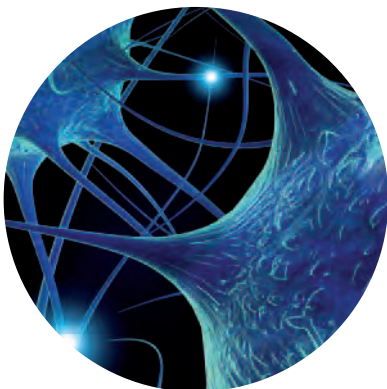
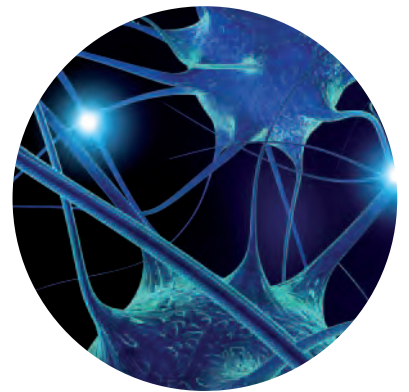
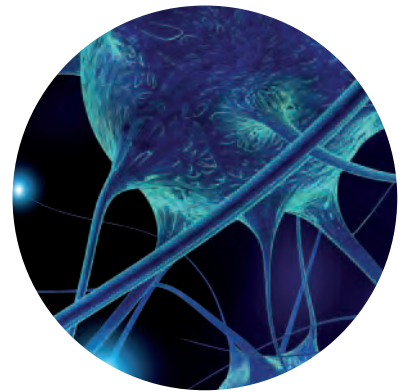
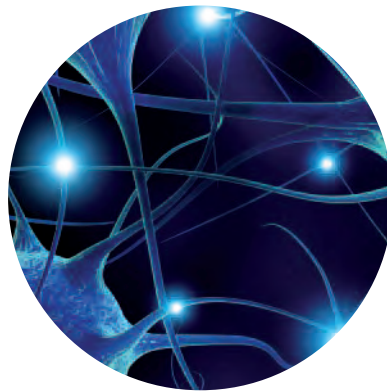
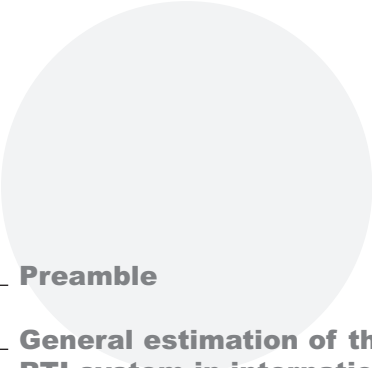




Report on Austria's Scientific and
Technological Performance Capability
2013



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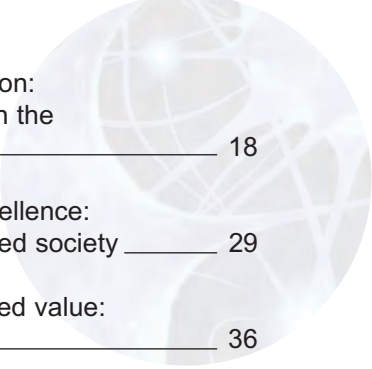


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preamble

In the presentation to the Council of ministers held on 9th September 2010 the federal government commissioned the Council for Research and Technology Development with the task of creating an annual report on the scientific and technological performance capacity of Austria. This report will be sent annually together with the research and technology report to the Austrian Parliament. The first report was presented in June 2012.

For the realisation of the report the Council continuously deals with the challenges to cope with the set objectives indicated by the federal government in order to be part of the leading innovative nations. The Council sees it as its task to observe the developments in these areas and to assess them according to their significance for the RTI system.

The report focuses on the achievement of the objectives of the RTI strategy. In this regard the Council carries out a strategic monitoring of the realisation of the federal government's RTI strategy and assesses the implemented measures as well as their goal orientation. These findings create a fundamental basis for the assessment of the performance of the Austrian RTI strategy. For this purpose a set of indicators for the illustration of the goal achievement was developed in co-operation with the WIFO, the Austrian Institute of Economic Research.

In order to define a rather broadly accepted and consistent set of indicators, which will serve as a basis for the Council to guarantee a regular and

transparent innovation monitoring in the years to come, a feedback discussion with experts as well as a broad discussion process with the responsible ministries was implemented in co-operation with the AG 8 (RTI rankings) of the Task Force RTI. The report has an independent structure, but it also takes into account – to a large extent – the installation of the RTI strategy, in order to facilitate the comparison of the essential challenges and fields of action.

The chapter "General evaluation of the performance of the Austrian RTI system in an international comparison" deals with primary fields of the national RTI system from the viewpoint of the Council.

In the chapter "Assessment of the performance of Austria in relation to the objective targets and measures of the RTI strategy", the implementation of the RTI strategy is analysed in detail. In each chapter of the strategy the Council assesses the status of the target achievement as well as the target achievement chances. In the single cases it is also assessed whether the implemented measures are suitable from the point of view of the Council in order to reach the objective targets of the RTI strategy and the vision for Austria by 2020. Furthermore, possible improvement options for the single strategy elements are listed.

The last chapter summarizes the primary fields of action from the viewpoint of the Council and comprises recommendations for the further development of the RTI system.



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Hannes Androsch
President



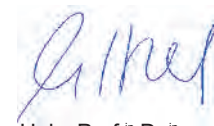
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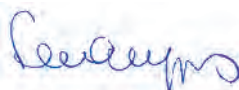
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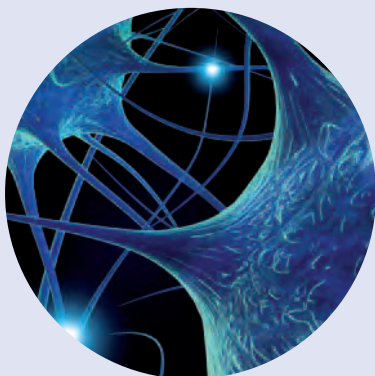
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General estimation of the performance
of the RTI system in international comparison



general assessment

Austria's economic competitiveness has hardly changed since the economic crisis in the year 2009. Even if during the last decade Austria has presented a high dynamic in many areas, a comparison of all respective rankings of different nations revealed that the Austrian development in the single driving political areas of competitiveness such as education, regulation etc. remained static in the last three years. In its monitoring report of 2012¹ the Austrian Federal Economic Chamber has arranged over 140 international rankings, which analyse the strengths and weaknesses of the Austrian national economics. In around one third of these rankings, the position of Austria dropped compared to the previous year, in one third it remained the same.

Nevertheless, Austria is performing relatively well in the global competition as measured by the macroeconomic performance variables. Austria's economic growth was continuously above the average within the eurozone. In an international comparison, Austria shows since 2004 a high occupation rate and an increasing wealth.² As measured by the income per capita, Austria still ranks third within the EU, while globally it is on place 11.³

There are various reasons for this positive development. The most important are certainly the internationally competitive industry and tourism economy with their numerous, dynamic small and medium enterprises as well as the comeback of the dynamic centre of Europe after the fall of the Iron Curtain. Mention should also be made of the fact that Austria's scientific and technological performance capacity has continuously increased since the 1980s. Numerous

analyses confirm a continuous improvement in the performance of the Austrian RTI system.⁴ However, this positive development cannot hide the fact, that Austria is still part of the group of innovation followers after the catching-up process during the last decade and that there is still a performance gap to the group of Innovation Leaders. This becomes evident through broader indicators related to innovation efforts and to the priority objective targets of the RTI strategy (see section "Austria's performance in relation to the priority objective targets", page 9 f.) as well as indicators related to resultant effects of the innovation system (i.e. innovation in its stricter sense, see section on "Effect monitoring", page 11 f.) From the point of view of the Council, catching up with the Innovation Leaders can nevertheless be seen as realistic. Austria's position within the front midfield is a good starting position to achieve the objective pursued by the federal government in the RTI strategy, namely to catch up from innovation follower to a leading innovation country. The pre-condition for this is the consistent implementation with emphasis of the measures established in the RTI strategy. These findings can be substantiated both by the positioning of Austria in various innovation rankings⁵ and by the indicators presented for the first time in this report.

As only two years have gone by since the publication of the RTI strategy, the probability of the achievement of the priority objectives cannot be assessed by today. Nevertheless, Austria's performance in relation to the target achievement can be indicated already now on the basis of several indicators through which central challenges can be recognized and respective options for action can be deduced.

¹ WKO, Austrian Chamber of Commerce (2012): Monitoring Report 2012: Austria in International Rankings.

² IWF (2012): World Economic Outlook; Eurostat; RTI strategy of the federal government, p. 4.

³ IWF (2012): World Economic Outlook.

⁴ Aiginger, K. / Falk, R. / Reinstaller, A. (2009): Evaluation of Government Funding in RTDI from a Systems Perspective in Austria. Synthesis Report; Austrian research and technology report 2010, 2011.

⁵ C.f. Proinno (Innovation Union Scoreboard, www.proinno-europe.eu/metrics), German Telekom Foundation (Innovation indicator, http://www.innovationsindikator.de/startseite/?no_cache=1), INSEAD (Global Innovation Index, www.globalinnovationindex.org).

Monitoring of the targets achievement of the RTI strategy 2020

In order to display the performance and the progress of the goal achievement of the RTI strategy in an international comparison, the Council is using a comprehensive set of indicators. This set was developed in co-operation with the WIFO, the Austrian Institute of Economic Research and was discussed with the ministries entrusted with the realisation of the RTI strategy. It comprises 62 indicators, which display the objective targets in the single chapters of the RTI strategy and make them operational.

The indicators are based on internationally used classifications of the OECD, Eurostat etc. and corresponding data portfolios. These are accessible to the public and are collected on a regular basis on a national as well as on an international level. A detailed explanation of the indicators including the objective target which they try to display as well as the calculations can be found in attachment 1; the data on which these are based can be found in attachment 2.

The number-supported indicators cannot display all the objective targets of the RTI strategy. This is valid in particular for the area of governance of the RTI system. For the assessment of the chapter on “Offering guidance, setting conditions” qualitative methods for the estimation of the goal achievement were thus used.

The presentation of all other chapters and areas concentrates mainly on the quantitative indicators. In order to unify the type of presentation in almost all areas and thus make their interpretation easier, the approach described below was chosen.

All the indicators used in this report are based on explicit objective targets established in the RTI strategy of the Austrian federal government. The

indicators are displayed according to their distance from the goal (**goal distance**) and their **target achievement chance**.

The **goal distance** indicates the Austrian actual value. It shows the relationship or the distance of the latest available Austrian value to the nationally set goal according to the RTI strategy or Education and Training 2020.⁶ If there is no national goal, the latest available average value of the current four Innovation Leaders Germany, Finland, Denmark and Sweden (“actual value of Innovation Leaders”) is used as a goal.⁷ This is due to the fact that catching up with the Innovation Leaders is a priority goal for Austria, as established in the RTI strategy.

All indicators should be interpreted in the same direction, i.e., values above 100 signalize a goal achievement, values below 100 their respective distance from the goal.⁸ The goal distance reveals some information on the level difference to the goal – on the present performance of Austria, but not on the changes or dynamics which are necessary for the goal to be achieved. Thus an indicator, which now lies only scarcely under the objective target because of a negative dynamic, can still deteriorate further. In other words, the exclusive comparison of the goal distances does not provide any hints on the probability of the goal achievement.

For this reason as a second dimension of the indicator-based presentation, the target achievement chance was chosen: it demonstrates whether the past growth of the indicator is sufficient for the target achievement. It indicates the relationship between the average annual growth rate of the past to the growth rate necessary for the target achievement (under a business-as-usual assumption). As target value for the

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⁶ As suggested by the BMUKK for some indicators of the education system, target values from the independent European Education-and-Training-2020 strategy have been adopted.

⁷ The term Innovation Leaders refers to the countries of the EU, which are part of the top group of the annual Innovation Union Scoreboard (IUS) of the European Commission.

⁸ The standardisation of the values is obtained as follows. The Austrian value is divided by the corresponding target value and multiplied by 100. If performance improvements are accompanied by a drop of the indicator values, as in the unemployment rate, the values are inverted (i.e. goal value in the numerator, Austrian value in the denominator) in order to maintain the interpretation “greater than or equal to 100 = target achievement”. The relevant indicators are marked with a (I).

general assessment

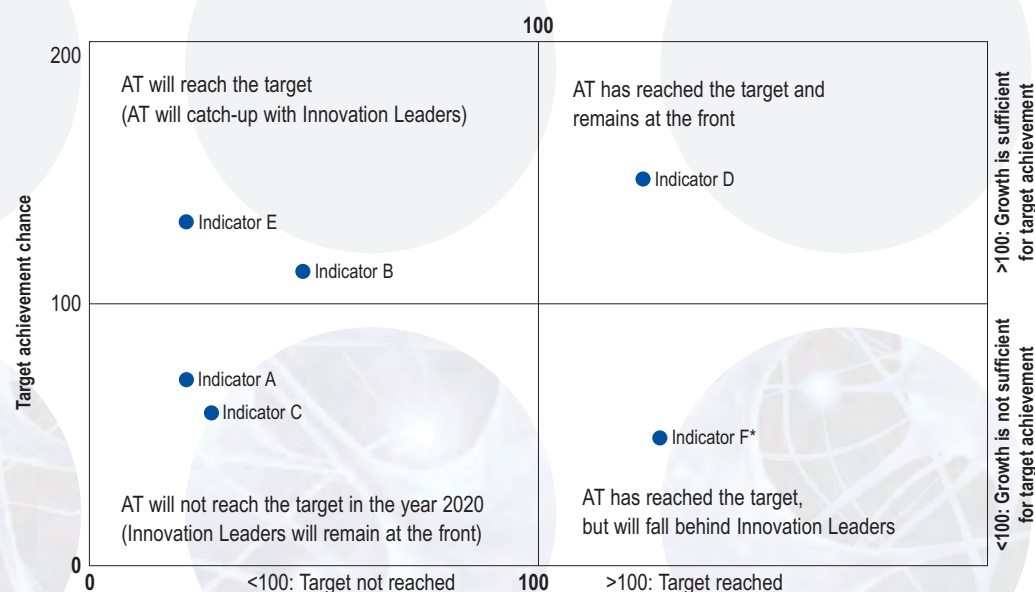
calculation of growth, if no national goal is set, the projection value for the year 2020 is consulted instead of the actual value of the Innovation Leaders in order to make a comparison. It is determined on the basis of the average growth rate of the past.⁹

A **target achievement chance** over 100 means that the growth in the past was above the growth necessary for the goal to be achieved. The probability to achieve the goal in the year 2020 should be respectively high. If the value is

below 100, the past dynamic indicates that the goal could be missed.¹⁰

In general it needs to be underlined that these calculations are based on the average growth rates of the past. Thus they do not represent a forecast based on assumptions, but explain the development assuming that everything goes on as usual. The results will change with the development of growth over the next years and will be integrated in the regular update of the illustration. They should be interpreted with care like all calculations, but they present in any case

Figure 1: Sample illustration to explain the interpretation of the indicators



Sources: see Attachment 1. Notes: goal distance = relation between actual value of Austria and actual value of Innovation Leaders (average value of latest available year DE, DK, FI, SE); with the exception *: relation between actual value of Austria and national goal according to the RTI strategy 2020. Target achievement chance = relation between the past growth and the necessary growth for the target achievement, considering the past growth of Innovation Leaders. Values on 200 were cut off. Raw data see Attachment 2

⁹ The underlying argument is that it is unlikely that the Innovation Leaders will remain at their current level. Thus, the positioning of Austria in the Innovation Scoreboard is always relative to the positioning of other countries, i.e. it always considers the growth of all countries. Setting the target value on the basis of the actual value of the Innovation Leaders would lead to too optimistic target achievement chances and the assessment of priority measures would be distorted.

¹⁰ In case of different indicators for growth rates (i.e. a drop in the indicator, although an improvement would be necessary) the distances of growth rates were equidistantly transformed to ensure a standardisation equal to 100 also in that case.

a rough draft of the dynamics in the single objective targets from which conclusions can be drawn on to the priority fields of action.

The combination of goal distance and target achievement chance results in a graphic description of four areas with different implications (see figure 1).

If there is an indicator in one of the two areas on the left hand side, this means that the corresponding goal has not been achieved yet. In the lower left hand side, due to the weak growth without additional measures or measures intensification, it could also remain the same. The measures, which are suitable for increasing the indicator values in this area, should be given priority. In the upper left hand side a continuous development as before could lead to the achievement of the goal, i.e. no further measures would be necessary here up to date, still assuming a further concurrent development.¹¹

The indicators in the two quadrants on the right side show that the corresponding goals have already been achieved. The upper right hand side will most likely remain so due to the high growth of the specific indicator, provided that the growth of the Innovation Leaders will develop within the expected limits. In the lower right hand side the growth of Austria is not sufficient to maintain the head start vis-à-vis the Innovation Leaders on the long run. In this context the development should be observed very precisely in order to take any timely countermeasures needed.

Austria's performance regarding the priority objective target of the RTI strategy

The priority objective targets established in the RTI strategy include goals on growth, competitiveness, sustainability and problem resolution as well as a general innovation performance goal.

More concretely speaking it concerns the following objective targets.

- Advance into the group of the leading innovation countries in the EU until the year 2020
- Consolidation of the competitiveness of the Austrian economy
- Enhancement of wealth in society
- Handling of the big social and economic challenges of the future

To illustrate these priority objective targets, indicators from the following areas will be used (see figure 2):

- Economy/occupation
- Innovation
- Health
- Environment and sustainability
- Life quality

These represent central target functions in politics and can also be defined as impact indicators for innovation, with the exception of innovation per se which in this case must be seen as the explicit overall goal of the RTI strategy.¹²

Figure 2 shows that in the area of the most important performance indicators for economy, which are the GDP per capita and the unemployment rate, the goals have already been achieved. Only the employment rate lies scarcely under the set goal.

The reasons for the good economic performance can be found for example in the high significance of tourism for Austria (the share of service exports in Austria is equal to 35 percent, the average share for the Innovation Leaders lies only at 13 percent), which offers occupation (also low-skilled) and growth especially in the rural areas. Further advantages result from the central position of Austria after the fall of the Iron Curtain¹³ and the tight connection to Ger-

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¹¹ Due to the annual update of the data, trend changes are promptly recorded.

¹² Impact indicators could also be defined as indicators for vote-winning performances: these are referring to areas which are basically important to the population of a country and serve basically as subordinate goal of the different political fields, innovation, education etc.

¹³ Cf. Ederer, S. / Janger, J. (2010): Wachstums- und Beschäftigungspolitik in Österreich unter europäischen Rahmenbedingungen. WIFO Monography, 2010.

general assessment

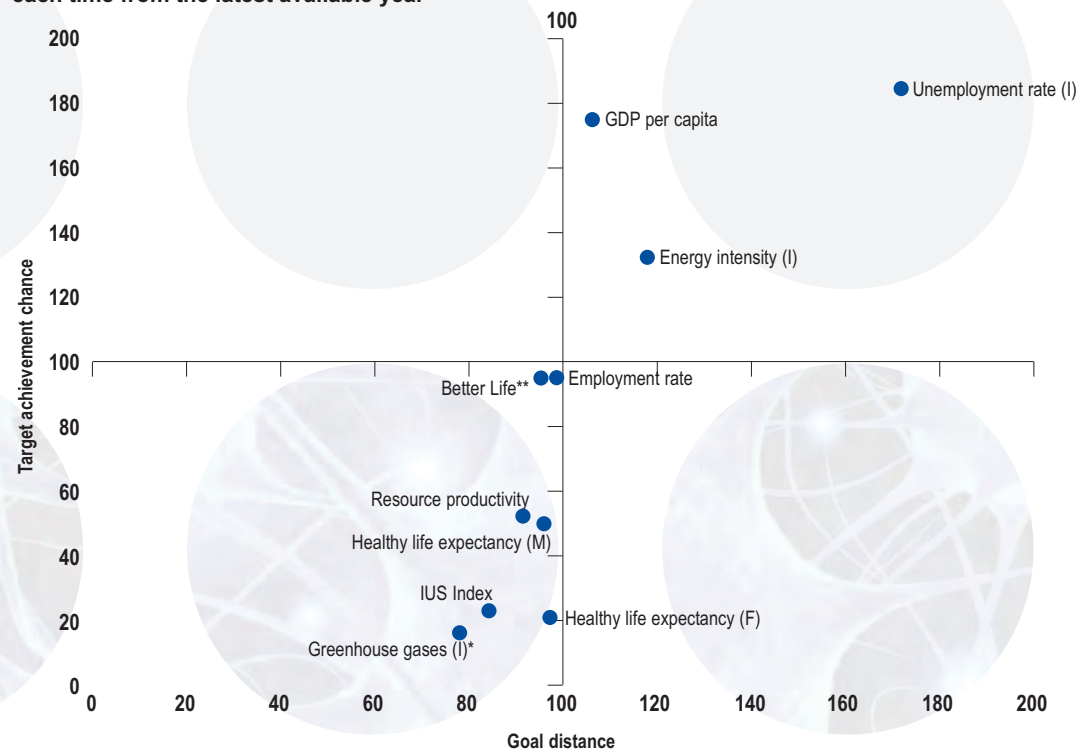
many, which has been economically very successful for many years now.

Thus, the very positive economic performance of Austria is obviously based, only partly, on innovation efforts. This becomes evident in the Innovation Union Scoreboard (IUS), according to which Austria still needs to improve its innovation performance. The target achievement chance according to the IUS lies clearly

below 100. Without additional efforts in this area, the distance from the leading countries will hardly be eliminated.

The IUS should however not be consulted as the only criterion to assess the effect of the Austrian innovation efforts. It underestimates the effect of innovation activities because it does not show any indicators for improvement in the existing sectors (see section “Monitoring of effect“, page 11 f.).¹⁴ Many of its components

Figure 2: Goal distance and target achievement chance of the priority objective targets, each time from the latest available year



Sources: see Attachment 1, WIFO-representation. Notes: Goal distance= relation between actual value of Austria and actual value of Innovation Leaders (average value of latest available year DE, DK, FI, SE); with the exception *: relation between actual value of Austria and national goal according to the RTI strategy 2020. Target achievement chance = relation between the past growth and the necessary growth for the target achievement, considering the past growth of Innovation Leaders. ** No growth calculation possible, target achievement with the same value as goal distance is assumed. *** Values over 200 were cut off. Raw data see Attachment 2. (I): Value inverted, explanation see section “Monitoring of target achievement“, page 7f. (F): Female, (M): male.

¹⁴ Cf. Janger, J. (2012): Strukturwandel und Wettbewerbsfähigkeit. WIFO-Monatsberichte (monthly reports) 2012, 85 (8), p. 625–640.

will be explained more in detail in the following chapters so that we can avoid a detailed analysis at this point. By summarizing it briefly, the main weaknesses of Austria can be found according to the IUS in the university graduate rate, the risk capital intensity (as measured by the GDP), the knowledge-intensive service exports and the turnover from patents and technology licensing.

In the area of health the unfavourable dynamic is especially remarkable. The number of years of life without disabilities due to diseases remains static or even drops, while the figure of Innovation Leaders in this regard increases. However, referring to life quality, time series are missing which would allow an exact estimation of the possible dynamics.

Environmental indicators show high-energy efficiency – the energy intensity lies below the level of those of the Innovation Leaders –, while the resource productivity (i.e. the GDP in relation to the material consumption) in the analogue countries increases faster. Because of unfavourable growth dynamics, additional measures in particular for the reduction of greenhouse gas emissions are necessary.

Thus in almost all non-economic areas (with the exception of energy intensity) additional or more intensive efforts are necessary. This for the RTI policies means to reinforce once more not only the potential contribution of innovation to growth and employment but also to environment and health.¹⁵

Impact monitoring of innovation efforts in a narrower sense

The previous section provided an overview on priority objective targets on a high aggregate level. The economic development on such a level cannot be clearly attributed to the effect of innovation activities. This is due in particular – as explained before – to the fact that innovation

effects are superimposed by many other factors. The impact of the innovation efforts represented in this section on the characteristics of enterprise and structure performances enables a well-substantiated assessment of innovation effects referring to economic developments, as well as an assessment of the productivity, efficiency and effectiveness of innovation efforts.

Basically, successful innovation efforts must be reflected either in an increase of the innovation performance, knowledge intensity in enterprises or existing sectors (intrasectoral structural change, sectoral upgrading) or in a drift of the economic structure towards more knowledge intensive sectors (intersectoral structural change). Indicators for both effects are necessary to obtain significant results for the economic success of innovation efforts.

Figure 3 shows the indicators for sectoral upgrading (trade-specific improvements). Thus again the average of the leading countries in the IUS (Innovation Union Scoreboard) is set at 100 and the Austrian value as well as the one of the EU-27 average is put in relation to it.

The indicators of the Innovation Union Scoreboard for intrasectoral structural change or sectoral upgrading are based on the Community Innovation Survey (CIS)¹⁶. As the CIS indicators are very volatile, their explanatory power is limited. Statistically more stable indicators such as the export quality in technology-oriented sectors or the structural adjusted R&D intensity demonstrate only a relatively low shortfall compared to the leading innovation countries.

Figure 4 shows indicators for the **intersectoral structural change** again as comparison between Austria and the EU in relation to the average Innovation Leaders (=100).

Referring to some indicators Austria is relatively far behind, with the exception of the export of

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¹⁵ As a small country, Austria can support only a small part of the environment and health research; moreover, the environment and health developments are obviously not depending only on innovation, but i.a. also on the attitude of the population and the appropriate policy measures in the individual fields, i.e. improved health prevention etc.

