leading performer, especially on the employment market. Only when it comes to alternative GDP indicators (HDI) and composite quality-of-life indicators (OECD Better Life Index) does Austria lag behind the Innovation Leaders.

In terms of innovation system performance, Austria trails relatively far behind the leading innovation nations. This suggests that Austria's success is not just attributable to innovation, but that other factors and sectors (e.g. tourism, location in the heart of Europe) are also of significance.<sup>19</sup> Were the significance of these other sectors to decline, there would be a corresponding increase in the importance of innovation performance.

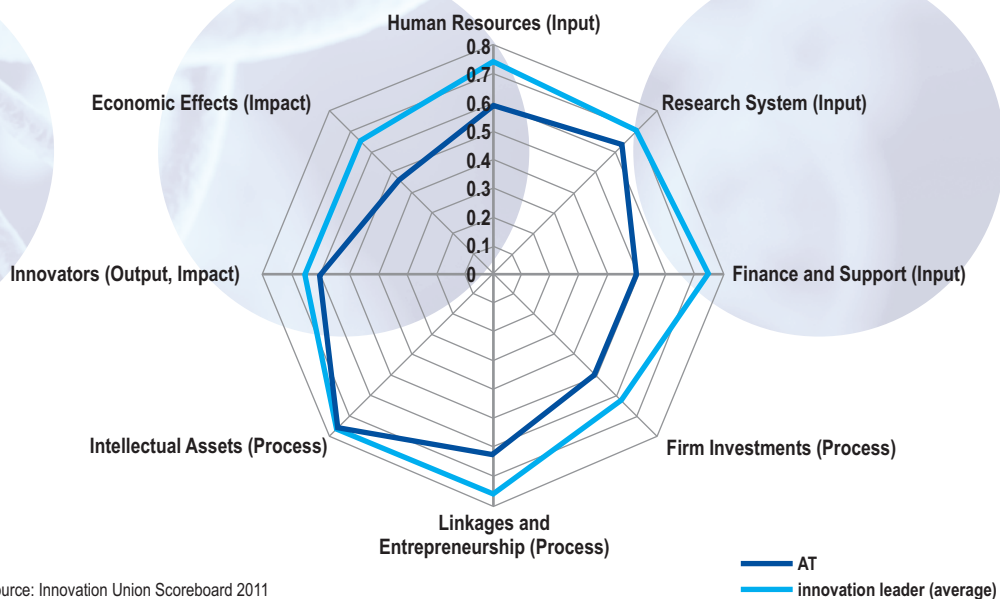
But it is particularly in respect of innovation performance that Austria has optimisation potential relative to the top players. Thus in the 2011

Innovation Union Scoreboard Austria has fallen from the sixth position<sup>20</sup>, which it had been able to hold for the two preceding years, to eighth place. This drop in the ranking is not due to any worsening of its own performance, but to the fact that its European competitors are evidently making faster progress. The Innovation Union Scoreboard rankings are always dependent upon the performance of other countries, which means that improvements in performance do not necessarily lead to a higher ranking if other countries improve at an even faster rate.

In sum, having caught up in the preceding decade, Austria is now stuck in the group of Innovation Followers. To be sure, the gaps within this group are relatively small, so the significance of year-on-year changes should not be overemphasised. By comparison, the gap to the group of Innovation Leaders is greater.

This is illustrated in Figure 3, which compares

**Figure 3: Austria's Position Relative to the Innovation Leaders in the Elements of the IUS by Structure of an Innovation Process**



Source: Innovation Union Scoreboard 2011

<sup>19</sup> Ederer, S. / Janger, J. (2010): Wachstums- und Beschäftigungspolitik in Österreich unter europäischen Rahmenbedingungen. Wien

<sup>20</sup> Due to new definitions in the 2011 IUS for the year 2010, Austria ranked 6th in 2010 instead of 7th.

Austria with the average of the Innovation Leaders in the individual areas. With the exception of intellectual assets such as patents, utility models or registered designs, there are still more or less significant gaps to the Innovation Leaders right across the different stages of innovation performance.

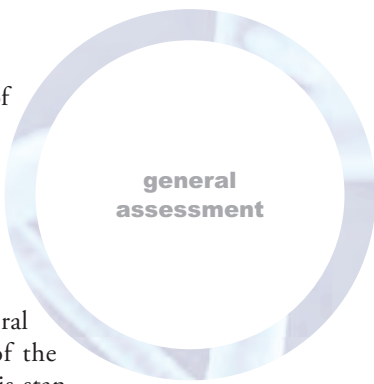
The Innovation Union Scoreboard mirrors the innovation performance of the overall system, one of the priority objectives. In due course, follow-up possibilities for the next level of goal attainment, the impact of innovation efforts on corporate and structural performance indicators, are to be shown. This involves evaluating the productivity, efficiency and effectiveness of innovation efforts.

Successful innovation efforts must impact either as an increase in innovation performance, knowledge intensity within companies or existing sectors (intersectoral structural change,

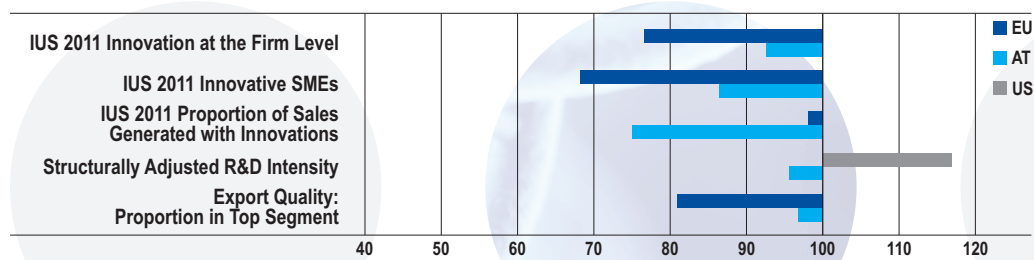
sectoral upgrading) or as a realignment of economic structure towards more knowledge-intensive sectors (intersectoral structural change). To obtain meaningful results for the economic success of innovation efforts, it is necessary to have indicators for both effects.

Figure 4 depicts the indicators for sectoral upgrading. Once again, the average of the Innovation Union Scoreboard leaders is standardised at 100 and the Austrian and the EU-27 averages, as well as the USA juxtaposed.<sup>21</sup>

The Innovation Union Scoreboard indicators are based on the Community Innovation Survey (CIS)<sup>22</sup> and are thus extremely volatile. Statistically more stable indicators such as the quality of exports in technology-oriented sectors or structurally adjusted R&D intensity show Austria to be only slightly behind the leading innovation countries.



**Figure 4: Impact Monitoring of Innovation: Indicators for Sectoral Upgrading**



Source: Innovation Union Scoreboard 2011, WIFO Calculations

<sup>21</sup> The USA is used as the benchmark for the indicator “Structurally Adjusted R&D Intensity” because the indicator cannot be calculated for the EU average.

<sup>22</sup> See <http://epu.eurostat.ec.europa.eu/portal/page/portal/microdata/cis>

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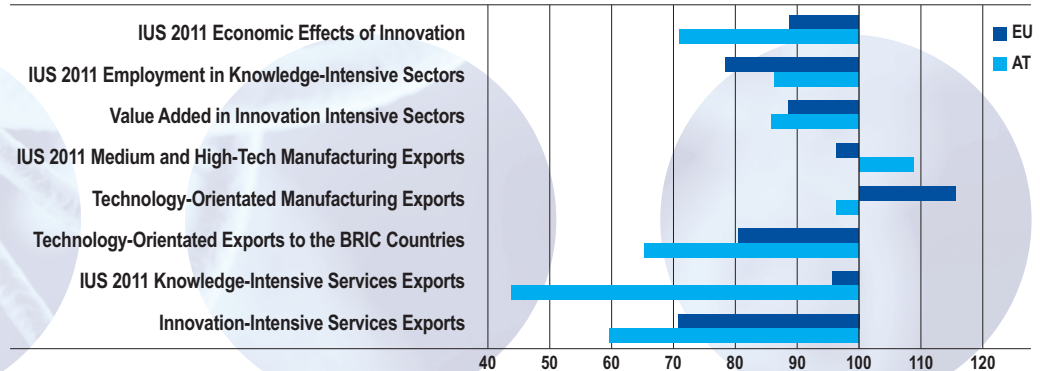
Figure 5 shows the indicators of structural change again comparing Austria and the EU relative to the Innovation Leader average (=100).

Here, Austria lies relatively far back on most indicators, the exception being technology-orientated manufacturing exports. However, the indicators do not take into account the actual content of the innovation activity. For example, Hungary, has an excellent Innovation Union Scoreboard ranking in respect of economic effects, yet a glance at the very low values for the sectoral upgrading indicators “Structurally-adjusted R&D Intensity” and “Export Quality”, demonstrates that Hungary is positioned in the production sector of the value creation chain and not in the research and innovation sector or the product development sector. Austria’s ratings are also massively

distorted by the high proportion of tourism in Services Exports (35 percent vs. 13 percent among leading innovation countries) and by the net technological performance balance. The latter is also negatively distorted by internal payment flows to the many foreign parent companies of Austrian firms.

Viewed in terms of structural change and sectoral upgrading, the impact effects of the innovation system can on the whole be regarded as a promising point of departure. Although there remains a performance deficit vis-à-vis the leading innovation countries, the Austrian Council takes the view that focused efforts to realise the objectives of the RTI Strategy 2020 offer Austria a realistic prospect of catching up to the leading innovation countries. This does however require a consistent and determined implementation of the measures contained in the RTI Strategy.

**Figure 5: Impact Monitoring of Innovation: Indicators for Structural Change**



Source: Innovation Union Scoreboard 2011, WIFO Calculations

## Strengths of the Austrian RTI System

- Above average growth in GERD as a percentage of GDP
- Selected university and non-university institutions with a high scientific reputation and excellent output
- Above average increase in output: Scientific publications and international co-publications
- Austrian research has a high degree of internationalisation
- Top scores for inventions, trademarks and utility models
- Strong cooperation between science and business

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### Above Average Growth in GERD as a Percentage of GDP

Between 2000 and 2008 the average annual growth rate of GERD as a percentage of GDP totalled 8.1 percent. This was higher than average in an international comparison, making Austria a leader in this regard. However, due to the global financial and economic crisis this growth decreased dramatically. Although the levels of

growth achieved before the crisis have not yet been regained, there is nevertheless a clear upward trend. Following the crisis year of 2009, growth rates of 6.7 percent, 3.5 percent and 4.2 percent were achieved in 2010, 2011 and 2012 respectively. The high level of public sector research support played a key role in this development.<sup>23</sup>

### Selected University and Non-University Institutes with a Good Scientific Reputation and Excellent Output

Overall, Austria has a host of university and non-university institutes which deliver an excellent performance in international comparison.

These institutions can boast a high scientific reputation and excellent output. This can be seen by the number of ERC grants that are obtained,

Figure 6: Approved ERC Grants According to Austrian Research Institutions<sup>24</sup>

	Advanced Grants	Starting Grants	Total
University of Vienna	7 (+1)	4 (+1)	11 (+2)
Austrian Academy of Sciences	4	5 (-1)	9 (-1)
Vienna University of Technology	2	2 (+1)	4 (+1)
University of Innsbruck	1	3	4
Institute of Science and Technology Austria (IST Austria)	3	0 (+1)	3 (+1)
Research Institute for Molecular Pathology	1	2	3
IIASA – International Institute for Applied Systems Analysis	1	1	2
Medical University of Innsbruck	1	1	2
University of Linz	1	0 (+1)	1 (+1)
Medical University of Vienna	–	1	1
Austrian Archaeological Institute	–	1	1
University of Natural Resources and Applied Life Sciences, Vienna	–	1	1
University of Graz	1	–	1
University of Klagenfurt	–	1	1
University of Veterinary Medicine Vienna	–	1	1
<b>Total</b>	<b>22 (+1)</b>	<b>23 (+3)</b>	<b>45 (+4)</b>

Note: The numbers in brackets represent those projects that have been added or removed because of portability (a change in host institutions during contract negotiations).

Source: European Research Council (ERC), 2011; processed by PROVISIO

<sup>23</sup> 23 Statistik Austria (2011): Globalschätzung

<sup>24</sup> Austrian Research and Technology Report 2011, p. 126

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the Wittgenstein Prizes that have been awarded as well as the level of participation in the European Research Framework Programmes (see Figure 6).<sup>25</sup> With a total of 45 ERC Starting und Advanced Grants, – i.e. 5.1 grants per million residents – Austria can boast a success rate akin to that of successful in-

novation nations such as Sweden, Denmark and Finland.

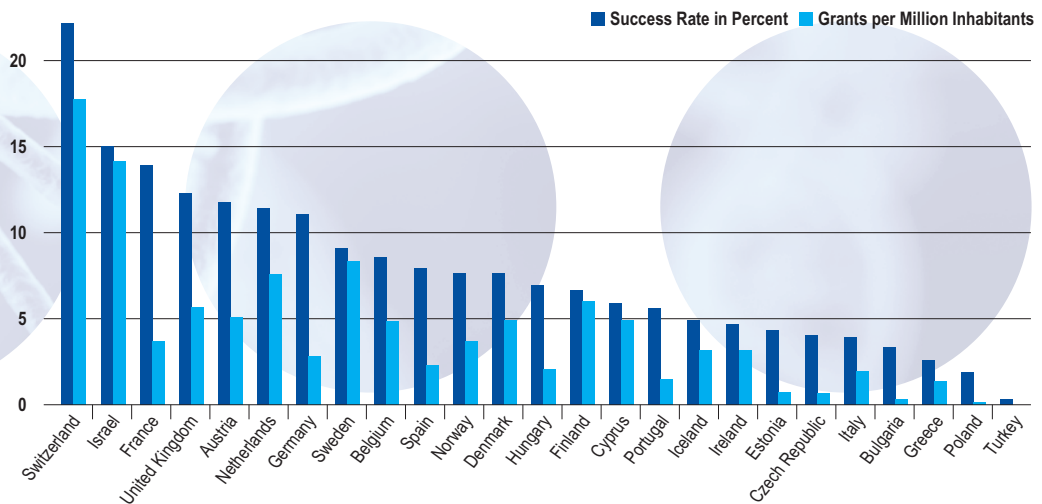
At least in respect of ERC grants, Austria's success rate is one of the highest in Europe (fourth place), which in view of the strict selection procedures can be considered proof of the quality and international competitiveness of Austria's research performance (see Figure 7).<sup>26</sup>

**Above Average Increase in Output:  
Scientific Publications and International Co-Publications**

Scientific publications are an important indicator of scientific output. In this respect Austria does comparatively well in international comparison. With average annual growth rates of 3.16 percent between 1995 and 2007, the growth in Austrian scientific publications in peer-reviewed journals was significantly above the global publication growth rate of 2.72 percent; within the

EU, Austria's growth rate was actually one of the highest.<sup>27</sup> The areas of medicine, mathematics, biology and computer sciences stand out in particular.<sup>28</sup> The proportion of Austrian scientists engaged in co-publications with partners abroad also increased markedly. In this regard Austria was able to significantly improve its position in the 2011 Innovation Union Scoreboard.<sup>29</sup>

**Figure 7: ERC Grants in an International Comparison by Success Rate**



Source: European Research Council (ERC), 2011

<sup>25</sup> Austrian Research and Technology Report 2011, p. 124 ff.

<sup>26</sup> Austrian Research and Technology Report 2011, p. 129 f.

<sup>27</sup> Austrian Research and Technology Report 2011, p. 114 f.

<sup>28</sup> Austrian Research and Technology Report 2011, p. 13, p. 115

<sup>29</sup> Innovation Union Scoreboard 2011, p. 27

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### Austrian Research has a High Degree of Internationalisation

Austrian research has a high degree of internationalisation. This is demonstrated not just by the high number of international co-publications, but also by a strong integration in the European Research Area. Some Austrian research institutions are excellently networked in the European Research Area, which is reflected in the large number of participations in EU projects (see Figure 8).<sup>30</sup>

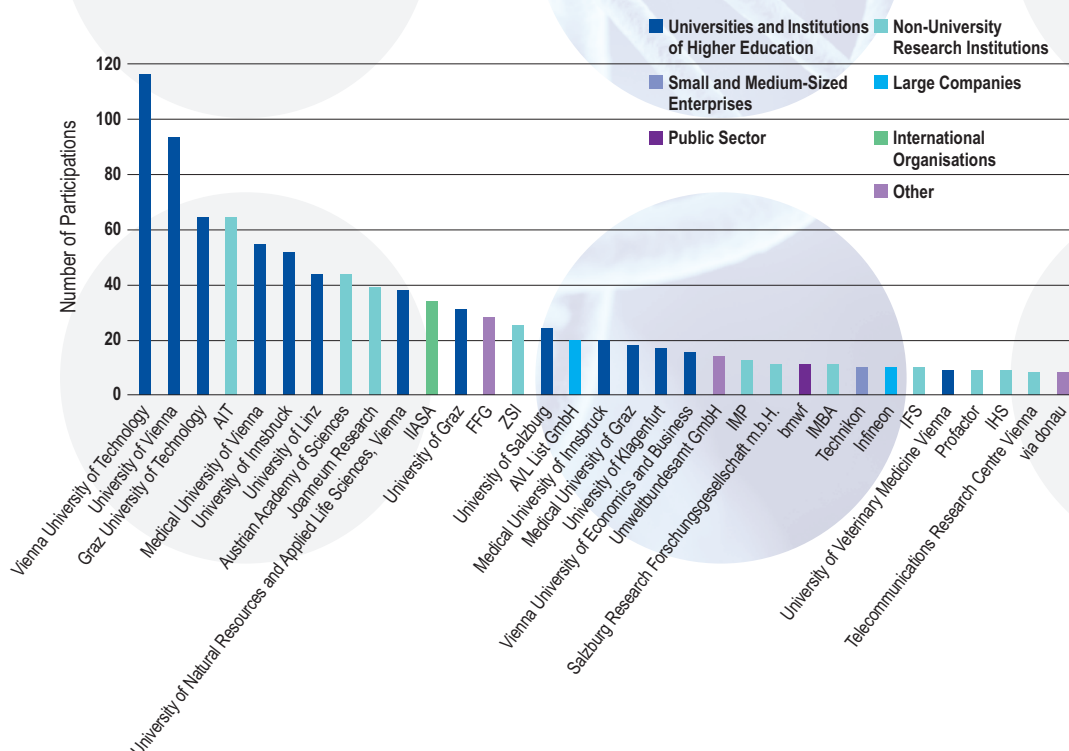
Measured against Austria's contribution to the EU budget, the return flow from EU Research Framework Programmes increased from 70 percent of the Austrian contribution in 1998 to 126 percent in 2010.<sup>31</sup> Overall, Austria took tenth place within the EU-27, with 2,095 approved participations.<sup>32</sup>

### Top Scores for Inventions, Trademarks and Utility Models

The protection afforded to intellectual property is one of the strengths of the Austrian innovation landscape. As demonstrated in the Innovation Union Scoreboard 2011<sup>33</sup>, the Austrian

innovation system is distinguished by its strong EU-wide trademarks. In terms of the number of Community Designs, Austria has been able to establish a lead over Germany, Switzerland

Figure 8: Austrian Participations in the 7th Framework Programme by Organisation Types



Source: Proviso Überblicksbericht November 2011

<sup>30</sup> Proviso Überblicksbericht November 2011, p. 33

<sup>31</sup> Austrian Research and Technology Report 2011, p. 229

<sup>32</sup> Proviso Überblicksbericht November 2011, p. 14

<sup>33</sup> Innovation Union Scoreboard 2011, p. 39 f.

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strengths**

and Denmark, and indeed at the head of the EU-27.<sup>34</sup> In respect of Community Trademarks Austrian has shown consistent improvement in recent years and now finds itself in the leading group, namely in 5th place. Trademarks are key innovation indicators, especially for the

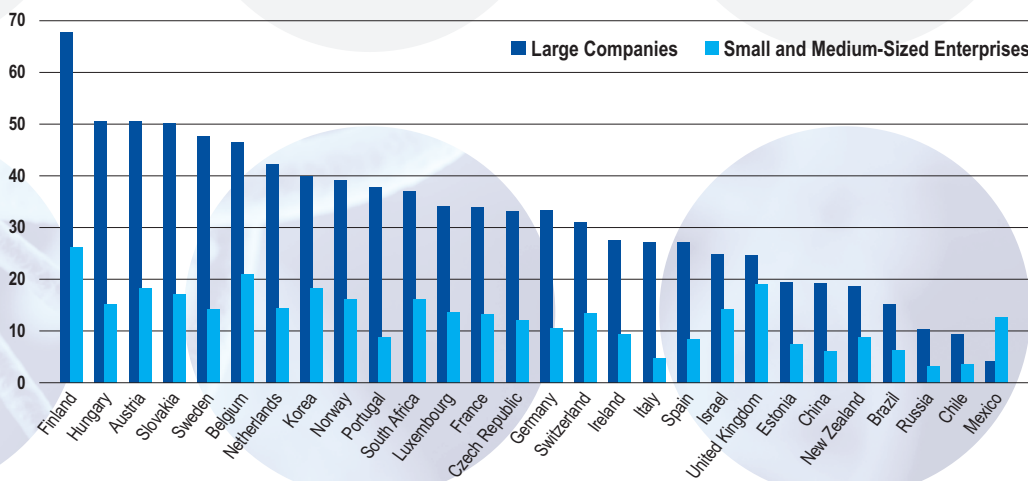
services sector. Austria also outperforms the EU average in respect of the number of international patent applications filed under the Patent Cooperation Treaty (PCT) – finding itself in 7th place, albeit behind the Innovation Leaders and in a slightly negative trend.<sup>35</sup>

**Strong Cooperation Between Science and Business**

Austria has been very well positioned in the area of cooperation between science and business for a number of years now. Specific funding instruments have enabled the development of an internationally respected and well functioning culture of cooperation. Compared internationally, Austria assumes a leading position in

respect of cooperation intensity (see Figure 9).<sup>36</sup> A further strengthening of cooperation between science and industry is a central factor for expanding the technological leadership in specific Austrian areas of strength and is also essential for Austria's entry into the group of leading innovation nations.

**Figure 9: Cooperation Intensity of Firms with Universities or Non-University Research Institutions (by Company Size in Percent)**



Source: OECD Science, Technology and Industry Scoreboard 2011<sup>37</sup>

<sup>34</sup> A Community Design is an industrial design right that confers upon its holder the exclusive right to use a design (colour, form, contours etc.).

<sup>35</sup> Innovation Union Scoreboard 2011, p. 37

<sup>36</sup> OECD (2011): Science, Technology and Industry Scoreboard 2011, p. 103

<sup>37</sup> Data based on Eurostat (CIS – Company Innovation Cooperations and SME Cooperations with Universities), June 2011

## Weaknesses of the Austrian RTI System

- **Educational system**
  - Low university access and graduation figures
  - High drop-out rate
  - Low proportion of graduates
  - Too few graduates in STEM subjects
- **Universities**
  - Insufficient coordination and planning in the tertiary education sector
  - Not an attractive destination country for researchers
  - Poor performance in international university league tables
  - Potential to improve research infrastructure
- **Companies**
  - Innovation performance and intersectoral structural change needs to be brought up to speed
  - Lack of risk capital
- **Governance**
  - Complex governance structures
  - Limited flexibility, coherence and steering capability of the funding system
  - Inadequately coordinated internationalisation strategy
  - Inadequate dialogue between science and society
- **Financing**
  - Funding quota not achieved, little private funding
  - Below average financing of education and universities
  - Inadequate financing of basic research

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assessment:  
weaknesses

### Educational system

#### Low University Entrance and Graduation Figures

Overall, higher education recruitment is rising too slowly to allow Austria to catch up with the leading nations. Even taking into account the different countries' classificatory systems, the overall picture in Austria is problematic. In 2009, university access in Austria comprised 54 percent (in 2008: 50 percent; in 2007: 42 percent): The OECD average is 59 percent, whilst that of leading innovation nations such as Sweden, Norway or Finland is about 70 percent. For its part, the graduation rate for Austria was only 29.3 percent, whilst the OECD-average is 38.6 percent and in Finland it stands at 44 percent.<sup>38</sup>

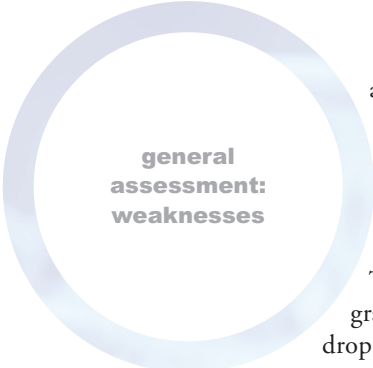
#### High Drop-Out Rate

In an international comparison, tertiary education in Austria is characterised by high drop-out rates. Although graduation rates have risen sharply as a result of the extension of university access – in the academic year 2009/2010 the success rate of full-time students at public universities comprised 76.8 percent –, it is still the case that too few of those who start to study actually complete their studies.<sup>39</sup> The high drop-out rates are attributable above all to unfulfilled expectations or programme related factors, i.e. those failing to complete did not come to terms with the “university system”, the supervisory situation (key word: over-subscribed subjects), or with the curriculum.<sup>40</sup> In

<sup>38</sup> BMWF (2011): Statistisches Taschenbuch, p. 111, p. 112

<sup>39</sup> BMWF (2011): Statistisches Taschenbuch, p. 67, p. 121; IHS (2009): Frühe Studienabbrüche an Universitäten in Österreich, Wien, p. 7

<sup>40</sup> IHS (2009): Frühe Studienabbrüche an Universitäten in Österreich, Wien, p. 170



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In addition, students from backgrounds that lack a tradition of higher education are disproportionately represented among those who drop out in the first three semesters.<sup>41</sup>

#### **Low Proportion of Graduates**

Together, the low university entrance and graduation rates combined with the high drop-out rate, results in a comparatively low proportion of graduates of 19 percent (defined as the proportion of 25 to 64 year old residents with a tertiary education award). This means that Austria lies well below the OECD-average of 30 percent.<sup>42</sup> This is mirrored in the comparatively low number of researchers. In 2009, the number of researchers per 1,000 workers in the labour force was 8.5 (in FTE). By comparison, the figures in leading innovation na-

tions like Finland and Sweden were 16.6 and 10.5 respectively.<sup>43</sup>

#### **Too Few Graduates in STEM Subjects**

The STEM subjects are of enormous importance for safeguarding and developing Austria as a business location. Surveys in the business and industry sectors repeatedly show significant demand for skilled labour from these disciplines. At the same time, the number of relevant graduates has for years been too low. This makes it increasingly difficult to find sufficient staff with qualifications in STEM subjects. Moreover, the proportion of women amongst STEM subject graduates is very low in international comparison. In 2008, women accounted for 34.7 percent of STEM subject graduates in Germany and Sweden; in Denmark the figure was 33.8 percent and in Finland still 33.1 percent, whilst in Austria it was only 28.5 percent.<sup>44</sup>

### **Universities**

#### **Inadequate Coordination and Planning in the Tertiary Education Sector**

In recent years, the various sectors of Austria's higher education system have in part developed separately, which has led to duplication and parallelisms.<sup>45</sup> The sectoral boundaries of the university system lack differentiation. This is especially true of the interfaces between univer-

sities and Fachhochschulen and teacher training colleges. The range of subjects and disciplines has in some areas resulted in unnecessary duplication. In 2009, the Austrian Science Council recommended a "careful streamlining" in those areas in which performance weaknesses are apparent.<sup>46</sup> The recently presented University Plan reflects long-standing demands for an overar-

<sup>41</sup> IHS (2010): Studierenden-Sozialerhebung 2009, p. 69 f.; compare IHS (2009): Frühe Studienabbrüche an Universitäten in Österreich, Wien, p. 169

<sup>42</sup> BMWF (2011): Statistisches Taschenbuch, p. 110. In this context it must be noted that due to differences in the education systems in the individual countries in the OECD, the figures are only partially comparable. Thus in Austria several vocational training programmes are traditionally offered by the non-university tertiary sector, while similar courses in other countries are included in the university sector (compare Statistik Austria [2012]: Bildung in Zahlen 2010/2011, p. 44). Fictitious calculations for the year 2007, which include exit awards from Secondary Technical and Vocational Colleges and nursing colleges in the tertiary sector (as is common in a number of OECD states) produced a fictitious proportion of graduates of 27 percent for Austria. Austria thus lies just slightly below the OECD average of 28 percent, but still way behind leading countries such as Finland and others (compare BMWF [2009]: Zahlen zur Entwicklung des Hochschulsektors. Unterlage für den „Dialog Hochschulpartnerschaft“, p. 11).

<sup>43</sup> OECD (2012): Country statistical profile: Austria 2011–2012; Country statistical profile: Finland 2011–2012; Country statistical profile: Sweden 2011–2012

<sup>44</sup> Institut der deutschen Wirtschaft (2011): MINT-Trendreport 2011, p. 28

<sup>45</sup> Austrian Science Council (2009): Universität Österreich 2025. Analysen und Ratsempfehlungen zur Entwicklung des österreichischen Hochschul- und Wissenschaftssystems, p. 39

<sup>46</sup> Austrian Science Council (2009): Universität Österreich 2025. Analysen und Ratsempfehlungen zur Entwicklung des österreichischen Hochschul- und Wissenschaftssystems, p. 33–70, p. 241 f.

ching university strategy for the whole tertiary sector. Yet it remains to be seen whether it can fulfil the high expectations. Overall, it is worth noting that the use of synergies is to be welcomed, but these must always be balanced against the inherent effects of reduced competition.

**Not an Attractive Destination Country for Researchers**

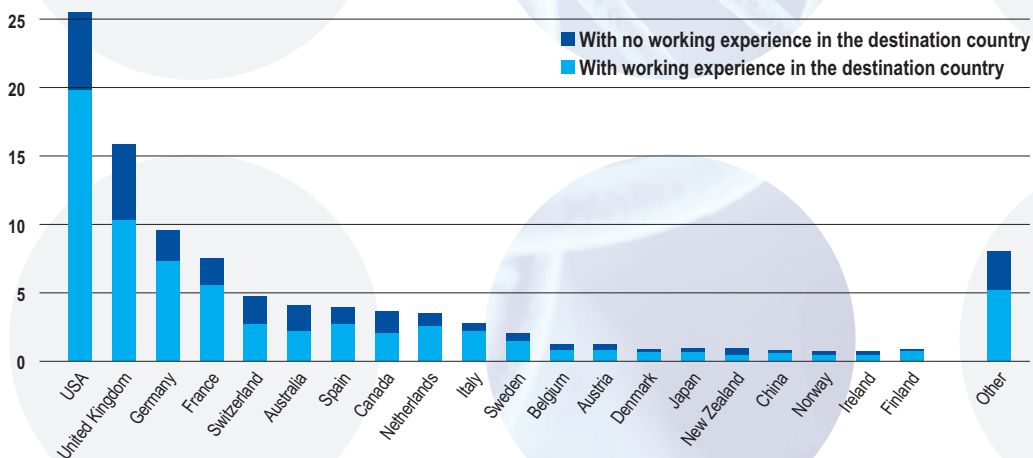
Austria is not a very attractive location for researchers. According to a WIFO study, Austria ranks 13th among the favourite countries for researchers (see Figure 10). According to the study, financial aspects play a relatively subordi-

nate role for researchers' mobility patterns. Significantly more important are the quality of the research environment, the potential for working together with leading experts, possibilities for career advancement and the available research infrastructure.<sup>47</sup>

An important indicator of limited attractiveness is the low number of doctoral candidates from non-EU countries.<sup>48</sup> Thus according to the BMWF's Statistical Yearbook, in the winter semester 2010/2011, the total number of non-EU junior researchers enrolled in doctoral programmes at Austrian universities was only 2,631.

**general assessment: weaknesses**

**Figure 10: The Most Attractive Destination Countries for Researchers**



Source: WIFO, 2011

<sup>47</sup> Reinstaller, A. / Stadler, I. / Unterlass, F. (2012): Die Arbeitskräftemobilität in der Hochschulforschung in der EU und in Österreich. WIFO-Monatsberichte, 2/2012, p. 105–119

<sup>48</sup> Aiginger, K. (2011): Horizonte der FTI-Politik: Wie bringt sich Österreich in Stellung? Präsentation bei der BMWF Europa Tagung 2011

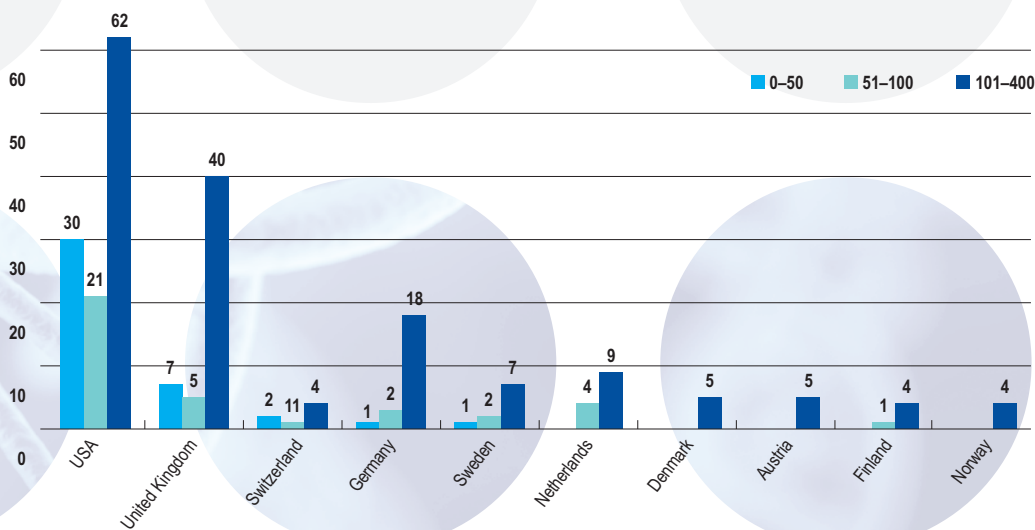
**general  
assessment:  
weaknesses**

**Poor Performance in International  
University League Tables**

Austrian universities fare badly in international rankings and have in recent years seen barely any improvement.<sup>49</sup> Austrian universities are located at best in the mid-field, predominately, however, in the lower mid-field of the world's 500 best universities. The countries with which Austria is typically compared each have at least one university in the Top 50 and two to three further universities in the Top 100, whilst none of Austria's five ranked universities makes it into the Top 100 (see Figure 11).<sup>50</sup> In the 2011 Times Higher Education Ranking, the University of Vienna achieved place 139 and

is thus the only Austrian university in the Top 200. Meanwhile, Switzerland boasts 3 universities in the Top 70. Germany and the Netherlands each have 12 universities in the Top 200.<sup>51</sup> In the 2011 Shanghai Ranking, the University of Vienna is again the only Austrian university located in the range between 151 and 200. By comparison, the Technical University of Munich was ranked 47th, the University of Munich and the University of Heidelberg were ranked in the Top 70, the ETH Zurich is ranked 23rd, the University of Zurich 56th.<sup>52</sup> Notwithstanding the methodological problems with these rankings, Austria's result is definitely too weak for a country that aspires to become an Innovation Leader.

**Figure 11: Ranking of Universities in the Leading Innovation Nations in Comparison to Austria**



Source: Times Higher Education Ranking 2011

<sup>49</sup> Despite a host of methodological problems – the Shanghai-Ranking ([www.arwu.org](http://www.arwu.org)), for example, emphasises science and technology subjects to the exclusion of all else, gives preference to large universities and discriminates against countries with strong non-university basic research, such as Germany and France – the university league tables arrive at very similar results in terms of rankings, including, for example, the bibliometrically demanding university table drawn up by the University of Leyden (<http://www.leidenranking.com/ranking.aspx>).

<sup>50</sup> The university league tables show the dominance of US research universities among the leading research universities in the world. The Shanghai league table ranks 34 US universities among the Top 50.

<sup>51</sup> World University Rankings 2011–2012 ([www.timeshighereducation.co.uk](http://www.timeshighereducation.co.uk))

<sup>52</sup> Academic Ranking of World Universities 2011 ([www.arwu.org](http://www.arwu.org))

### Potential to Improve Research Infrastructure

Austria undoubtedly possesses a respectable number of research infrastructures in the various subject areas. Compared to other research-intensive countries, however, there is only a lower than average presence of large-scale infrastructures of international significance. Moreover, the availability of sources of funding is

unsatisfactory; there is no funding programme targeted specifically at research infrastructure. Furthermore, the potential for cooperation that exists within the research infrastructures is far from being fulfilled and access for external user groups is rarely provided.<sup>53</sup>

general  
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weaknesses

### Companies

#### Innovation Performance and Intersectoral Structural Change Needs To Be Brought Up To Speed.

Structurally, Austria has a very narrow sector of companies engaged in research with very few enterprises taking part.<sup>54</sup> Research infrastructure is concentrated at just a few companies, especially multi-nationals.<sup>55</sup> Compared to the Innovation Leaders, Austria is characterised by a limited number of innovating SMEs. Start-up dynamics also remain weak in Austria.<sup>56</sup> In addition to financial aspects, it is above all the legal and regulatory framework, and lack of social recognition of enterprise within Austria that act as deterrents.

In terms of output, this is also reflected in economic effects, such as below average turnover from innovation, as well as the very slow progress of structural change toward more knowledge-intensive sectors. In respect of research-intensive services exports, Austria is thus located considerably below the EU-average at the bottom of the field, even allowing for the distortions arising from the tourism sector.<sup>57</sup> Overall, Austria does not achieve the performance of the leading innovation countries, measured for example, by reference to structurally-ad-

justed R&D intensity and export quality, or by structural change indicators such as value creation in knowledge-intensive sectors (see the chapter “General Assessment of the Performance of the RTI-System in an International Comparison”).