¹⁶ Cf. <http://epp.eurostat.ec.europa.eu/portal/page/portal/microdata/cis>.

general assessment

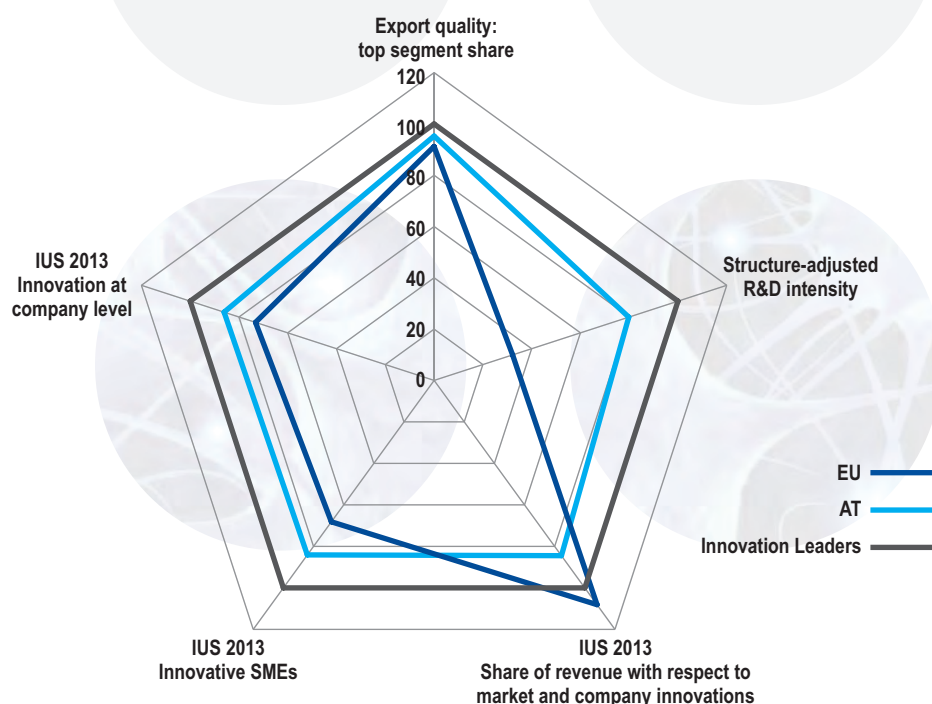
technology-oriented goods. But as explained, the indicators do not take into account the real content of the innovation activity or the sectoral upgrading.¹⁷ Austria's values referring to the IUS indicator "Economic effects of innovation" are massively distorted additionally due to the high share of tourism within the export of services in Austria (35 vs. 13 percent of Innovation Leaders) and to the technological performance record. The latter is not that significant because of the intracompany payment flows directed to the numerous holding companies of Austrian enterprises.

The resultant effects of the innovation system, which have been retraced with the help of indicators for the intersectoral structural change and for a sectoral upgrading can be summarized as a good starting basis. Indeed, there is still a shortfall in performance vis-à-vis the leading innovation countries, but catching up with the group of Innovation Leaders is seen as realistic under the condition of a focused effort.

Assessment of the creative performances in Austria on the basis of patent indicators

In the two previous sections the Austrian innovation efforts of macro and mesoeconomic vari-

**Figure 3: Impact monitoring of innovation:
indicators for intra-sectoral structural change (sectoral upgrading)**



Sources: Innovation Union Scoreboard 2013, WIFO-calculations

¹⁷ For example, Hungary is performing outstandingly in the IUS with respect to the economic effects. However, a look at the very low values in the sectoral upgrading indicators "Structure-adjusted R&D intensity", and "Export Quality" shows that Hungary positioned itself in the production area of the value chain but not in the research and innovation sectors or in the product development area.

ables were contrasted, in order to represent innovation activities in comparison with economic indicators. In this section the effect of research and innovation efforts are analysed on a deeper level, namely on the level of patent-registered inventions. Quantity and quality of these inventions in comparison to the leading innovation countries can inform on the Austrian technological performance record.

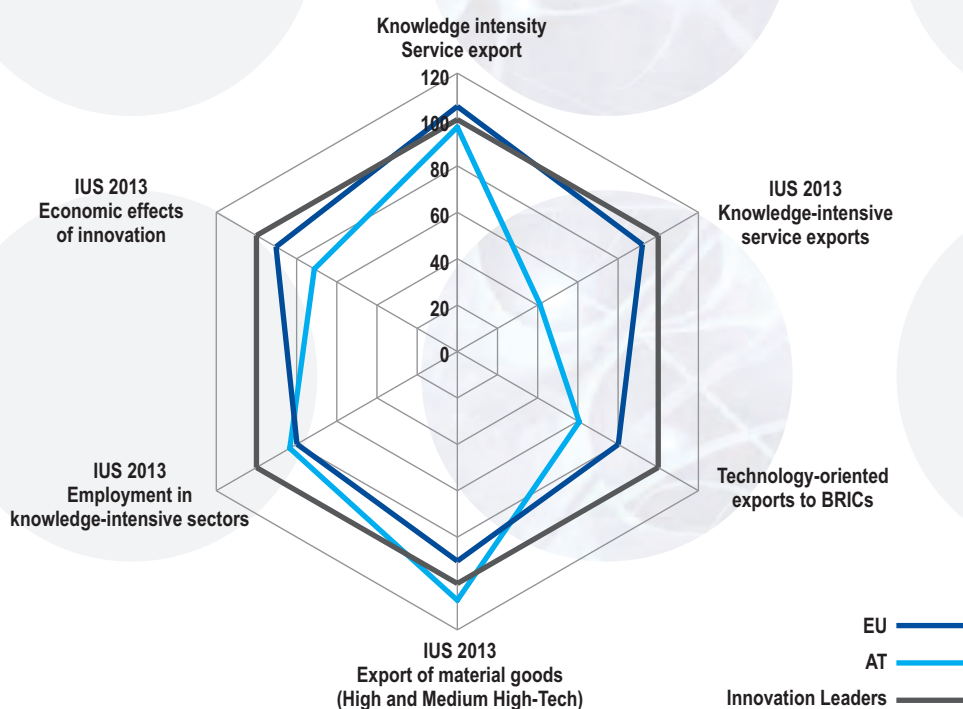
At the same time, the number of inventions in certain technological fields represents the specialisation of Austria with regard to the contents. The assessment of the creative performance on the basis of patent indicators reveals information on the technological quality of

inventions. Out of it, however the economic significance of the discovery cannot be clearly determined. Thus, this section complements the two previous ones in which the focus lies on the economic success of innovation efforts around technological characteristics such as quality and technological amplitude of innovation efforts. It is based on a detailed analysis of patent registrations at the European Patent Office (EPO) by the WIFO.

The results of the assessment show a consistent picture, bearing in mind that not all inventions will be protected by patent. Austrian patents offer a lower quality (figure 5) and lower tech-

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assessment**

**Figure 4: Impact monitoring of innovation:
Indicators for inter-sectoral structural change**



Sources: Innovation Union Scoreboard 2013, WIFO-calculations

general assessment

nological amplitude (figure 6) in comparison to the Innovation Leaders but they have caught up upon them in numerous dimensions.

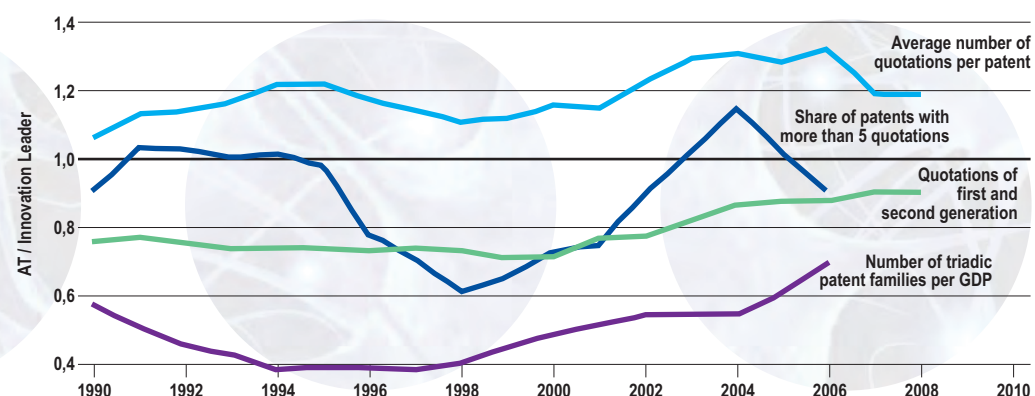
As measured by the average number of quotations of a patent as a quality criterion for the following patents, Austria has been able to reduce the shortfall vis-à-vis the Innovation Leaders in the last two decades and has even exceeded them (see figure 5, indicators “Quotations of first and second generation“, and “Average number of quotations per patent”). However, the patents which reunite more than five quotations and are thus qualitatively significant, can be found less frequently in Austria than in the analogue countries (see figure 5, indicator “Patent with more than 5 quotations”).¹⁸

Furthermore Austria reveals less triadic patent families relative to the GDP i.e. patent registrations at all three big patent offices in the world in Japan, the U.S.A and Europe (see figure 5, indicator “Number of triadic patent families“). Registrations at all of these three patent offices indicate a high quality of the patent.

The technological significance and the technological spectrum of the Austrian inventions indicate their technological amplitude. A broader spectrum is more radical from the Schumpeterian point of view, since it recombines know-how from very different technological areas in new inventions.

From the indicators in figure 6 it can be deduced that Austrian patents are technologically more specific and thus have a lower degree of technical universality than the patents of the Innova-

Figure 5: Quality of Austrian patent activities. Applications to the European Patent Office (EPO) according to inventors in relation to Innovation Leaders



Source: OECD, Regpat Database, June 2012, OECD, Triadic Patent Families Database, June 2012. WIFO-calculation.

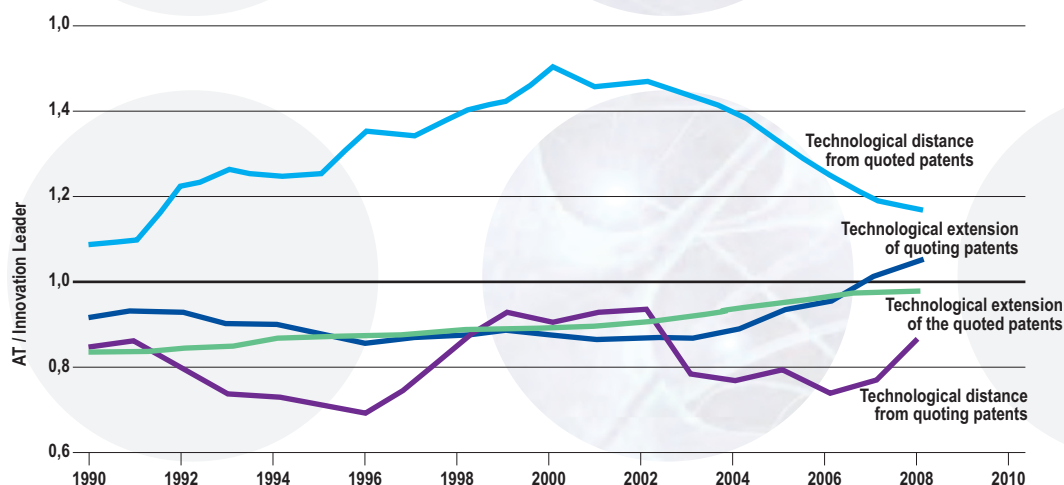
Innovation Leaders: Average of DE, DK, FI, SE = 1.0.

¹⁸ For instance, changing the threshold from 5 to 6 or 7 results in the same picture.

tion Leaders (see figure 6, indicators “Technological expansion of the quoting patents”¹⁹ and “Technology distance from the quoting patents”²⁰). On the other hand, Austrian patents quote other patents more frequently but these quotations remain more often within the same technological field than the ones of Innovation Leaders (figure 6, indicators “Technological expansion of the quoted patents”²¹ and “Technology distance from the quoted patents”²²). This means that the Austrian patents are more clearly defined from a technical point of view, are more specialised and deal with the improvement of existing and established technologies but less with the development of new knowledge. These analyses confirm the previous illustra-

tions of the technological performance capacity in Austria, which is based mainly on incremental further developments in delimited technological fields (niche-quality strategy). In the last ten years this picture has started to change. Austria is catching up with the quality and technological amplitude of its inventions. This presentation of the quality in inventions contributes to the conclusion that Austria is in fact still behind the leading innovation countries, but a clear tendency to catch up with them is visible. Provided that the RTI political efforts are carried out, the corresponding objectives of the RTI strategy can be achieved by 2020.

Figure 6: Technological significance and technological spectrum of Austrian patents.
Applications to the European Patent Office (EPO) according to inventors in relation to Innovation Leaders



Sources: OECD, Regpat Database, June 2012, OECD, Triadic Patent Families Database, June 2012, WIFO-calculation.
Innovation Leaders: Average of DE, DK, FI, SE = 1.0.

¹⁹ How differentiated are the technology fields of patents which quote Austrian patents?

²⁰ Is the Austrian patent quoted, technologically far from the quoting patent?

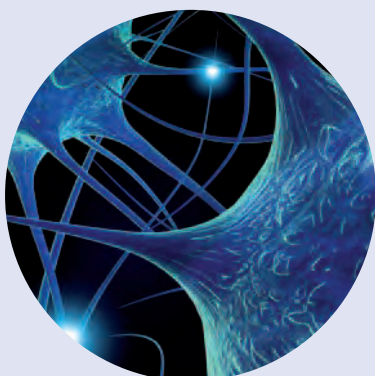
²¹ How differentiated are the technology fields of patents which are quoted by Austrian patents?

²² Are the patents quoted by the Austrian patent, technologically far from the quoting Austrian patent?

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The technological specialization of Austria was not illustrated. As measured by the patent registration activities in the areas of environmental technology, progressive production and material engineering and photonic, Austria is, compared to the leading countries, relatively specialised.

In certain technological areas (for example material engineering, photonic, IKT as well as micro and nanotechnology) a catch up process can be observed. In the area of environmental technology, the degree of specialisation decreases relatively speaking (see also section on “Setting of priorities“, page 47 f.)



Assessment of the Austrian Performance in relation to the objective targets and measures of the RTI strategy

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In this chapter the objective targets defined in the RTI strategy are analysed in detail and the degree of the target achievement is assessed. In order to alleviate the comparability, the single chapters of the RTI strategy create the reference framework of the RTI strategy. However, in single cases the structure of the strategy is also changed if it seems to be reasonable. To better explain and compare the essential objective targets with the degree of the target achievement, the Council has created an indicator set in co-operation with the WIFO, the Austrian Institute of Economic Research. This has also been discussed with the ministries entrusted with the realisation of the RTI strategy.

The indicator set includes 62 single indicators. These are based on the objective targets of the RTI strategy, the internationally used classifications of the OECD, Eurostat etc. and corresponding data sets. All data are accessible by the public and are collected on a regular basis on a national and also international level. Each time the latest available numbers are used and a trend is revealed. An explanation on how to read the descriptions as well as instructions on how to interpret the pictures can be found in section 1.1. A detailed explanation of the indicators including the objective targets, which they try to represent as well as the calculation can be found in the Attachment 1; the data on which they are based can be found in Attachment 2.

Developing talent, awakening passion: Implementing sustainable reforms in the education system

The educational system of a country is the starting basis for and thus an essential component of the innovation system. Coverage and quality of education not only guarantee that single citizens participate in the economic and social life but have increasingly become a central economic engine in particular in countries without noteworthy resources.²³

The RTI strategy of the federal government has indicated very clearly in its forecast that in the existing Austrian educational system there is an early division between training and educational institutions and that access to education depends strongly on the walk of life of a student. Together with the lacking penetrability of education, this early selection determines the educational horizon of children and young people – a circumstance, which can hardly be corrected later on in life.²⁴

In order to address these and other challenges, the RTI strategy of the federal government comprises a series of different objective targets in the area of preschool, primary, secondary and tertiary edu-

cation. These influence in particular the quality and social selectivity of the educational system, quantity aspects (assistance, number of secondary school graduates, young researchers etc.) as well as gender aspects in research. The intended measures in this regard provide actions in the following areas:

- Structure reform in the educational system
- Improvement of the tertiary educational system
- Promotion of gender-balance in research

The objective targets of the RTI strategy for which no standardized indicators are available are as follows:

- The educational system promotes creative thinking and action.
- The reforms aim at a better penetrability between the educational courses and pathways.
- Vision 2020: Interest and motivation for technical-natural scientific education are promoted comprehensibly.

Even though some goals have currently been achieved within the educational system and the dynamics of the past years leave hope for the tar-

²³ See in this context Bock-Schappelwein, J. / Hölzl, W. / Janger, J. / Reinstaller, A. (2013): Die Rolle von Bildung für die wirtschaftlichen Perspektiven Österreichs, WIFO-Monatsberichte (monthly reports) 2/2013, S. 121–133.

²⁴ RTI strategy of the federal government, p. 14.

get to be achieved by 2020, most indicators do not develop according to the plan – and the growth rate seems to be too low for the goals to be achieved.²⁵ This finding accords with the analyses of the educational system as an important component of the innovation system which represents the most significant shortage for the further intensification of innovation efforts at present.²⁶ Because of the high number of indicators in the education sector, these are subdivided into two figures. Figure 7 comprises the indicators on the educational system without tertiary education, while figure 8 displays those of the tertiary education sector including the gender-related indicators.

Educational system (without tertiary education)

The indicators in figure 7 clearly reveal that in the educational sector most objective targets of the RTI strategy based on the existing political and substantial conditions cannot be achieved. There are only five objective targets, which can be achieved by 2020 or have already been achieved. The goal in the area of the early childhood education is very likely to be achieved. The targets in the area of the reduction of the number of early school leavers have already been reached, the assistance situation in primary education has been improved and the share of students with a first language other than German who also complete secondary education has already been increased. In the areas of the RTI strategy, which according to the indicator illustration have already achieved the aim, the indicator regarding the integration of

migrants at school should be further interpreted. Its objective target was set under the assumption that only 40 percent of the non-German native speakers will complete the secondary education²⁷. Indeed the goal defined in the RTI strategy – namely increasing this share from 40 to 60 percent – had already been exceeded at the time of the implementation of the strategy according to the available data. At the same time from this indicator no conclusion to a successful integration should be drawn because at present only 81 percent of the 18-to-24-year-old students with migration background have completed secondary education vis-à-vis 94 percent of the same peer group without migration background.

In the debates on different school achievements and the educational participation of students with migration background reference is usually made to the individual students and/or their parents and often also to cultural factors. Thus the “Construct of the low-performing immigrant child” sometimes hides the fact that it is mostly structural factors of influence, evolving in a society as a whole, which strongly influence the performances of students. A migration background, as many international studies reveal, does not necessarily have to be connected to weak academic performance and low educational participation. However, the socio-economic background of a student is definitely decisive and effective: the higher the educational qualifications of parents and their professional positions, the more probable the higher educational performance by their children.

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Objective targets of the RTI strategy

- 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 to better integrate immigrants.
- 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.

²⁵ As to the quality of the data on which the following analysis is based, it should be noted that for the indicators – “PISA – Science“, “Immigration of highly qualified workers“, “Language knowledge migrants“, as well as “Skill Mismatch“, only limited data are available. This must be considered when interpreting the dynamics.

²⁶ Bock-Schappelwein, J. / Hölzl, W. / Janger, J. / Reinstaller, A. (2013): Die Rolle von Bildung für die wirtschaftlichen Perspektiven Österreichs. In: WIFO-Monatsberichte (monthly reports) 2/2013, p. 121–133; Forschungs- und Technologiebericht 2010, Chapter 5, Bildung und Innovation, p. 110–137; Report, Part 1: Rahmenbedingungen für das Innovationssystem. Ihre Bedeutung für Innovation und Wechselwirkung mit der österreichischen Innovationspolitik. In: Aiginger, K. / Falk, R.: Systemevaluierung der österreichischen Forschungsförderung und -finanzierung, Vienna 2009; Aiginger, Karl / Falk, Rahel / Reinstaller, Andreas (2009): Evaluation of Government Funding in RTDI from a Systems Perspective in Austria, Vienna.

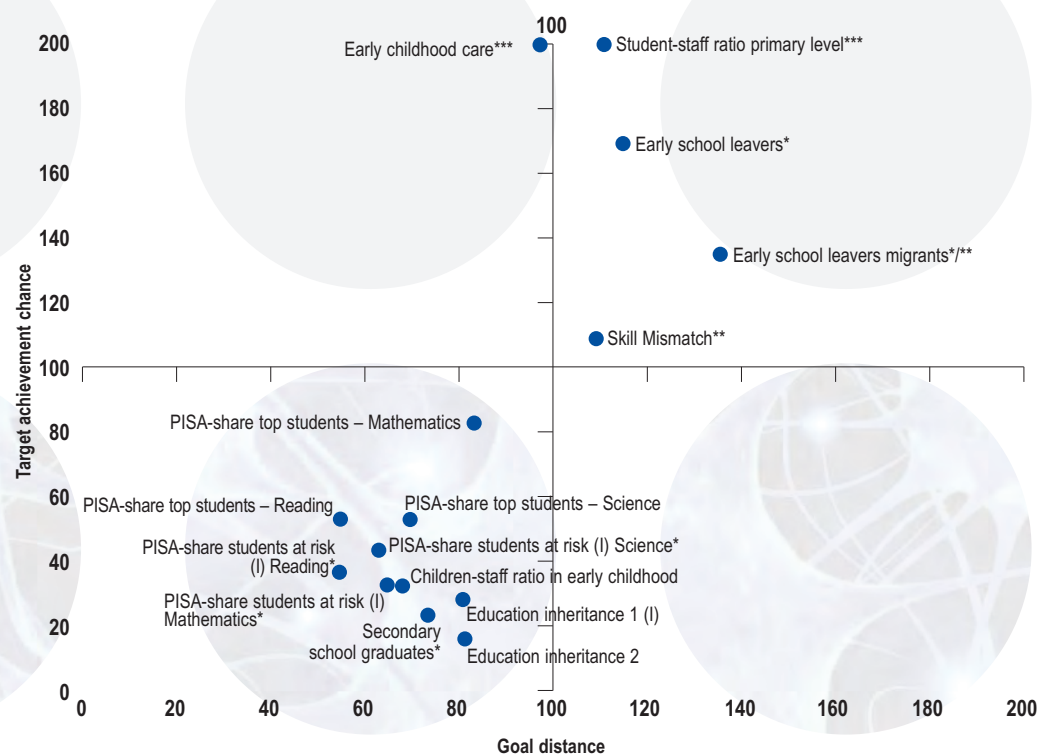
²⁷ School leaving examination or diploma examination at secondary schools (AHS or BHS), 3-year technical school or apprenticeship.

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Furthermore, a social self-conception regarding migration, interculturality and multilingualism is also an important factor of influence. If pluralisation is mainly associated to negative aspects and migrants are mainly perceived as a threat in public, it can be assumed that for students with migration background it is difficult to see themselves as a successful part of society.²⁸ Referring to another indicator, namely early

school leavers, Austria lies also thanks to the job-related educational system and further efforts over the last few years (education guarantee etc.) above the goal, as well as with regards to the so called “Skill Mismatch“ indicator which basically indicates how quickly young people find a job after they have completed their studies. In this context not only the orientation of the educational system towards the job market but also the general job market and economic performance play an important role (see page 9 f.). In

Figure 7: Goal distance and target achievement chance in the educational system (excluding tertiary area), in their latest available year



Sources: see Attachment 1, WIFO-representation. Notes: Goal distance= relation between actual value of Austria and actual value of Innovation Leaders (average value latest available year DE, DK, FI, SE); with the exception *: relation between actual value of Austria and national goal according to the RTI strategy 2020. Target achievement chance = relation between the past growth and the necessary growth for the target achievement, considering the past growth of Innovation Leaders. ** No growth calculation possible, target achievement with the same value as goal distance is assumed. *** Values over 200 were cut off. Raw data see Attachment 2. (I): Value inverted, explanation see section “Monitoring of target achievement“, page 7f.

²⁸ Herzog-Punzenberger, Barbara / Unterwurzacher, Anne (2009): Migration – Interkulturalität – Mehrsprachigkeit. Erste Befunde für das österreichische Bildungswesen. In: BIFIE (2009): Nationaler Bildungsbericht Österreich 2009. Volume 2. Edited by Werner Specht. Graz: Leykam. p. 161–182, here p. 176 and 178 (also online at: http://www.bmukk.gv.at/medienpool/17992/nbb_band2.pdf).

practice this means that the indicator does not necessarily show the orientation of the educational system towards the job market, but the overall economic success.

Also Austrian primary schools seem to be at least quantitatively well assisted in a comparison. At the same time, however, the results presented at the end of 2012 by PIRLS and TIMSS, which inform on the reading or mathematic and natural scientific competences of the students of the fourth grade in an international comparison, reveal that also in this case there is still a need for qualitative improvement. Thus Austrian students only ranked 25 in the PIRLS 2011 referring to their reading competences out of 45 participating countries, clearly lagging behind the students from the leading countries, i.e. Finland, Denmark, Sweden and Germany.

The performance of Austrian students in mathematics is similar: in this case in the context of the TIMSS 2011 they ranked 23 out of 50 participating countries and thus also only reached a place in the midfield. The students, however, performed significantly better in natural sciences, where by ranking 13 they were able to position themselves within the first third of the 50 participating countries.²⁹ As to the preschool educational situation, the target achievement chance with regards to the number of the available places on the basis of the available data is realistic. Yet, the staff-student ratio referring to qualified educators in the preschool surroundings lies behind the one in analogue countries – a circumstance, which needs to be changed urgently considering the enormous significance of early childhood education and promotion in particular for language learning. The early acquisition of the Ger-

man language is an essential pre-condition to overcome the social selection and strongly depends on how many educators are available and how qualified they are.

The measure quoted in the RTI strategy by the federal government of an “improved early childhood support thanks to the obligatory free kindergarten year”³⁰ will thus not be sufficient if no additional measures regarding the staff-student ratio through qualified educators are set on the basis of unique standards for the whole of Austria. As to the quality of assistance, the “Education Framework” for primary education institutions is a first and important step since it is cross-regional.³¹ Furthermore, through the “Educators training NEW”, whose first legal framework conditions have already been submitted for appraisal, decisive improvement is expected.³²

However, it remains uncertain how those objective targets of the RTI strategy, which refer in particular to quality and the social selectivity of the secondary educational system can be achieved without additional efforts. Both, in the share of students in the top group (students exhibiting skills above the average) and in the group of students at-risk (i.e. students who do not achieve the minimum level of competence), Austria lies behind the target values specified by the analogue countries (see in this context the PISA indicators in figure 7). Furthermore, the negative dynamics in this context are very remarkable since the introduction of the PISA tests in the year 2000: the number of students at-risk increases while the share of top students decreases.³³ The introduction of the educational standards, whose first consultation in the area of

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²⁹ As to the results in detail see: Suchan, Birgit / Wallner-Paschon, Christina / Schreiner, Claudia (editors) (2012): PIRLS und TIMSS 2011. Erste Ergebnisse. Graz: Leykam. Also on Internet at: <https://www.bifie.at/buch/1742>.