#### Lack of Risk Capital

The Austrian innovation system has considerable need for improvement in respect of framework conditions for innovation financing (e.g. venture capital and private equity).<sup>58</sup> Austria's risk capital market is underdeveloped, and this is attributable especially to the lack of an internationally competitive (legal) framework.<sup>59</sup> There is a lack of investors and appropriate funding structures. Venture capital and private equity are utilised above all for later stage businesses.<sup>60</sup> Early stage businesses are especially important for promoting innovation dynamics, but suffer from a lack of private financing and are instead predominantly reliant upon state support. Austria has a paucity of start-up finance and equity capital. This situation is exacerbated by the financial crisis and Basel III, and by the consequent reduced availability of

<sup>53</sup> Pock, H. et al. (2009): Erhebung österreichischer Forschungsinfrastruktur, p. 152–157

<sup>54</sup> Austrian Research and Technology Report 2010, p. 10

<sup>55</sup> Aiginger, K. (2011): Horizonte der FTI-Politik: Wie bringt sich Österreich in Stellung? Präsentation bei der BMWF Europa Tagung 2011


<sup>56</sup> WKÖ (2012): Start-ups in Austria 1993-2011, preliminary results

<sup>57</sup> Innovation Union Scoreboard 2011, p. 46

<sup>58</sup> Innovation Union Scoreboard 2011, p. 31, p. 68

<sup>59</sup> Machart, J. / Url, T. (2008): Hemmnisse für die Finanzierung von Frühphasen- oder Venture-Capital-Fonds in Österreich, WIFO/AVCO

<sup>60</sup> EVCA Yearbook 2011, p. 100



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assessment:  
weaknesses**

institutional borrowed capital. However, risk capital can of itself not resolve the financing problems of young businesses. Additional instruments, such as tax concessions for investments in start-

ups, would also be useful (see the remarks “Start-Ups and Risk Capital” in the sub-section “Utilising Knowledge” of the chapter “Assessment of the Implementation of Goals and Measures from the RTI Strategy”).

## **Governance**

### **Complex Governance Structures**

Various analyses and evaluations highlight weaknesses in the governance structures, which hinder the strategic repositioning of the Austrian RTI system.<sup>61</sup> Its causes have been identified as pillarised and insufficiently integrated political structures, which undermine a systemic perspective and make coordination of the overall system more difficult. The strategic demands of the individual institutions are inadequately coordinated, leading to delays and obstacles in operational processes. At least in part, the cooperative relations between ministries and agencies lack transparency.

The RTI Strategy constituted a response to this situation and the establishment of the RTI Task force, which is a direct result of the Federal Government’s RTI Strategy, took a significant step toward optimising processes of coordination and planning. Yet the complexity of the Austrian RTI system is considered by the Austrian Council to still result in attrition losses and reduced efficiency.

### **Limited Flexibility, Coherence, Steering Capability of the Funding System**

Notwithstanding the fact that by international standards, Austria’s funding system is financially well endowed and highly differentiated, its flexibility and adaptability is limited. There is still considerable scope for optimising its steer-

ing capability especially in respect of its targets and the substantive orientation of the funded innovation activities. The current impact of the funding system on corporate strategic R&D planning is limited.<sup>62</sup> The system of primary funding via programmes constitutes a rather narrow approach to innovation, which largely neglects the embedding of innovation in an overall context and its reciprocal relationship with other areas of the economic system. To be welcomed in this context is the departure from a purely natural science and technological concept of innovation and the inclusion of some service provision innovations. This development does justice to the current change towards a knowledge-based society and its associated economic reorganisation.

Overall, the individual direct funding measures frequently lack systemic coherence.<sup>63</sup> There is no overall perspective of the instruments used with regard to their joint contribution to the national innovation system and associated with this, a clear division of competence between the responsible ministries. In addition, too little account is taken of the reciprocal relations between direct and indirect funding. In particular, there is a limited understanding of the way in which indirect research funding operates. What is required is a more differentiated approach based on a more extensive analysis.

<sup>61</sup> System Evaluation (2009): Report 2: Strategische Governance – Der Zukunft von Forschung, Technologie und Innovation ihren Möglichkeitsraum geben, p. 16 ff.; System Evaluation (2009): Report 3: Governance in der FTI-Politik im Wechselspiel zwischen Ministerien und Agenturen; CREST (2008): Policy Mix Peer Reviews: Country Report – Austria, p. 6 ff.; Austrian Council for Research and Technology Development (2010): Strategy 2020, p. 68 ff.

<sup>62</sup> Janger, J., et al. (2010): Forschungs- und Innovationspolitik nach der Krise: Spitzenreiterstrategie trotz Budgetknappheit? Presentation on the RTI Strategy in Parliament on 12 October 2010

<sup>63</sup> Falk, R. (2011): Systemevaluation & die Weichen für Morgen. Presentation at the 1st Annual Conference of the Wissenschaftskonferenz Österreich on 11 March 2011

### **Inadequately Coordinated Internationalisation Strategy**

Austria is well integrated in the European Research Area, as shown, for example, by the number of international co-publications or successful participations of Austrian researchers and research institutions in the EU Framework Programmes. Yet, this is not based on any Austria-wide strategies, but on the very successful initiatives and projects of individual research institutions. The system evaluation also identifies a particular need for action here: There must be a shift from a mentality based on programme return flows toward strategically co-shaping relevant areas.<sup>64</sup> For this, Austria still lacks a coherent participation strategy that would allow it to optimise the opportunities offered by the European Research Area and incorporate Austrian interests with specific goals in mind.<sup>65</sup> There is also considerable potential to extend strategic cooperation with countries outside the European Union and this demands coordinated action. In this context, account must be taken of the growing importance of the whole Asian region, and also Africa. This requires a long-term perspective.

### **Financing**

#### **Funding Quota Not Achieved, Little Private Funding**

The Government's goal of achieving a GERD-to-GDP target of 4 percent by 2020 has been dropped. The RTI Strategy revised the target to 3.76 percent, but in view of the financial situation it is not even certain whether the revised target can be realised. To achieve a GERD-to-GDP target of 3.76 percent in 2020, it would be necessary for R&D-expenditure (assuming annual

### **Inadequate Dialogue Between Science and Society**

Surveys and studies repeatedly demonstrate the Austrian population's relatively low awareness of science and research.<sup>66</sup> In addition to further causal factors such as the low proportion of graduates, this is attributable not least to the fact that science communication in general, and participatory discussion and engagement formats in particular, is markedly underdeveloped in Austria when compared to other European countries. An analysis of the programme formats of public broadcasters also reveals a massive deficit compared to the other German-speaking countries.<sup>67</sup> The success of the Long Night of Research shows a strong interest in science communication on the part of both the research community and the general public. This event helps address the often-voiced demand for dialogue with the public, but it is necessary to create an extended engagement with science and research via additional, more extensive formats that extend across different ministries.

(nominal) GDP growth of 3.4 percent) to rise by about 6.5 percent per annum from 2011 to 2020.<sup>68</sup> Austria is far away from its goal that by 2020, at least 66, if not 70 percent, of total research funding should come from the private sector. In 2012 private funding accounted for 60.2 percent of total spending on research. It is also worth noting that the share of private funding of the tertiary educational sector and basic research is lower than that of leading innovation nations.

**general  
assessment:  
weaknesses**


<sup>64</sup> System Evaluation (2009): Kurzzusammenfassung des Endberichts, Pos. 15

<sup>65</sup> Federal Government RTI Strategy, p. 40

<sup>66</sup> European Commission (2010): Special Eurobarometer 340: Science and Technology

<sup>67</sup> Woelke, J. (2010): Berichterstattung über Wissenschaft, Technologie, Forschung und Entwicklung in österreichischen Fernsehvollprogrammen


<sup>68</sup> WIFO (2011): Forschungsquotenziele 2020



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assessment:  
weaknesses**

In order to catch up with the most innovative research nations, this faltering dynamic needs to be accelerated. Comparable countries such as Switzerland (3.01 percent) or Sweden (3.75 percent) already have a significantly higher GERD-to-GDP ratio and also a higher rate of corporate R&D spending than Austria.<sup>69</sup> When one adjusts the figures for industrial structure, R&D spending in the business sector is 0.1 percent lower than in the USA and Japan and 0.6 percent lower than in Sweden and Denmark. Nor should we underestimate the immense efforts that China and India are making to develop research.

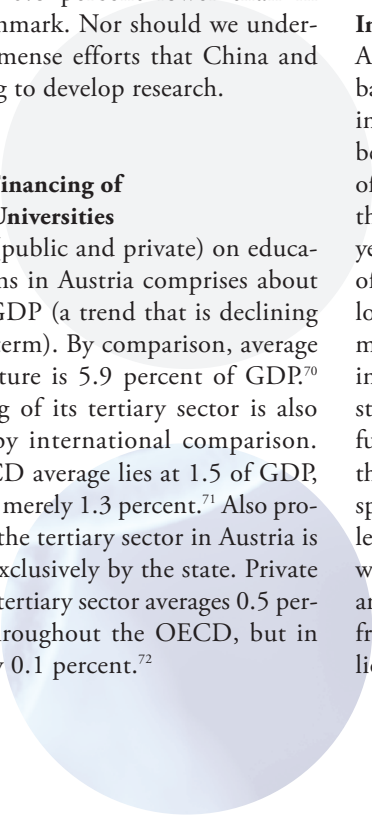
**Below Average Financing of  
Education and Universities**



Total spending (public and private) on educational institutions in Austria comprises about 5.4 percent of GDP (a trend that is declining in the medium term). By comparison, average OECD expenditure is 5.9 percent of GDP.<sup>70</sup> Austria's funding of its tertiary sector is also below average by international comparison. Whilst the OECD average lies at 1.5 of GDP, that of Austria is merely 1.3 percent.<sup>71</sup> Also problematic is that the tertiary sector in Austria is funded almost exclusively by the state. Private financing of the tertiary sector averages 0.5 percent of GDP throughout the OECD, but in Austria is merely 0.1 percent.<sup>72</sup>

Important successes such as the so-called “university billion” cannot negate the fact that Austrian universities have for years been suffering from inadequate funding.<sup>73</sup> Austria remains far removed from the goal of spending 2 percent of GDP on the tertiary sector. There is no binding budget commitment. The precarious financial situation is exacerbated by the absence of a systematic system for managing access and of structural reform of university governance structures.

**Inadequate Financing of Basic Research**



At around 0.53 percent of GDP, the funding of basic research in Austria is lower than in leading innovation nations and in important OECD benchmark countries.<sup>74</sup> Although the trajectory of expenditure for basic research has been above that of total R&D expenditure in the last ten years, spending on basic research as a proportion of total R&D expenditure remains relatively low. Moreover, this share has only increased marginally since 2002. It is for this reason that in its contribution to the discussion about the strategic reorientation of the structure of R&D funding and expenditure, the WIFO pointed to the option of increasing the proportion of GDP spent on basic research.<sup>75</sup> To catch up with the leading countries, expenditure on basic research would have to increase by about 10 percent per annum from 2011 onwards (in absolute terms from EUR 1.6 billion in 2011 to EUR 2.4 billion in 2015).<sup>76</sup>

<sup>69</sup> OECD (2011): Science, Technology and Innovation Scoreboard 2011

<sup>70</sup> OECD (2011): Education at a Glance 2011, p. 279

<sup>71</sup> OECD (2011): Education at a Glance 2011, p. 279

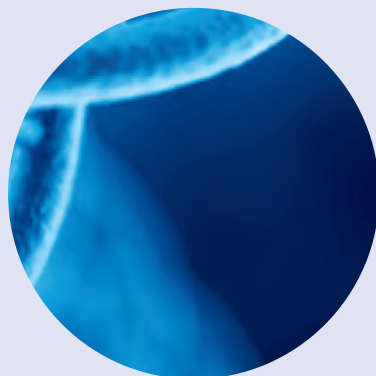
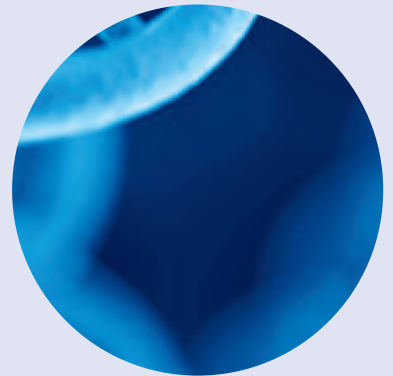
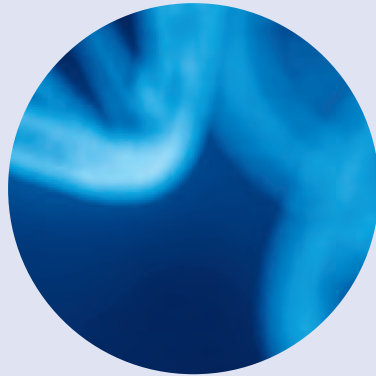
<sup>72</sup> OECD (2011): Education at a Glance 2011, p. 280

<sup>73</sup> Austrian Science Council (2009): Universität Österreich 2025. Analysen und Ratsempfehlungen zur Entwicklung des österreichischen Hochschul- und Wissenschaftssystems, p. 239

<sup>74</sup> Federal Government RTT Strategy, p. 8

<sup>75</sup> WIFO (2011): Forschungsquotenziele 2020, S. 9; compare Austrian Research and Technology Report 2011, p. 27

<sup>76</sup> WIFO (2011): Forschungsquotenziele 2020



Evaluation of the Implementation of the Goals  
and Measures of the RTI Strategy



evaluation  
of strategy  
implementation

## Overall Evaluation

On 8 March 2011, the Federal Government presented its RTI Strategy “Becoming an Innovation Leader: Realising Potentials, Increasing Dynamics, Creating the Future.” The Strategy document was jointly developed and discussed by the Austrian Federal Chancellery (BKA), the Ministry of Finance (BMF), the Ministry of Education, Art and Culture (BMUKK), the Ministry of Transport, Innovation and Technology (BMVIT), the Ministry of Science and Research (BMWRF) and the Ministry of Economic Affairs, Family and Youth (BMWFJ) before being approved by the cabinet.

In the RTI Strategy, the Government recognises that education, research, technology and innovation are essential preconditions for overcoming the challenges of tomorrow. The priority goals of the Strategy are as follows:

- “We want to continue developing the potentials of science, research, technology and innovation in Austria, to
  - ... make our country one of the most innovative in the EU by 2020, strengthening the competitiveness of our economy and increasing the prosperity of our society.
  - ... deal with the major societal and economic challenges of the future.”<sup>77</sup>

The part of Vision 2020, which corresponds to the priority goals, contains the following goal definition:

- “By 2020, Austria will be solidly established among the EU’s most innovative countries and considered one of Europe’s Innovation Leaders.”<sup>78</sup>

In the view of the Austrian Council, the Federal Government’s RTI Strategy is an important milestone for the future development of Austria as a centre of research, technology and innovation. The goals are ambitious. Their point of departure is on the one hand, the politically agreed goal, to position Austria in the group of Innovation Leaders. On the other hand, it is the global economic and financial crisis, which (given the lack of structural reform in administration, in the pension and the health systems), is currently manifesting itself in the form of restrictive budgets for areas that will significantly affect our future.

A glance at the most innovative countries of Europe and the world shows that almost all have binding strategy documents. It is therefore to be welcomed that the Federal Government has followed these international examples of good practice. Another positive aspect worth stressing is that the Austrian RTI Strategy is much more specific than many other internationally comparable documents.

A further positive fact is that the RTI Strategy represents agreement between six ministries. The joint elaboration and agreement of binding goals, as well as of support measures, is indicative of the considerable emphasis which the Federal Government places on education, research, technology and innovation. At present, however, the political intentions only inadequately correlate with what is politically feasible.

The principled approach of the Strategy is also worthy of note. Mention should, in particular, be made of the comprehensive and systematic

<sup>77</sup> Federal Government RTI Strategy, p. 9

<sup>78</sup> Federal Government RTI Strategy, p. 12

approach to innovation policy, and the focus on an efficient and effective use of resources.

A final positive aspect is that the findings or analyses of the status quo have been exceptionally insightful. They provide a very good summary of the results of the Austrian Research Dialogue, system evaluation and the Austrian Council's strategy and present an honest and critical picture of Austria's current position as an RTI location.

In the opinion of the Council, however, one aspect to be criticised is that a large number of the specific support measures that are now

being acted upon are not new, and in some cases are limited to the unaltered continuation of existing instruments. Some of these measures have been in place for many years and yet have failed to bring about any significant improvements. It is worth critically reviewing the justification for continuing each of these individual initiatives. About one third of the measures in the RTI Strategy existed prior to its formulation and were incorporated into it unchanged (i.e. more than 30 of about 100 measures).



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### **Goals of the RTI Strategy and Indicators for Measuring their Achievement**

To highlight and make more comparable the essential goals and the extent to which they are fulfilled, the Austrian Council has compiled a set of indicators (see Table 2). These are based on the goals of the RTI Strategy and relevant data and use the latest available figures to show a trend. It is worth noting that the chosen procedure represents an initial attempt to systematically monitor implementation and should thus be treated with appropriate caution. On the other hand, it is only one year since the RTI Strategy was published, and it is thus rather difficult to demonstrate any causal effects.

In cooperation with the WIFO, there will be greater differentiation of the indicators used and of the extent to which the goals are achieved.<sup>79</sup> It is intended to use additional indicators in future, but these still need to be specified in detail. In addition, feedback will be sought from the Task Force and the participating ministries so that a generally accepted set of sustainably consistent indicators can be defined, on the basis of which the Austrian Council will be able to undertake a regular and transparent monitoring of innovation.

<sup>79</sup> To this end, the Austrian Council entered into a partnership with WIFO and awarded a contract to carry out a study: WIFO (2012): Monitoring und Bewertung der Umsetzung der FTI-Strategie der Bundesregierung.

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**Table 2: Objectives From the RTI Strategy and Indicators for Measuring Achievement**

Objective/Indicator	Comparative Value as the Average of the Innovation Leaders
<b>Chapter 1: Priority Objectives</b>	
Innovation Leaders	Places 1–4
Strengthen Competitiveness	
• Employment Rate	75.68 %
• Unemployment Rate	7.2 %
Increase Prosperity	
• GDP per Capita (PPP)	29,550 €
• Net National Income	25,024 €
• HDI Human Development Index	0.894
Overcome the Grand Challenges	
• Greenhouse Gas Emissions	10.30
• OECD Better Life Index	7.45

Objective/Indicator	Comparative Value as the Average of the Innovation Leaders
<b>Chapter 2: Developing Talent, Awakening Passion: Implementing Sustainable Reforms in the Education System</b>	
Influence of the Socio-Economic Background	0.3
School Drop-Out Rate	
Proportion of People with a High School Leaving Certificate	85 %
Increase the Proportion of Pupils Whose First Language is not German who Complete Upper Secondary School	
Increase the Proportion of University Graduates (Proportion of Graduates in the Tertiary Sector A)	39 %
Researchers per 1,000 employed	11
Women Researchers as a Percentage of Total Researchers	30 %
Percentage of Women with "Habilitation"	
Glass Ceiling Index <sup>88</sup>	
Staff-Student Ratio in the Tertiary Sector	1:11.8

<sup>88</sup> The Glass Ceiling Index compares the proportion of female professors (grade A positions) with the proportion of women in academia (grade A, B and C). A score of 1 means that women and men have equal chances of being able to attain a position as professor; the lower the score, the lower women's chances of career advancement and the "thicker" the glass ceiling. Compare BMWF (2011): Statistisches Taschenbuch 2011, p. 122

- \* ↑ ascending (= The Austrian Council anticipates an improvement in Austria's position in the next 3 to 5 years)
- ↓ descending (= The Austrian Council anticipates a deterioration in Austria's position in the next 3 to 5 years)
- stagnating (= The Austrian Council anticipates that Austria's position will remain stable in the next 3 to 5 years)

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RTI Strategy Target	Figure for Austria 2011 (or last available date)	Expected Medium-Term Trend for Austria*
1st–4th Place	8th Place in EU-27 / Innovation Follower <sup>80</sup>	→
	74.90 %	→
	4.2 %	↓
	30,800 €	↑
	25,537 €	↑
	0.883	↑
	9.58	→
	7.02	→

<sup>80</sup> See [www.proinno-europe.eu/inno-metrics/page/ius-2011](http://www.proinno-europe.eu/inno-metrics/page/ius-2011)

RTI Strategy Target	Figure for Austria 2011 (or last available date)	Expected Medium-Term Trend for Austria*
	0.06 <sup>81</sup>	→
9.5 %	8.3 % <sup>82</sup>	→
55 %	42.9 % (2010/11) <sup>83</sup>	↑
60 %	40 % (2010) <sup>84</sup>	→
38 %	29.3 % (2009) <sup>85</sup>	↑
	8.39 (2009) / 10th Place in OECD <sup>86</sup>	→
	28 %	↑
	27.1 % (2010) <sup>87</sup>	→
	0.6 (2010) <sup>89</sup>	↑
	1 : 15.6 <sup>90</sup>	↓

<sup>81</sup> OECD (2011): Bildung auf einen Blick, p. 114. The indicator used here (“Index of Economic, Social and Cultural Status” – ESCS) measures the influence of economic, social and cultural background on school performance.

The lower the figure, the greater the socio-economic influence.

<sup>82</sup> BMUKK (2011): Zahlenspiegel 2011, p. 42

<sup>83</sup> BMUKK (2011): Zahlenspiegel 2011, p. 7

<sup>84</sup> Federal Government RTI Strategy, p. 16

<sup>85</sup> Statistik Austria (2012): Bildung in Zahlen, p. 45, and BMWF (2011): Statistisches Taschenbuch 2011, p. 112

<sup>86</sup> OECD (2010): Main Science and Technology Indicators

<sup>87</sup> BMWF (2011): Statistisches Taschenbuch, p. 116

<sup>89</sup> OECD (2011): Bildung auf einen Blick, p. 492; compare BMWF (2011): Statistisches Taschenbuch, p. 118

<sup>90</sup> BMWF (2011): Statistisches Taschenbuch, p. 114

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Objective/Indicator	Comparative Value as the Average of the Innovation Leaders
<b>Chapter 3: Creating Knowledge, Promoting Excellence: The Foundation of a Knowledge-Based Society</b>	
Basic Research as a Percentage of GDP	0.62 %
Per Capita Endowment of Funds to Finance Basic Research (incl.) Overheads <sup>92</sup>	53.86 €
Number of Excellence Clusters	
International Scientific Publications	Absolute Value IUS 0.786
Number of Scientific Publications in 10 % of the Most Frequently Cited Publications Worldwide	Absolute Value IUS 0.767
Number of ERC Grants per 1,000 Inhabitants	5.2
International University Comparison	2 Universities among the Top 2

Objective/Indicator	Comparative Value as the Average of the Innovation Leaders
<b>Chapter 4: Utilising Knowledge, Increasing Added Value: Activating Innovation Potential</b>	
Ease of Starting a Company	54th Place
Cooperation Science-Business / Cooperation Intensity Large Firms / SMEs	7th Place
Intellectual Property Rights	
Patents Applications	Absolute Value IUS 0.942
Community Trademarks	Absolute Value IUS 0.572
Community Designs	Absolute Value IUS 0.756
Proportion of Turnover from Innovation	Absolute Value IUS 0.452
Risk Capital	Absolute Value IUS 0.104
Knowledge-Intensive Services Exports	Absolute Value IUS 0.688
Economic Effects	Absolute Value IUS 0.659
Innovative SMEs	Absolute Value IUS 0.621
Employment in Knowledge-Intensive Sectors	Absolute Value IUS 0.737
License- and Patent Income from Foreign Countries	Absolute Value IUS 0.692
<b>Chapter 5: Providing Guidance, Establishing Frameworks</b>	
Participation in EU Framework Programme	8th Place
<b>Chapter 6: Providing Incentives, Creating Options</b>	
GERD as a Percentage of GDP	3.29 %
Percentage of R&D Expenditures from Private Sources	70.7 %

- \* ↑ ascending (= The Austrian Council anticipates an improvement in Austria's position in the next 3 to 5 years)
- ↓ descending (= The Austrian Council anticipates a deterioration in Austria's position in the next 3 to 5 years)
- stagnating (= The Austrian Council anticipates that Austria's position will remain stable in the next 3 to 5 years)

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RTI Strategy Target	Figure for Austria 2011 (or last available date)	Expected Medium-Term Trend for Austria*
	0.53 % <sup>91</sup>	→
	24.9 €	↑
10	0	→
	Absolute Value IUS 0.665 / 8th Place in EU 27 <sup>93</sup>	↑
	Absolute Value IUS 0.688 / 7th Place in EU 27 <sup>94</sup>	↑
	5.1 / 4th Place <sup>95</sup>	↑
	0 among Top 100 <sup>96</sup>	↓

<sup>91</sup> Statistik Austria, Statistisches Jahrbuch Österreichs 2011; WIFO (2011): Forschungsquotenziele 2020, p. 9; Austrian Research and Technology Report 2011, p. 27

<sup>92</sup> Internal calculations of the Austrian Science Fund

<sup>93</sup> Innovation Union Scoreboard 2011, p. 27, 89

<sup>94</sup> Innovation Union Scoreboard 2011, p. 28, 89

<sup>95</sup> European Research Council (ERC); [http://rp7.ffg.at/RP7.aspx?target=362519&#IL\\_462510](http://rp7.ffg.at/RP7.aspx?target=362519&#IL_462510)

<sup>96</sup> World University Rankings 2011–2012

RTI Strategy Target	Figure for Austria 2011 (or last available date)	Expected Medium-Term Trend for Austria*
	134th Place among 183 Countries <sup>97</sup>	↓
	3rd Place / 5th Place in OECD <sup>98</sup>	↑
	Absolute Value IUS 0.666 / 7th Place in EU 27 <sup>99</sup>	↑
	Absolute Value IUS 0.794 / 4th Place in EU 27 <sup>100</sup>	↑
	Absolute Value IUS 1 / 1st Place in EU 27 <sup>101</sup>	↑
	Absolute Value IUS 0.447 / 18th Place in EU 27 <sup>102</sup>	→
	Absolute Value IUS 0.029 / 16th Place in EU 27 <sup>103</sup>	→
	Absolute Value IUS 0.300 / 24th Place in EU 27 <sup>104</sup>	→
	Absolute Value IUS 0.468 / 20th Place in EU 27 <sup>105</sup>	↓
	Absolute Value IUS 0.629 / 8th Place in EU 27 <sup>106</sup>	↓
	Absolute Value IUS 0.636 / 12th Place in EU 27 <sup>107</sup>	↑
	Absolute Value IUS 0.323 / 14th Place in EU 27 <sup>108</sup>	→
	10th Place <sup>109</sup>	→
	3.76 %	→
	66–70 %	→
	2.80 % <sup>110</sup>	→
	60.8 % <sup>111</sup>	→

<sup>97</sup> World Bank (2011): Doing Business, p. 80

<sup>98</sup> OECD (2011): Science, Technology and Industry Scoreboard 2011, p. 103

<sup>99</sup> Innovation Union Scoreboard 2011, p. 37

<sup>100</sup> Innovation Union Scoreboard 2011, p. 68

<sup>101</sup> Innovation Union Scoreboard 2011, p. 68

<sup>102</sup> Innovation Union Scoreboard 2011, p. 47

<sup>103</sup> Innovation Union Scoreboard 2011, p. 31

<sup>104</sup> Innovation Union Scoreboard 2011, p. 46

<sup>105</sup> Innovation Union Scoreboard 2011, p. 43 ff.

<sup>106</sup> Innovation Union Scoreboard 2011, p. 34

<sup>107</sup> Innovation Union Scoreboard 2011, p. 43

<sup>108</sup> Innovation Union Scoreboard 2011, p. 48

<sup>109</sup> Proviso Überblicksbericht November 2011, p. 14

<sup>110</sup> Statistik Austria (2012): Globalschätzung

<sup>111</sup> Statistik Austria (2011): Globalschätzung

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### Implementing the Measures in Detail

A fundamental point is that only a year has passed since the publication on 8 March 2011 of the RTI Strategy, so a definitive evaluation of the implementation of its measures is not yet possible. Yet it is already very much apparent, whether initiatives necessary to achieve the

goals have been launched and what impact they can be expected to have. In this respect, the Austrian Council wishes to emphasise the medium to long-term character of the implementation activities and points to the ongoing processes in the Working Groups, established by the Task Force to implement the RTI Strategy.

#### RTI Strategy Objectives Developing Talent, Awakening Passion

*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 aim to mitigate social selectivity, to improve permeability between education courses and tracks, to implement thorough quality improvements in school and university instruction, to better integrate immigrants and to balance out gender discrepancies in research.*

*The portion of drop-outs should be reduced to 9.5 percent by 2020.*

*The portion of pupils graduating with a school-leaving certificate 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.*

*The conditions of study at universities should be fundamentally improved, which will require establishing new financing models for higher education.*

*The proportion of 30- to 34-year olds who have completed a university degree or have an equivalent educational certificate should be increased to 38 percent by 2020.*

#### Developing Talent, Awakening Passion: Implementing Sustainable Reforms in the Education System

The education system is an essential part of the innovation system. The system evaluation has identified the education system as the bottleneck of Austria's RTI system.<sup>112</sup> The effect of this hindrance is that the existing potential for qualifications is insufficiently realised. This is above all due to Austria's selective and segmented school system, in which children's educational opportunities remain strongly influenced by the educational attainment level of their parents. The Austrian Council thus welcomes the Strategy's goal of optimising the entire education system and mitigating "social selectivity, to improve permeability between education courses and tracks".

#### Structural Reform of the Education System

The need to structurally reform the education system is an urgent corollary of the finding that the Austrian education system in its present form distinguishes very early on between vocational and academic paths; access to education is strongly influenced by social stratification.<sup>113</sup> For some time now, numerous steps which the Austrian Council regards as necessary and important have been undertaken (e.g. New Secondary School, vocational diploma programme for apprentices, educational standards, reform of teacher training etc.). However, to date the underlying problem of Austria's educational system has not been addressed: early pupil selection.

In respect of measures to support early learning, success will depend above all on improving primary school teacher training. The plan set out in the programme to reform teacher training (PädagogInnenbildung NEU) and carry it out in the tertiary sector is an important step toward improving quality and should therefore be promptly implemented. The implications for employment and salary conditions will also have to be clarified.

The vocational diploma programme for apprentices started in 2008 can be cited as a positive step towards improving the permeability of routes through education. That this measure is much needed is demonstrated by the marked increase in the number of participants from 2,088 in 2008 to 9,484 by the end of November 2011. The Austrian Council thus also recommends this measure's further expansion. It still remains to be seen, how the recently introduced educational standards will contribute to sustainable structural improvements. Equally, it is not yet possible to provide a final judgement on the extent to which the New Secondary Schools introduced in the school year 2008/09 have contributed to improving the permeability of lower secondary education. Only when the ongoing evaluation becomes available will it be possible to establish whether, and to what extent, a substantial impact on the promotion of equal opportunities and educational justice has been achieved.

<sup>112</sup> System Evaluation (2009): Report 7: Public RTDI Funding in Austria – the Target Groups' Perspective, p. 11

<sup>113</sup> Federal Government RTI Strategy, p. 14

The concrete support measures set out in the RTI Strategy did not formulate any further measures that would actually help to overcome high social selectivity and inadequate de facto permeability. It therefore remains to be seen what the impact in this important area will be of Parliament's discussion of the Education Petition.

Many of the measures named under the rubric "Strengthening Human Potential in STEM Subjects" have already been in existence for numerous years and have not yet brought about any significant improvement in the sense of a significant growth of interest in STEM subjects.

It will not be possible to achieve a sustainable rise in the proportion of women taking STEM subjects until the totality of this complex has been understood. This encompasses questions of teaching at school, the situation at the universities of technology, but also the influence of traditional role models, which influence young people just as strongly as the limited willingness of men to take paternity leave. Above all, it is also necessary for women to have appropriate career options in the STEM areas. This requires new career models that enable greater compatibility between work and family, and above all changes to selection procedures and to the performance indicators used therein. The measures contained in the RTI Strategy will not suffice for this, so there is an urgent need for action.

#### **Improved Education Transitions**

The Austrian Council welcomes in principle the extension of career orientation and student counselling, as well as the establishment of introductory periods of study. Simultaneously however, the Austrian Council points out that this counselling will only make sense if its quality is guaranteed and if in addition there is a dismantling of the hurdles between the various education routes.

#### **Introductory Periods of Study**

One reason why the intake to some of the more popular subjects remains consistently high is

that the paucity of advice and information prior to the commencement of studies leaves students with a false understanding of their career options. Rather than selecting via examinations, it would thus be more sensible to improve information on career options and opportunities, and to provide students with an early opportunity to transfer to another subject. The Government's measures have not been implemented long enough for them to be evaluated. Yet the current regulation that stipulates a single opportunity to be reassessed must be regarded critically.

#### **Improving the Quality of University Teaching**

Teaching quality has to date been given far less attention than research quality. It is thus especially welcome that this subject has been taken up in the RTI Strategy.

The RTI Strategy measures constitute important impulses for improving the quality of university teaching. In the opinion of the Austrian Council, these measures do not contain sufficient guidance for a future-orientated strategy. For example, the model of a capacity-orientated system of university financing (study place financing), has already been developed in the framework of the University Plan and only needs to be implemented. Other important aspects of quality improvement are not sufficiently discussed in this context, including, for example, a substantial increase in financial resources, or limiting capacity.

#### **Improved Integration Programmes**

The increased use of teachers whose first language is not German is extremely important for assuring the quality of teaching of children whose mother tongue is also not German and can contribute significantly to reducing the drop-out rate of such pupils. The RTI Strategy's ambition to encourage more bilingual secondary school graduates to enter teacher training should certainly be extended to encouraging them to take up university studies. This means that more bilingual pupils must obtain the

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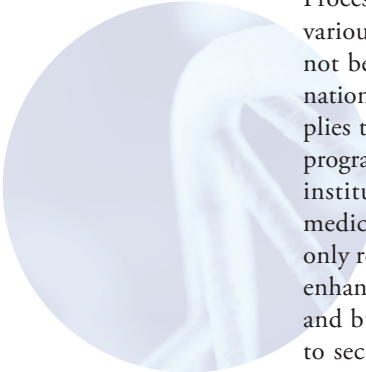
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qualifications necessary to entitle them to enter university.

The extension of language support should embrace both German and the relevant first or family language, since competence in one's mother tongue or family language is an essential precondition for learning a second language.<sup>114</sup>

More flexible recognition and accreditation of diplomas and exit awards can promote integration. Yet the specific support measure regarding professional recognition relates to only one aspect of this problem. A concrete support measure to improve the recognition of non-Austrian university exit awards is desirable. It remains to be seen whether the situation can be improved by the planned implementation of ENIC NARIC AUSTRIA, a dedicated source of information for those seeking accreditation, and by shortening the deadline within which universities make their decisions from six to three months.

### **Increasing Mobility**



Even ten years after the beginning of the Bologna Process, the realistic possibilities to take up the various opportunities available in Europe have not been fully developed. It is not only international mobility that is difficult. The same applies to transferability between different study programmes and from one university to another institution within Austria, especially within medicine and law. Moreover, the RTI Strategy only refers in very general terms to measures to enhance intersectoral mobility between science and business. Equally undefined are measures to secure improvements in the repatriation of Austrian researchers who have gone to work abroad or for retaining highly educated incoming students (especially from non-EU states) in Austria in the long term.

In the opinion of the Austrian Council, priority should be given to measures to reduce administrative hurdles and implement genuine perme-

ability in all areas. Furthermore, it is necessary to improve career prospects and conditions at Austrian universities.

### **Improved Conditions for University Researchers**

In order to offer attractive conditions for researchers it is necessary to create an environment comprising equipment, infrastructure and budgets but also career structures within the organisations. In this respect there have long been deficits in Austria.<sup>115</sup> Precarious employment conditions mean that in recent years new problems have emerged. Time-limited contracts and restricted extension opportunities, together with regulations stipulating the maximum number of years that universities can employ individuals on non-permanent contracts, constitute an unattractive basis for academic careers. The success of other initiatives, such as career development positions has been limited, or have only been used by small numbers of researchers, and the international model of a tenure track-system is problematic because of the legal position.

The Austrian Council thus welcomes the envisaged measures to improve conditions. The gradual introduction of doctoral programmes is to be regarded as an important step, since it will enhance academic quality. Yet the Austrian Council also encourages the creation of genuinely effective incentives and attractive conditions for researchers and recommends that mobility barriers for students and researchers are reduced, in order to increase the number of scientific careers in Austria.

### **Promote Gender Equality in Research**

The Strategy's finding that the proportion of women throughout the university and non-university research sectors is significantly lower at the post-doctoral level is in the opinion of the Austrian Council a significant cause for the increasing paucity of excellently qualified research staff, above all in STEM subjects.

<sup>114</sup> Bundesländerübergreifender Bildungsrahmenplan für elementare Bildungseinrichtungen in Österreich, Endfassung vom August 2009, p. 14

<sup>115</sup> WIFO Monatsberichte 2/2012, p. 105 ff.

Yet the necessary promotion of young female researchers will only reach the desired result, namely, an increase in the proportion of women, if the barriers that still exist in the form of the “glass ceiling” can be reduced. This requires attractive career options for women that enable them to reasonably combine a family and a career, as well as the aforementioned reform of selection procedures (e.g. tenure for lecturers) and of the performance indicators used therein.

The items in this list of measures, such as gender budgeting or specific support measures for women, should basically be viewed positively, yet the steps to realise them are neither new nor have they been, to date, sufficiently effective. In the judgement of the Austrian Council, this is not least a consequence of the usually limited funding provided for these measures.

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### **Recommendations of the Austrian Council for the Implementation of the Measures in the Federal Government’s RTI Strategy**

The Austrian Council suggests that when implementing the measures in the RTI Strategy, particular attention is devoted to the following points:

#### **Chapter “Developing Talent, Awakening Passion: Implementing Sustainable Reforms in the Education System”**

##### **Structural Reform of the Education System**

The Austrian Council urgently recommends a modernisation of the structures of the education system, above all via strengthening school autonomy and streamlining the division of competences between the Federal Government and provinces. The Austrian Council recommends that to overcome early-age selection in the education system, there be a commitment to and appropriate implementation of comprehensive full-day secondary schools, alongside ability differentiation and talent development.

In addition, the Austrian Council recommends greater support of STEM subjects, above all for women and already starting in the primary education sector.

##### **Improving the Quality of University Teaching**

The Austrian Council recommends the earliest possible implementation of the system that has been developed for financing study places and an enduring enhancement in the status of university teaching.

##### **Improved Integration Programmes**

The Austrian Council recommends greater promotion of German and other first language skills, since the development of appropriate linguistic competence constitutes a precondition for all forms of education.

##### **Mobility Barriers and Framework Conditions**

The Austrian Council recommends the reduction of mobility barriers faced by students and researchers, as well as the creation of effective incentives and attractive conditions, so as to increase the number of scientific careers in Austria.

##### **Promote Gender Equality in Research**

To promote gender equality in research, the Austrian Council recommends the development of attractive career models for women both in university, non-university, and above all, in industrial research. In addition it is necessary to review the selection processes and the performance indicators used therein.