³⁰ RTI strategy of the federal government, p. 17.

³¹ Elementary education institutions are all institutional forms of education and care of children up to school age. For the education framework plan also see: <http://www.bmukk.gv.at/medienpool/18698/bildungsrahmenplan.pdf>.

³² http://www.bmukk.gv.at/medienpool/23490/20121120a_01.pdf and <http://www.bmukk.gv.at/ministerium/vp/2013/20130403a.xml>.

³³ The PISA-results 2009 should, however, be interpreted with care, since calls for boycotts during this year could have deteriorated the results.

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mathematics in the 8th grade in May 2012 revealed results as critical as those of the PISA survey³⁴, can only lead to a significant improvement of the situation on a mid-term basis, i.e. to the improvement of the performances of the students, if they are supported by concurrent measures which lead to concrete reactions by the teachers³⁵ and thus to a significant improvement in the quality of school lessons.³⁶ In this context the reinforcement of the school autonomy is also very significant wherefore the Council already made a corresponding recommendation in its first “Report on the scientific and technological performance capacity of Austria 2012”.³⁷ Furthermore, a general simplification of the competences between federal government and the regions is necessary in order to use more financial means for education through savings in the administrative area.³⁸ Just as worthy of attention is the recommenda-

tion of the Council on the realisation of a common, all-day school in secondary education³⁹ in order to address one of the central problems of the Austrian educational system, namely social selectivity (see figure 7, indicators “Education inheritance 1” and “Education inheritance 2”). Indeed, the performances of the students in all PISA participating countries are influenced by the social background: in Austria however, the connection between the socio-economic status of a family and the performances at school are particularly evident and thus it represents an essential obstacle to the education opportunities of students from families with a lower socio-economic background.⁴⁰ And also in this case the indicators reveal that the target achievement chance, i.e. the tempering process of social selectivity due to the dynamics over the last few years is very low and the achievement of the goal thus very improbable. Even if the New Secondary School (*neue Mittelschule*, NMS) introduced in the academic year

³⁴ Only 5 percent of the students of the 8th grade have exceeded the requested mathematic standards, 53 percent have reached the standards, 26 percent have partly reached them and 17 percent have not reached them, see: http://www.bmukk.gv.at/medienpool/23742/20121211a_03.pdf.

³⁵ The supporting analyses for the implementation of the education standards have shown that teachers consider the feedback on the results of standard-related tests indeed as “concrete data and facts for the self-reflection of the their own practice”, but the “immediate relevance of these data for the introduction of changes is relatively lower”. And also the “effects which have produced the performance feedback to the standard tests referring to the school as an organisation are kept within narrow limits – for example in the form of jointly supported insights, decisions or school development measures “. See: Grabensberger, Eva / Freudenthaler, H. Harald / Specht, Werner (2008): Bildungsstandards: Testungen und Ergebnissrückmeldungen auf der achten Schulstufe aus der Sicht der Praxis. Ergebnisse einer Befragung von Leiterinnen, Leitern und Lehrkräften an Pilotsschulen. Edited by BIFIE, p. 71 <https://www.bifie.at/node/555> (last up-date from 18th February 2013).

³⁶ It should also be noted that a whole range of accompanying measures is available, in particular the amendment of Art.18 of the Federal School Inspection Act, which came into force on 1st September 2012 and entails development plans and periodical budget and target agreement discussions between schools and school inspection and thus provides for the commitment missing before. On a pedagogical level this legislative measure is complemented by the project “School quality in general education” (SQA), which supports schools in their development processes.

³⁷ Council for research and technology development (2012): Bericht zur wissenschaftlichen und technologischen Leistungsfähigkeit Österreichs. Vienna, p. 35

³⁸ Ibid., p. 35.

³⁹ Ibid., p. 35.

⁴⁰ For details see: BIFIE (2010): PISA 2009. Internationaler Vergleich von Schülerleistungen. Erste Ergebnisse –Lesen, Mathematik, Naturwissenschaft. Edited by Schwantner, Ursula / Claudia Schreiner. Graz: Leykam, p. 40 ff. (also online at: <https://www.bifie.at/buch/1249>). See also: BIFIE (2012): Nationaler Bildungsbericht Österreich 2012. Volume 1. Edited by Bruneforth, Michael / Lassnigg, Lorenz. Graz: Leykam. p. 22 ff (also online at: http://www.bmukk.gv.at/medienpool/23874/nbb_2012_b01_gesamt.pdf).

2008/09, which currently comprises 691 locations⁴¹ and according to the budget report of the federal government⁴² will cover all secondary schools by the academic year 2015/16, cannot be finally assessed as to its effects on an improved penetrability on the secondary school level I and thus also on the selectivity of the educational system, to date no real improvements have been noticed.⁴³ This could also be due to the fact that at the moment only very few high schools have transformed their secondary levels into a New Secondary School and thus the selection of students at age 10 still persists.

Even the goal defined in the RTI strategy, of increasing the share of secondary school graduates to at least 55 percent by 2020, is most likely not to be reached, even if the project “Apprenticeship with school leaving examination” shows a clear growth rate – from 2,088 participants in the year 2008 to 10,432 in the year 2012⁴⁴ and can therefore be seen as a success.

Tertiary education system

The indicators chosen for the assessment of the tertiary education sector – in particular in teaching at universities – in figure 8 show two strongly divergent tendencies. On the one hand the classification numbers for graduates and doctorate graduates of the STEM studies in the area of university expense rates as well as the share of women in research in total make reference to a high dynamic. A target achievement by 2020 is very probable in this area from today's point of view. On the other hand important indicators such as the share of university graduates (without ISCED 4a), Non-EU postgraduates, women in the area of engineering or natural sciences, researchers, the employed population or the immigration of highly qualified persons reveal massive weaknesses. The partly very high dynamic of the areas mentioned above cannot hide the fact that all the analysed indicators still lie under their set goal.

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Objective targets of the RTI strategy

- The conditions of study at universities should be fundamentally improved, which will require establishing new financing models for higher education.
- The reforms aim at (...) implementing thorough quality improvements in university instruction and a better integration of immigrants(...).
- 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.

⁴¹ School year 2012/23; from the school year 2013/14 the NMS (New Secondary Schools) will include a total of 945 locations, thus almost 119,000 students will be taught in NMS classes. See more at: <http://www.bmukk.gv.at/medienpool/23753/20121212.pdf>.

⁴² Federal ministry for financial affairs (2012); Report of the federal government. Budget report 2013 from 10th October 2012, Vienna, p. 43 (also online at: http://www.bmf.gv.at/Budget/Budgetsimberblick/Sonstiges/Budgetsimberblick/Budget2013/Budgetbericht_2013.pdf).

⁴³ In the analysis of the Austrian education system with respect to equal opportunities and the guaranteed minimum education, the authors Bruneforth/Weber/Bacher come to the conclusion that the question whether the New Secondary School (NMS) has compensatory effects as to the education and occupation of parents cannot be answered with the currently available data. Indeed it is not yet known whether through the NMS more students from lower educational and occupational classes will be able to access schools with school leaving examinations. Only the social composition of the NMS during the transition can be analysed at present and it shows that the NMS basically reveals a similar social composition to the former secondary schools of first level (Hauptschule). Few differences can be observed in the professional position of the parents, which however indicate that the NMS is less successful in addressing lower occupational positions. This becomes particularly evident, according to the authors, if only students are analysed who have an AHS (secondary school of general education) in their neighbourhood. The strong preference for AHS by children from parents with higher education has not changed with the introduction of the NMS in the first years and thus precludes a social mix of students. See more in this regard: Bruneforth, Michael / Weber, Christoph / Bacher, Johann (2012): Chancengleichheit und garantiertes Bildungsminimum in Österreich. In: BIFIE (2012): Nationaler Bildungsbericht Österreich 2012. Volume 2. Edited by Barbara Herzog-Punzenberger. Graz: Leykam, p. 189–227, here p. 204 (also online at: http://www.bmukk.gv.at/medienpool/23883/nbb_2012_b02_gesamt.pdf).

⁴⁴ http://www.bmukk.gv.at/medienpool/23811/20121220b_pu.pdf.

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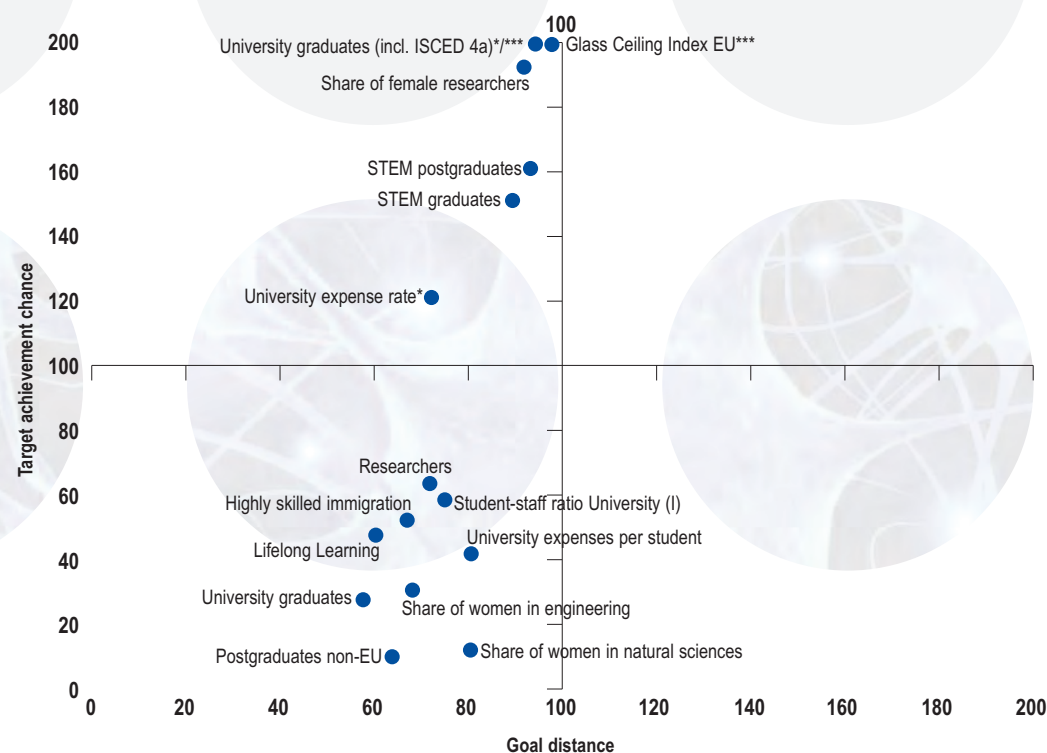
An essential goal for the tertiary education sector is increasing to 38 percent, the share of 30-to-34-year-old people who have completed a university study or have an equivalent qualification. In the calculation and description of the indicators for this target achievement due to the different history of the educational systems in the analogue countries and the thus resulting divergent data basis, a differentiated approach is needed.

The students of the tertiary education sector in Austria, which includes universities, polytechnics and pedagogical institutes conclude with the highest educational grades. In the international

standard classification for education (ISCED), these are statistically attributed to the categories ISCED 5a and 6. Comparable trainings of experts with a non-academic education in Austria and an educational degree ISCED 4a and b (BHS, higher technical and vocational schools, graduate hospital nurse), in other analogue countries conclude in part with an academic degree.

The share of the population in Austria with a tertiary education certificate without ISCED 4a, an indicator of the Innovation Union Scoreboards, lies well below the average in the European comparison. Austria is in this context with regards to the actual value as well as the dynamics far below the analogue values of the Innova-

Figure 8: Goal distance and target achievement chance in the tertiary educational system, each time for the latest available year



Sources: see Attachment 1, WIFO-representation. Notes: Goal distance= Relation actual value of Austria vis-à-vis actual value of Innovation Leaders (average value latest available year DE, DK, FI, SE); with the exception *: relation actual value Austria vis-à-vis national goal according to the RTI strategy 2020. Target achievement chance = relation between the past growth and the necessary growth for the target achievement considering the past growth of Innovation Leaders. ** No growth calculation possible, target achievement with the same value as goal distance is assumed. *** Values over 200 were cut off. Raw data see Attachment 2. (I): Value inverted, explanation see section "Monitoring of target achievement", page 7f.

tion Leaders. The target achievement chance by 2020 as the corresponding indicator in figure 8 indicates, lies under 30 percent. This means that this goal will most likely be missed.

If we add like in the Europe 2020 targets, graduates with the educational certificate ISCED 4a (BHS, graduate hospital nurse) to the group of “higher qualified workforce“ the education statistics clearly indicate a lower distance from comparable European countries. With 36.8 percent⁴⁵ the distance from the leading innovation countries is only marginal and the target achievement chance is very high.

In any case for Austria a trend towards higher education can be observed. The share of the population aged between 25 and 64 with a tertiary education (universities, academies, colleges) in 2010 was equal to 14.9 percent.⁴⁶ Thus the share has more than doubled since 1991 (6.9 percent). The number of annual graduates has also increased enormously. In the academic year 2010/2011, 47,909 students completed a study at a tertiary educational institute in Austria. 64.9 percent thereof completed a study at a public university and 24.8 percent at a university for applied sciences. Comparing these numbers to those in 2001 when there were still 16,863 graduates at a university and 2,376 at a university for applied sciences, an increase of 123.6 percent can be detected.

The trend towards a higher qualification is also motivated. The demand for highly qualified workforce increases due to more education intensive working structures. University graduates are advantaged on the job market and the scientific demand of the professional spectrum increases.⁴⁷ Another target of the RTI strategy in the tertiary sector is the improvement of the conditions for studying at universities. The optimization of the

staff-student ratio at the universities is also an important contribution in this sense.

These have strongly deteriorated in the OECD comparison over the last few years. As the corresponding indicator “Staff-Student ratio at university (I)” shows in figure 8, the distance from the leading innovation countries is very high and the target achievement chance is relatively low.

However, this overall picture does not always represent reality. Well assisted fields of study are lumped together with those offering insufficient conditions in particular in the fields of study attracted by masses such as economic and social sciences, pedagogy or psychology. The situation in the single fields of study requires a deeper analysis. The recent efforts to improve care rates such as the “Quality Package Teaching”⁴⁸ in the corresponding fields, represent a step in the right direction, but they can only represent the beginning of a continuous development of the academic staff. This can also be seen in the sense of a decreasing drop-out rate and vice versa a higher rate of graduates.

Two central measures to improve the conditions of a course of studies and university teaching in Austria are the introduction of a university place funding according to the international Best Practice and the adaptation of the funding in order to reach the goal of 2 percent of the GDP for tertiary education.⁴⁹ A more practicable model of a university place funding would enable universities to choose students and to adapt the number of students to the available resources. This would lead to a reputation competition between universities, which could be very efficient for the improvement of the quality of teaching⁵⁰; at the same time this would represent an important step to complete the autonomy of universities. At least

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⁴⁵ Statistik Austria, Bildung in Zahlen 2011/2012.

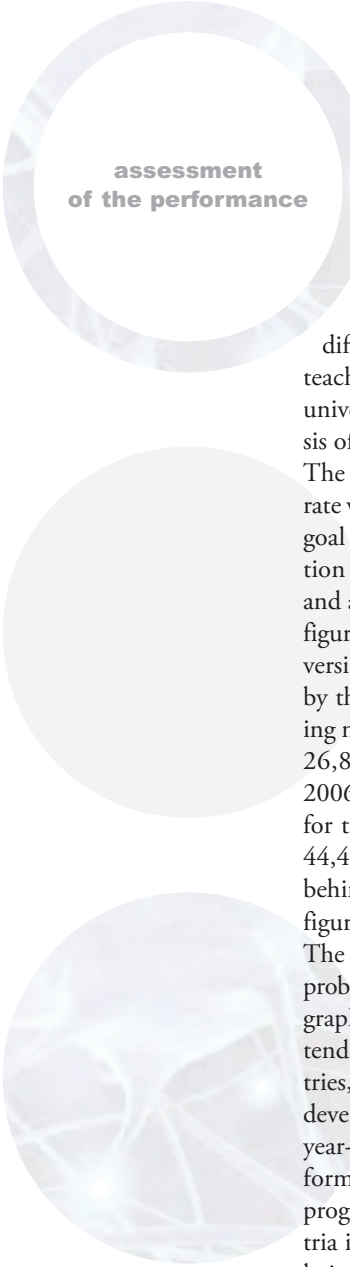
⁴⁶ Statistik Austria, Bildungsstandregister.

⁴⁷ WIFO-Monatsberichte (monthly reports) 2/2013, p. 135–147 and p. 149–158.

⁴⁸ The “Quality Package Teaching” of the BMWF which will become effective in the framework of the performance agreement, provides 95 professorships for the subjects information technology, biology, architecture, business economics and pharmacy.

⁴⁹ Governmental programme XXIV. GP, p. 216–217.

⁵⁰ Janger, J. / Hölzl, W. / Hranyai, K. / Reinstaller, A. (2012): Hochschulen 2025: Eine Entwicklungsvision.



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in master studies access procedures should be introduced in order to bring the best students to Austria's universities. The "pilot project" of the student and capacity oriented university place funding⁵¹ is a first step for the reform of university funding and could help control the expenses for teaching and research in a more differentiated way. However, in particular the teaching, education and research capacities of universities must represent the key to the analysis of the possible university places.

The current dynamic of the university expense rate would make the achievement of the national goal of 2 percent of the GDP for tertiary education possible assuming a constant growth rate and annually increasing additional expenses (see figure 8). This requires an annual increase of university funds from 350 up to EUR 600 million by the year 2020.⁵² Due to the strongly increasing number of first-time students, amounting to 26,850 in the academic year 2001/2002, in 2006/2007 a total number of 33,515 registered for the first time and in 2011/2012 there were 44,452 first-timers, the expenses per student lie behind the level of the analogue countries (see figure 8).

The enormous increase in first-time students will probably not continue, not least due to the demographic development in Austria and the general tendencies in the respective neighbouring countries, in particular Germany. If we observe the development of the 5-year-peer-group of the 18-year-old to the 22-year-old-young-people, who form the main part of first-year students, the prognosis for the total number by 2013 in Austria is downward.⁵³ Despite the predicted population increase and a positive immigration balance, about 67,000 young people less than in 2012 out of this peer group will be living in Austria by 2030. This is equal to a drop of around 13 percent. In Germany for the same peer group an

even stronger drop of about 20 percent is predicted by 2030.⁵⁴ Similarly, the numbers of the university planning prognosis 2011 do not reveal any important growth rate by 2030 – against the trend of the past ten years and despite an increasing share of foreign students as well as a higher access rate to the tertiary education sector.

If this prognosis is true, assuming a development of the funding alongside the 2 percent line, a big opportunity will be offered which will significantly improve the structures and the research performance in universities and will optimize the "overall system of universities". However, the access rate from schools with secondary school leaving examinations to universities has not yet been fully exhausted, which means that the share of high-school graduates who start a university course further increases and thus it could compensate the demographic effects.

The aforementioned high dynamic of the indicators for graduates and postgraduates in the STEM fields suggests that there is a sufficient offer of qualified graduates in the STEM area at universities and enterprises. For example a more detailed observation of the number of graduates in natural sciences and engineering reveals a boom in the natural science studies from 1999 to 2003. The annual increase rate of degrees was on average equal to 17.3 percent. This development advanced on the expenses of engineering graduates, whose number increased within the same period of time annually only by an average of 3.1 percent. Since then the annual rate of degrees in both areas increases by 8 percent on average. In 2010, 4,896 students completed a study in natural sciences and 4,579 students graduated in the area of engineering. Despite these increases the number of researchers does not grow rapidly enough compared to the occupational situation in Austria in order to keep pace with the recent developments in the analogue countries.

The measures of the RTI strategy for the consol-

⁵¹ §§ 14a-i UG 2002.

⁵² Janger, J. / Hölzl, W. / Hranyai, K. / Reinstaller, A. (2012): Hochschulen 2025: Eine Entwicklungsvision

⁵³ Statistik Austria (2012): Statistik des Bevölkerungsstandes (status 14. 2. 2012), Population projections (main variation); own calculation.

⁵⁴ Statistisches Bundesamt Deutschland (2012): Bevölkerungsvorausberechnungen, Version 1-W1; own calculation.

idation of human potentials in the areas of mathematics, information technology, natural sciences and engineering in particular in (pre)school education, can by nature be assessed for their efficiency only after several years. In any case, they should be consolidated even more, in order to further strengthen the significance of science and research in school kids who are the future generation in charge of our society.

Other areas, which need to catch up are “Life long learning” and the “Immigration of highly qualified workforce”. As to the latter it should be underlined that the introduction of the “Red-White-Red Card” implemented in the context of the “Foreigners Rights Amendment Law 2011”, represented the basis for qualified immigration taking place according to clear and transparent criteria. As a consequence the dynamic in the “Immigration of highly qualified workforce” has been significantly improved.⁵⁵ Even though the assessment of these measures is based only on data from a relatively short period of time, they made first positive steps towards development possible.

Thus, in the first year of the existence of the “Red-White-Red Card” (from July 2011 to July 2012) the number of qualified immigrants coming to Austria, with 1,556 approved applications, has doubled; by the end of 2012 almost 2,700 applications were accepted, even if this figure includes for example many top athletes.⁵⁶ A further positive step is also the decision of the federal government according to which in the future also university assistants from third countries as “particularly highly qualified workforces” get easier access to the “Red-White-Red-Card”, if they prove to have work experience, language knowledge and research success as well as a minimum wage of EUR 2,000.⁵⁷ This eliminates the biggest obstacle, the proof of a full-time job. For a final

assessment of the Red-White-Red Card a mid-term evaluation is missing. Such an evaluation should be centred on the organization of a proactive immigration policy for highly qualified workforce.

Gender-balance in research

The indicators in figure 8 for the determination of the dynamics in the gender objective targets reveal both positive and negative developments. While the “Glass Ceiling Index”, based only on a few data points – i.e. the share of female professors compared to the share of female scientific staff as well as the share of female researchers reveals a dynamic development which could lead to the target achievement, additional measures referring to the gender objectives on a study level are necessary, in particular as to the share of female graduates in engineering or natural sciences.

A more detailed analysis shows that the share of women and men both in natural science studies and in the technical studies despite the initiatives to motivate more women to register for a technical university cannot reveal any new trend. About 80 percent of the graduates from technical universities are men. The situation was the same 12 years ago. In the area of natural sciences the share of women in the analysed period of time increased from 55 to 64 percent. Failure to involve more women in particular in the area of technical studies and to increase the number of female graduates, with reference to the “Glass Ceiling Index” and the share of female researchers, could lead to dynamics which cannot be maintained either on a mid or a long-term basis.

The contemplated and realised steps in the framework of the RTI strategy of the federal government to date, such as the measures to better reconcile work and family or gender budgeting in all research support measures⁵⁸, do not seem to be suf-

assessment of the performance

Objective targets of the RTI strategy

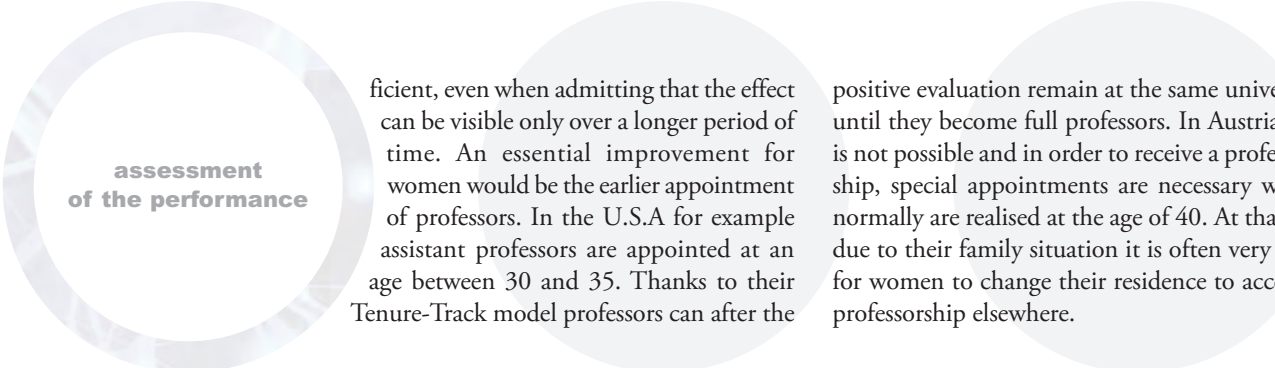
- The reforms aim at (...) balancing out gender discrepancies in research.

⁵⁵ The “Red-White-Red-Card” is handed out in particular to highly qualified workers, professionals in shortage occupations, other (employed) key professionals, self-employed key professionals as well as university graduates.

⁵⁶ http://diepresse.com/home/wirtschaft/economist/1343113/Kaum-gezielte-Zuwanderung-nach-Oesterreich?_vl_backlink=/home/index.do.

⁵⁷ http://www.bmwfgv.at/startseite/mini_menuue/presse_und_news/news_details/cHash/5c8e0047c84d0aa1a3309c83c70c1208/article/minister-toechterle-und-hundstorfer-spuerbare-verbesserung-der-rahmenbedingungen-fuer-universitaets/.

⁵⁸ RTI strategy of the federal government, p. 17.



assessment of the performance

ficient, even when admitting that the effect can be visible only over a longer period of time. An essential improvement for women would be the earlier appointment of professors. In the U.S.A for example assistant professors are appointed at an age between 30 and 35. Thanks to their Tenure-Track model professors can after the

positive evaluation remain at the same university until they become full professors. In Austria this is not possible and in order to receive a professorship, special appointments are necessary which normally are realised at the age of 40. At that age due to their family situation it is often very hard for women to change their residence to accept a professorship elsewhere.