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### RTI Strategy Objectives Universities and Basic Research

- We want to increase investments in basic research by 2020 to the level of the 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 institutes, should be better aligned with an overall strategy.
- To do this, the entire education system must be optimised, from the early childhood phase to models of lifelong learning.

### RTI Strategy Objectives Non-University Research Institutes

- Develop clear role models along defined performance goals for various institutions in the non-university research sector
- Internal research institute structures should be strengthened through reforms and adjusted to new requirements.
- The overall structure of the non-university sector should be optimised to improve co-ordination.

## Creating Knowledge, Promoting Excellence: Strengthening the Foundation of the Knowledge-Based Society

### Universities and Basic Research

The role of the state is even more decisive in the case of basic research than it is in applied research. The RTI Strategy thus correctly emphasises that this is a “core area of governmental responsibility”.<sup>116</sup> Since more than two thirds of basic research takes place at universities, this has to be given special attention in the context of implementing the RTI Strategy.

In order to promote excellence in basic research, but also in view of ever-growing international competition, it is essential to extend external funding via the FWF. It is urgently necessary to significantly increase FWF funds, to universally introduce overheads and to implement the Clusters of Excellence which have been planned for years.<sup>117</sup>

The Austrian Council considers performance agreements to be a useful means of target-orientated steering and coordination of the different actors within the basic research sector. In view of the mixed experience with university performance agreements in recent years, it is, however, necessary to rethink and optimise their implementation; This applies in particular to recently concluded performance agreements such as those of the Austrian Academy of Sciences. Optimising the governance structures and management of the ÖAW should be seen as central to performance agreement implementation. As one of Austria's leading institutions of non-university basic research, the ÖAW is however dependent upon having an adequate level of funding. It is to be regretted that the ÖAW's stagnating budget inevitably dramatises its already precarious financial situation.

### Non-University Research Institutes

As the OECD notes in its report on Public Research Institutions, non-university research

organisations are, together with universities and companies, key pillars of the RTI system in many countries.<sup>118</sup>

Austria has seen the development of a diverse and differentiated non-university sector, the significance of which has for years been consistently increasing. This is underlined by the fact that in 2009, this sector accounted for about 14 percent (EUR 1 billion) of Austria's total R&D expenditure. 22 percent of public R&D expenditure flow into non-university research institutions. With some 14,000 employees, the non-university sector accounts for about 14 percent of all researchers in Austria.<sup>119</sup>

It is the view of the Austrian Council that it is thus only right for the RTI Strategy to explicitly address the subject of non-university research. The goals and measures contained in the ponymous chapter are in principle very welcome; yet it must be said that the measures being implemented refer above all to reforms in the internal structure of research institutions and that therefore in reality only one of the three goals of the chapter is addressed.

Moreover, most of these measures comprise reform processes already begun, including for example, the structural reforms at AIT, ÖAW and ACR. Nor is the performance-orientated distribution of funds at IST Austria new. The implementation plan is therefore more of a reflection of the status quo regarding the relevant activities.

By contrast, it remains unclear how the measures will contribute to achieving the chapter's two other objectives. It is not possible to discern a comprehensive strategic approach in the area of non-university research that directly addresses the relevant goals of the RTI Strategy. In particular, the Austrian Council notes that there is a lack of measures to achieve better coordination of the overall structure of the non-university

<sup>116</sup> Federal Government RTI Strategy, p. 8

<sup>117</sup> Austrian Science Council (2007): Stellungnahme zur Exzellenzentwicklung in der österreichischen Wissenschaft; FWF (2008): Programmdokument Exzellenzcluster

<sup>118</sup> OECD (2011): Public Research Institutions: Mapping Sector Trends, p. 18 f., p. 27 f.

<sup>119</sup> Joanneum Research (2011): Erhebung zu den öffentlichen Forschungsinstitutionen in Österreich, p. 6

research sector. The Austrian Council thus considers it desirable for this sector to be analysed as a whole with a view to deriving clear role models, performance goals, success factors and structural adjustments that do justice to the various institutions of the non-university research sector. In this context it is necessary to consider functional differentiations by reference to the specific range of tasks of the individual institutions.

#### **Research Infrastructure**

The quality of research is significantly shaped by the available infrastructure. State-of-the-art research infrastructure is thus of great scientific and macro-economic importance for Austria. The measures which the RTI Strategy presents

on the subject of research infrastructure correctly address themes that have long been a topic of discussion.<sup>120</sup> Another positive aspect is that the Task Force has established a working group on this subject. Furthermore, the Research Infrastructure roadmap drawn up in the context of the University Plan is also to be welcomed.

The RTI Strategy goes on to mention support measures in respect of networking incentives, extending cooperation and Austrian ESFRI participation, yet it is almost impossible to discern what specific initiatives should in future be undertaken in this area. In its recommendation of 24 November 2011, the Austrian Council made very specific proposals in this area.<sup>121</sup>

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#### **RTI Strategy Objectives Research Infrastructure**

- *We want to expand research infrastructures in Austria as the foundation for excellent research and to internationally position Austrian research in a coordinated manner.*
- *The development of research profiles of universities and non-university research institutions as hubs of research infrastructure strives to guarantee optimal coverage, synergies as well as increase existing strengths.*

## **Recommendations of the Austrian Council Concerning the Implementation of the Measures in the Federal Government's RTI Strategy**

The Austrian Council suggests that when implementing the measures in the RTI Strategy, particular attention is devoted to the following points:

### **Chapter "Creating Knowledge, Promoting Excellence: The Foundation of a Knowledge-Based Society"**

#### **Universities and Basic Research**

The Austrian Council recommends the significant increase in FWF funds, the universal introduction of overheads and the implementation of the Clusters of Excellence that have been planned for many years. To this end, it would also be worth considering reallocating funds from the core funding of the various institutions to the FWF budget. Leading institutions in the basic research sector, such as the ÖAW are to be provided with appropriate funding. The foundations for longer-term financial planning and an appropriate safeguarding of the central institutions of the Austrian science and research system should be anchored within the federal budget via the frequently-promised research financing law. Building on the experience of recent years, performance agreements should be further developed so as to become genuine steering instruments.

#### **Non-University Research**

The Austrian Council recommends better coordination of the overall structure of the non-university research structure. To this end, an overall analysis should be conducted, on the basis of which clear role models, performance goals, success factors and structural adaptations can be derived, which do justice to the various institutions of the non-university research sector. In this context it is necessary to consider functional differentiations by reference to the specific range of tasks of the individual institutions.

#### **Research Infrastructure**

In the interests of the necessary Austria-wide coordination and alignment, the Austrian Council recommends the earliest possible operationalisation of the research infrastructure roadmap and the development of funding approaches for different needs.

<sup>120</sup> Pock, H., et al. (2009): Erhebung österreichischer Forschungsinfrastruktur, p. 152 ff.

<sup>121</sup> Austrian Council Recommendation Concerning Research Infrastructure in Austria of 24 November 2011

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### RTI Strategy Objectives Innovation and Corporate Research

- We want to enhance domestic value creation by encouraging research intensive industries and knowledge-intensive services. In the process, we want to stimulate innovations through a strong emphasis on demand-side instruments in public procurement, regulation and standardisation.
- The number of firms that systematically conduct research and development should be increased between 2010 and 2013 by a total of 10 percent from 2,700 and by a total of 25 percent by 2020.
- The role of internationally successful Austrian leading firms as a central pillar for the innovation system should be strengthened and the research and innovation potential of small and medium enterprises should be activated.
- Austria's attractiveness as a location for research and technology-intensive firms has to be increased further.
- The innovation level of firms has to be raised by expanding the share of radical innovations that are new to the market.
- The structure of the manufacturing and service sectors has to be improved by increasing the innovation and knowledge-intensity of firms.

## Utilising Knowledge, Increasing Added Value: Activating Innovation Potential

### Innovation and Corporate Research

In the last 10 years, the research and development expenditure of Austria's corporate sector has almost doubled. However, the economic and financial crisis caused a collapse in company research and development expenditure. Nevertheless, in the years following 2010, the corporate sector was again able to increase its contribution to financing – and with an increase of 5.9 percent, the financial contribution of companies to GERD as a percentage of GDP grew more strongly than that of central government, the provinces and foreign sources.

One reason for this is that Austria boasts companies that deliver outstanding performance in research, development and innovation. Yet the economic structure remains mainly traditional. Compared to innovation leaders, Austria's research and knowledge-intensive sectors remain underdeveloped<sup>122</sup> and the corporate share of R&D expenditure too low.<sup>123</sup> The research structure is concentrated in too few firms, especially in multi-national concerns.<sup>124</sup> Overall the negative dynamic of Austria's Innovation Union Scoreboard rating reflects this finding, since this development was driven above all by declines in the areas of research activities at SMEs, successful introduction of research results into the market by SMEs and in venture capital.<sup>125</sup> The RTI Strategy recognises that the corporate sector's share of total support for innovation is still too low. Yet there is a lack of

innovative concepts that could demonstrate how this process could be accelerated.

In the final analysis, the RTI Strategy's goal of a GERD-to-GDP ratio of 3.76 % by 2020 can only be achieved via a sustainable growth regime based on innovation and accompanied by a high rate of start-ups. In turn, this requires a broad mix of subsidised and supportive conditions that make Austria an attractive location for research. To be mentioned in this context are above all, highly competitive product markets and a strong private risk financing sector. If measures to increase the GERD-to-GDP ratio were to be limited to raising the amount of indirect and direct research funding, without improving conditions,<sup>126</sup> there would be a high risk of this being undermined by inadequate levels of absorption capacity on the part of companies.<sup>127</sup>

Also to be welcomed are the RTI Strategy's output goals, which are designed to raise the research and innovation performance of the Austrian economy. Yet the proposed measures appear insufficient to realise the stated goal of increasing radical innovation within companies. Radical innovation goes hand in hand with greater risk as failures are much more frequent here than in cases of incremental innovation.<sup>128</sup>

The generation of highly innovative projects thus requires a willingness to assume greater risks in the support of such projects. In addition to introducing appropriate criteria for evaluating individual innovation projects, it is

<sup>122</sup> 122 Innovation Union Scoreboard 2011, p. 68

<sup>123</sup> Austrian Research and Technology Report 2010, 73 ff. For the sake of completeness, it should be noted here that this does not have an excessively negative impact as long as intersectoral upgrading, i.e. the movement along the quality ladder of a sector functions properly and the sectors in which a country is specialised, continues to grow.

<sup>124</sup> Aiginger, K. (2011): Horizonte der FTI-Politik: Wie bringt sich Österreich in Stellung? Präsentation bei der BMWF Europa Tagung 2011

<sup>125</sup> Innovation Union Scoreboard 2011, p. 68

<sup>126</sup> WIFO (2012): Die Arbeitskräftemobilität in der Hochschulforschung in der EU und in Österreich, in: WIFO-Monatsberichte 2/2012, p. 105–120

<sup>127</sup> WIFO (2011): Forschungsquotenziele 2020

<sup>128</sup> Leo, H. (2008): Die Integration von Exzellenz und Risiko in die österreichische Forschungs-, Technologie- und Innovationslandschaft, Wien

necessary at the Governance level, to establish appropriate incentive structures at the interface between owner ministries and funding agencies. In the view of the Austrian Council, an important aspect is the increase in the proportion of innovative services. Measures such as the services initiative of the BMWFJ are to be seen positively. Yet what is lacking is an overall concept that goes beyond the individual funding measures and contributes to anchoring this sector in the consciousness not only of those who make decisions in respect of RTI policy, but also among innovating entities and thereby in Austria's innovation system.

#### Cooperation Between Science and Business

The importance of strategic cooperation between science and business for developing innovations that impact on the macro-economy can never be underestimated. Prerequisites are a well established academic foundation, high-quality research institutions, and a functioning culture of cooperation. The cooperation deficits that existed in Austria's RTI system well into the 1990s, were significantly improved by targeted initiatives and programmes to promote cooperation between science and business (e.g. COMET, COIN, BRIDGE or CDG). This enabled an internationally recognised and functioning culture of cooperation to be developed. In the 2011 OECD Science, Technology and Industry Scoreboard, Austria ranks third internationally in respect of the cooperation intensity of large firms with universities and non-university research institutions.<sup>129</sup> There is room for improvement in the SME sector, where the 2011 Innovation Union Scoreboard noted a year-on-year reduction in cooperation intensity.<sup>130</sup> In this area, the targets of the RTI Strategy are continuity and the further expansion of the

strategically orientated cooperation of business and science. The Austrian Council takes the view that the measures to further develop support for research cooperation are very well suited to further increase cooperation intensity and also to increase the share of private-sector funding. Here, it is especially important to stress the necessity for strategic further development of the proven COMET programme. The Austrian Council thus places a high priority on continuing the programme for the long-term support of excellent research projects which should be adjusted to accommodate the changed environment. In its recommendation regarding the COMET programme, the Austrian Council has proposed just such a flexibilisation of the structures of the K-Centres.<sup>131</sup> In addition it is worth considering what should be done with the best centres once the programme has ended.

Given the positive development of the cooperative sector, the Austrian Council takes a negative view of the suspension of financial support for the successful BRIDGE programme Translational Research. The initiative to close the funding gap between basic research and applied research has as its goal to jointly develop the potential of basic and applied research. The surprising suspension of financing is incomprehensible, above all, because the evaluation clearly recommends a continuation of the programme in its current form.

#### Start-Ups and Venture Capital Financing

In international comparison, Austria still has a low rate of business start-ups.<sup>132</sup> The contribution of young businesses to innovation, growth and employment is undisputed. State measures are therefore required to improve the start-up rate.

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#### RTI Strategy Objectives Cooperation Between Science and Business

- We want to increase the cooperation intensity of Austrian firms and strengthen the strategically-oriented collaboration between science and business – with a special focus on excellence and sustainability.
- This means that we must reduce barriers and hindrances among firms, especially SMEs, for cooperating with science/research facilities, and make it easier for innovative firms to access external resources.
- This will allow more firms to expand their technology leadership and attain top positions in innovation.

#### RTI Strategy Objectives Enterprise Formation and Risk Capital

- 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.
- The growth of innovative firms should be accelerated.

<sup>129</sup> OECD (2011): Science, Technology and Industry Scoreboard 2011, p. 103

<sup>130</sup> Innovation Union Scoreboard 2011, p. 68

<sup>131</sup> Austrian Council Recommendation Concerning the Further Development of the COMET Programme of 15 September 2011

<sup>132</sup> Global Entrepreneurship Monitor (2008): Bericht zur Lage des Unternehmertums in Österreich; WKÖ (2012): Unternehmensneugründungen in Österreich 1993–2011, vorläufige Ergebnisse

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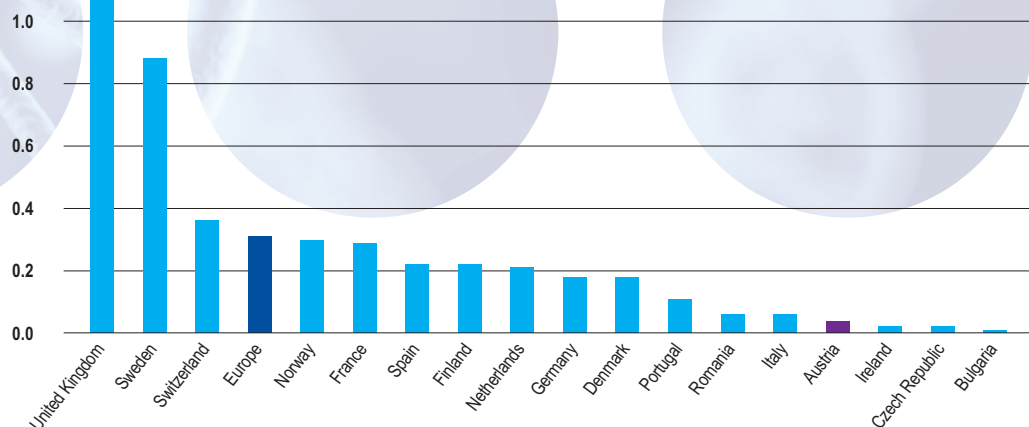
In this respect, the Government has already put in place a large number of efficient, direct funding initiatives. Especially worthy of note are the AplusB programme of the BMVIT and JITU initiative of the BMWFJ. Almost all provinces have seen the establishment of AplusB centres as regional points of contact for graduate entrepreneurs. These centres should be available for all innovative knowledge and technology-intensive entrepreneurs, so that the existing assets of good regional roots and visibility can be utilised as a reference point for local entrepreneurs. The aim here is above all to offer initial advice regarding further support through the Federal Government and provinces, whose systems appear confusing to new funding applicants.<sup>133</sup> In view of the goal to achieve a 3 percent annual increase in the number of knowledge and research-intensive start-ups by 2020, there is an urgent need for broader support measures.

As argued in the RTI Strategy, however, the main bottleneck faced by early-stage businesses, relates to financing, above all where the acqui-

sition of external private capital is concerned. The widespread absence of risk and equity capital, in particular for innovative young businesses, remains one of Austria's greatest weaknesses. In international comparison, the country still lags far behind (see Figure 12). Private capital in the form of private equity or venture capital and of business angel capital is virtually non-existent. There is an absence of private investors willing to take risks, especially when it comes to financing early-stage businesses and in particular new research areas.<sup>134</sup> The venture capital initiative run by the awv constitutes an important governmental stimulus, but its long-term impact requires a critical mass of ongoing finance. At present, this appears not to be guaranteed since there is a lack of funding sources that are secured in the long term.

However, the main cause of the poor risk capital situation in Austria is the absence of internationally competitive framework conditions which makes it difficult to attract institutional investors for Austria as a business location. It is not possible to present such investors with an "Austria Package" by means of which the invest-

**Figure 12: Investments by Business Angels and Venture Capitalists as a Percentage of GDP**



Source: EVCA PEREP Analytics, AVCO, 2011

<sup>133</sup> Austrian Council Recommendation Concerning Austrian Start-Up Activities in the Knowledge- and Technology-Intensive Sector of 9 December 2008

<sup>134</sup> EVCA Yearbook 2011, p. 100

ment can be standardised and legally secured. Sector representatives<sup>135</sup> and the Austrian Council<sup>136</sup> have thus long been calling for an internationally competitive private equity law which would provide the framework for the flexible and speedy acquisition and repayment of capital. The AVCO and its experts responded to the IGG by developing IGG light,<sup>137</sup> which offers a good starting point for further reflections. The problem of financing start-ups and small businesses will of course not be resolved solely by risk capital. Other instruments, e.g. tax concessions for start-up investments, also need to be considered in order to raise the intensity of private sector investment capital.<sup>138</sup>

#### **Promote Innovation Through Competition**

As confirmed by the Federal Government's RTI Strategy, the OECD maintains that the framework conditions for innovation (e.g. competition, regulation, financing etc.) are just as significant for raising R&D expenditure as is, for example, direct research funding.<sup>139</sup> The innovation performance of individual actors (above all companies, but also other organisations) are shaped by a broad set of institutional framework conditions and patterns of interaction.<sup>140</sup> This implies a significant role for structural reform in the institutional sphere, if the latter impedes innovative activities. For example, the competitive situation within some Austrian sectors is hostile in respect of the promotion of innovation, e.g. the entry into the market of new suppliers. Thus Austria does particularly badly in the "Starting

a Business" category of the World Bank's "Doing Business" Report.<sup>141</sup>

In light of this, the Federal Government's recent initiatives regarding reform of competition and cartel laws are to be welcomed. Performance-based competition between market participants frequently underpins the emergence of innovations. Since higher competitive pressure leads to more innovation, it can be concluded that appropriate measures would have a positive impact on innovation dynamism. According to the Federal Government there are plans for a statutory anchoring of competition monitoring, and this is explicitly welcomed by the Austrian Council.

To secure free competition it is necessary to have appropriate framework conditions. At the national level, attention must be paid to removing constraints upon competition that are posed by administration, costs, distortions caused by state funding and intervention, as well as by legislation. The Austrian Council therefore welcomes the suggestion advanced in the context of the RTI Strategy that sector-specific analyses be conducted. This will be an important first step toward identifying possible obstacles to innovation. In addition, the studies and expertises at the European level should also inform the analysis.

Establishing appropriate framework conditions would make a great contribution to the RTI Strategy's stated goal of simplifying company start-ups and reducing their cost. In addition to

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##### **RTI Strategy Objectives Promote Innovation Through Competition**

- *We want to stimulate innovation via an active competition policy.*
- *To do this, institutions that monitor competition should be strengthened.*
- *Starting a business should be made much easier and relieved of cost burdens.*

<sup>135</sup> AVCO Press Release of 5 June 2007: Lack of Framework Conditions for Growth Financing Threatens 30,000 Jobs, AVCO (2003): Better Framework Conditions for PE /VC in Austria: Summary of the Working Group "Fund Structures"

<sup>136</sup> Austrian Council Recommendation Concerning the Creation of Suitable Framework Conditions for Private Equity in Austria of 24 November 2011; Austrian Council Recommendation Private Equity (PE) / Venture Capital (VC) for the Austrian Innovation System of 14 March 2008

<sup>137</sup> AVCO (2008): Draft proposal for an "IGG light"

<sup>138</sup> Austrian Council Recommendation Concerning the Introduction of an Investment Allowance of 24 November 2011

<sup>139</sup> Federal Government RTI Strategy, p. 9

<sup>140</sup> Soete, L. / Verspagen, B. / Weel, B. (2009): Systems of Innovation. In: UNU-MERIT Working Paper 2009-062; Nelson, R. (1993): National Innovation Systems: A Comparative Analysis, New York: Oxford University Press; Metcalfe, S. (1995): Systems Failure and the Case of Innovation Policy. In: Llenera, P. / Matt, M. / Avadikya, M. (ed.): Innovation policy in a knowledge-based economy: theory and practice. Berlin: Springer Verlag; Edquist, C. (1997): Systems of Innovation: Technologies, Institutions and Organizations, London: Pinter

<sup>141</sup> World Bank (2011): Doing Business, S. 80



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legal aspects, such as the introduction of a “GmbH light”, the RTI Strategy also addresses measures to reduce the tax burden in the early years of a company’s existence. International role models – such as the Innovation Leaders or Canada – offer valuable ideas in this respect. Possible measures in this connection, would, for example, be the (partial) exemption from

social security contributions or payroll taxes, the abolition of the one percent company tax on capital injections, as well as a differentiated application of the research premium for young entrepreneurs, so that smaller, early-stage companies receive a higher percentage, whilst older, larger companies receive a lower percentage, since the financial pressures are strongest in the early phases.

### **Recommendations of the Austrian Council Concerning the Implementation of the Measures in the Federal Government’s RTI Strategy**

The Austrian Council suggests that when implementing the measures in the RTI Strategy, particular attention is devoted to the following points:

#### **Chapter “Utilising Knowledge, Increasing Added Value: Activating Innovation Potential”**

##### **Innovation and Corporate Research**

The Austrian Council recommends that the framework conditions for R&D participation by the corporate sector be further improved by the development of innovative concepts and a broad mix of funding instruments and supportive framework conditions. In respect of implementation, the Austrian Council refers to the following recommendation:

- Austrian Council Recommendation Concerning the Efficient Translation of Research Results into Innovations of 24 November 2011

##### **Start-Ups and Venture Capital Financing**

In view of its significance, the Austrian Council recommends the prioritisation of this area and in particular of risk capital. In respect of implementation, the Austrian Council refers to the following recommendations:

- Austrian Council Recommendation Concerning the Creation of Appropriate Framework Conditions for Private Equity in Austria of 24 November 2011
- Austrian Council Recommendation Concerning the Introduction of an Investment Allowance of 24 November 2011
- Private Equity (PE) / Venture Capital (VC) for the Austrian Innovation System of 14 March 2008
- Austrian Council Recommendation Concerning Austrian Start-Up Activities in Knowledge and Technology-Intensive Sectors of 9 December 2008

##### **Cooperation Between Science and Business**

The Austrian Council recommends that in view of its strategic relevance, the further development of the COMET programme be treated as a high priority. To this end, the Austrian Council proposed in its recommendation of 15 September 2011 a flexibilisation of Competence Centre structures. It is also necessary to consider what will be done with the existing centres once the programme has finished.

The Austrian Council recommends that all programme lines of BRIDGE be continued. At the same time, it suggests that funding sources be stabilised to secure the programme’s long-term financing.

##### **Promote Innovation Through Competition**

The Austrian Council recommends the creation of appropriate framework conditions to support start-up activities in the knowledge and technology-intensive sector.<sup>142</sup> This includes, in addition to the introduction of the “GmbH light”, measures to reduce the tax burden on early-stage businesses. Particular mention should be made here of the (partial) exemption from social security contributions or payroll taxes, the abolition of the one percent company tax on capital injections, as well as a differentiated application of the research premium for young entrepreneurs, so that smaller, younger companies receive a higher percentage, whilst older, larger companies receive a lower percentage.

<sup>142</sup> Austrian Council Recommendation Concerning Austrian Start-Up Activities in the Knowledge- and Technology-Intensive Sector of 9 December 2008

## Providing Guidance, Establishing Frameworks: Efficiently Organising Political Governance

### Governance Structures

Numerous analyses and evaluations of recent years point to weaknesses in the governance structures of Austria's RTI system. These hinder Austria from restructuring in a manner that would enable it to mirror the Innovation Leaders.<sup>143</sup> The RTI Strategy provided a direct response to this situation.<sup>144</sup>

The Austrian Council welcomes the objective to clearly coordinate the competencies of the responsible ministries and to optimise the division of responsibilities between ministries and research agencies. It is the view of the Austrian Council that the establishment of the high-level Task Force to facilitate interministerial steering and support for the implementation of the RTI Strategy is an important step towards improved planning and coordination of the activities of the ministries. In the opinion of the Austrian Council, the measures relating to the steering of funding agencies via performance agreements also constitute important milestones on the road to a modern governance system (key word agencification).

However, the Council considers that the measures proposed are insufficiently wide ranging. In Austria, the political steering of RTI policy is still shaped by the complexity and fragmentation of the system. In principle, there is a specification of the functions, tasks and roles of RTI policy system actors. Yet it is frequently obvious that in practice, these are not

clearly understood and implemented as specified.<sup>145</sup> This is also noted in the RTI Strategy. The Strategy further points to the fact that “asymmetrical information between ministries and agencies make effective management difficult, as does the double function of ministries as owners and clients in programme development.”<sup>146</sup> The Austrian Council considers that the relevant support measures do not constitute an adequate response to these findings.

The Austrian Council takes the view that the objectives in respect of the optimisation of the division of labour between ministries and agencies toward subsidiarity are also insufficiently far-reaching. The goal should be to further consolidate strategic steering by the ministries and simultaneously extend the operative independence of the agencies. A further suggestion is that there be a concentration of owner responsibility during the next legislative term. The governance structures of the leading innovation nations are less complex than those in Austria. Comparison shows that in some of these countries the RTI responsibilities are divided between two ministries.<sup>147</sup> There, those divisions pertain to divisions between science or business and technology orientation. The Austrian Council again suggests that in a future legislative term consideration be given to organising RTI responsibilities at ministerial level in accordance with practice in Innovation Leaders.

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#### RTI Strategy Objectives Governance Structures

- *We want to coordinate the competencies of the responsible ministries in a clear way. To do this, efficient coordination 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.*

<sup>143</sup> System Evaluation (2009): Report 2: Strategische Governance – Der Zukunft von Forschung, Technologie und Innovation ihren Möglichkeitsraum geben, p. 16 ff.; System Evaluation (2009): Report 3: Governance in der FTI-Politik im Wechselspiel zwischen Ministerien und Agenturen; CREST (2008): Policy Mix Peer Reviews: Country Report – Austria, p. 6 ff.; Austrian Council for Research and Technology Development (2010): Strategy 2020, p. 68 ff.

<sup>144</sup> Federal Government RTI Strategy, p. 32 f.

<sup>145</sup> The System Evaluation draws the following conclusion: “Although the legal division of labour between the ministries and agencies is essentially clear, the agencies have more extensive influence in respect of agenda setting and strategy development, than would be ascribed to them on the basis of the theoretical requirements. On the other hand, the ministries are in many cases active where implementation tasks are concerned.” (System Evaluation [2009]: Report 3: Governance in der FTI Politik im Wechselspiel zwischen Ministerien und Agenturen, p. 79).

<sup>146</sup> Federal Government RTI Strategy, p. 33

<sup>147</sup> Compare the rubric “Governance Structures” of the country profiles of Denmark, Germany, Finland and Sweden on Erawatch (<http://erawatch.jrc.ec.europa.eu/erawatch/opencms/>).

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### RTI Strategy Objectives Setting Priorities

- *We want to strengthen Austria's competitiveness in a wide range of cross-cutting fields in science and technology by focussing 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.*
- *Priorities in research and technology development should be set on the basis of systematic selection and decision-making processes. While doing so we must make sure that governmental priorities are sufficiently justified to prevent market or system failure.*
- *The definition of new priorities for specific challenges should lead to a concerted coordination of activities in a comprehensive system approach by all concerned ministries in the context of the Research, Technology and Innovation Task Force.*
- *To address the great societal challenges (Grand Challenges) of the future comprehensive system priorities must be established.*
- *Priorities should be defined on the basis of preliminary analyses, their effects should be limited in time, and they should be monitored.*

### Setting Priorities

The importance of priority setting in RTI policy has in recent years grown throughout the world. In part this is a consequence of the fact that in times of restrictive budgets it is necessary to be more focused in the allocation of funding – also with a view to bundling critical mass. It is also because setting priorities allows the pursuit of mission-orientated approaches to overcoming the major social challenges.<sup>148</sup> In this regard, it is above all some of the leading innovation nations like the USA<sup>149</sup>, Singapore<sup>150</sup>, Sweden or Finland<sup>151</sup> that are pioneers of prioritisation and mission-oriented RTI policy at the level of the nation state. Identifying priorities always also implies a balance between the advantages of specialisation and those of a broadly diversified research and technology portfolio. Finding the right balance between thematically open and thematically prescriptive instruments and programmes is thus a very sensitive issue. In principle, a balance should be guaranteed between “bottom-up” and “top-down” with a clear preponderance of thematically open instruments. The priorities set by the RTI Strategy constitute the right approach to achieving the focused application of resources and targeted funding of research-based approaches to solving the Grand Challenges, and are thus an important element of the Strategy document. The Austrian Council therefore welcomes the ambitious work pro-

grammes and timetables of the two relevant working groups of the Task Force. Given the importance of setting priorities, the Austrian Council does, however, note the absence of more far-reaching activities related to a comprehensive, overarching thematic strategy and of a pan-ministerial management of topics. The goal of priorities must be the long-term building up of expertise. Isolated individual measures in a specific area will not permit Austria to become a European research leader. It is therefore the view of the Austrian Council that establishing and developing priority themes requires a thoroughgoing concept agreed between the ministries and secured for the long term. Furthermore, a systematic and steady approach to evaluating existing priority themes and identifying new ones should be drawn up on the basis of transparent heuristics.

### The Funding System

Austria is characterised by a comprehensive, differentiated system of innovation funding. Until recently there was a strong increase in the variety of funding instruments employed, which made it increasingly difficult to retain an overview of the funding landscape. In as much as the recommendations of the system evaluation were adhered to and indirect fiscal support for research was harmonised by the abolition of the research allowances and by raising the research premium to 10 percent, it was possible to accommodate that complexity.<sup>152</sup>

<sup>148</sup> Weber, M. (2008): Forschung zur Bewältigung gesellschaftlicher Herausforderungen – neue Programme und Programmarchitekturen. In: Österreichischer Forschungsdialog: Ergebnisdokumentation, p. 119–121. Compare Gassler, H. / Polt, W. / Rammer, C. (2006): Schwerpunktsetzungen in der Forschungs- und Technologiepolitik: Eine Analyse der Paradigmenwechsel seit 1945, Österreichische Zeitschrift für Politikwissenschaft (ÖZP), 35 (1), p. 7–23

<sup>149</sup> National Economic Council, Council of Economic Advisers, and Office of Science and Technology Policy (2011): A Strategy for American Innovation, p. 25 ff.

<sup>150</sup> Ministry of Trade and Industry (2011): Growing Singapore's Economy through Research, Innovation and Enterprise (RIE): Singapore's RIE Landscape & Key Thrusts for 2011–2015, p. 17; A\*Star (2011): Science, Technology and Enterprise Plan 2015, p. 38 ff.

<sup>151</sup> Luif, P. / Berger, M. / Elias, B. / Zahradnik, G. (2009): Strategien kleinerer europäischer Staaten in der Technologiepolitik als Antwort auf die Herausforderung durch China und Indien: Die Entwicklung von Strategien in Finnland, Schweden, der Schweiz und den Niederlanden. Working Paper 61 of the Austrian Institute of International Affairs

<sup>152</sup> System Evaluation (2009): Report 4: Evaluation of Government Funding in RTDI from a Systems Perspective in Austria, p. 59–63

The first restructuring measures are gradually being implemented in the context of optimising direct research funding. Yet the concentration on improving individual instruments has been accompanied by a lack of consideration for the overall RTI system. It is thus possible that individual programmes may well be effective and useful on their own terms, but the resources thus employed might have been better used to achieve even greater value for Austria's overall RTI system. Greater attention should therefore be paid to the interconnections and interplay between the instruments and programmes.

The intended establishment of strategic theme management within the ministries is to be welcomed. A central point in this regard is not just the strategically coordinated implementation of selected thematic priorities on the part of the agencies but also the choice of themes itself. The current manner in which themes are identified is a product of history and appears arbitrary. The management of themes in the current planning system takes place exclusively and in isolation within the respective ministries. What is missing is the overarching, national management of themes that has regard to existing development potential, strengths and grand challenges as demanded in the section "Setting Priorities." This also requires regional coordination to take place. This means not only identifying overlaps and gaps, but also coordinating with other types of instruments (such as the structural measures).

It is also the case that the interplay between direct and indirect research funding has not been fully taken into account. The Austrian Council is therefore planning to carry out additional analyses that build upon the insights gained from the system evaluation to capture the complex interrelationship and interdependences in the overall innovation system and, where necessary, to advance proposals for possible modifications. Nor should the funding for institutions be evaluated in isolation, but with an eye to the other funding instruments. The stronger emphasis on performance through ongoing formulation of performance agreements on the part of the responsible ministries is an important

first step towards improving the social political contribution of the institutions and sharpening their profile.

The envisaged increase in the proportion of resources that are allocated to basic research on a competitive basis is the result of long-standing demands and is also consistent with the international trend. In addition, it is absolutely essential to take account of the fact that the underlying global budget and the required competitive orientation (international benchmarks) are secured. These are an important guarantee of the freedoms needed for curiosity-driven research, for the creation and development of human capital and for the provision of the required research infrastructure. It is essential, however, that this does not result in the global budget being compromised by a corresponding significant increase in the overhead rates for project funds obtained through competitive processes.

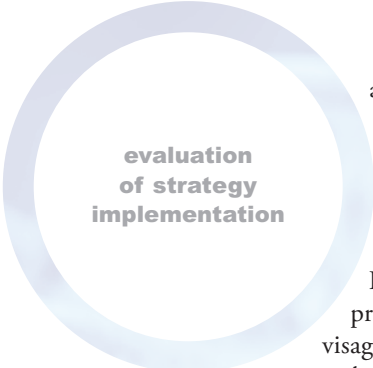
#### **International Positioning**

A central challenge for Austria's RTI system is the country's international positioning. The Austrian Council thus welcomes the RTI Strategy objectives that are targeted at key areas related to this challenge. The Austrian Council, thus in principle views positively those Strategy document measures that facilitate and support the participation of Austria's research community in international projects. However, the Austrian Council considers that a more concrete formulation of how these measures are to be implemented is still lacking. This is certainly understandable in view of the time dimension, however, as the implementation activities of the Working Groups established by the Task Force have only just begun.

Notwithstanding this, the Austrian Council would like to draw attention to a theme which should in this context be prioritised: The alignment of the content of Horizon 2020 with national and regional research funding programmes is essential and must be regarded as a constituent element of Austria's participation strategy. The partnerships between different public bodies in particular must be regarded as



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### RTI Strategy Objectives Research and Society

- *We want a culture of appreciation for research, technology, 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 society and society, along the lines of a “scientific citizenship”.*
- *Responsibility and integrity in science should be strengthened via institutional processes.*

an essential component of Horizon 2020 and this must be reflected in robust national funding within the individual member states. Austria must also structure its budget planning to take account of this.

In the interests of competitiveness, improvements and harmonisation such as envisaged in Horizon 2020 need to be extended to other funding instruments and programmes. There is a particular need to act in respect of Structural Funds (EFRD), which will be more strongly linked to the Horizon 2020 programme.<sup>153</sup> The subject of Structural Funds is not addressed in the RTI Strategy. The Austrian Council considers that Structural Funds will become increasingly important for Austria and this report thus deals with this issue separately in the chapter “Evaluation of Elements not Included in the RTI Strategy.”

### Research and Society

The RTI Strategy of the Federal Government comes to the conclusion that the structuring of the relationship between science and the public is a complex and dynamic area of policy which in Austria is still underdeveloped. This is one of the major reasons why Austrian society’s awareness of the importance of scientific performance is not very pronounced.<sup>154</sup> The inadequate awareness of the achievements of science and research are further exacerbated by the fact that since the dialogue campaign Innovative Austria ended in 2006, there has been no targeted coordination

and public funding of measures and projects designed to communicate science and research. It is therefore all the more regrettable that the RTI Strategy’s telling analysis is not followed by more comprehensive measures. The Strategy does point to this deficit, but the measure it then cites is merely the “Aula der Wissenschaften” or “Forum for Science” as the central location for the dialogue between science and society. It is doubtful that this will really enable an improvement in scientific communication. Nor is it possible to discern more extensive steps to develop participatory and dialogue-orientated formats to draw in broader sections of the population.

The only major event that was successfully established and really made the achievements of the innovation system accessible to a broader public was the Long Night of Research (LNF). Other formats have a more focused impact and only reach a selective target audience. Despite the great success of, and positive experiences with, the Long Night of Research in recent years, the survival of this major event remains uncertain since it is not possible to secure even sub-critical financial contributions for the most important measures.

The naming and extension of the Nano Trust cannot be regarded as an independent technology impact assessment. It is also unclear who will be affected by the guideline regarding conflicts of interest in contract research, which was cited in the context of establishing higher standards of scientific integrity.