Recommendations by the Council to achieve the goals established in the RTI strategy of the federal government

Chapter “Developing talent, awakening passion: Implementing sustainable reforms in the education system“

On the basis of the previous analysis of the objective targets of the RTI strategy and the indicator-based assessment of the degree of the goal achievement the Council recommends, that special attention be paid to the following items. Most recommendations of the previous year for the structure reform of the educational system as well as the promotion of the gender balance continue to be valid.

Educational system (without tertiary sector)

The Council urgently recommends the modernization of the structures of the educational system, in particular by reinforcing the school autonomy as well as by settling the competences between the national and the federal states.

In order to overcome the early selection in the educational system the Council recommends a commitment to a common, all-day school in the secondary sector, along with performance differentiation and talent unfolding as well as the corresponding implementation.

Furthermore, the Council recommends stronger support for the STEM fields, in particular for the technically-oriented area of these subjects. Measures to increase the share of women must be supported, starting from the primary education sector.

The Council recommends the promotion of language learning in German as well as in other first languages, since the development of the respective language competences is the precondition for each educational path.

Therefore amongst others more kindergarten places are necessary and so is a significant increase in the number of qualified educators. This means that a second obligatory kindergarten year should be introduced. More kindergarten places are needed and so is a significant increase in the number of qualified educators.

Tertiary educational system

The Council recommends that the national goal of raising university funds to 2 percent of GDP be vigorously pursued further to implement suitable measures for a quality-oriented improvement of universities.

The Council furthermore recommends that the funding of university places be adjusted to suit the requirements of universities. In particular the factually available capacities for teaching and teaching infrastructure of universities must be consulted in order to establish the number of students.

Gender-balance in research

For the promotion of gender-balance in research, the Council recommends the development of attractive career models for women – at universities as well as in the non-university and in particular in the industrial research area. Additionally, the selection processes should be monitored and the indicators used in the selection procedures for the performance assessment should be examined.

Creating knowledge, promoting excellence: The foundation of a knowledge-based society

Knowledge production and knowledge transfer are central tasks of universities and are increasingly significant for economy and society. A high education standard and research performance above the average are essential factors for the future of highly developed societies. They stand at the beginning of the research chain and are a key factor in creating value in a high-technology country, which aims at being part of the leading innovation countries.

The RTI strategy of the federal government has rightly made reference to the central role of basic research as “supporting pillar of the innovation system”⁵⁹ as well as to the significance of university and non-university research institutions. The corresponding objective targets in this chapter are partly very ambitious and were basically welcomed by the Council in its first

“Report on the scientific and technological performance capacity of Austria 2012”. As part of the creation of a standardized assessment basis exclusively practicable indicators for the objective targets of universities and basic research could be identified. The indicator-based analysis of the success chances and development trends in chapter “University and basic research” highlights in detail the following topics:

- Quantity and Quality of university research
- Career structures in universities

No standardised indicators are available for the objective targets of the RTI strategy on non-university research and research infrastructure. The corresponding targets and measures in these chapters are thus assessed mainly qualitatively

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Universities and basic research

On the whole, the indicators presented in figure 9 for the area of the universities and the basic research – with the exception of the assessment of international co-publications – show only an insufficient dynamic for target achievement by 2020. Furthermore, it becomes evident from the figure that all indicators within this segment are (still) below the actual value of Innovation Leaders as well as below the nationally pursued goals. In particular the competitive funding of university research needs to increase further and its dynamic and current value clearly underlines the need for a dramatic increase. The dynamics and the level of the share of basic research also lie behind the one in the analogue countries, in this case the five OECD-countries with the highest share in basic research.⁶⁰

All in all, with a share in basic research equal to

0.51 percent of the GDP, Austria ranks 5 together with Denmark out of all the OECD-countries for which data are available (Switzerland, Denmark, South Korea, France, U.S.A.). The goal defined in the RTI strategy of raising investments in basic research by 2020 up to the level of the leading research nations, can only be obtained by increasing the funding percentage in basic research.

The research funds of the universities and the ÖAW (Austrian Academy of Sciences) originate mainly from the global funds defined in the performance agreement and from the university structure funds. Additional research funds are solicited from the project-oriented research support by national and international research funding bodies (FWF, FFG, ERC Provincial funds etc.) in a competitive way. If the share of competitive research funding is increased, the

Objective targets of the RTI strategy

- 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.

⁵⁹ RTI strategy of the federal government, p. 18.

⁶⁰ As to the data quality of basic research it must be considered that, with the exception of the observed OECD countries, only a small number of comparative data is available (cross-section of a small number of countries).

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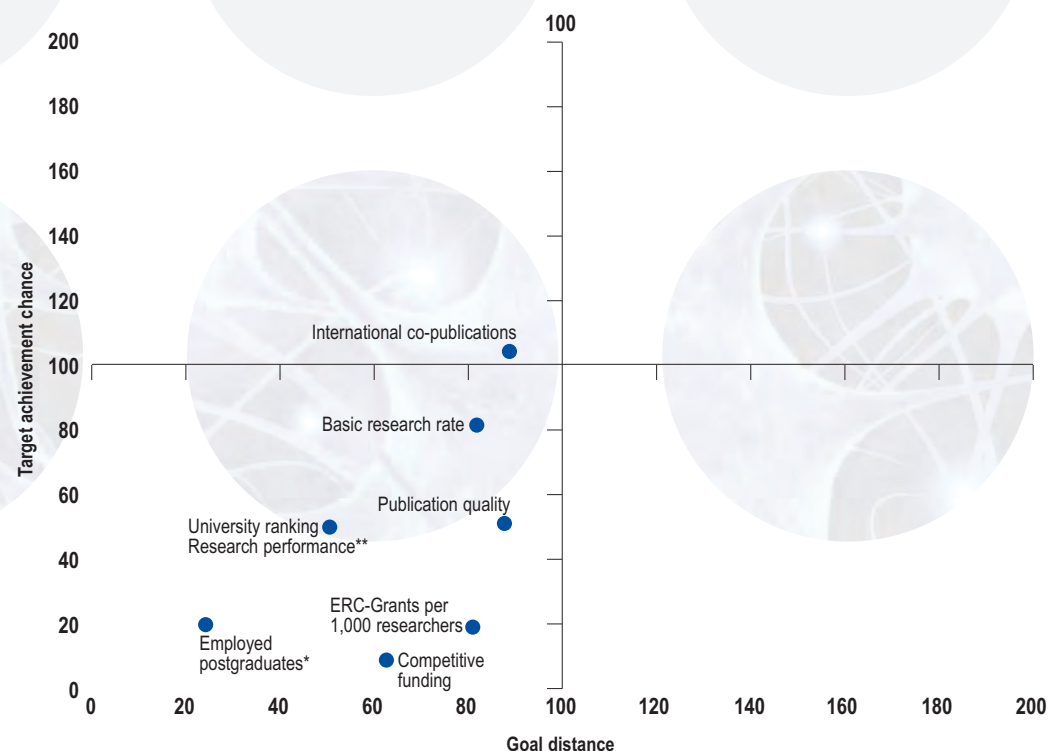
intended funds by the national funding bodies also need to be significantly increased. If the funds by the FWF are compared to the ones of similar institutions of the Innovation Leaders, the institution mentioned-above has only half of the funds at its disposal. The extension of competitive research funding defined in the RTI strategy lies thus clearly below the average of the leading countries. The indicator “basic research share” in figure 9 shows that another increase is necessary by 2020 in order to reach the goal.

The payout of overhead payments is particularly

relevant. The (re)introduction of pre-agreed overheads in the amount of 20 percent for single FWF projects and the PEEK programme, put the universities and other research centres in the position to partly finance indirect project costs which otherwise could be paid by the global fund. But this is not sufficient to cover the actually incurring indirect costs, especially in natural science and technically-oriented studies.

The Council believes that the measures of the RTI strategy should extend the payment of general expenses in various steps. First, the payment of the general expenses should be

Figure 9: Goal distance and target achievement in universities and basic research, in their latest available year



Sources: see Attachment 1, WIFO-representation. Notes: Goal distance= relation between actual value of Austria and actual value of Innovation Leaders (average value of latest available year DE, DK, FI, SE); with the exception *: relation between actual value of Austria and national goal according to the RTI strategy 2020. Target achievement chance = relation between the past growth and the necessary growth for target achievement, considering the past growth of Innovation Leaders. ** No growth calculation possible, target achievement with the same value as goal distance is assumed. Raw data see Attachment 2.

expanded to additional supporting programmes, then the overhead pre-agreed sum for infrastructural and technically demanding research projects – distinguished between disciplines and research institutions – should be increased and finally indirect costs should be compensated on the basis of a full-cost pricing as it is used in companies with other research projects.

The necessary funds could partly be available from a restructured global fund. However, in the future new funding approaches for universities and non-university institutions should also create space for research outside of the competitive area. Thus, the social task of high quality education and training in a broad offer of education and research centres is guaranteed.

The evaluation of the quality of scientific research must be slightly corrected compared to last year. The most recent data from the year 2012 reveal a drop in successful project approvals in relation to the leading innovation countries at the European equivalent of the FWF, the European Research Council (ERC), which assigns research funds exclusively for excellent basic research projects. However, no trend can yet be derived from this. As illustrated in figure 9, the indicator on the publication quality shows, as measured by the share of the articles, which are located within the most quoted 10 percent of their subject also a significant drop behind the dynamics of the Innovation Leaders. However, it is still significantly higher than the specific indicator for the research performance of universities. Universities are in this regard far behind at only half of the value of the analogue countries. Various non-university institutions such as the ISTA, IMBA, IMP etc. contribute greatly to the quality of general publications.

Central measures to improve the research performance of universities would be increasing competitive funding, as defined, and improving career structures and scientific training of younger generations in order to be attractive for international highly qualified workers.

In the framework of an excellence initiative, a measure of the RTI strategy also mentions the implementation of up to ten excellence clusters

by the year 2020. So far no further measures in this regard could be introduced due to the lack of funding. It needs to be questioned though, whether alternative possibilities are at hand to obtain the effects of the excellence cluster. In the system evaluation the approach to introduce a support programme for the resolution of structural problems, has already been questioned. If the excellence clusters are not introduced, the increase of the funding on a competitive basis and the reform of the career structure to increase international competitiveness should be pursued more vigorously.

Improving the conditions for researchers at universities is an important goal defined in the RTI strategy. A relevant measure would entail the intensified promotion of postgraduates and Post-Docs. Indeed, in this area many measures have already been taken. The respective indicator in figure 9, however, indicates that the number of postgraduates employed by the university is still relatively low and thus the opportunities for professional research training are limited. If postgraduates need to work on the side to be able to finance their studies, they will be disadvantaged compared to students who can devote full time to their thesis and research. The initiatives to reorganise the doctoral programmes of universities need to be significantly increased – even if the funds were already slightly increased last year.

A further measure, for which no indicator is available yet, is the implementation of a “Tenure Track System“. However, systemic difficulties can be observed in its implementation. The realisation of new career structures, based on a “Tenure Track System“ along with the continuation of existing career schedules at different universities, inevitably create heterogeneous personnel structures.

A continuous career model like the “Tenure Track System“ in the U.S.A. is not planned in the framework of the UG (University Organisation Act) 2002. “Tenure“ for Austria would mean that the candidates have to undergo a defined selection process in case of sufficient qualifications. In case of the conclusion of a

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Objective targets of the RTI strategy

- 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.

qualification agreement – a definition of the goals to be achieved – after approximately four years the teaching and research performance will be evaluated based on the defined goals. If these are fulfilled and the evaluation has a positive result, a permanent appointment as associate professor can be established. A “full professor” position can be obtained only through an independent appeals procedure (Art. 98 UG 2002), which de facto almost always leads to a university relocation.

The university, which originally received an assistant professor, will lose high personnel investments and also a precious talent. Hiring international highly qualified workers is also quite difficult due to the ambiguous career perspectives. Young scientists can for example start at the MIT as “Assistant professor” – because of an appointment procedure, which is not different from the one of a “full professor” and after the positive evaluation become also a “full professor”. These structures – lacking in Austria – constitute a competitive disadvantage for Austrian universities when recruiting international highly qualified workers.

A clear and flexible personnel structure is needed to allow a new culture in establishing the scientific personnel. A reform of the appointment procedures ruled under the UG 2002, a sufficient funding structure, an increased offer of structured postgraduate studies, clear guidelines in career planning and a suitable “access and exit management” are the preconditions to further develop career structures towards international competitiveness. These reforms should be prioritized, even if implementing them is difficult and requires time due to the necessity to change existing personnel structures.

Non-university research

For the area of non-university research (AUF) no indicators are available. Thus in this chapter the target achievement chance will be assessed merely on a qualitative basis.

Non-university research organisations are besides universities and companies in many countries essential pillars of the RTI system as defined by the OECD in its report on Public Research Institutions.⁶¹ In Austria a manifold and differentiated AUF sector has developed, whose significance has grown steadily over the years. It is supported by the fact that in the year 2009 around 14 percent (around EUR one billion) of the total R&D expenses in Austria were spent in this area. 22 percent of the public R&D expenses are spent for non-university research institutions. With around 14,000 employees, the AUF sector provides 14 percent of all researchers in Austria.⁶²

As stated in the RTI strategy of the federal government, variation and a regional distribution of non-university research organisations promise flexibility, creativity and competition; on the other hand exactly this will also lead to a small-scale structure with high fixed costs and too inefficient parallel structures. Very often also the funds for a long-term creation of competences are missing. Consequently many institutions of non-university research also lack clearly defined role models. Furthermore, so far there are hardly any essential empirical investigations on the role of the AUF and its impact on the innovation system.

The Council thus believes, that the RTI strategy of the federal government should deal explicitly with non-university research. The objective targets defined in the corresponding chapter – Development of clearly defined role models for

⁶¹ OECD (2011): Public Research Institutions: Mapping Sector Trends, p. 18 f., 27 f.

⁶² Joanneum Research (2011): Erhebung zu den öffentlichen Forschungsinstitutionen in Österreich, p. 6.

the various AUF institutions, reforms of the internal structures of the AUF, coordination of the overall structure of the AUF sector are basically very welcome.

In its first “Report on the scientific and technological performance capacity of Austria 2012“ the Council however established that the measures implemented are dealing mainly with reforms of the internal structures of the research institutions and thus they address only one of the three goals defined in this chapter. The measures on the internal structure reforms of the institutions were implemented at the end of 2010 and thus already prior to the implementation of the RTI strategy and also mainly independently from the measures included in the latter. The current reform process is based on a “Three-pillars model“ for non-university research in Austria. The reform processes – partly launched before – of institutions such as the ÖAW, AIT, ACR and LBG are therefore carried on.

The first pillar of the reform process deals with negotiations, which lead to a better integration or respectively to an improved co-operation of non-university institutions with universities or the ÖAW. Examples include: co-operations such as the one between the Erwin Schrödinger Institute and the University of Vienna, the integration of the International Research Centre for Cultural Studies (IFK) into the University of Fine Arts of Linz or the foundation of the Conflict-Peace-Democracy-Cluster (CPDC) at the University of Klagenfurt. This process, however, reveals a low degree of structuring. On the whole it must be noted that the previous measures were characterized by little transparency. A call for bids launched in the first semester of 2013 by the BMWF to promote the co-operation of universities and scientific and cultural or economic institutions offered at least the opportunity to carry on the process.

The second pillar of the reform process is rep-

resented by the programme TOPEU. It guarantees the financial support of successful project participations in the 7th EU research programme of the AUF institutions doing research in the area of humanities, social and cultural sciences (GSK). The funds for this programme amount to around EUR 2.8 billion over the years 2011 to 2014 and will be completed with the termination of the 7th EU Framework Programme for Research. So far over 40 projects have been co-financed. A strategy going beyond that has not been planned. Thus, it remains to be seen whether by then sustainable structures can develop between the respective non-university institutions and universities, for example.

The third pillar deals with the consolidation of the research infrastructure in the GSK area. Due to the increasing volume of data and the international networking in many research areas, this task needs to be coordinated both at a national and international level. This requires the creation of a national research infrastructure roadmap (see also section “Research infrastructure“ page 34 f.).

It remains to be seen how the measures can contribute to achieving the two other goals of the chapter. A comprehensive strategic approach to the area of non-university research, which addresses the respective goals of the RTI strategy directly cannot be observed. The Council is missing in particular measures, which lead to a better coordination of the overall structure of the non-university research sector and aim at developing role models.

The Council has suggested a comprehensive analysis of the AUF sector in its report from the previous year in order to elaborate an overview on the overall structure as basis for further reform steps. So far this suggestion has not been discussed sufficiently, that is why the Council itself has become more concerned with the topic.⁶³ The Council believes that it would be

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⁶³ Katzmaier, H. / Gulas, C. (2012): Der nachhaltige Aufbau von außeruniversitären Forschungseinrichtungen – Erfolgsfaktoren und Hebel aus Sicht der Stakeholder.



assessment of the performance

Objective targets of the RTI strategy

- 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.

advisable to analyse this area as a whole and thus deduce clear role models, performance goals, success factors and structural adaptations, which can keep pace with the different institutions of the non-university research sector. In particular the functional differentiation according to the concrete task spectra of individual institutions should be taken into consideration.

Research infrastructure

The two objective targets of the RTI strategy connected to the topic of research infrastructure cannot be depicted with indicators and are thus assessed qualitatively. As established by the RTI strategy, the quality of the research infrastructure represents an essential success factor for the research performance of a country.⁶⁴ Excellent research at universities, non-university institutions and universities for applied sciences as well as companies highly depends on access to the modern research infrastructure.

In the area of publicly financed research it is universities and non-university institutions, which act as responsible parties for the research infrastructure. The modernization, extension, construction and acquisition of big machines or the establishment of “Core-Facilities”, thus depend mainly on the allocation of public funds.

The current situation of the planning and funding of the research infrastructure is not satisfactory. Universities receive a certain amount of funds for research infrastructure, which is ruled under the partial amount for infrastructure and clinical additional expenses of the total funds. Currently however a targeted, competitive infrastructure promotion is missing, aimed at facilitating acquisitions with a bigger volume.

Over the years 2002 to 2010 on the whole five university research infrastructure programmes with a total amount of around EUR 216 million

were tendered and assigned. An evaluation of these projects shows that in particular the creation of intra- and inter-university research focuses have been supported.

With increasing time duration of the programmes, the infrastructure funds have also contributed to a stronger development process of the university profiles. A further positive effect has resulted from the co-operative planning of these research infrastructures through a better use of the facilities and equipment. This motivation is no longer at hand due to the lack of competitive infrastructure funding. The university internal funds for research infrastructure in the framework of the total budget will neither allow big investments nor encourage inter-university co-operations.

According to a study commissioned by the Council⁶⁵ the yearly average funding requirement over the years 2010 to 2014 for university research infrastructure amounts to around EUR 132 million. This number makes reference to an evaluation of all the existing planning programmes at the time of the investigation. Even if this investigation is based on an ideal funding scenario, the numbers show the real requirement, which clearly exceeds the framework of the past research infrastructure programmes. The complete lack of suitable funding both from a scientific and economic point of view indicates a strong barrier for the research sector.

An important step to optimize the planning and the particular requirements lies in the measure of the RTI strategy aimed at developing a binding “National Roadmap for the Research Infrastructure”. This would on the one hand improve a coordination of the research infrastructure undertakings on a national level and on the other hand it would represent also an important component for an optimized participation in European research infrastructure undertakings (ESFRI).

⁶⁴ RTI strategy of the federal government, p. 23.

⁶⁵ Austin, Pock & Partners (2010): Erhebung der österreichischen Forschungsinfrastruktur (2010).

An appraisal of the university research infrastructure on a national level carried out by the BMWF can serve as a basis for the optimized development of the research infrastructure and for the participation in co-operative projects. The involvement of all research sectors – i.e. universities, non-university institutions as well as universities for applied sciences and research-based companies would in this regard be an important step to overcome the future chal-

lenges for financing the necessary research infrastructure.

Without the use of sufficient funds on the basis of suitable, flexible structures the defined and planned measures of the RTI strategy are not able to reach the development of the research infrastructures in Austria as a basis for excellent research and international positioning.

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Recommendations by the Council to achieve the goals included in the RTI strategy of the federal government

Chapter “Creating knowledge, promoting excellence: The foundation of a knowledge-based society“

Based on the previous analyses of the objective targets of the RTI strategy and the indicator-based assessment of the degree of target achievement, the Council recommends particular attention on the following aspects:

Universities and basic research

The Council recommends a gradual increase of the FWF funds to the level of the Innovation Leaders and the comprehensive introduction of overheads. The funding of universities and other leading institutions in the area of basic research such as the ÖAW needs to be adapted to the required research and training capacities.

The attractiveness of the career structures of Austrian universities should be improved in order to be more competitive in recruiting international highly qualified workers. The offer of structured postgraduate programmes should be further developed to support young researchers more effectively.

Non-university research

On the basis of its preliminary work in this regard, the Council recommends to conduct an

overall analysis of the non-university research sector. The focus should be on the definition of clear role models, performance targets and success factors as well as possibilities for structural adaptations, which do justice to the different institutions of the non-university research sector.

Research infrastructure

The Council recommends the provision of a sufficient financial framework for the modernization and development of the necessary research infrastructure in the scientific and economic interest of Austria. The analysed requirement should be met at least in an adequate limit with regard to the infrastructure programmes of the past periods in an amount of EUR 50 million per year. Coordinating the infrastructure undertakings all over Austria, and introducing a competitive assignment procedure should enable a targeted assignment of funds. A clearly defined subdivision and a differentiated funding approach should meet different requirements in funding. In this context a “National Roadmap for the Research Infrastructure“ should be made operational as soon as possible.

assessment of the performance

Utilising knowledge, increasing added value: Activating innovation potential

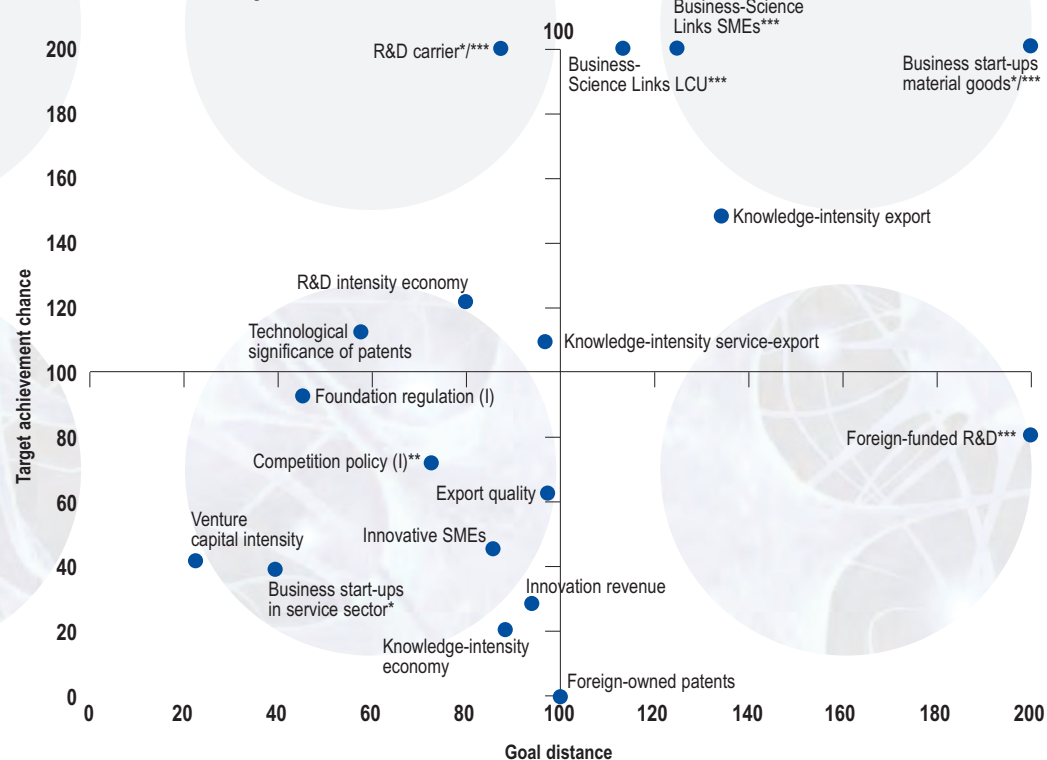
This chapter deals in particular with innovation in the area of enterprises in their manifold facets. The RTI strategy establishes that the Austrian competitiveness and quality of the location can only be guaranteed and further developed “if the transformation to a knowledge-based society is successful”.⁶⁶ A further increase in innovation performance and the efficient use of knowledge are

thus central aspects. The objective targets in the area of innovation efforts of enterprises concern the below aspects, summed up as follows:

- Innovation and operational research
- Co-operation of science and economy
- Business creation and venture capital
- Innovation through competition

Figure 10 shows a heterogeneous picture for the

Figure 10: Goal distance and target achievement chance in the area “Exploiting knowledge“, in their latest available year



Sources: see Attachment 1, WIFO-representation. Notes: Goal distance= relation between actual value of Austria and actual value of Innovation Leaders (average value of latest available year DE, DK, FI, SE); with the exception *: relation between actual value of Austria and national goal according to the RTI strategy 2020. Target achievement chance = relation between the past growth and the necessary growth for target achievement, considering the past growth of Innovation Leaders. ** No growth calculation possible, target achievement with the same value as goal distance is assumed. *** Values over 200 were cut off. Raw data see Attachment 2. (I): Value inverted, explanation see section “Monitoring of target achievement“, page 7f.

⁶⁶ RTI strategy of the federal government, p. 24.

area of operational research with weaknesses and strengths. Many of the illustrated indicators are in their current development only scarcely behind the defined national goal for 2020 or in its absence behind the current level in the analogue countries. For some indicators the defined goals have already been achieved.

On the whole, the area of company innovations reveals the weaknesses already known in the area of company foundations such as insufficient venture capital intensity, partly also the development of the foundation in itself and the extent of innovations, which are new on the market. In this context it should also be noted that this measure for innovative top positions or the “radicalness” of innovation is based on an indicator of a common innovation survey and is affected by the related weaknesses. A detailed analysis on the basis of patent indicators (see section “Assessment of creative performance“, page 12 f.) shows that the quality and technological amplitude of Austrian inventions indeed still lie below the average of the leading countries; over the last few years, however, a catch-up process could be observed.

objective targets for which no standardized indicators are available, concern the increased use of demand-side instruments in the acquisition, regulation and the standardization for the stimulation of innovations.

Innovation and operational research

The first two objective targets of this chapter concern the promotion of the research and knowledge intensity (“consolidation“) in the economy and the enterprises. The targeted increased knowledge basis of the Austrian economy can also be intended as a goal of the RTI strategy on the whole (see section “Effect monitoring“, page 11 f.). This is indicated by the successful increase in knowledge intensity in existing sectors such as the structurally adjusted R&D intensity in economy as well as the struc-

tural change in the direction of knowledge intensive sectors, as measured by the share of knowledge intensive service exports (without the strongly distorting tourism sector) and by the share of high and medium high-tech export of goods on the total export (indicator “knowledge intensity export“).

All indicators except two indicate either an already achieved target or a probable achievement by the year 2020. The low target achievement chance of the export quality should in this context not be overestimated. The level is very close to the one in analogue countries while the values have hardly changed over time. Regarding the indicator for knowledge intensity in economy only a very short time series is available in the framework of the IUS; indicators available on a long-term basis referring to the structural change reveal a clear trend in the direction of stronger knowledge intensity for Austria.⁶⁷

For the consolidation of knowledge intensive services as part of the general efforts to strengthen the knowledge-based structure and as an explicit goal of this chapter an overall concept going beyond the single supporting measures in the service sector is missing, which will make RTI political decision makers, innovating units and the Austrian innovation system as a whole more aware of this area and its contribution to innovation. The increase in the service sector initiative of the BMWFJ by EUR 2 million to a total amount of EUR 7 million for the promotion of innovations in the service sector also needs to be mentioned in a positive way in this regard.

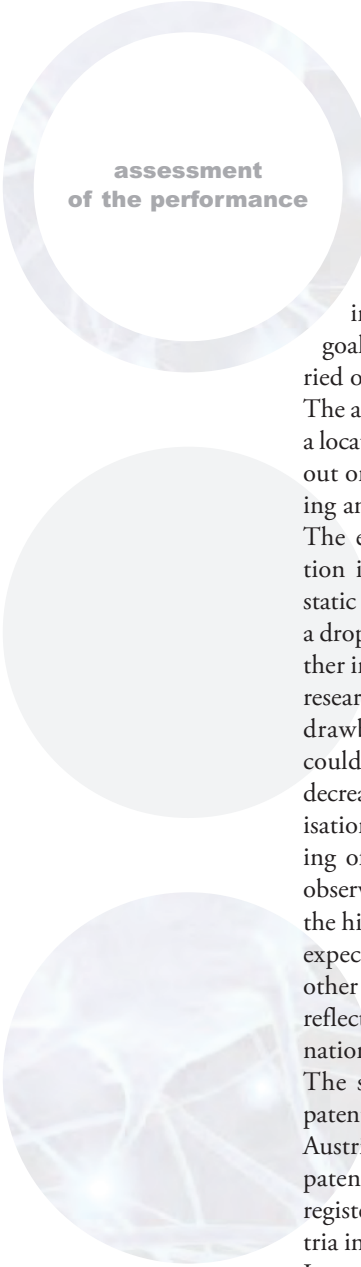
The second block of objective targets on the number of R&D-based companies and innovative SMEs concerns the amplitude of the innovation basis in the economy. Due to the high dynamic of the development in the past an important increase can be expected for R&D-based companies and so can the target achievement. Referring to the number of innovative

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Objective targets of the RTI strategy

- 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 structure of the manufacturing and service sectors has to be improved by increasing the innovation and knowledge-intensity of firms.
- 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.

⁶⁷ Cf. Janger, J. (2013): Strukturwandel als Indikator für die Qualifikationsnachfrage der Wirtschaft. In: WIFO-Monatsberichte (monthly reports) 2/2013, p. 135–147.



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SMEs the efforts need to be strengthened from today's point of view in order to reach the aspired extent by 2020. Thus two essential performance areas of the innovation system – intensity (“consolidation”) and amplitude of the research and innovation efforts – could be pushed in the right direction so as to achieve their goal provided that the previous efforts are carried on and intensified.

The assessment of the attractiveness of Austria as a location for research-active enterprises is carried out on the basis of indicators for external funding and the possession of patents abroad.

The external funding of research and innovation is an exception. It should at best remain static proportionately, since both an increase and a drop could have undesired effects. While a further increase would contribute to the fragility of research activities in Austria, since in case of the drawback of multinational companies these could be slightly damaged, a drop could also decrease the attractiveness of Austria for the realisation of research activities. The external funding of research and innovation should be best observed apart from the other indicators. Due to the high dynamic of the Innovation Leaders it is expected that – with unchanged trends – the other analogue countries will overtake Austria, reflecting the general trend towards more internationalisation in the innovation system.

The second patent indicator (“possession of patents abroad”) to measure the attractiveness of Austria as research location shows the share of patents with Austrian discovery participation, registered by a foreign entity. Even though Austria in the past has shown higher values than the Innovation Leaders in line with the external funding of Austrian research, Innovation Leaders, in particular Denmark and Finland have caught up strongly over the last few years. Basically, it should be mentioned that the patent analysis reveals volatility. It will take the next few years to confirm the trend.

The determining factors for the attractiveness of the location for research active companies are i.a. the qualification of the workforce, the proximity to research infrastructure and universities and the system of the research support in general. As figure 14 (see chapter “Offering incentives – creating options“, page 51 f.) shows, Austria boasts a relatively well-equipped supporting system in an international comparison. As mentioned, the development of the educational sector and universities requires however an intensification of the reforms from the point of view of the location.

The targeted increase in “radical innovations” or market innovations within companies, defined in the RTI strategy as a further objective target has already been discussed. As to the level, Austria still lies behind the Innovation Leaders, but is in a catch-up process. However, no measures are available in this area to further promote this process. The RTI strategy does not provide any specific proposals to promote market innovations. The probability that innovations projects will lead to market innovations is influenced by many factors, including the quality of the academic-scientific research system (quality of research and researchers, i.e. the graduates who then join the economy), the structure of industries and their determination factors (Austria is strongly specialised on industries which further develop mainly through incremental innovation) or the quality of the support equipment (i.e. mechanisms for project assessment, interaction between the instruments). The federal government should in this regard develop a coherent concept to cover these manifold influence factors as a consistent package of measures).

“Radical innovations” carry a higher risk. Failures are more frequent in this area than in incremental innovations.⁶⁸ The generation of these innovations thus requires willingness, to take more risk in the promotion of such undertakings. Besides the introduction of corresponding criteria in the individual assessment of innovation

⁶⁸ Leo, H. (2008): Die Integration von Exzellenz und Risiko in die österreichische Forschungs-, Technologie- und Innovationslandschaft, Vienna.

undertakings on the level of governance, it is also necessary to create suitable incentive structures at the interface between business owners and agencies (see chapter “Offering guidance, setting conditions”, page 44 f.)

As the indicators for the share of sales with market innovations reveal, the transition from research results to innovation and thus marketable products and services in Austria is still difficult. The improvement of the transition to production and the transformation of operational research into marketable products and services are not established in the strategy as goals, but the Council considers them important challenges. Amongst others, there is a gap in funding at the interface between the market and young, innovation-intensive companies.

The funding problems at the interface for the market launch have in part already been recognized. The Council welcomes in this regard the initiatives of the BMVIT, which has established two important promotion instruments with the market bonus and in particular with the initiative “Market start“ 2012. For the sake of quick and easy implementation only projects already promoted by the FFG were initially taken into consideration. To effectively cover this previously unprocessed area of the system, an expansion to all young research and technology intensive companies should be carried out on the basis of the first empirical values and evaluation results after the positive evaluation of the instruments.⁶⁹

At EU level, Horizon 2020 deals with the so-called innovative financial instruments as important factors for the promotion of the market launch of innovations. These comprise all interventions except for the mere subsidization. Normally these investments or guarantees are made by financial institutions such as the European Investment Bank (EIB) or financial institutions in the member states with public tenders, and at a lower level by local financial institutions and market participants. The financial instruments

represent an important opportunity for follow-up financing. At national level they should be simple enough to be accepted by banks. Banks and other appropriate institutions should be prepared accordingly.⁷⁰ In this context the Council welcomes the fact that for the AWS all provisions have been taken to participate in the financial instruments and to provide relevant offers in Austria.

Co-operation between science and economy

As figure 10 indicates, the Austrian performance in the area of co-operation between science and economy was already above the average in the last few years. The corresponding objective targets of the RTI strategy have already been achieved. The corresponding indicators – i.e. the share of big companies with innovation co-operation with universities (Business-Science Links LCU) as well as the share of the small and medium enterprises, the SMEs (Business Science Links SMEs) indicate that Austria lies well above the actual value of the analogue countries.

The RTI strategy in this regard focuses on continuity and the further development of the strategic-oriented co-operation of science and economy. As already mentioned in the first “Report on the scientific and technological performance capacity of Austria 2012“ the Council is convinced that the measures to further develop the support of research co-operation is appropriate to increase the co-operation intensity and also the private funding share. In this context reference should again be made to the need for strategic further development of the proven and tested COMET programme.

Mention should also be again made of the fact that considering the positive development of the cooperative area, the Council believes that the suspension of the funding of the successful programme line “Translational Research” of the BRIDGE programme needs to be questioned. The Council thus welcomes the planned substan-

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Objective targets of the RTI strategy

- 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.

⁶⁹ Recommendations by the Council from 19th November 2012 to optimize the RTI-related start-up activities.

⁷⁰ Recommendations by the Council from 19th November 2012 to optimize the RTI-related start-up activities.



assessment of the performance

Objective targets of the RTI strategy

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

tial further development and adaptation of the BRIDGE programme by the FFG to the modified framework conditions.

The realisation of knowledge transfer centres on the basis of the results of the work group “Knowledge transfer and foundations“ by the Task Force RTI is also very welcome.

Business creation and venture-capital

The number of the science and research-intensive new foundations should be increased by an annual average of 3 percent by 2020. As shown in figure 10, the start-up rate in particular for knowledge-intensive services is still far away from the pursued target value while its dynamic is rather weak. In the research-intensive production of material goods the rates lie above the pursued goal.

The foundation goals of the RTI strategy should however not be overestimated. An international standard of comparison is missing in this regard. The goal referring to an increase of 3 percent was set nationally without knowing the data situation. Thus, in Austria a comprehensive, consistent collection of the RTI-related start-up activities is missing.⁷¹ Indeed, the achievement of the start-up rate in the area of material goods or the non-achievement in the service sector, as shown in figure 10, cannot give an immediate hint as to the foundation dynamic. The Council thus recommends an immediate generation of the corresponding database and its yearly continuation. Conclusions from the industry taxonomy of the Statistik Austria or the sole collection of academic spin-offs are not sufficient.

In the work group “Knowledge transfer and start-ups“, established by the Task Force RTI to implement the RTI strategy, measures for the achievement of the strategy’s goals in the area of knowledge transfer and start-ups are harmonised. The work group has included the topic “Optimization of existing measures for technology-based, innovative business start-ups“ in its

current working plan, in which particularly the problems of an insufficient data situation in view of the RTI-related start-ups was recognized and assessed as quite urgent. The further necessary steps are being discussed and established in the work group amongst others together with the Council for research and technological development.

Referring to the objective target of the RTI strategy, namely to facilitate the foundation of enterprises and relieve them from costs, it is mainly the implementation of framework conditions which would contribute to the promotion of start-up activities. In the Doing Business Report of the World Bank, Austria still performs very poorly in the category “Starting a business“.⁷² The regulation for start-ups in Austria – as measured by the administrative steps related to the foundation of a LLC (GmbH), the time duration, the costs and the necessary minimum capital – lies far below the one of the Innovation Leaders. Furthermore, the indicator shows a moderate development perspective for the upcoming years. Its dynamic, however, needs to be interpreted with care since it reflects political measures, which could be changed relatively quickly.

In this area processes can be observed referring to the already existing draft of a LLC (GmbH) light with its intended reduction of the minimum capital to EUR 10,000, which will be realised relatively soon. But also measures for the reduction of the tax burden in the first years can offer an important financial relief for recently founded companies.

In Austria the New Companies Promotion Act (NEUFÖG) provides depreciation tax shields for business start-ups. These tax shields are valid for all enterprises, regardless of their innovative development. Additional tax shields such as those offered in other countries, which are granted according to the innovative degree and the research performance of young enterprises, do not exist in Austria.

⁷¹ Recommendations by the Council from 19th November 2012 to optimize the RTI-related start-up activities.

⁷² International Bank for Reconstruction and Development / The World Bank (2013): Doing Business 2013, p. 148.

Thus, the Council believes it still seems worthwhile to verify international examples of tax shields for young scientific and technology-based enterprises regarding their possible implementation within the Austrian system. Here, in particular the French models (JEI – jeune entreprise innovante) and the Netherlands (WBSO, law on the reduction of taxes on wages and contributions for stock-in-transit insurances) will serve as examples.⁷³

The differentiation of the research contribution in terms of higher percentages exceeding 10 per cent for young and small enterprises was neither politically discussed nor realised. This is however all the more important since the biggest financial burden of research companies can be found mainly in the early stages of the enterprise's existence. It is also important to carry out a concomitant analysis of the effect of this instrument on the target group.⁷⁴ Austria presents a very comprehensive offer of direct support services for research-based business start-ups. This is also attested by the latest analysis of the Global Entrepreneurship Monitor for 2012.⁷⁵ As to supporting instruments based on a subsidy almost no gap was observed but rather a lack of clarity. All in all, in the area of subsidies an improved harmonisation is necessary, especially between the regional and national level as well as between the single regions. The aim is not to simplify the offer of subsidies itself but rather orientation should be facilitated for potential company founders within the offered variety.

For the purposes of the required clarity and transparency it should be clear for funding seekers which location to contact in terms of a One-Stop-Shop in order to have access to all the possible support services. In this regard the transfer to the national level should also take place. The regionally in part well-established AplusB centres

could in this regard be a possible but however not compulsive choice. If this position cannot be implemented in this area, appropriate One-Stop-Shop alternatives such as Chambers of Commerce or the regional development agencies could be a possible solution. In this case, for the specific requirements of research-based start-ups tailor-made services should be guaranteed.⁷⁶

Basically, the promotion of start-ups requires an orientation, which focuses not so much on the project-related but rather on a strengthened business perspective. This implies a stronger consideration of market-based risks.⁷⁷ Young enterprises are often neglected in the system of subsidies since they are assessed frequently as economically insecure due to the lacking economic power and proof of success. On the whole, when assessing project applications on the part of young enterprises in the early stages, the lacking proof of evidence of economic performance capacity and the future chances of success should be taken into consideration accordingly.

The venture capital intensity is also far below the goal and features an unsatisfactory dynamic (see figure 10). The predominant lack of venture and participation capital, especially for innovative young enterprises is still one of the main weaknesses in Austria. Risk-taking private investors are missing, especially when it comes to financing the early stages of a company, especially new areas of research.⁷⁸ In this regard the Venture-Capital-initiative launched back in 2010 as well as the initiative for young entrepreneurs planned for 2013, consisting of a start-up fund carried out by the AWS and a business Angel Fund are very welcome.

The main cause for the low venture capital availability in Austria are the missing competitive,

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⁷³ Recommendations by the Council from 19th November 2012 to optimize the RTI-related start-up activities.

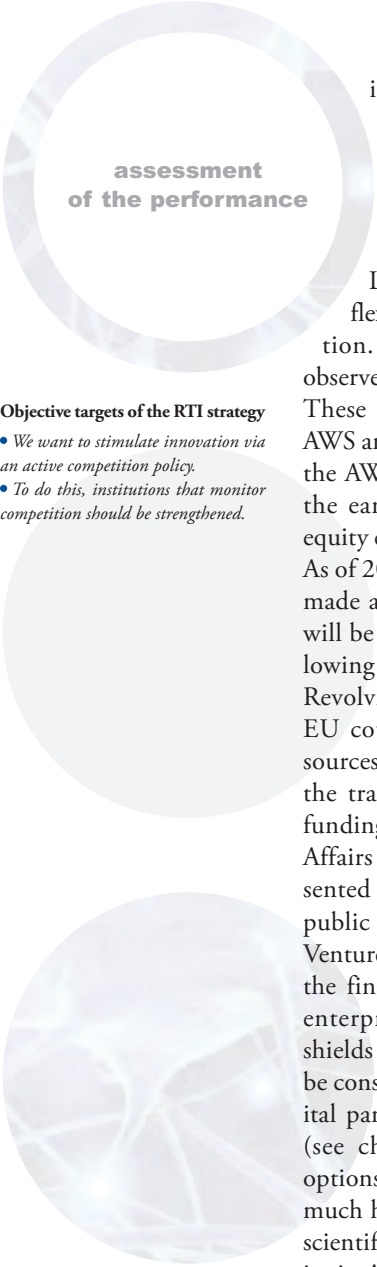
⁷⁴ Recommendations by the Council from 19th November 2012 to optimize the RTI-related start-up activities.

⁷⁵ Global Entrepreneurship Monitor, 2012 Global Report, p. 39.

⁷⁶ Recommendations by the Council from 19th November 2012 to optimize the RTI-related start-up activities.

⁷⁷ Stockhammer, C. (2012): Monitoring der Optimierung des Gründungsgeschehens, Rat für Forschung und Technologieentwicklung, Vienna, October 2012, p. 56.

⁷⁸ EVCA Yearbook 2011, p. 100.



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Objective targets of the RTI strategy

- We want to stimulate innovation via an active competition policy.
- To do this, institutions that monitor competition should be strengthened.

international framework conditions, which make it harder to gain institutional investors for Austria. For quite some time representatives of the industry⁷⁹ and the Council⁸⁰ have called for an internationally competitive “Private-Equity-Law” which enables the framework for a flexible and fast capital raising and redemption. In this regard little progress can be observed compared to the previous year.

These are the start-up fund managed by the AWS and a Business Angel Fund also realised by the AWS. This package should fill the gaps in the early financing period and improve the equity capital situation of young entrepreneurs. As of 2013 additional EUR 110 million will be made available through these new funds which will be gradually put on the market in the following years.

Revolving funds such as those used in other EU countries represent important financing sources for young entrepreneurs especially for the transfer from public subsidies to private funding. In 2012 the Ministry for Economic Affairs and the Ministry of Finance have presented together the introduction of two new public financing sources.

Venture capital alone, however, does not solve the financing problem of start-ups and small enterprises. Other instruments such as tax shields for investments in start-ups should also be considered in this regard to increase the capital participation intensity by private partners (see chapter “Offering incentives, creating options”, page 51 f.).⁸¹ Also in this regard not much has changed since the first report on the scientific and technological performance capacity in Austria.

Innovation through competition

The requirement of the RTI strategy to stimulate innovation activities also through competition is to be welcomed. Empirical analyses repeatedly show low competition intensity in some industries in Austria, in particular in service sectors such as independent professions, insurances or determined areas of the banking sector. The indicator for the competition policy as measured by the ability of different regulations on competition policy is still quite far from the average level of the Innovation Leaders. However, it should be noted that the corresponding data are several years old. Growth calculations and a resulting estimation of the development dynamic are thus not possible at the moment. An up-date of the indicator is planned for autumn 2013.

In order to guarantee free competition, corresponding framework conditions are needed. On a national level it is important to provide for the elimination of obstacles to competition caused by administration, costs, contortions through state subsidies and interventions into the legislation. In this regard studies and expert opinions on a European level should also be taken into consideration.

Against this background, the initiatives of the federal government to reform competition and cartel right are very welcome. However, the competition authority in Austria is still suffering from insufficient personnel resources. In many sectors there are rules, which impede competition without any good reason.

On the whole, the possibilities to promote innovation through competition incentives may not be fully exhausted by now. In this regard the further reinforcement of the competition authority is a priority for the upcoming years.

⁷⁹ AVCO-media communication from 5th June 2007: Fehlende Rahmenbedingungen für Wachstumsfinanzierung gefährden 30.000 Jobs; AVCO (2003): Bessere Rahmenbedingungen für PE/VC in Österreich: Summary by “Work group for fund structures”.

⁸⁰ Recommendations by the Council from 24th November 2011 to create appropriate framework conditions for private equity in Austria. Recommendation by the Council Private Equity (PE) / Venture Capital (VC) for the Austrian innovation system, 14th March 2008.

⁸¹ Recommendations by the Council from 24th November 2011 to introduce participation exemption.

Recommendations of the Council to achieve the goals of the RTI strategy of the federal government

Chapter “Utilising knowledge, increasing added value: Activating innovation potential“

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On the basis of the previous analysis of the objective target of the RTI strategy and the indicator-based assessment of the degree of target achievement, the Council recommends to pay particular attention to the following aspects. Last year's recommendations are still valid.

The recommendation by the Council regarding the optimization of the RTI-related start-up activities was added on 19th November 2012. It was developed in accordance with the work group “Science transfer and start-ups“ by the Task Force RTI and will also be integrated into the planned business creation strategy of the work group.

Innovation and operational research

The Council recommends further improving the framework conditions for research and innovation in the company sector by innovative concepts or by introducing a mix of subsidies and supporting framework conditions. For the implementation, please refer to the corresponding individual recommendations by the Council:

- Recommendation by the Council from 19th November 2012 to optimize the RTI-related start-up activities
- Recommendation by the Council from 24th November 2011 to efficiently implement research results in innovation

For the promotion of market innovations the Council recommends the development of an adapted concept of measures.

Business start-ups and venture capital

The Council recommends prioritizing this area and in particular venture capital since it is very topical. For the implementation, please refer to the individual recommendations of the Council:

- Recommendations by the Council from 19th November 2012 to optimize the RTI-related start-up activities

- Recommendations by the Council from 24th November 2011 for the creation of suitable framework conditions for private equity in Austria
- Recommendations by the Council from 24th November 2011 for the introduction of a participation exemption

The Council recommends using corresponding framework conditions for the promotion of start-up activities in knowledge and technology-intensive areas.⁸² Besides the introduction of the LLC (GmbH) light, measures for the reduction of the tax burden in the first years after the foundation of a company are addressed. They take into consideration the innovative content and research performance of young enterprises such as the relief from social security taxes or taxes on the company's earnings.

The Council recommends considering whether international models of tax shields can be applied to young knowledge and technology-based companies in Austria.

A differentiation of the research premiums in terms of higher percentages – above 10 percent – for young and small enterprises should be developed and implemented in detail.

Co-operation between science and economy

The Council recommends highly prioritising the further development of the COMET programme in light of its strategic relevance. In its recommendation from 15th September 2011, the Council proposed more flexible structures for K-centres. Furthermore, decisions must also be made on what to do with these existing centres after the termination of this programme.

Innovation through competition

The Council recommends further strengthening the resources of the competition authorities.

⁸² Recommendation by the Council from 19th November 2012 to optimize the RTI-related start-up activities. Recommendations of the Council from 9th December 2008 on the Austrian start-up activities in the knowledge and technology-intensive sector.

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Providing guidance, establishing frameworks: Efficiently organising political governance

In order to face the challenges of political guidance in its manifold facets, the RTI strategy includes a series of different objective targets and measures. The essential aspects of the chapter refer to the following items:

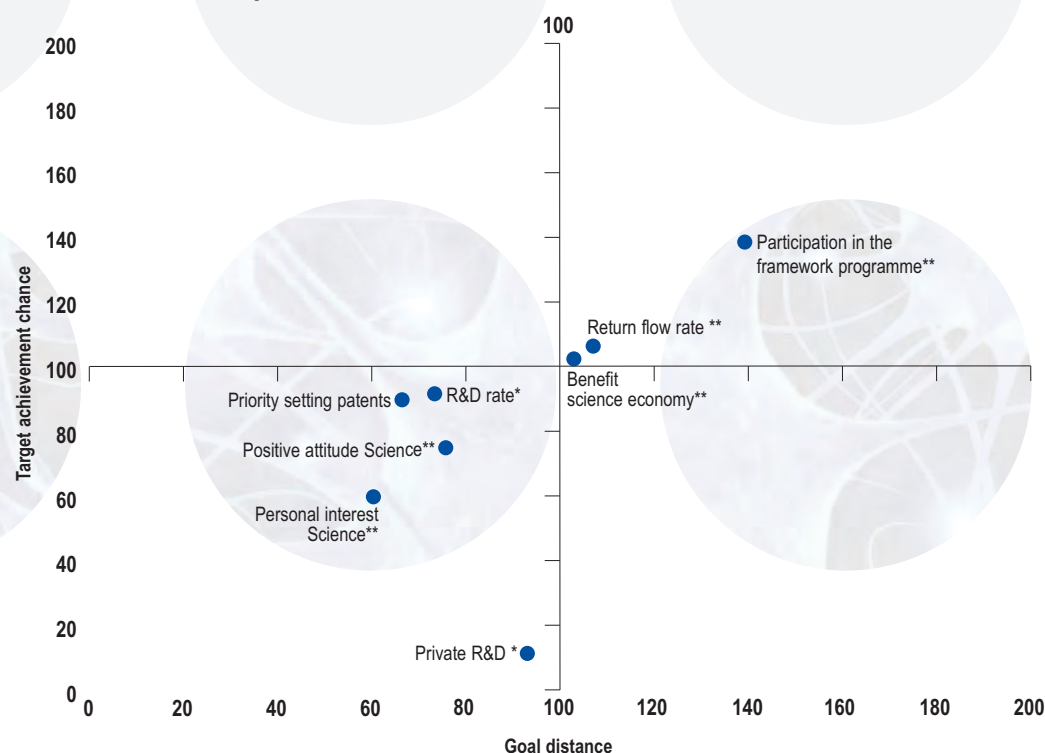
- Organising governance structures more efficiently
- Improving international positioning
- Optimizing the topical focus
- Increasing efficiency in the subsidies policy

- Improving the attitude of society towards science
- As for this chapter of the RTI strategy only a few objective targets exist which can be represented by indicators, the approached topics are assessed mainly qualitatively. Accordingly figure 11, only highlights a few single aspects since the topics treated in this chapter are very heterogeneous. The figure also contains the two indicators on the R&D proportion and on the private funding share which are covered in the chapter “Offering incentives, creating options” on page 51 f.