<sup>153</sup> EU Cohesion Policy 2014–2020: legislative proposals; Status: February 2012 ([http://ec.europa.eu/regional\\_policy/what/future/proposals\\_2014\\_2020\\_en.cfm#2](http://ec.europa.eu/regional_policy/what/future/proposals_2014_2020_en.cfm#2) )

<sup>154</sup> Federal Government RTI Strategy, p. 42

## Recommendations of the Austrian Council for the Implementation of the Measures in the Federal Government's RTI Strategy

The Austrian Council suggests that when implementing the measures in the RTI Strategy, particular attention is devoted to the following points:

### Chapter "Providing Guidance, Establishing Frameworks: Efficiently Organising Political Governance"

#### Governance Structures

The Austrian Council recommends that there should be some reflection in a future legislative period regarding the organisation of RTI responsibilities at the ministerial level in accordance with the example of the Innovation Leaders. Also recommended for the next legislative period is a concentration of owner responsibility.

#### Priority Themes

The Austrian Council recommends the development of a thoroughgoing concept for the creation and continuation of the priority themes that is secured for the long term. This should contain a systematic and steady approach to evaluating existing priority themes and identifying new ones.

#### The Funding System

The Austrian Council recommends an overall approach to the RTI system that extends beyond the improvement of individual instruments. This should take account of the interconnections and interplay between the instruments and programmes. Institutional funding should also be evaluated with regard to its reciprocal impact on other funding instruments.

The Austrian Council recommends an overarching, inter-ministerial and national management of themes that has regard to existing development potential, strengths and grand challenges. Overlaps and gaps should be avoided and there should be coordination with other types of instrument such as structural measures. A central point is the development of comprehensible criteria for identifying themes.

The Austrian Council recommends an analysis of the reciprocal relationship between direct and indirect research funding that builds upon the insights gained from the system evaluation. This will enable the complex interrelationships and interdependencies in the context of the overall innovation system framework to be captured and where necessary will permit adaptations to be made.

#### International Positioning

The Austrian Council recommends the continuation of coordination processes in the international research environment and welcomes the measures of the Working Group set up by the Task Force to coordinate stakeholders and ministries.

#### Research and Society

The Austrian Council recommends the expansion of dialogue-based and participatory forms of science communication. This requires the prior development of a system of incentives that would encourage scientists and researchers to actively engage in dialogue with society.

The Austrian Council recommends that Long Nights of Research be held regularly. This requires cooperation between the Federal Government and provinces that enjoys the support of all responsible ministries. Also essential in this context are the continuity of the joint measures and secure financial planning.

The Austrian Council further recommends expanding the technology impact assessment and concomitant ethical impact analyses.

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**Providing Incentives, Creating Options: Broadening the Financial Base**

In the opinion of the Austrian Council, the objectives set by the RTI Strategy in this chapter are to be welcomed without qualification. Yet the Austrian Council does not see how the objectives are to be realised by the implementation of the measures.

In light of the premises of the existing budget planning until 2015, the RTI Strategy's objective of achieving a GERD-to-GDP ratio of 3.76 percent by 2020 now seems more difficult to achieve. This relates both to the private and public contribution to GERD as a percentage of GDP. From what we currently know about the budget figures until 2015 we can

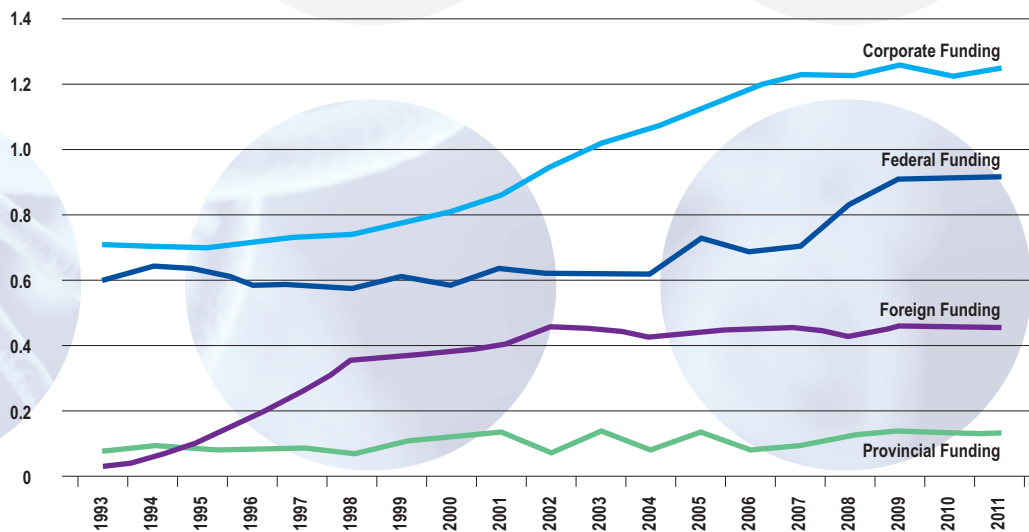
conclude that public expenditure would have to rise disproportionately strongly after 2015 for it to be possible to achieve the target figure by 2020. In view of the absorption capacity of the system, there are serious grounds for doubting the feasibility of such a trajectory. Research capacities are built gradually, but can be lost very quickly if research personnel, for example, move abroad due to lack of prospects and resources.<sup>155</sup>

To catch up with the group of Innovation Leaders such as Sweden, Denmark or Switzerland, it is above all necessary to raise the private (corporate) share of total R&D expenditure. In respect of public funding for R&D Austria is already an international leader.

**RTI Strategy Objectives  
Providing Incentives,  
Creating Options**

- 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.

**Figure 13: Contribution of Sectors to GERD as a Percentage of GDP**



Source: Statistik Austria

<sup>155</sup> WIFO (2011): Forschungsquotenziele 2020

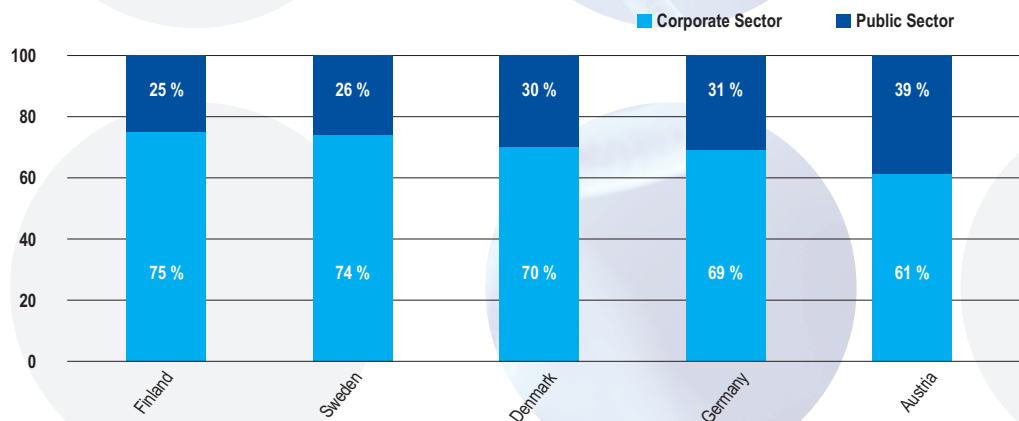
Figure 13 illustrates the problem. It shows the expenditure of the Federal Government and provinces (public sector), of the corporate sector and from abroad relative to GDP (disaggregated GERD-to-GDP ratio) This makes clear that in the final analysis it is only the Federal Government that boasts a dynamic development. By contrast, we see stagnation in the expenditure of the corporate sector (albeit at a high level) and of foreign funding. Meanwhile, in the leading innovation nations, where GERD as a percentage of GDP is above that of Austria, the proportion of R&D spending attributable to the private sector is already significantly higher (see Figure 14).

It is therefore necessary to ask the question how the contribution of companies to total R&D spending can be raised to the target figure of at least 66 percent, and if possible, to 70 percent. In

the opinion of the Austrian Council, achieving the goal of stimulating the corporate sector to increase research and innovation and thus to increase the number of companies conducting R&D, is undermined on the one hand by still inadequate venture capital finance (above all for young, ambitious companies), and on the other hand, by the still insufficient level of tax concessions for philanthropic activities. Thus the WIFO criticises the fact that Austrian risk capital intensity has for years been at the lower end of the table of all European countries.<sup>156</sup> To solve this problem, the WIFO suggests a loosening of investment regulations for life insurances and pension funds to enable them to invest a greater proportion of their resources in risk capital funds. The results of the 2011 Innovation Union Scoreboard

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Figure 14: Public and Private Sector Contribution to GERD as a Percentage of GDP



Source: Statistik Austria, OECD

<sup>156</sup> WIFO (2010), WIFO-Positionspapier zur FTI-Strategie 2020, p. 23

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clearly point in this direction: Austrian weaknesses are characterised above all in the areas of SME research activity, in the successful implementation by SMEs of research results in the market, as well as in venture capital.<sup>157</sup>

The Austrian Council very much welcomes the RTI Strategy objective of attaching greater importance to the output and impact orientation of the innovation system when allocating public funds. The support measures planned in connection with this are very promising, as are the methods presented for evaluating the impact-orientated budget management. Only in the long term will it be possible to establish whether the planned objectives can actually be realised.

Worthy of special mention is the objective of guaranteeing innovation system actors the greatest amount of planning security possible. It is in the opinion of the Austrian Council all the more regrettable that the current discussions in this regard focus exclusively on extending financial planning for IST Austria (2017–2026). In its statement of 19 March 2012, the Austrian Council charac-

terises the long-term securing of IST Austria as exemplary. However, the same must be guaranteed for all other Austrian research institutions.

The EU Commission has recommended to its member states that in the medium-term they spend two percent of GDP on the tertiary education sector (universities, Fachhochschule, teacher training universities). The Austrian Parliament (24 September 2008) and the Federal Government (3 November 2009) have also committed themselves to this objective. If the Federal Government is to achieve this goal, this must also have budgetary implications and involve a stronger performance orientation, enhanced output efficiency as well as securing social equality of opportunity.

The foundations of financial planning and an appropriate safeguarding of the central institutions of Austria's science and research system would thus need to be anchored in the federal budget. This necessitates the introduction of the research finance law announced in the RTI Strategy, which must establish a corridor for research and development investments, so that the GERD-to-GDP target of 3.76 percent by 2020 can be reached.

### **Recommendations of the Austrian Council for the Implementation of the Measures in the Federal Government's RTI Strategy**

The Austrian Council suggests that when implementing the measures in the RTI Strategy, particular attention is devoted to the following points:

#### **Chapter "Providing Incentives, Creating Options: Broadening the Financial Base"**

The Austrian Council regards the statutory anchoring of research finance to be an important signal and in the interests of planning and financial security calls for the rapid implementation of this measure.

The Austrian Council recommends the implementation of the 2 percent of GDP target for

tertiary sector funding recommended by the EU Commission and approved by the Austrian Parliament on 24 September 2008 and by the Federal Government on 3 November 2009.

The Austrian Council recommends in addition greater examination of international models for increasing R&D expenditure by the private sector.

<sup>157</sup> Innovation Union Scoreboard 2011, p. 68

## Summary Assessment of the Implementation of the RTI Strategy Measures

On the basis of its preliminary evaluation, the Austrian Council has compiled a detailed overview of the implementation of RTI Strategy measures. Table 3 (see overleaf) offers a systematic overview of the extent to which measures from the RTI Strategy have been implemented and their effect on the achievement of objectives. The table must be interpreted with caution, since the implementation period thus far comprises merely one year and the validity of the data will increase over time. To evaluate the measures, a multi-criteria grid was developed so that a systematic comparison could be achieved.<sup>158</sup>

In general, Table 3 is to be understood as a “flow chart” and less as a static overview of the imple-

mentation of the Strategy, which cannot be provided until after 2020. In the years to come, new measures will be added or existing ones will be adapted on the basis of evaluation results. The prime purpose of the table is to provide indicators for a systematic monitoring of Strategy implementation that will permit a consideration of priorities and possible additions over the course of the coming years.

Table 3 shows that a total of 117 support measures were defined (column 1), of which about a quarter related to each of the following areas “education system”, “creating insights”, “utilising knowledge” and “providing guidance”.<sup>159</sup>

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<sup>158</sup> The following criteria were examined for each individual measure:

- **Problem-Solving Orientation:** Which problem is addressed by the measure; is it relevant for achieving the specific objective?
- **Degree of Implementation of the Measure:** The degree of implementation of the measures was estimated by the Austrian Council and external experts of the WIFO and roughly allocated a value of 0 (= not started) to 3 (= implemented). In addition, information was collected as to whether the
  - measure had already existed and had been adopted unchanged by the RTI Strategy and whether
  - measures for which sufficient results are already available had been subjected to an impact analysis that allowed a judgement of their possible contribution to achieving the objective.
- **Potential for Indicator-Based Monitoring:** For the quantitative tracking of the implementation measures, the first step was to establish whether
  - output indicators could depict the performance of the measures;
  - impact indicators could depict the effectiveness of the measures;
  - quantitative objectives were established in cases where the effectiveness of the measure could be quantitatively monitored
- **Priority of Measures:** The concept of priority summarises the potential contribution to achieving objectives. The higher the potential contribution, the higher the priority for the implementation of the measure. The measures were thus divided into 3 categories (1 = generally lower priority, 2 = average priority, 3 = priority).
  - To determine the priority of measures, the Austrian Council and external WIFO experts primarily estimated the dimension of the measure. Was the measure a structural reform with a broad target circle or for example, an administrative action to improve coordination within a small area of the strategy? Which budget is responsible for the specific measure? It is planned that in future years this information will be supplemented by the inclusion of distance from objective information, i.e. how far the specific measure is from completion.
  - In addition, a distinction was made between the priority for achieving the objective of the specific area in which the measure is located (operative goals, e.g. proportion of drop-outs, investments in basic research) and the priority for achieving the higher overall strategic objective (priority objectives, e.g. growth, competitiveness, innovation leaders).
- **Appropriateness of the Measures:** A measure is characterised as appropriate if it contains all substantive changes necessary for achieving the objective. The Austrian Council and the external experts of the WFO undertook a cursory assessment of appropriateness based on their knowledge of the interrelationships of impacts and of all strategy measures. This did not take the form of an allocation of points, but only identified ways in which the measures might be extended (e.g. particular elements of a measure for the effective achievement of objectives).
- **The Principles of the Strategy:** The RTI Strategy cites six principles for the implementation of the measures: the broad use of instruments, the agreed and coordinated use of instruments, impact orientation, efficiency, effectiveness; Leverage function of public investments; excellence in research; internationalisation of RTI actors. Using available information, relevant principles were allocated to the specific measures. This information will be collected over time and can at an advanced stage of Strategy implementation highlight the potential for additions to or adaptation of measures.
- **Type of Measures:** Finally, all measures were roughly allocated to different types, i.e. classified as measures relating to a funding programme, a framework condition or an administrative action.

<sup>159</sup> It should be noted that several of the measures referred to in the context of universities in the field “Education System” actually relate to the field “Creating Knowledge.”

## evaluation of strategy implementation

The degree of implementation (column 2) is generally relatively high for the second year of the Strategy. That is to be explained by the fact that about 30 percent of the measures already existed prior to the introduction of the Strategy (column 3).

Indeed, in the education system almost half the measures were actually adopted unchanged. A future impact evaluation should establish whether these measures have effectively contributed to the achievement of objectives and, if not, whether they have been appropriately adapted. Column 4 shows that there is still potential to investigate the effectiveness of measures that were implemented some time ago.

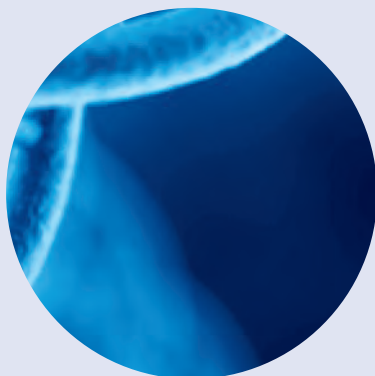
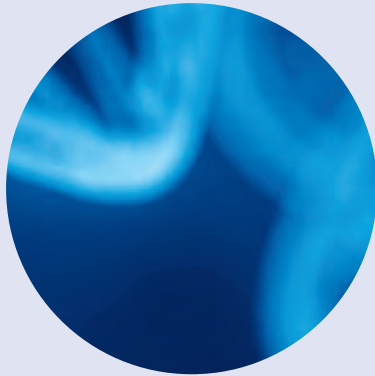
For over half of all the specific support measures currently underway, it is possible to establish quantitative indicators for their operationalisation (column 5); in about 10 percent of cases this was also done (column 6). Increased use of quantitative goals when setting measures would make it easier to monitor the implementation of the Strategy and to evaluate whether the Strategy has come closer to meeting its objectives. Columns 5 and 6 show that there are definitely possibilities for this.

Column 7 (operational goals – e.g. school drop-out rate, investments in basic research...) and column 8 (priority objectives – e.g. growth, competitiveness, Innovation Leader) mirror the priority ranking of the measures. The highest priority is to be found in the first row, the middle priority in the second and overall lower priorities in the third. Priority support measures for achieving priority objectives (column 8, in each case the first line) are to be found above all in the areas of “research finance”, “education system” and “utilising knowledge”, whilst an area such as “political steering” (providing guidance) predominantly contains piecemeal measures. Using implementation monitoring, the Austrian Council has identified two thematic areas in which implementation should be especially pursued. As yet the urgent challenges in the education system – from early learning support through to the universities – are not adequately reflected in the specific support measures of the RTI Strategy. Finally, the area of research financing should be dealt with as a priority. There is above all still a paucity of specific concepts for increasing the proportion of private funding in R&D expenditure.


**Table 3: Overview of the Extent to which the Measures Contained in the RTI Strategy Have Been Implemented and Their Effects on Goal Achievement (Explanation in Text)**

	1. Number of Measures	2. Extent of Implementation	3. Measure Existed Unchanged Prior to the Strategy	4. Impact Evaluation of Measures already in Force for a Lengthy Period	5. Can Measure be Quantified with Indicators?	6. Goal Set	7. Priority of the Measures for Operational Goal	8. Priority of the Measures for Operational Objectives
<b>Total</b>	117	1,9	31 %	15 %	55 %	11 %	18 % 48 % 33 %	16 % 27 % 56 %
<b>Educational System</b>	30	2,2	48 %	0 %	74 %	5 %	17 % 46 % 37 %	18 % 52 % 30 %
<b>“Creating Knowledge” / Universities &amp; Non-University Institutions</b>	18	1,8	25 %	50 %	38 %	33 %	13 % 75 % 13 %	6 % 50 % 44 %
<b>Utilising Knowledge Corporate</b>	32	1,9	30 %	43 %	63 %	10 %	19 % 48 % 33 %	15 % 30 % 55 %
<b>Providing Guidance Political Steering</b>	35	1,8	23 %	0 %	37 %	0 %	10 % 48 % 43 %	0 % 10 % 90 %
<b>Research Financing</b>	2	1	0 %	n.a.	50 %	100 %	100 % 0 % 0 %	100 % 0 % 0 %

Source: WIFO, Austrian Council calculations. All figures are approximate and are intended to illustrate implementation efforts.