Objective targets of the RTI strategy

- 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.

**Figure 11: Goal distance and target achievement in the area “Offering guidance”,
in their latest available year**



Sources: see Attachment 1, WIFO-representation. Notes: Goal distance= relation between actual value of Austria and actual value of Innovation Leaders (average value of latest available year DE, DK, FI, SE); with the exception *: relation between actual value of Austria and national goal according to the RTI strategy 2020. Target achievement chance = relation between the past growth and the necessary growth for target achievement, considering the past growth of Innovation Leaders. ** No growth calculation possible, target achievement with the same value as goal distance is assumed. Raw data see Attachment 2.

Governance structures

The RTI system in Austria still reveals the weaknesses in the governance structures already identified in the CREST report and in the system evaluation.⁸³ This results in framework conditions which prevent performance from improving as was clearly recognized and addressed in the analysis of the RTI strategy.⁸⁴ This was partly addressed directly with the corresponding objective targets. Setting up the task force allowed operational control on the implementation of the measures. The Council welcomed the resulting intensified harmonisation of the departmental activities in its first “Report on the scientific and technological capacity of Austria 2012” as well as the new forms to control business support agencies through performance agreements. However, the governance system is still highly fragmented and is assessed as very complex. The findings of the system evaluation and the CREST report in view of the distribution of competences and ministerial competences are partly still valid. At a closer look the formal structures still indicate ambiguities in the distribution of roles. The departments are for example active both in the role of programme owners and in the commissioning of evaluations of these programmes. Furthermore, decision-making processes are always taken in parallel and without comparing information, which can lead to duplicities and inconsistencies in the downstream institutions. These parallel processes hinder consistent, strategic control. The Council believes that the measures of the RTI strategy contribute only partly to a solution.

Due to the significance of the topic, the Council has established in its working programme 2012+ that it will deal more intensively with the

governance of the RTI system. Since optimizing the governance structures is an explicit field of action of the RTI strategy of the federal government, the Council deals with said project also in the framework of its monitoring task. The governance structures of the entire RTI system and the co-operation relationships between its different institutions should be analysed in view of subsidiarity and division of work. The results of the project and the resulting recommendations will be available in autumn 2013 at the latest.

International positioning

Austria can look back on a positive success story within the European framework programme for research for quite long. Both as to participation and return flow from the EU research framework programmes, Austria has been well ahead of the analogue countries for quite long. This is also clearly expressed by the two corresponding indicators in figure 11. Also in the transnational projects of the “European territorial co-operation” (ETC) very good results have been achieved from a financial point of view.

The goal of the RTI strategy of developing a harmonized science and research foreign policy to support the internationalisation is already being pursued. The corresponding work in the task force and in the deriving work groups have brought together the involved people from the competent technical ministries for research and innovation in a first step in order to summarize the needs of the research community on the whole. This step is important in particular in view of the new positioning of European instruments. However, this does not lead to any con-

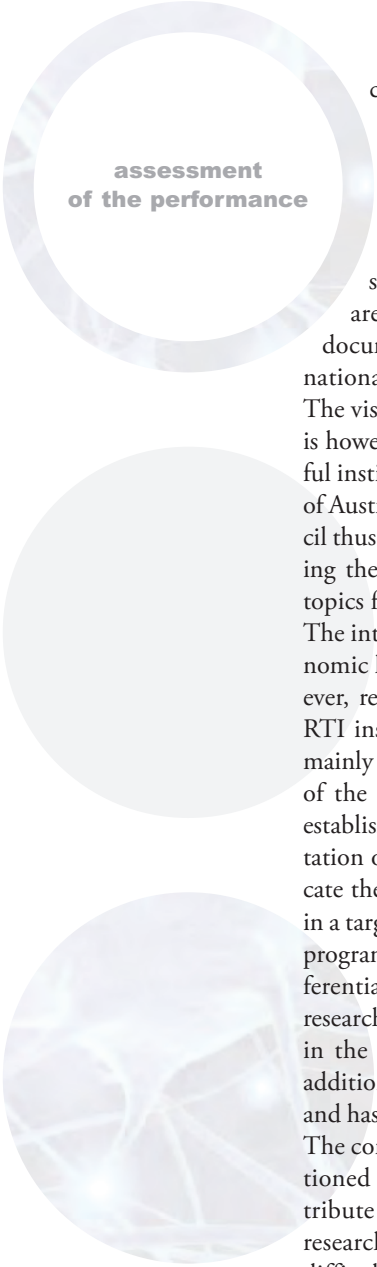
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Objective targets of the RTI strategy

- By bundling existing measures for the support of the internationalisation we want to develop a harmonised science and research foreign policy. The appropriate institutional structures should be created.
- Austria should optimally position itself in the “European Knowledge Area” by actively participating in the formulation of a pan-European research, technology and innovation policy.
- Furthermore, an even stronger Austrian participation in European supporting programmes should be pursued, i.e. in the research framework programmes or European structure funds with the aim of further increasing the return flow rate.
- Selective, global co-operation should be developed and further extended with innovation frontrunners such as the U.S.A., selected Asian countries and the emerging BRIC countries.
- The co-operation with the countries of Central, East and South-East Europe should be further strengthened.

⁸³ System evaluation of the Austrian research promotion and funding (2009): Report, part 2: Strategische Governance – Der Zukunft von Forschung, Technologie und Innovation ihren Möglichkeitsraum geben; Report, part 3: Governance in der FTI-Politik im Wechselspiel zwischen Ministerien und Agenturen; CREST (2008): Policy Mix Peer Reviews: Country Report – Austria, p. 6 ff.

⁸⁴ RTI strategy of the federal government, p. 32 f.



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clusion regarding a common procedure. Already established information events and platforms on European topics (for example Austrian Forum on European Research, conference on European research, dialogue between federal and state government, website “era.gv.at” etc.) are accepted well by the Community and document the need for information on international possibilities.

The visibility of the research community abroad is however limited to single, partly very successful institutions. A comprehensive representation of Austria abroad however is missing. The Council thus recommends continuing and strengthening the information exchange on international topics for the national research system.

The international presentation of Austria as economic location has established structures. However, research focuses and the offer of national RTI institutions are only transferred via single, mainly isolated initiatives and separate structures of the institutions. The Council recommends establishing a harmonised international presentation of the RTI location Austria to communicate the corresponding needs and performances in a targeted manner. For that purpose European programmes and global activities should be differentiated. As mentioned before, measures in research quality lead to long-term improvement in the international university rankings. This additionally increases the international visibility and has a positive effect on the research location. The concept “European Knowledge Area” mentioned in the RTI strategy which should contribute to the formulation of a pan-European research, technology and innovation policy, is difficult to allocate.

In this context it cannot be found in other documents. In general, Austrian research institutions are well established in the European environment and can be seen as part of the European Community. This is also certified by the good performance in the EU research framework programmes.

Certainly in this context a good consultation and self-motivation of the participants is a decisive aspect. The lack of incentives and financial

support as well as the time-consuming harmonisation of big projects such as the KICs (“Knowledge & Innovation Communities”) or FET (“Future and Emerging Technologies”) by the public authorities have complicated the access to the European level in particular for small institutions and SMEs. The Council thus recommends creating framework conditions which facilitate and support the participation of Austrian research in the “European Knowledge Area”. Contributions given by Austria on the European level also need to be supported by national structures. In order to face the legal matters related to the EU, a professional expertise should be created in a department open to all spheres. This department should serve as consultation and information point for other departments and also serve the federal government and funding agencies. Furthermore, this department would be able to coordinate and forward the statements to be sent to the European commission. It needs to be determined, if the Europe department implemented by the BMWF can take over these tasks.

The creation and development of selective global co-operation with leading innovation countries such as the U.S.A, selected Asian countries and the BRIC countries has already been implemented in some countries. A clearly defined focus on a few countries seems to be appropriate since a positioning in all mentioned regions requires a lot of resources.

The opening of the Asian countries has already been provided for with the presence of representatives on the spot and contacts on a ministerial level. Even if the manifested interest of these countries regarding co-operation and exchange with the Austrian know-how is partly very high, the first pilot projects implemented show that in this regard long-term commitment and comprehensive negotiations are necessary if co-operation is to be successful. Due to the very resource-intensive acquisition period for co-operation projects and directly assigned research commissions, the public authorities need to agree to establish long-term co-operation with these countries. The Council recommends naming special representatives for science and tech-

nology (Offices for Science and Technology – OST) in countries for which Austria has a clearly defined strategic interest in co-operation. For that purpose a long-term guarantee is needed regarding the required resources of these representatives on the part of the ministries involved.

The reinforcement of co-operation with Central, East and South-East Europe is well represented in the strategic documents – in particular in the operational programmes – of corresponding European Territorial Co-operation. Furthermore, the common strategies such as the Danube Region Strategy to reinforce co-operation are appropriate. As in these countries some structural deficits still exist, an active role of Austria is required for the target to be achieved. The Council recommends that the regions use the possibilities for the funding period 2014 – 2020 appropriately and that they increase the attractiveness of regional development (ETC, EFRE) through research and innovation by creating simple, unified and transparent framework conditions.

Priority setting

As to priority setting the RTI strategy focuses on “Reinforcing the competitiveness of Austria in generic cross section fields of science and technology by concentrating the activities in internationally competitive size units”. “The indicators used to measure target achievement in environmental technology and health (see indicator “Priority setting-patents” in figure 11) suggest the following: the innovation activity in environment and health, as measured by the patent indicator of the IUS as representation of the objective target of increased mission-oriented research lags currently clearly behind the one of Innovation Leaders. However, the data representation ends with the year 2008 meaning that it does not include the efforts made since the strategy was agreed upon.

A detailed patent analysis by the WIFO shows that up to before the RTI strategy was implemented, the specialisation of the Austrian innovation activities in the area of environmental technologies had decreased, while in the area of

biotech a strong catch-up process can be observed. This coincides with the political efforts of the last ten years, which were strongly orientated towards the life-science area while the strong, but decreasing position in environmental technologies resulted from the regulatory efforts made in the 80’s.

The Council is still missing activities going beyond the measures of the RTI strategy to set priorities in view of a comprehensive topical overall strategy and pan-departmental topic management. In fact, different activities are already available in the framework of the two work groups “Climate change and scarce resources” and “Quality of life and demographic change” of the Task Force RTI. However, no final results are available yet. The Council believes that a consistent long-term concept, harmonised at inter-ministerial level is needed to develop and continue priority topics, which deal with specific social challenges and go beyond historically grown topical orientations of single departments. However, a systematic procedure is missing for the continuous evaluation of existing and new priority topics on the basis of trace-able heuristics.

The above-mentioned inter-ministerial work groups dealing with the governmental priorities also pursue the goal of interconnecting and further harmonising the different activities of the departments in both subject areas. The Council has already welcomed this development in its first “Report on the scientific and technological capacity of Austria 2012”. It needs, however, to be observed to what extent the activity of the work groups is reflected in the harmonization of concrete subsidy activities.

Currently – as the activities of the year 2012 show – the topics are managed exclusively and in an isolated manner in each department. The harmonization with similar or complementary priorities of other departments is limited to a supplementary, at best accompanying definition of already selected individual topical orientations. Normally, priorities are not commonly set in advance. Broader national topic management, which focuses on existing development

assessment of the performance

Objective targets of the RTI strategy

- 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 decisionmaking 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 Task Force RTI
- 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.



assessment of the performance

Objective targets of the RTI strategy

- We want to establish an overall policy approach in the funding system, which will co-ordinately make use of the most efficient bunch of measures in each context.
- Direct research funding should then be further developed in line with the use of an appropriate mix of instruments.
- The regulatory basis for research funding should be streamlined.
- The principle of competition-based allocation should be strengthened.

potentials and strengths in view of the Grand Challenges is urgently needed. This includes a corresponding regional harmonization.

Funding system

When optimizing direct research funding first reorganisations are slowly implemented.

Yet, when concentrating on improving individual instruments, the overall observation of the RTI system is still missing. The focus should be put more on the correlation and interaction between instruments and programmes.

Also the interaction of direct and indirect research funding has not yet been taken into account in full. In this regard, continuative analyses based on the system evaluation findings are missing in order to collect the complex relations and interdependencies in the context of the overall innovation system and to make, if applicable, suggestions for adjustments.

In connection with indirect research funding, its further development by increasing the overall cap for contract research from EUR 100,000 to EUR 1,000,000 as well as the control carried out in January 2013 regarding the legitimacy of the claim by the research premium in the framework of a FFG expertise need to be outlined in a positive way.

The strengthened performance orientation in the framework of support for institutions made possible by the elaboration of objective agreements on the part of the responsible departments is an important first step to improve the socio-political contribution and the profile creation of institutions. Its effect has not been seen yet.

With regards to the pursued overall political approach, which should use the most efficient bunch of measures in each context, first highlights are set in this direction with the programme JITU (young, innovative technology-oriented enterprises). This programme supports

the foundation and development of enterprises together with the consultation programmes and guarantees of the AWS and the white paper "Shortage of human resources" for the harmonization of the bunch of measures on human resources by the federal ministries BMVIT and BMWFJ. The white paper establishes that the division of tasks between the two federal ministries responsible for the corresponding department-related priority setting will follow and build on the established formats of phased out previous programmes. An integration of BMUKK and BMWF as important players in the educational area is, however, missing.

Observing the overall funding of research undertakings will show that overheads are not managed satisfactorily (see also section "Universities and basic research", page 29 f.). Overheads serve as a balance for necessary structural performances and must be basically chargeable. The Council has indicated in its recommendations that the legal security of expected overheads must be provided at the beginning of the research undertaking. Overheads have to be interpreted as an instrument for the direct and non-bureaucratic support of research performances and are meant to strengthen researchers at universities and other RTI institutions.⁸⁵ Different handling and recognition of overheads depending on the programme, but also depending on the form of enterprise of research-driven institutions have created a very complex system.

The standardisation of the legal basis for research funding is necessary not only from the point of view of overheads. The present situation is characterized by a variety of different requirements, verifications and directives. This leads on the one hand to uncertainty for applicants and on the other hand it creates a non-transparent interpretation space for certification organisations. The legal security is not at hand until the conclusive verification and has caused strong criti-

⁸⁵ Recommendations by the Council from 16th December 2011 to guarantee common costs in funded research projects.

cism in particular in regionally co-financed projects of the structure funds. A real simplification and standardisation of European and national directives has not taken place yet. The Council recommends to critically revise and standardise the framework conditions for the nationally regulated legal basis which possibly needs to be defined anew for the planned common utilisation of the European research framework programme and the structure and investment fund 2014 – 2020 as well as in view of the new subsidy framework.

Research and society

The attitude towards science in Austria is perceived as very negative, as shown in a survey by Eurobarometer.⁸⁶ A detailed analysis of the Eurobarometer data shows, however a nuanced image (see indicator “Personal interest science”, “Positive attitude Science” and “Benefit science economy” in figure 11). The Austrians have thus an even more positive opinion on the benefit of science for economy than analogue countries do. As to the positive attitude to science and the personal interest in science, Austria lies far behind in this survey.

The basically negative or disinterested attitude towards science and research can still be described as one of the biggest deficits. The development of a stable, infrastructural environment for various forms of dialogue between science and society in terms of “Scientific Citizenship” still represents a big challenge.

Simple access to dialogue must be offered to researchers and citizens alike. Single events such as the Long Night of Research taking place every two years affirm the mutual interest in communicating scientific topics. Other formats such as ScienceSlam and FameLab are also significant, yet an increase of the range of influence should be pursued. It has been observed that the dispo-

sition for such a dialogue has come from a group dynamic. Thus it seems reasonable to eliminate the fear of the unknown by simple and regular forms of dialogue. The media (print, radio and Internet) as well as the places of encounters (museums, venues, events, etc.) are also of great importance in this context.

Existing formats must be communicated and reflected according to target groups. Sustainable and comprehensive structures should be established regardless of single institutions and ministerial competences. The inclusion of the operative level in planning processes is indispensable since quite often real communication requirements and needs are not taken into consideration. The Council recommends an intensification of the dialogue by using successful formats. A regular offer should awake interest and eliminate fears of the unknown. Planning security and financial undertakings for communication service providers in the RTI area should guarantee the necessary continuity early enough and enable a critical reflection of the formats.

For quite some time the question of ethics in research and technology assessment have caused discussion, yet they have not led to any satisfactory result for the research community and society. In line with the first “Report on the scientific and technological capacity of Austria 2012” the Council underlines the importance of ethical secondary research and the technology assessment.

Finally structural determinants for the attitude towards science and research should not be kept secret. They include the low rate of university graduates in Austria but also the quality of universities, perceived as low.

(see section “Tertiary education system”, page 23 f., as well as section “Universities and basic research”, page 29 f.).

assessment of the performance

Objective targets of the RTI strategy

- 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.

⁸⁶ Eurobarometer, 2010.

Recommendations of the Council to achieve the targets of the RTI strategy of the federal government

Chapter “Providing guidance, establishing frameworks: Efficiently organising political governance”

Based on the previous analysis of the objective targets of the RTI strategy and the indicator-based assessment of the degree of target achievement, the Council recommends particular focus on the following aspects:

International positioning

The Council recommends the continuation of the harmonisation process in the international research environment and welcomes the measures of the work group established by the Task Force RTI for the harmonisation of stakeholders and departments as a first step.

The Council recommends the development of the information offer regarding international topics for the national research system. This could be organised in terms of a department for European legal matters in the RTI area, and should serve as an information pool and contact point.

Furthermore, the Council recommends establishing a harmonised international presentation of the RTI location Austria in order to communicate the corresponding needs and performances in a targeted way. A distinction should be made between the European programmes and the global activities. The Council recommends focusing the RTI co-operation on strategically selected countries. Development of the RTI representatives in these countries must be guaranteed on a long-term.

Priority topics

The Council recommends the development of a broader national topic management, which focuses on the existing development potential and strengths in view of the Grand Challenges. This should comprise a systematic and continuous procedure to evaluate existing and identifying new priority topics as well as a corresponding regional harmonisation. Overlaps and gaps should be avoided. Furthermore, harmonisation is to be pursued with other instrument types such as open-topic and structural measures. A central aspect is the development of traceable heuristics of the subject search.

Funding system

The Council recommends improving the individual instruments beyond the overall observation of the RTI system. Interrelations and the interaction between the instruments and the programmes should also be considered. Institutional support should also be assessed against the background of its interplay with other funding instruments.

The Council recommends analysing the interplay between direct and indirect research subsidies on the basis of the recognitions of the system evaluation in order to collect the complex interconnections and interdependencies in the context of the overall innovation system as framework and, if applicable, to carry out adaptations.

The Council recommends to critically revise and unify the framework conditions for the nationally regulated legal basis possibly to be defined anew in view of the preparation of the planned common utilisation of the European research framework programme and the structure and investment fund 2014 – 2020 as well as in view of the new support framework.

Research and society

The Council recommends the development of dialogical and participatory forms of science communication. This requires the development of an incentive system for scientists and researchers in advance to actively engage in a dialogue with society. The intensification and concentration of the dialogue activities is absolutely necessary.

The Council welcomes the regular realisation of the Long Nights of Research. For this purpose the Council recommends co-operation between all research-relevant departments in the federal and national government. It is essential to provide continuity for the commonly defined measures, as well as have financial planning security.

Furthermore, the Council recommends developing technology assessment and ethical secondary research.

Providing incentives, creating options: Broadening the financial base

The funding of research, technology and innovation is an essential condition for many objective targets and measures of the RTI strategy. In this context two of the objective targets of this chapter are particularly relevant:

- Increasing the research rate by the year 2020 to 3.76 percent of the GDP
- Increasing the private funding share up to at least 66 percent – possibly up to 70 percent – of investments

From a financial perspective and due to a strong expansion of the funding system, the business sector developed positively up to 2008. Due to the economic crisis however, as measured by the percentage rate of the GDP, research funding by the private sector has stagnated since 2008.⁸⁷ In view of the intention to increase research expenses to 3.76 percent of the GDP by 2020,

the increase of the private R&D funding is urgently needed to implement the targeted relation from 66 to 70 percent from the private sector and from 30 to 34 percent from the public sector.⁸⁸

The research rate of Austria is according to the goal distance and target achievement chance (see figure 11 in chapter “Offering guidance, setting conditions“, page 44 f.) not so far away from the necessary dynamic for the target achievement. However, this estimation of the development path is also based on growth rates from the years before 2009; the research rate has been stagnating since 2010 and thus this depiction could be too optimistic. As becomes evident from figure 12, the rate is partly still clearly below the one of the Innovation Leaders.

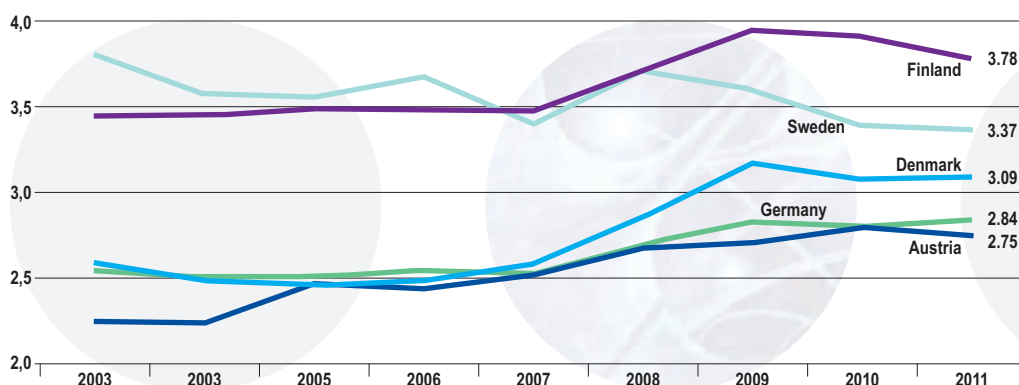
The public share of R&D expenses – again as

assessment of the performance

Objective targets of the RTI strategy

- 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 simulated 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 12: Research rates of Innovation Leaders compared with Austria



Source: Eurostat. The numbers mentioned here were taken from the Eurostat for comparability. In the Statistik Austria the new global estimation was recently published with the newest R&D rates. Thus, Austria reveals a rate of 2.81% for the years 2012 and 2013 respectively.

⁸⁷ In absolute numbers (in Mio. EUR) the R&D expenses reveal an increasing trend with the exception of the year of crisis 2009

⁸⁸ Currently (situation 2013) the relation lies at 40 percent public and 60 percent private (source: Globalschätzung 2013, Statistik Austria).

assessment of the performance

measured by the structure of Innovation Leaders – is already comparatively high (see figure 13). The private funding share lies below the target of 66 percent and shows a negative dynamic, thus the target achievement chance is very low. This implies a priority need for action in the private funding share.

Moreover, according to recent OECD calculations on subsidy intensity, as measured by the public R&D funding with respect to the GDP, Austria ranks fourth within the OECD countries (see figure 14).

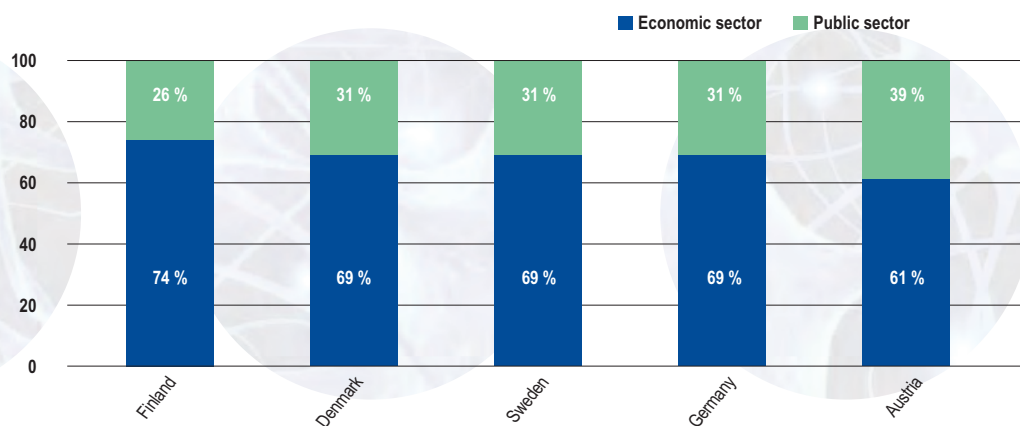
Options to increase the private funding share include concentrating public means and instruments on increasing the leverage, i.e. increasing the incentive of private spending on R&D.⁸⁹ Examples include the assignment of direct R&D subsidies as auction mechanisms or already discussed proposals such as the frame-

work conditions for private risk financing (see section “Business creation and venture capital“, page 40 f.).⁹⁰ To increase private funding shares, concepts should be increasingly tested.

The increase of the private funding share can also be interpreted as indicator of manifold efforts, aimed at increasing productivity or the leverage of public funds and the innovation system under strong public control (i.e. universities).

In the context of an increase of private R&D funding additional initiatives should be launched to increase philanthropic donations, which for example in the US form an essential part of private R&D funding. In Austria the philanthropic culture is not strongly developed. In countries with an established philanthropic culture small and big contributors, non-profit foundations and enterprises are the main players, whereas none of these segments is over proportionally developed in Austria.

Figure 13: Share of the public and private sector on the total research spending (in percent with respect to the GDP), 2011



Source: OECD Science and Technology Indicators 2011. The figures for Germany are available only up to the year 2010

⁸⁹ Janger, J. / Böheim, M. / Falk, M. / Falk, R. / Hölzl, W. / Kletzan-Slamanig, D. / Peneder, M. / Reinstaller, A. / Unterlass, F. (2010): Forschungs- und Innovationspolitik nach der Wirtschaftskrise. In: WIFO-Monatsberichte (monthly reports) 2010, 83 (8), p. 675–689.

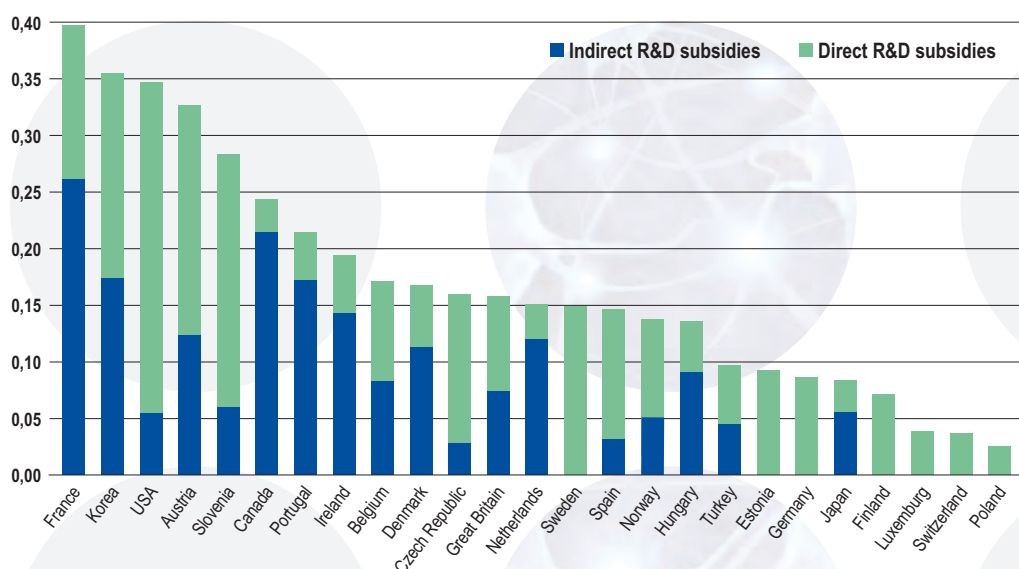
⁹⁰ See also Reinstaller, A. (2010): Die Förderung risikoreicher F&E-Projekte. In: Newsletter of the platform Research and Technology Policy Evaluation, 34, p. 68–75.

Actually, people in Austria are willing to donate, but the volume of the donations is however quite low.⁹¹ The donation culture can be promoted in Austria via different channels, such as a change in the legislative basis (key word: tax-systematic discrepancies in tax deductibility of donations)⁹² or a stronger com-

mitment of graduates vis-à-vis the universities according to the US model.⁹³ An essential component to complete all planned funding steps in the research area consists in regular quality controls, carried out on an objective and independent basis.

assessment
of the performance

Figure 14: Public direct and indirect R&D subsidies in relation to the GDP

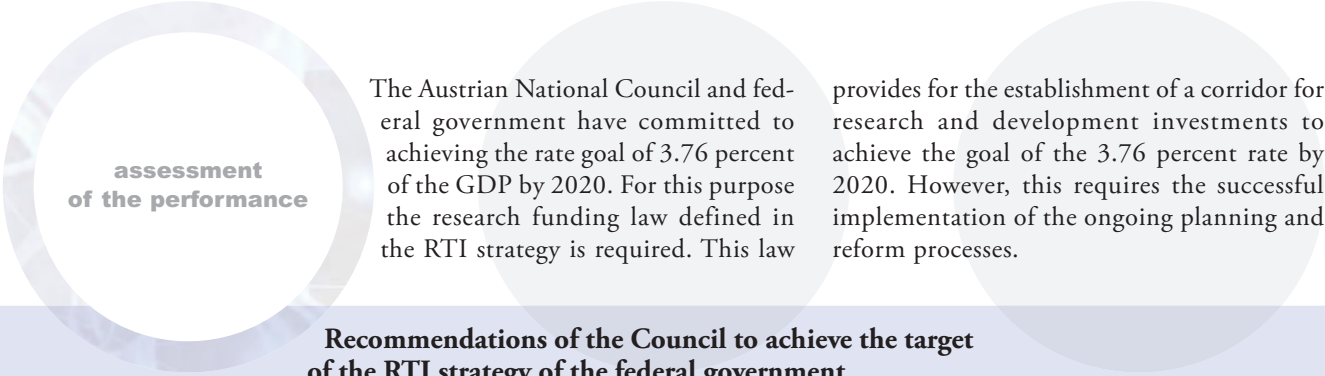


Source: OECD, MSTI Database, June 2012

⁹¹ Cf. Neumayr, M. / Schober, C. (2009): Spendenstudie 2008: Ergebnisse einer repräsentativen Bevölkerungsbefragung zum Spendenverhalten in Österreich; Fundraising Verband Austria (2010): Spendenbericht 2010.

⁹² Basically, donations to explicitly listed non-profit organisations can be deducted from taxes up to a maximum of 10 percent of the annual earnings of the donor. Due to a tax systematic discrepancy this tax deductability does not apply to private foundations because of the following reasons: capital income of private foundations is burdened with an "interim tax" in the amount of 25 percent. If donations are granted by private foundation to donation receivers, the capital returns tax applies and is, however, offset by the interim tax paid. In case of donations granted to non-profit-organisations listed in the law, no capital returns tax applies. The law, however provides that the interim tax can only be returned if donations with obligatory capital returns tax have been paid. Therefore these donations remain burdened with the 25 percent interim tax. This problem applies to all philanthropic donations, thus also to donations granted for research. See also Leo, H. (2012): Strategien zur Erhöhung der privaten F&E-Ausgaben.

⁹³ Donations from graduates imply an emotional attachment to the university, which is created in the U.S.A. and Great Britain by the fact that universities can select students and are committed to guiding them until the final examination. In Austria there is an implicit access mechanism made up of the examinations, which must be passed at the beginning of the studies, see Hranyai, K. / Janger, J. (2013): Hochschulfinanzierung. In: WIFO-Monatsberichte (monthly reports) 2/2013, S. 173–186.



assessment of the performance

The Austrian National Council and federal government have committed to achieving the rate goal of 3.76 percent of the GDP by 2020. For this purpose the research funding law defined in the RTI strategy is required. This law

provides for the establishment of a corridor for research and development investments to achieve the goal of the 3.76 percent rate by 2020. However, this requires the successful implementation of the ongoing planning and reform processes.

Recommendations of the Council to achieve the target of the RTI strategy of the federal government

Chapter “Providing incentives, creating options: Broadening the financial base”

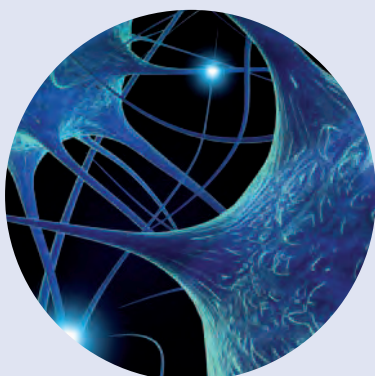
The Council recommends further testing of international models for the increase of R&D funding by the private sector. To increase the private funding share, the Council recommends concentrating the public means and the instruments on the increase of the leverage, i.e. the increase of the incentive effect on private spending for the R&D.

The Council recommends implementing the commitment put forward by the EU commis-

sion and agreed upon by the Austrian National Council on 24th November 2008 and by the Austrian federal government on 3rd November 2009, i.e. to devote 2 percent of the GDP to the tertiary sector.

To realise these projects the Council sees the embodiment of research funding in a law as an important signal and calls for a rapid implementation in terms of planning and funding security.





Summary of the
priority fields of action

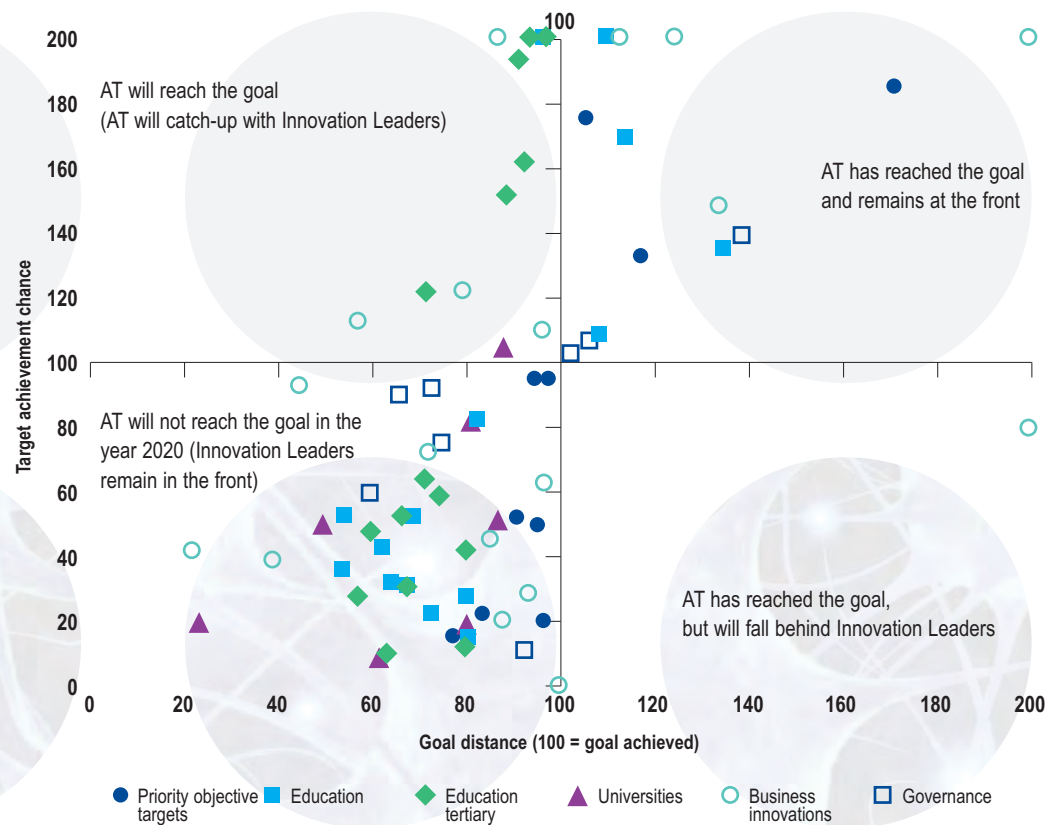
**priority fields
of action**

Overview of the performance in all areas of the RTI strategy

The Council has created a concrete image of the general degree of target achievement on the basis of an indicator-based assessment of the objective targets of the RTI strategy. Figure 15 offers a sys-

tematic overview of all target distances and target achievement chances represented by indicators within the meaning of the scheme presented in the section “Monitoring target achievement“, on page 7f.

Figure 15: Comparison of the performance of all areas of the RTI strategy



Sources: See attachment 1. Notes: Goal distance = relation between actual value of Austria and actual value of Innovation Leaders (average values DE, DK, FI, SE latest available year).

Figure 15 represents all the indicators of the corresponding areas divided by colours and symbols. On the whole, the need for action is generally speaking greater for the education system and for universities than it is for enterprises. A higher proportion of education and university indicators is in the lower left-hand quadrant, meaning that more intensified measures or additional reforms are needed to turn the dynamics of the last few years into a positive direction.

In light of the developments of the last 10 to 15 years the following basic statement is plausible: the main focus of the efforts in this period was on improving the innovative efforts of companies with a corresponding increase in funding, structure reforms of the subsidy (foundation of the Austrian Research Promotion Agency – FFG, tax subsidies etc.) and on evaluations. In universities, however, the major structural efforts appear in the form of the University Act – UG 2002 which needs further strengthening (competitive financing, funding of university places, career systems). In the educational system some positive measures have recently been put into place, however, their effect does not appear in the data yet (measures include: standards, expansion of all-day schools, etc.). Here too many other measures are definitely needed.

In particular the quality of the educational system is far behind the one of analogue countries. The tertiary sector features some dynamic developments such as the number of postgraduates

also in natural sciences and technological studies. Both teaching and research need to catch up. The strong dynamic in publication quality is not least connected to some non-university institutions (such as ISTA, IMBA, IMP etc.). Competitive funding is relatively low developed in comparison, even if the share of basic research is relatively high, which leads to high research funding of universities thanks to the financial means of the global budget.

Basically, the area of enterprises can be assessed as positive, with the exception of the known weaknesses in the knowledge-intensive foundation area and the venture capital intensity as well as in the low but increasing share of market innovations. The performance of the educational system could, however, threaten many positive developments in the tertiary sector and the area of enterprises if new employees and researchers have lower skills or if fewer employees are competent in the area of innovation activities. Conversely, significant reforms in the educational system and in universities could have a very positive effect on other areas, for example on the innovativeness of companies (more market innovations due to improved top research at universities, better research training for post-graduates) on the immigration of highly qualified workers by offering attractive postgraduate programmes (such as in the U.S.A.).

**priority fields
of action**

priority fields of action

Priority fields of action

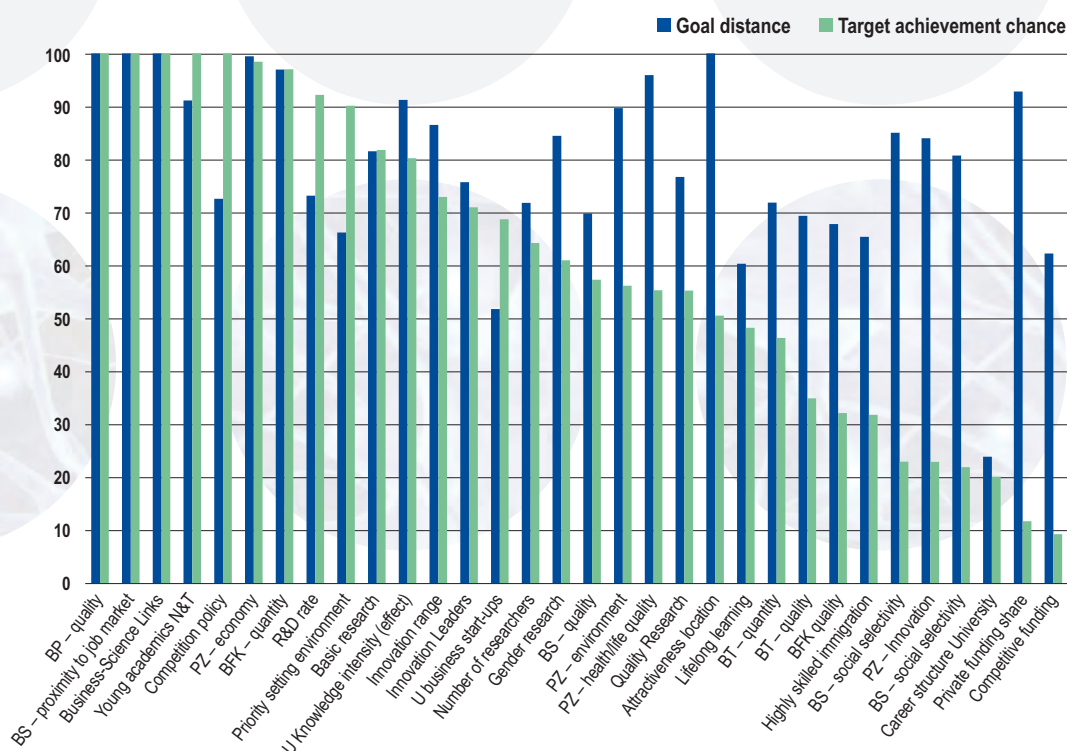
The basic statement in figure 15, which shows a rough comparison of all indicators, can be further compacted. Here they are assigned to the broad objectives of the strategy and summarised by forming averages of all individual indicators (see figure 16). In addition, all indicator values greater than 100 are limited to 100, so that achieved goals do not help compensate for not-achieved goals. As a result, figure 16 ranks the objective targets according to their value. A more precise selection of priority fields of action can be derived from the above ranking. These are determined not only by the numbers

but also by the economic interrelations and the shortcomings of some indicators.⁹⁴

The following priority fields of action have been identified:

- Performance of the educational system (quality, social selectivity; lifelong learning)
- Performance of universities
- Women in natural science studies
- Business start-ups (foundation dynamics, business growth, funding)
- Orientation of innovation efforts on environment and health (mission orientation)
- Private funding share of R&D

Figure 16: Ranking of the objective targets of the strategy, goal distance and target achievement chance



Sources: WIFO-calculations on the basis of the set of indicators. Notes: BFK early childhood care, BP educational system primary level, BS educational system secondary level, BT educational system tertiary level, N&T natural sciences & engineering, PZ priority objective targets, U companies.

⁹⁴ If for example for the quality of the primary sector of education there is only one student-staff-ratio but no international test data are available. The table in Attachment 3 shows how the indicators are assigned to the individual priority fields of action.

Conclusive recommendations for the further development of the RTI strategy and system

On the basis of its indicator-based analysis of the Austrian RTI strategy, the Council has come to the conclusion that the catch-up process of Austria in innovation performance has become less dynamic over the last three years. In an international comparison the Austrian RTI strategy ranks in the upper midfield. While the starting situation for connecting to the top group and achieving the objective targets of the RTI strategy is still good, more efforts are needed not to fall behind in international competition.

This estimation is not undermined by the recently published results of the Innovation Union Scoreboard 2013. According to the IUS 2013, the Austrian position compared to the previous year has deteriorated by one place. Thus, Austria now ranks ninth. Although this means a failure for Austria for the third time in a row, the Council believes that this is far less dramatic than it appears at first glance. This is due to the fact that some indicators of the IUS strongly distort the assessment of Austria. These are mainly indicators on university graduates, venture capital, knowledge-intensive service exports as well as on technological balance of payments. Some indicators based on a survey of enterprises (Community Innovation Survey, CIS) show negative results for Austria. International diverging subjective estimations of innovation could play a role here.

A more differentiated observation as was carried out in this report (in particular in the chapter "Assessment of the performance", page 17 f.) with a total of 62 instead of the 24 indicators used in the IUS, results in a more positive picture. In addition, the objective targets of the strategy are not identical to the IUS, but go far beyond that. This justifies the optimistic conclusion mentioned above.

At the same time, however, it is evident that delays in optimising the framework conditions, meant to increase the innovation performance, have a strong influence. The European and International competitors also improve their performance. It is thus necessary to prioritize the

implementation of the measures of the RTI strategy not least because some developments in the Austrian innovation system could jeopardise again what has already been achieved. Austria could fall further behind again, for example in the educational system.

Considering the fact that the RTI strategy was agreed upon only two years ago and the implementation of the measures understandably takes time, the Council focuses its recommendations on two core areas, which it believes are fundamental for the further development of the RTI strategy and system:

1. Intensifying reforms in the educational system
 2. Increasing the private share of R&D funding
- The indicator-based monitoring of the Council clearly shows that major efforts are still needed in particular in the area of education. The Council believes that reforming the educational system remains a top priority. The background to this is the fact that education is essential for research and innovation. Thus, the framework conditions of the educational system have a strong influence on the RTI area. The high social selectivity means that the existing potentials are not exploited sufficiently. Here the implementation of relevant measures of the RTI strategy must be greatly supported.

The second sticking point, according to the monitoring results lies in broadening the financial sponsorship of R&D activities. Although the Austrian economy has coped with the economic crisis in research and innovation much better than many other countries, compared to many leading innovation countries it is still lagging behind. In particular the share of private R&D funding should be significantly increased. The share of private funding can also be interpreted as an indicator of the productivity and effectiveness of the efforts by the public sector and is thus particularly important.

The Council recommends attaching special significance to the implementation of activities in these two areas. On the one hand modernising

priority fields
of action

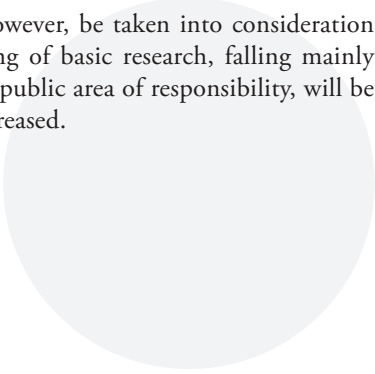
**priority fields
of action**

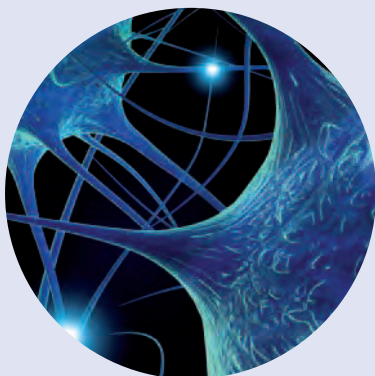
the structures of the educational system is essential. This can be achieved by strengthening school autonomy and simultaneously introducing standards adjusting competences between the federal and state government. To overcome the early selection in the educational system the Council recommends committing to a common, all-day school in secondary education, while simultaneously differentiating performance and developing talent and implementing them accordingly.

On the other hand, increasing the share of private R&D funding is a central aspect. The Council recommends on the one hand a closer examination of international models to see how R&D funding from the private sector could be

increased. In parallel, the Council considers incorporating research funding into a law an important signal for both research organizations and enterprises. In terms of planning and funding safety a fast implementation of this project is of great relevance. On the other hand, the increase of the private R&D funding share will also result from the successful implementation of reforms in many areas of the innovation system, which were mentioned above (for example in the governance, in the educational system etc.).

It must, however, be taken into consideration that funding of basic research, falling mainly within the public area of responsibility, will be further increased.





Attachment 1: Set of indicators
Attachment 2: Raw data of indicators
Attachment 3: Assigning indicators to the priority fields of action
Attachment 4: List of Abbreviations

Attachment 1: Set of indicators

Objective target of the strategy	Indicator to track target achievement	Abbreviation	Numerator
Priority objective targets			
Vision: In 2020 Austria will be Innovation Leader. Target objective: We want to further develop the potentials of science, research, technology and innovation in Austria to make our country one of the most innovative in the EU....	IUS Innovation index (Summary Innovation Indicator)	IUS Index	Innovation index value (normalized 0–1)
...and thus strengthen the competitiveness of our economy and increase the wealth of our society....	GDP per capita at purchasing power standards (PPS)	GDP/per capita	Gross domestic product (GDP) at purchasing power standards
	Occupation rate	Employment rate	Employed (20–64)
	Unemployment rate	Unemployment rate (I)	Unemployed (15–74)
...and face the big social and economic challenges of the future.	OECD Better Life Index	Better Life Healthy Life expectancy (F)	Better Life Index– value (0–10)
	Life expectancy in health: proportion of years without diseases/impairment of life expectancy	Healthy life expectancy (M)	Years without chronic diseases/functional impairments
	Reduction of greenhouse gas emissions in%	Greenhouse gases (I)	Emissions of greenhouse gases, base year 1990 Index (1990=100)
	Efficiency increase: energy intensity	Energy intensity (I)	Gross domestic consumption of energy (kg oil equivalents)
	Efficiency increase: productivity of resources	Productivity of resources	GDP

	Denominator	Short explanation of indicator	Source
	n.a.	The innovation index of the IUS should make the innovation performance of EU member states comparable. It comprises 25 unweighted individual indicators, which refer to various innovation-relevant areas (i.e. human resources, research expenses, patents, structural change).	IUS Innovation Union Scoreboard
	Total population	The Gross Domestic Product, GDP per capita is a measure of the economic performance of a national economy. It is defined as the value of all newly created goods and services, minus the value of all goods and services consumed as inputs. The underlying figures are expressed in PPS, a common currency, which balances price level differences between countries and allows significant GDP volume comparisons.	Eurostat
	Working-age population (20–64)	The employment rate complements the GDP per capita as a measurement for the economic development of a country. Working population is made up by the people who during the report week worked at least one hour against payment or worked to reach a certain goal or did not work, but had a work place and were only temporarily absent.	Eurostat
	Employed (15–74)	The unemployment rate complements the GDP per capita as a measure of the economic development of a country. The unemployment rate is defined as percentage share of unemployed compared to the employed population. The working population comprises the employed and unemployed people. The data are season-adjusted.	Eurostat
	n.a.	The indicator measures wealth and life quality in a broad definition. It comprises several areas; income, education and health overlap with other areas and are therefore not depicted. The remaining areas are a balance of workplace-privacy, integration in social networks, participation in social/political events, personal safety, environmental quality, living quality and life contentment.	OECD Better Life Index
	Life expectancy	This indicator reflects challenges related to the population aging. Life expectancy in health can be influenced by medical-technological progress as well as social innovations such as new occupational disease prevention models.	Eurostat
	n.a.	This indicator constitutes one of the Austrian Europe-2020 goals and the fact that climate change can only be efficiently contained by absolutely reducing greenhouse gases. Here, the target contains a reduction and not an increase.	Eurostat, Austrian Federal Environment Agency
	GDP (in1,000 €)	This indicator shows the development of energy efficiency i.e. the energy consumption, which goes along with the annual production performance of the Austrian economy.	Eurostat; Statistik Austria
	National material consumption (kg)	This indicator is a measurement for the physical resource consumption, which goes along with the annual production performance of the Austrian national economy.	Eurostat; Statistik Austria

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Objective target of the strategy	Indicator to track target achievement	Abbreviation	Numerator
Objective targets education system – preschool and primary area			
The educational system as a whole needs to be optimized, starting in the early childhood stage. Vision 2020: age-based, early childhood pedagogical support has been established.	Participation in early childhood education	Early childhood care	Children (4–primary level) in institutional childcare facilities
	Staff-student-relation	Staff-student ratio early childhood	Number of children (4–5) in institutional childcare facilities
	Staff-student-relation in primary education	Staff-student ratio primary level	Number of students in primary education
objective targets education system – secondary education			
The rate of school leavers should be reduced to 9.5% by 2020.	Rate of school leavers	Early school leavers	People aged 18–24 with a school leaving certificate from a lower secondary school level at most
The rate of secondary school graduates should be increased to 55% within one peer group by 2020.	Rate of secondary school graduates	Secondary school graduates	Passed final school leaving examination
The number of students with a first language other than German, who complete the second secondary level, should increase from the current 40 to 60%. Better integration of immigrants.	Number of students with a first language other than German who have completed the second level of secondary school	Early school leavers migrants	Number of students with a first language other than German who have completed the second level of secondary school (AHS, BHS, 3-year technical school, apprenticeship)
The reforms aim at mitigating social selectivity.	Influence of the socio-economic background on reading competence	Education inheritance 1(I)	Influence of PISA Index for the socio-economic background on reading competence (increase in socio-economic gradient)