Assessment of elements, which are not  
included in the FTI strategy




**assessment of  
elements not included  
in the strategy**

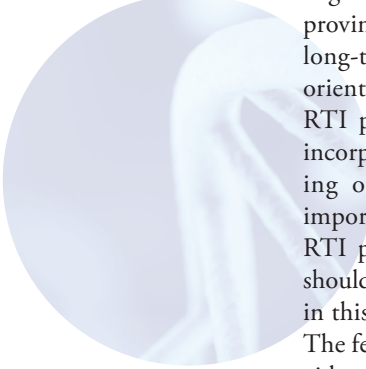
In addition to evaluating the implementation of the measures contained in the RTI Strategy, the Austrian Council has identified elements not addressed in the Strategy. Given the significance of these elements for improving the performance of Austria's RTI system, the Austrian Council considers it necessary to list them below:

- Coordination between the Federal Government and provinces
- Aligning the RTI Strategy with the University Plan
- Developing an innovation-orientated STRAT.AT plan for 2014 to 2020
- Humanities, social and cultural sciences
- Risk in Research Funding

### **Coordination Between the Federal Government and the Provinces**



The significance and activities of the provinces in respect of funding research, technology and innovation (RTI) have risen sharply in the last two decades. Linked to that, there has also been an increased formulation of RTI policies at regional level. Nowadays, practically every province has an RTI policy strategy or an economic policy strategy that takes into account RTI-policy components.<sup>160</sup>



At the same time, the increasing RTI policy activities of the provinces have led to a large number of in part sub-critical measures. For there to be an effective coordination and alignment between central government and the provinces, it is necessary for there to be a clear, long-term and generally accepted RTI policy orientation. There is at present no satisfactory RTI policy learning system that adequately incorporates the provincial level. And a deepening of RTI policy know-how is especially important for provinces with a large number of RTI policy actors. The Federal Government should thus establish cooperation incentives and in this way assume a structuring role.<sup>161</sup>

The federal level is and remains the central provider of RTI policy impulses and thus has a central coordination function in respect of a pan-provincial alignment of RTI policy strategies and activities. Steering should occur above all through

an effective and symmetrical exchange of information.<sup>162</sup> Existing initiatives such as the BMWF-provincial dialogue are certainly to be positively evaluated. Yet this presents only one part of innovation whilst innovation activities that are close to the market are not addressed. Yet these are strongly regionally anchored which means that an appropriate coordination and consultation process is required. The platform RTI Austria can play a central role in this regard, since it is a body charged with cooperation and coordination in research, technology and innovation-orientated matters, the brief of which spans the federal and provincial levels.

The Austrian Council therefore recommends developing a clear strategic thrust in cooperation with the provinces, which would serve as an umbrella for the long-term orientation of regional and national RTI policy activities. In the medium term and operationally, the Federal Government should evaluate the relevance of the measures for implementing the RTI Strategy and the areas where they touch upon regional RTI strategies and innovation policy measures. This primarily concerns areas that also fall within the competences of the provinces and which can thus, at least in part, be implemented by them. In some strands, the provinces have become independent RTI policy partners,

<sup>160</sup> System Evaluation (2009): Report 2: Strategische Governance – Der Zukunft von Forschung, Technologie und Innovation ihren Möglichkeitsraum geben, p. 12

<sup>161</sup> System Evaluation (2009): Report 2: Strategische Governance – Der Zukunft von Forschung, Technologie und Innovation ihren Möglichkeitsraum geben, p. 68

<sup>162</sup> System Evaluation (2009): Report 2: Strategische Governance – Der Zukunft von Forschung, Technologie und Innovation ihren Möglichkeitsraum geben, p. 67

especially in areas where the provinces have a direct financial involvement. An effort to incorporate the provinces and give them voice should be made. A failure to incorporate the

provinces would leave unrealised opportunities to include existing province-specific potential in the federal strategy and its measures.<sup>163</sup>

**assessment of elements not included in the strategy**

#### **Recommendation of the Austrian Council Concerning Coordination Between the Federal Government and the Provinces**

The Austrian Council recommends that a clear strategic vision be developed for the long-term orientation and alignment of regional and national RTI policy activities.

The Austrian Council recommends that an operational-level-evaluation be carried out of the measures for implementing the Federal Government's RTI policy to verify their relevance for and interfaces with regional RTI strategies and innovation policy measures.

#### **Aligning the RTI Strategy with the University Plan**

Although the University Plan is orientated toward the RTI Strategy, it is not explicitly mentioned, and nor does it assume a prominent position in the planned support measures. The support measures make only limited reference to the University Plan (e.g. regarding funding for university places, the research infrastructure roadmap or when discussing performance agreements in connection with cooperation in the area of research). In the opinion of the Austrian Council, there is an urgent need for a systematic alignment with the relevant goals and measures

of the RTI Strategy. Important concerns of the University Plan, such as improved collaboration, synergies or the alignment of subjects and research in the tertiary sector, are insufficiently clearly addressed in the RTI Strategy. The Austrian Council thus welcomes the planned initiatives to connect the individual aspects of the University Plan with the RTI Strategy. Especially worth stressing in this regard is the plan for the Task Force to address on an annual and comprehensive basis the implementation status and further development of the University Plan.

#### **Austrian Council Recommendation Concerning the Coordination of the RTI Strategy with the University Plan**

The Austrian Council recommends that the University Plan be regarded as an integral component of the RTI Strategy and that the implementation of the two instruments be coordinated. This will permit the avoidance of parallel activities and duplications.

<sup>163</sup> System Evaluation (2009): Report 2: Strategische Governance – Der Zukunft von Forschung, Technologie und Innovation ihren Möglichkeitsraum geben, p. 68

**assessment of  
elements not included  
in the strategy**

### **Developing an Innovation-Orientated STRAT.AT Plan for 2014 to 2020**

By far the largest proportion of the EU's future RTI budget will be financed via the Structural Funds, which in Austria too are an important source for the funding of research projects. The totality of the planning flows into the STRAT.AT Plan, the operational programmes of which describe specific implementations in the regions. The lack of any reference in the Federal Government's RTI Strategy to the important area of Structural Funds illustrates that there is still a considerable need for coordination. In the current financing period, there have been increasing problems identified in the accounting of innovation projects and these are to be attributed to the formulation and interpretation of the regulations. It is thus very important

to address the structural and practical hurdles in the area of Structural Funds. In the planning process for the next financing period (up to 2020) it is essential to take into account the potential of the Structural Funds for the Austrian innovation system.

It is envisaged that the national RTI systems will receive approximately one third of the EU Structural Funds. The Structural Funds thus constitute a significant source of funding for Austria's innovation system. It is therefore necessary to find appropriate measures to counteract the frequent errors in project accounting and declining take-up on the part of research institutions. The Austrian Council already drew attention to problems in the recognition of project costs in its recommendation of 24 March 2011.

### **Austrian Council Recommendation Concerning an Innovation-Orientated STRAT.AT Plan for 2014-2020**

The Austrian Council recommends coordinating and harmonising European research programmes – especially the Structural Funds – with national guidelines, and with the participation of the provinces, with a view to significantly simplifying project administration for researchers.

### **Humanities, Social and Cultural Sciences**

The humanities, social and cultural sciences are the bridge between the past, present and future. Their variety and diversity thus supports social development.

This high social relevance does not however imply a direct economic utility. This not only leads to difficulties acquiring third-party funding, but also frequently to legitimation pressure arising from discussion regarding a country's competitive performance and a competitive attitude vis-à-vis the natural sciences. Matters are made more difficult for the humanities, social and cultural sciences by virtue of the fact that their research findings are often insufficiently recognised and because the number of students in some subject areas of the humanities, social and cultural sciences is very high. The latter results on the

one hand in poor supervisory conditions and on the other in a relatively limited number of research activities alongside a simultaneously high number of teaching commitments. This leads to deficiencies in the training of young scientists as well as to often precarious conditions at universities, above all, however, in many non-university research institutions.

In view of their social significance and the fact that the humanities, social and cultural sciences have in recent years not received the recognition they deserve, the Austrian Council urgently recommends that greater attention be devoted to them. The goal must be to place socially important science and research areas on a structurally and financially sound footing.

**assessment of  
elements not included  
in the strategy**

### **Austrian Council Recommendation Concerning the Humanities, Social and Cultural Sciences**

The Austrian Council recommends that greater attention be devoted to the humanities, social and cultural sciences and in addition the implementation of the Austrian Council Recommendation Concerning the Future Development of the Humanities, Social and Cultural Sciences of 2 April 2008.

**assessment of  
elements not included  
in the strategy**

### **Risk in Research Funding**

The path to becoming an Innovation Leader also requires an appropriate increase in the technological standards that are demanded in the Austrian innovation system. Large leaps forward in innovation imply increased risk. The question thus arises how one can better anchor the idea of risk in science and economic policy instruments. The challenge is to anchor appropriate incentive structures in the system, rather than steering via new funding measures. Providing incentives and opportunities for more high-risk projects in RTI funding have to be addressed not only in project selection (e.g. via alternative evaluation criteria or auctioning procedures), but also in the goals and incentives given to funding agencies (legitimation via assumption of risk vs. success

stories). For this reason, it is also important that the relevant ministries ensure that appropriate incentives and latitude (dare to fail) are created in the “performance indicators” for funding and agencies.<sup>164</sup>

This problem has long been of concern to the actors in the Austrian innovation system.<sup>165</sup> Although the system evaluation contained a demand for more risk in research funding, no deeper analyses have been undertaken or concrete measures implemented to date. In the longer term, this will make it very difficult for Austria to develop from being a follower to a leading innovation nation. For the further a country is in respect of technological development, the more important risk and high-end innovations are for maintaining competitiveness.

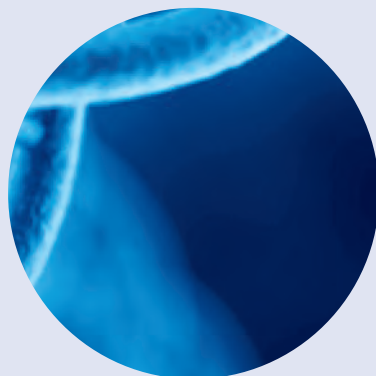
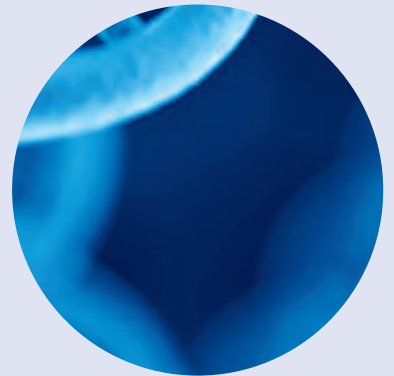
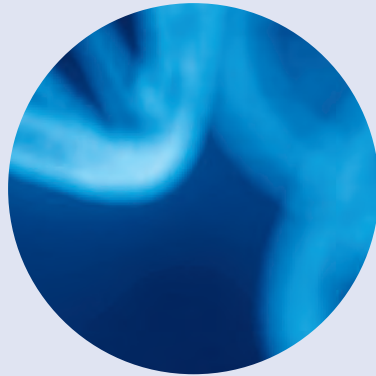
### **Recommendation of the Austrian Council**

The Austrian Council recommends creating appropriate incentives or latitude for the agencies, with a view to funding high-risk projects (dare to fail).

The Austrian Council recommends the greater incorporation of aspects of risk (including developmental and market risk) in the evaluation of funding applications (e.g. via alternative evaluation criteria or auction procedures).

<sup>164</sup> System Evaluation (2009): Report 5: Das Angebot der direkten FTI-Förderung in Österreich, p. 123

<sup>165</sup> Ungerboeck, L. (2007): Wenig Risiko, wenig Misserfolg. In: Der Standard, 31. 10. 2007




Recommendations Concerning the Further Development  
of the RTI Strategy and the RTI System



**recommendations for further development**

Austria faces large demographic and ecological challenges, increasing global competition and thus constant structural change in economy and society. The effects of the international financial and economic crisis on public budgets as well as on medium-term growth potential in the domestic economy will continue to be of concern to Austria.

Austria thus faces the question of how it will secure its future viability and further extend prosperity to embrace future generations. In its RTI Strategy, the Federal Government has expressed the conviction that this can be achieved above all by strengthening research, technological development and innovation. The Austrian Council welcomes this statement of conviction, for it holds the firm view that education, research and innovation are among the key factors for overcoming the challenges Austria faces.<sup>166</sup>



On the basis of its analysis of Austria's RTI system as well as of the initial results of its implementation monitoring of the Federal Government's RTI Strategy, the Austrian Council reaches the judgment that, subsequent to an impressive process of catching up, Austria's innovation performance has in the last three years stagnated. In international comparisons, Austria's RTI system has a good mid-range ranking.

Austria thus finds itself in a position from which its prospects of joining the leading group and achieving the objectives of the RTI Strategy remain good. Yet delays in optimising the framework conditions to increase innovation performance are having a very strong impact. European and international competitors are also actively working towards increasing their innovation performance. The implementation of the RTI Strategy measures must therefore be accorded high priority.

In view of the fact that the RTI Strategy was agreed just one year ago and that the implementation of the measures understandably requires time, the Austrian Council's recommendations emphasise the following two core areas, which in the opinion of the Austrian Council are especially essential for the future development of the RTI Strategy and the RTI System.

- Modernising the education system
- Increasing the private share of R&D funding

The Austrian Council's implementation monitoring clearly shows that major efforts are necessary above all in the area of education. The education system remains the bottleneck of Austria's RTI system. The high selectivity means that existing potential is not being sufficiently realised. Here, it is necessary to vigorously pursue the implementation of the relevant measures in the RTI Strategy.

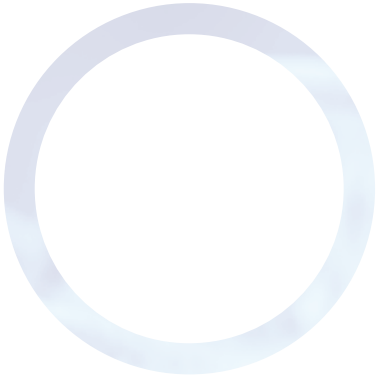
<sup>166</sup> Compare also OECD (2010): Innovation Strategy – Getting a Head Start on Tomorrow

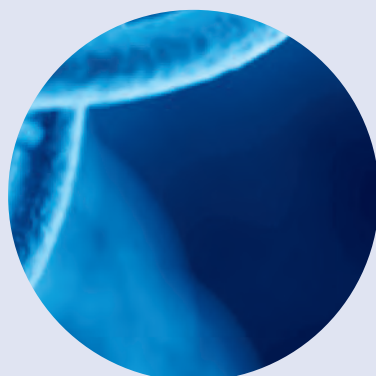
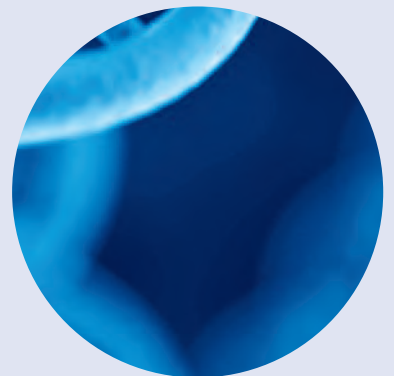
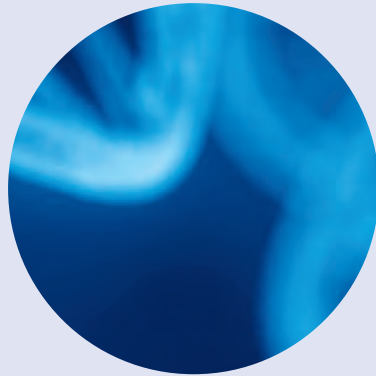
According to the findings of the implementation monitoring, the second crucial substantive area is to be found in broadening the sources of funding for R&D activities. When it comes to research and innovation, the Austrian economy has mastered the crisis years better than many other countries, yet compared to leading innovation nations there is still some catching up to do. It is above all necessary to significantly raise the proportion of private R&D financing. Yet there is a lack of new concepts as to how this should be done. In addition, however, the degree to which the measures contained in the RTI Strategy have been implemented is still inadequate.

The Austrian Council recommends that particular importance be attached to implementation activities in these two areas. In this regard, it is on the one hand essential to modernise the structures of the education system. This can be done by strengthening school autonomy, as well as by streamlining the division of competences between central government and the provinces. To overcome early selection in the education system, the Austrian Council recommends a commitment to and appropriate implementation of comprehensive all-day secondary schooling, alongside performance differentiation and talent development.

On the other hand, an increase in the private share of R&D funding is central. The Austrian Council thus recommends greater examination of international models for increasing the R&D expenditure of the private sector. Parallel to that, the Austrian Council regards the statutory anchoring of research funding to be an important signal for research organisations, but also for companies. The prompt implementation of this ambition is of great relevance for planning and funding security.

**recommendations for further development**







## abbreviations

<b>ACR</b> Austrian Cooperative Research	<b>FFG</b> Austrian Research Promotion Agency
<b>AIT</b> Austrian Institute of Technology	<b>FWF</b> Austrian Science Fund
<b>AKA</b> Academy of Finland	<b>GDP</b> Gross Domestic Product
<b>AplusB</b> Academia plus Business	<b>IHS</b> Institute for Advanced Studies
<b>AVCO</b> Austrian Venture Capital Organisation	<b>IIASA</b> International Institute for Applied System Analysis
<b>AWS</b> Austria Wirtschaftsservice	<b>JITU</b> Initiative to Build Young, Innovative, Technology-Oriented Companies
<b>BKA</b> Austrian Federal Chancellery	<b>IMBA</b> Institute of Molecular Biotechnology
<b>BMF</b> Ministry of Finance	<b>IMP</b> Institute of Molecular Pathology
<b>BMUKK</b> Ministry of Education, Art and Culture	<b>IST</b> Austria Institute of Science and Technology Austria
<b>BMVIT</b> Ministry of Transport, Innovation and Technology	<b>IUS</b> Innovation Union Scoreboard
<b>BMWF</b> Ministry of Science and Research	<b>NARIC</b> National Academic Recognition Information Centres
<b>BMWFJ</b> Ministry of Economic Affairs, Family and Youth	<b>ÖAW</b> Austrian Academy of Sciences
<b>BRIC</b> Brazil, Russia, India, China	<b>OECD</b> Organisation for Economic Cooperation and Development
<b>CDG</b> Christian Doppler Research Association	<b>PCT</b> Patent Cooperation Treaty
<b>COIN</b> Cooperation & Innovation	<b>PEREP</b> Private Equity Research Exchange Platform
<b>COMET</b> Competence Centres for Excellent Technologies	<b>R&amp;D</b> Research and Development
<b>CREST</b> European Union Scientific and Technical Research Committee	<b>RCUK</b> Research Councils United Kingdom
<b>DFG</b> German Research Foundation	<b>RTI</b> Research, Technology and Innovation
<b>EFRD</b> European Fund for Regional Development	<b>SNF</b> Swiss National Science Foundation
<b>ENIC</b> European Network of Information Centres	<b>SME</b> Small and Medium-Sized Enterprises
<b>ERC</b> European Research Council	<b>TU</b> University of Technology
<b>ESFRI</b> European Strategic Framework for Research Infrastructure	<b>WEF</b> World Economic Forum
<b>ETH</b> Swiss Federal Institute of Technology Zurich	<b>WIFO</b> Austrian Institute of Economic Research
<b>EU</b> European Union	<b>WU</b> University of Economics and Business
<b>EVCA</b> European Private Equity and Venture Capital Association	<b>ZSI</b> Centre for Social Innovation