	Denominator	Short explanation of indicator	Source
	Population 4–5 for Austria, for other countries depending on school start (4–6)	The share of population aged between 4 and the beginning of school age, who participate in early childhood education. Based on this indicator the primary target of the strategy “General and professional education” is measured, to increase the share of children who participate in preschool education to at least 95% by 2020 (share of 4-year-olds up to the age of compulsory primary education).	Eurostat
	Number of pedagogically qualified teachers without assistants	The student-staff ratio (as measured in full-time equivalents) results from the number of students of a certain education area divided by the number of teachers (not assistants) of the same education area and similar education institutions.	OECD, Education at a glance
	Number of teachers (full time-equivalents) in primary level	The student-staff ratio (as measured in full-time equivalents) results from the number of students of a certain education area divided by the number of teachers of the same education area and similar education institutions.	Eurostat
	Total population at age 18–24	This is a core target in the framework of the Europe 2020 strategy. “Early education and training leavers” are people aged 18 to 24, who fulfill the following conditions: the highest obtained degree of the general or professional education corresponds to ISCED 0,1,2 or 3c – briefly: this is the lower secondary level, and the questioned persons should not have participated in any measure of general education or training in the four weeks before the questionnaire.	Eurostat
	Peer group of the population aged 18-to-19	Final examination rate: passed final examinations (without second or subsequent degrees), as measured by the arithmetic mean of the population aged 18 to 19.	Statistik Austria
	Peer group of the population aged 18-to-19 with a first language other than German	The indicator shows the share of students with a first language other than German, who obtained a final degree in the higher secondary level (final school leaving examination, apprenticeship, middle technical schools).	Statistik Austria
	n.a.	The average difference in the students' performances in reading which goes along with an increase in one unity on the PISA index of the economic, social and cultural status is defined as increase in socio-economic gradients. The higher the average difference, the higher the influence of socio-economic background of students on their reading skills. The socio-economic background is measured by the PISA-index of the economic, social and cultural status and is based on information provided by the students on the education and occupation of their parents and certain items in the parental home such as a writing desk for studying and the number of books. Statistic fluctuations are taken into consideration in the assessment.	OECD PISA

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Objective target of the strategy	Indicator to track target achievement	Abbreviation	Numerator
Objective targets education system – secondary level			
The reforms aim at continuously increasing quality in education (secondary level).		Education inheritance 2(l)	Influence of PISA Index for the socio-economic background on reading skills (strength of correlation–share of the declared variance)
	Share of students with bad performances in basic skills (reading, mathematics, natural sciences) Target: max.15%	PISA-share of students at risk (l) reading	Students who reach at best the competence level 1 of the corresponding PISA scale
		PISA-share of students at risk (l) mathematics	
		PISA-share of students at risk (l) science	
	Share of students who reach the competence level 5 or higher (in reading, mathematics, natural sciences)	PISA-share of top students – reading	Students who reach the competence level 5 or higher
		PISA-share top students – mathematics	
		PISA-share top students – science	
Best possible qualification for economic action (...)	Share of employed graduates (aged 20 to 34)	Skill Mismatch	Employed graduates of an education programme at least at the secondary level II aged 20 to 34 who left the general education and training system for more than 3 years before the reference year

	Denominator	Short explanation of indicator	Source
	n. a.	The strength of correlation between the reading performance and the socio-economic background is measured by the percentage of the variance of students' performances, which can be explained by the differences in the socio-economic background of students. The higher the share of the declared variance, the higher the influence of the socio-economic background.	OECD PISA
	Total number of students participating in OECD PISA	The indicator informs on the dimension of the share of students within the total population examined, who are classified the most at the first competence level of the corresponding PISA scale due to their test results. It has to be assumed that the low competence level in these 3 fundamental areas causes high impairments in private and social life.	OECD PISA
	Total number of students participating in OECD PISA	This indicator shows the distribution of the school performance upwards, i.e. the share of students with very good results.	OECD PISA
	All graduates of an education programme of the secondary level II aged 20 to 34, who have left the general education and training system for more than three years before the reference year	This indicator is the attempt to reflect the degree of concordance of the education offer with respect to the demand of the job market (Skill Mismatch). It is an official target of the European Framework "Education and Training 2020".	Eurostat

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Objective target of the strategy	Indicator to track target achievement	Abbreviation	Numerator
Objective targets education system – tertiary sector			
Share of 30-to-34-year-olds with a university degree amounting to 38% by 2020	Share of 30-to-34-year-old university graduates in the peer group of the 30-to-34-year-olds of the population	University graduates	Number of 30-to-34-year-olds with an ISCED4a degree (only Austria, D), 5or 6
		University graduates (incl. ISCED 4a)	
The study conditions at universities should be greatly improved and new funding models for university teaching should be established.	Student-staff ratio	Student-staff ratio University(I)	Number of students
Vision: universities, technical schools and non-university research institutions work under excellent framework conditions and are sufficiently financed to optimally perform their tasks in research and teaching.	University expense rate	University expense rate**	Expenses for the whole tertiary area
	University expenses per student	University expenses per student	Expenses for the whole tertiary area
This is to guarantee universities, research institutions and companies a sufficient supply of highly qualified researchers.	Number of researchers per 1,000 employees	Researchers	Researchers according to OECD Frascati definition
	Postgraduates in STEM fields per 1,000 of the total population	Postgraduates STEM	Post graduates MINT subjects
	Graduates STEM fields per 1,000 of the total population	STEM graduates	Graduates STEM fields
The reforms are aimed at balancing the gender imbalances in research.	Number of female researchers	Share of female researchers	Number of female researchers (OECD Frascati definition)
	Number of female STEM graduates	Share of women in natural sciences	Number of female graduates in natural sciences
		Share of women in engineering	Number of female graduates in engineering
	Glass Ceiling Index (Share of female professors in relation to the share of female scientific and artistic staff)	Glass Ceiling Index EU	Share of female professors

	Denominator	Short explanation of indicator	Source
	Peer group 30-to-34-year-olds	This is an Austrian Europe 2020 core indicator and reflects the successful participation in tertiary education; in Austria also vocational higher schools are included (ISCED 4a).	Eurostat, Statistik Austria Mikrozensus
	Scientific staff at universities	The indicator shows the student-staff ratio in universities. It is calculated, wherever possible, on the basis of full time equivalents.	OECD, Education at a glance
	GDP	Share of the tertiary education expenses with respect to the GDP as a measure for funding in international comparison. The federal government has set a goal of 2% in the federal programme.	OECD, Education at a glance
	Number of students (ISCED5a,5b,6)	The university spending per student complements the GDP rate by considering different dimensions of the tertiary sector in different countries. A tertiary sector with a 50 % graduation rate will ceteris paribus require considerably more funds than a sector with a 25% graduation rate.	OECD, Education at a glance
	Total employment	The indicator shows the number of researchers in relation to total employment, i.e. the researcher-intensity in employment.	OECD MSTI
	Peer group of 25-to-34-year-olds /1.000	Tertiary degrees ISCED 6 in natural sciences and technological disciplines per 1,000 of the population aged 25 to 34	Eurostat
	Peer group of 20-to-29-year-olds /1.000	Tertiary degree in natural sciences and technological disciplines (ISCED 5,6) per 1,000 of the population aged 20 to 29	Eurostat
	Number of researchers (OECD Frascati definition)	This indicator measures the percentage of women within the scientific research staff.	OECD MSTI
	STEM graduates natural sciences in total	This indicator measures the percentage of women within STEM graduates, who are often involved in technological innovation processes.	Eurostat
	STEM graduates engineering in total	This indicator measures the percentage of women within STEM graduates who are often involved in technological innovation processes.	Eurostat
	Share of female scientific staff	The indicator shows how likely it is that a woman makes the leap from scientific staff to a top position at university.	BMWF, European Commission

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Objective target of the strategy	Indicator to track target achievement	Abbreviation	Numerator
Objective targets education system – tertiary area			
Vision: The immigration of highly qualified workers is used and supported.	Share of highly qualified foreign-born population	Share of female researchers	Foreign-born highly qualified workers residing in Austria
	Postgraduate students from non-EU countries	Share of women in natural sciences	Number of post-graduate students from non-EU countries
The educational system as a whole needs to be optimized – up to models of lifelong learning.	Participation in lifelong learning	Share of women in engineering	Participants in measures for further education aged 25 to 64
Objective targets “Offering recognition, promoting excellence” – Basic research and universities			
Investment in basic research by 2020 to the level of leading research nations	Basic research rate	Basic research rate	Basic research expenses as defined by the OECD Frascati Manual
Strengthening of basic research through further structure reforms of the university system. Vision: Austria is a top location for research, technology and innovation, which offers best working and career chances for excellent scientists. Excellent research is a matter of course in Austria.	Publication quality	Publication quality	Number of publications among the most quoted 10% worldwide
	International co-publications	International co-publications	Number of scientific publications with at least one foreign co-author
	ERC Grants per 1,000 researchers	ERC Grants per 1,000 researchers	ERC Grants (Starting and Advanced together)
	Positioning of Austrian universities in international comparisons of research performance	University ranking research performance*	Number of the Austrian universities in broad ranking groups in international comparisons of research performance, weighted by ranking groups and relative to the population (currently only Leiden Ranking)

	Denominator	Short explanation of indicator	Source
	All foreign-born people residing in Austria	The indicator reflects the qualification structure of immigration. It comprises foreign-born people with residence permit and at least three-month of duration of stay. A university degree is the qualification criterion.	OECD
	All postgraduate-students	Share of postgraduate-students from non-EU countries on the total number of postgraduate students.	IUS Innovation Union Scoreboard
	Total population 25 to 64	The participation in lifelong learning is an official target of the ET 2020 Strategy (general and vocational learning)	Eurostat
	GDP	In this case Innovation Leaders are not consulted for a comparative value, since only Denmark analyses basic research. The analogue countries are in this case the five OECD countries with the highest (available) basic research rate in the latest available year (2010: Switzerland, South Korea, Denmark, France, U.S.A.).	OECD MSTI
	Total number of scientific publications	The indicator is a measure for the quality of scientific publications, i.e. the quality of research.	IUS Innovation Union Scoreboard
	Total population	International scientific co-publications can be interpreted as an indication of the quality of scientific research, since international co-operation normally increases scientific productivity.	IUS Innovation Union Scoreboard
	Number of academic researchers /1,000	The indicator reflects the success in applying for ERC funds, which go along with a strict quality assessment and are awarded only for international top research. The indicator is calculated based on the data published annually by the ERC.	ERC or OECD MSTI
	n. a.	The indicator shows how Austrian universities position themselves in an international context in research performance. It shows the number of Austrian universities in broad ranking groups (1-50, 51-100, 101-200, 201-300) in international university comparisons (Leiden Ranking) with respect to the size of the country (number of the universities per 10 million inhabitants); the number of universities is weighted with the ranking groups (the better the ranking group, the higher the weight). This indicator also shows whether a country has only a single central institution or offers a wider range.	Leiden Ranking

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Objective target of the strategy	Indicator to track target achievement	Abbreviation	Numerator
Objective targets “Offering recognition, promoting excellence” – Basic research and universities			
Reforming university funding (more competitive and project-related, incl. cost coverage). The funding of university research through competitive external funding from the FWF needs to be reinforced.	Budget funds for the promotion of basic research per academic researcher	Competitive funding	Budget for funds for the promotion of basic research
Vision: attractive scientific careers based on international models are a common standard in Austrian universities.	Share of postgraduate students employed at university (uni:data)	Employed postgraduates	Postgraduate students with an employment contract at university
Objective targets “Using knowledge, increasing value creation” – Innovation and operational research			
Increasing national value creation by promoting research-intensive economy and knowledge-intensive services	Share of knowledge intensive sectors in occupation	Knowledge-intensity economy	Employment in knowledge-intensive sectors (sectors with more than 33% share of employed persons from the tertiary area)
	Contribution of medium and high-technology products to the trade balance	Knowledge-intensity export	Contribution of medium and high-technology products to the trade balance (for the exact calculation see IUS 2013)
	Share of innovation-intensive sectors with respect to the service export	Knowledge-intensity service export	Export innovation-intensive service sectors
Improvement of the product and service structure by increasing the knowledge and innovation intensity of companies	R&D rate in the corporate sector, adjusted by the industry structure	R&D intensity economy	R&D expenses of the corporate sector, adjusted by the industry-specific R&D intensities
	Export quality in technology-oriented industries	Export quality	Exports of technology-oriented industries of material goods in the highest and middle price segment

	Denominator	Short explanation of indicator	Source
	Number of researchers in the university area according to research statistics	As a rule, funds for the promotion of basic research assign their financial means in a competitive and project-related way. The budget per academic researcher is thus an indicator of the structure of university funding.	OECD MSTI, FWF
	Number of postgraduate students	A job during the postgraduate studies conforms to international standards for attractive scientific careers. Scientific postgraduate studies can last 3 to 6 years; during this period of time non-postgraduate-students already work. Without employment scientific careers are thus hardly attractive vis-à-vis economic careers.	Uni:Data
	Total employment	The indicator shows the weight of employment in sectors, which employ many university graduates in an international comparison and are thus regarded as particularly knowledge-intensive.	IUS Innovation Union Scoreboard
	Total value of all exports	The indicator measures the contribution of medium and high technology products with respect to the trade balance and can thus also be seen as a measure of the knowledge intensity of the export structure.	IUS Innovation Union Scoreboard
	Total service export without tourism	The indicator shows the export weight of service sectors with high innovation intensity and can thus also be seen as a measure of the knowledge intensity of the export structure. Due to the specific characteristics of Austria (Alps, cultural cities) in an international comparison Austria reaches an above-average share of tourism in the service export. Thus this sector is not taken into consideration.	EBOP, WIFO-calculations
	Value creation in the corporate sector	The R&D intensity can be interpreted as a measure of knowledge intensity. However, the average R&D intensities vary greatly depending on the sector and an adjustment of the industry structure is necessary in order to make an internationally comparable statement on the R&D intensity of the corporate sector.	OECD, WIFO-calculations
	Total export of technology-oriented industries for material goods	The export quality can be interpreted as a measure to improve the product structure.	Eurostat, WIFO-Calculations

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Objective target of the strategy	Indicator to track target achievement	Abbreviation	Numerator
Objective targets “Using knowledge, increasing value creation” – Innovation and operational research			
Increasing the number of companies active in systematic research and development from about 2,700 (2010) by about 10% by 2013 and by about 25% by 2020	Increasing the number of companies active in systematic research and development	R&D providers	Number of companies in Austria active in systematic R&D
Activating SMEs in their research and innovation performance	Share of innovative SMEs	Innovative SMEs	SMEs with product or process innovation
Further improving the attractiveness of the location Austria for settling research and technology-intensive companies	Foreign funded R&D	Foreign funded R&D	R&D funding from abroad
	Share of foreign owners (applicants) with respect to the EPS-patents with the participation of domestic resident inventors	Patents by foreign owners	Number of patents with mere foreign applicants and at least one national inventor
Sustainable increase in the level of innovation in companies by increasing the share of innovations, which are new to the market	Share of innovations, which are new to the market as measured by the revenue	Innovation revenue	Revenue produced by innovations, which are new to the market
Objective targets “Using knowledge, increasing value creation” – Co-operation between science and economy			
Increasing the intensity of co-operation of Austrian companies, reinforcing the strategic co-operation between science and economy (focus on excellence and sustainability)	Share of companies with innovation co-operation with universities/research institutions	Business-Science Links LCU	Companies with innovation co-operation universities/research institutions
Reduction of barriers and fears of the unknown of companies (SMEs) for co-operation with science/ research	Share of SMEs with innovation co-operation with universities/research institutions	Business-ScienceLinks SME	SMEs with innovation co-operation universities/research institutions
More companies should expand their technology leadership and advance in innovation top positions	Patent registrations according to PCT with respect to the GDP	PCT-patent registrations	Patent registrations according to PCT (in international stage, indicating EPA)

	Denominator	Short explanation of indicator	Source
	n. a.	R&D by leading survey units according to conducting sector of co-operative area and company-owned area together	Statistik Austria
	Total number of SMEs	The indicator describes the share of SMEs with innovation activity, i.e. a measure of the innovation range.	IUS Innovation Union Scoreboard
	Gross domestic expenses for R&D	Austria's research expenses are financed above average from abroad in an international comparison. This is an indicator for the location quality, at the same time it increases the fragility of research in Austria. Thus, it is not necessary that the share of foreign funding continues to increase, but it should not drop drastically.	OECD MSTI
	Number of all patents with participation of at least one national inventor	This indicator provides the control of foreign players in inventions made by inventors living in Austria. It shows the share of patents with at least one national inventor and exclusively applicants living abroad with respect to all patents with national inventors.	OECD, REGPAT-database, June 2012
	Revenue of companies	The indicator reflects the economic significance of innovations, which are not only new to the company, but also new to the market and the degree of novelty is thus especially pronounced. It is thus an effect indicator for innovation	Eurostat
	Total population of companies	This indicator reflects the co-operation intensity of companies with science and research	Eurostat
	Total population of SMEs	This indicator reflects the co-operation intensity of SMEs with science and research	Eurostat
	GDP at PPS	The number of patent registrations can be understood also as an indicator of the number of innovations.	IUS Innovation Union Scoreboard

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Objective target of the strategy	Indicator to track target achievement	Abbreviation	Numerator
Objective targets “Using knowledge, increasing value creation” – Venture capital market and start-up dynamics			
Substantial increase in the participation and venture capital intensity of technology-based start-ups and innovative companies	Venture capital intensity (market statistics)	Venture capital intensity	Venture capital invested in Austria (also through foreign funds)
Annual increase in the number of knowledge and research-intensive start-ups by an average of 3% by 2020	Average annual growth in the number of knowledge and research-intensive start-ups	Business start-ups material goods	Number of knowledge and research-intensive business start-ups (material goods)
		Business start-ups	Number of knowledge and research-intensive business start-ups (services)
The foundation of companies should be considerably facilitated and relieved from costs.	Ranking with respect to start-up regulations in Doing Business	Services Start-up regulation (I)	Ranking with respect to start-up regulations in Doing Business
Objective targets “Using knowledge, increasing value creation”– Innovation and competition			
Encouraging more innovation activities through active, innovation-supporting competition policies. Here, institutions of competition control should be strengthened.	OECD indicator Competition policy	Competition policy (I)	OECD indicator Competition policy
Objective targets “Organizing the political control efficiently” – Priority setting			
Strengthening the competitiveness of Austria in generic cross-cutting fields of science and technology by focusing activities in internationally competitive size units considering existing areas of strength of the national science and economy as well as the competences and potentials to overcome the Grand Challenges.	Patent registrations according to PCT in technology fields, which are particularly important for social challenges	Priority setting patents	PCT-patent registrations in selected technological fields (fight against climate change and for health)
Objective targets “Organizing political control efficiently” – International positioning			
Stronger Austrian participation in European supporting programmes, i.e. in the research framework programmes or the European Structural Funds	Return flow rate	Return flow rate	Share of Austria in subsidies within the 7 th framework programme (core programme)
	“Exhausted capacity” (Participation in framework programme based on the researchers per country)	Participation in framework programme	Share of successful Austrian participations in the total participations (EU-27) of the respective framework programme

	Denominator	Short explanation of indicator	Source
	GDP	This indicator measures the venture capital intensity on the basis of the total invested sums in Austria also by foreign funds (market statistics)	AVCO, EVCA
	n. a.	This indicator measures the start-up activity in knowledge and research-intensive industries within the industry of material goods.	Statistik Austria
	n. a.	This indicator measures the start-up activity in knowledge and research-intensive industries within the service sector.	Statistik Austria
	n. a.	The indicator compares the regulation of founding a LLC (GmbH) in the different countries based on the following four criteria: number of the necessary administrative steps, time duration, costs (% GDP per capita) and minimum capital (% GDP per capita)	World Bank
	n. a.	The indicator classifies several competition policy rules based on their competition promotion capacity.	OECD
	GDP in PPS	This indicator measures the inventive activity in technology fields, which is important for the solution of two social challenges (climate change and population aging and health)	IUS Innovation Union Scoreboard
	Share of capital resources of Austria within the EU-budget	The indicator shows the success of Austria in applying for European financial means with respect to the total capital resources of Austria in the EU-budget, i.e. whether Austria obtains an above or below-average return flow of financial means in research. An above-average return flow indicates that Austria strongly participates in European subsidies.	PROVISO
	Share of researchers/ Country with respect to total number of re - searchers EU-27	This indicator shows whether a country is involved above/below its "theoretically" available (potential) in the framework programme. The indicator is calculated over the period of time of the corresponding framework programme (always at the relevant date)	PROVISO

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Objective target of the strategy	Indicator to track target achievement	Abbreviation	Numerator
Objective targets “Organizing political control efficiently” – Research and society			
Promoting a culture of appreciation of research, technology and innovation and understanding that these make a significant contribution to improving life quality and social wealth.	Attitude towards science (personal interest, economic benefits)	Personal interest science	Share of people with high to medium appreciation of science in different areas
		Benefits Science Economy	
		Positive attitude science	
Objective targets “Offering incentives, creating options” – Research funding			
Increasing the research rate by the year 2020 by one percentage point from the current 2.76 to 3.76% of the GDP	R&D rate	R&D rate	Gross domestic expenses for research and development
Here, at least 66%, but possibly 70% of the investments should be carried by the private sector. Companies should thus be stimulated on a broad range through improved framework conditions and appropriate incentive structures to strengthen research and innovation. The number of companies active in research and development should be increased.	Private research funding share	Private R&D	R&D funding from non-governmental sources

	Denominator	Short explanation of indicator	Source
	All respondents	This indicator shows the appreciation of science by the population. The questions of the Special Eurobarometer were divided into two groups. On the one hand questions concerning the personal use or the personal interest in science and engineering, on the other hand those, which depict the use of science and engineering for economy.	Eurobarometer
	GDP	R&D rate: Gross domestic expenses for R&D in% of the GDP	OECD MSTI, Statistik Austria
	Total expenses for R&D	The private share of research funding is the part of the R&D expenses, which is financed by the corporate sector.	OECD MSTI, Statistik Austria

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Attachment 2: Raw data of indicators

Indicator	Actual value AT Inno. Lead.		Goal distance	Growth AT Inno. Lead.		Productive growth	Target achieve- ment chance	Time series
IUS Index	0.60	0.72	84	0.86	1.50	3.76	23	2008–2012
GDP/per capita**	129.00	121.75	106	-0.21	-0.14	0.43	175	2000–2011
Employment rate	75.20	76.45	98	0.47	0.30	0.50	95	2000–2011
Unemployment rate (I)**	4.20	7.20	171	1.41	0.81	-4.48	185	2000–2011
Better Life***	7.53	7.92	95	n.a.	n.a.	n.a.	95	2011
Healthy life expectancy (F)	71.90	74.13	97	-0.31	0.38	0.88	21	2004–2011
Healthy life expectancy (M)	76.30	79.78	96	0.00	0.50	0.99	50	2004–2011
Greenhouse gases (I)*	108.00	84.00	78	0.48	-0.43	-2.48	16	2000–2010
Energy intensity (I)**	131.82	155.09	118	0.19	-0.96	-1.42	133	2000–2010
Resource productivity	1.38	1.51	91	1.38	1.67	2.63	52	2000–2009
Early childhood care ***	92.10	95.00	97	0.85	1.48	0.31	275	2000–2010
Children-staff ratio in early childhood	14.73	9.99	68	-2.63	-3.54	-8.18	32	2002–2010
Student-staff ratio in primary level**	12.20	13.48	110	-1.75	-1.03	-2.72	261	2001–2010
Early school leavers*/**	8.30	9.50	114	-1.86	-0.98	-3.20	169	2000–2011
Secondary school graduates*	40.20	55.00	73	0.81	n.a.	3.54	23	2000–2011
Early school leavers migrants*/***	81.06	60.00	135	n.a.	n.a.	0.00	135	2011
Education inheritance 1(I)	48.14	38.75	81	0.93	-0.61	-2.38	28	2000–2009
Education inheritance 2(I)	16.56	13.40	81	-0.04	-1.01	-2.92	16	2000–2009
PISA-share students at risk (I) Reading*	27.58	15.00	54	7.31	0.35	-5.39	37	2000–2009
PISA-share students at risk (I) Mathematics*	23.24	15.00	65	3.62	1.29	-3.90	33	2000–2009
PISA-share students at risk (I) Science*	23.92	15.00	63	13.54	3.55	-4.15	43	2000–2009
PISA-share students at risk – Reading	4.90	8.97	55	-6.33	-3.11	2.81	53	2000–2009
PISA-share top students – Mathematics	12.95	15.61	83	-1.62	-2.54	0.17	83	2000–2009
PISA-share top students – Science	8.03	11.58	69	-6.97	-0.09	3.11	53	2000–2009
Skill Mismatch***	89.20	82.00	109	n.a.	n.a.	n.a.	109	2009
University graduates	23.80	41.35	58	2.52	2.27	8.93	28	2005–2011
University graduates (incl.ISCED4a)*	35.80	38.00	94	2.38	2.27	0.66	359	2004–2011
Student-staff ratio University (I)	17.09	12.80	75	3.50	0.62	-2.42	59	2002–2010
University expense rate*	1.44	2.00	72	3.66	1.69	3.01	122	2002–2010
University expenses per student	14,257.40	17,699.22	81	3.08	5.09	7.25	42	2000–2010
Researcher	8.72	12.15	72	4.09	2.61	6.38	64	2000–2010
Postgraduates STEM	1.00	1.08	93	5.24	2.47	3.24	162	2002–2009
STEM -graduates	15.50	17.38	89	7.97	3.93	5.26	152	2000–2010
Share of female researchers	28.44	30.97	92	4.64	1.72	2.40	193	2000–2010
Share of women in natural sciences	34.09	42.39	80	-0.32	0.87	3.33	13	2004–2007
Share of women in engineering	18.12	26.64	68	1.99	1.74	6.38	31	2000–2009
Glass ceiling index EU	2.00	1.95	98	-5.90	-2.95	-2.50	236	2004–2009

Indicator	Actual value AT Inno. Lead.		Goal distance	Growth AT Inno. Lead.		Productive growth	Target achieve- ment chance	Time series
Glass ceiling index EU	17.73	26.46	67	2.82	1.49	5.34	53	2000–2011
Postgraduates non-EU	8.78	13.78	64	1.11	5.28	10.40	11	2004–2010
Lifelong Learning	13.40	22.23	60	4.45	3.17	9.23	48	2001–2007
Basic research rate	0.51	0.62	82	4.52	3.31	5.52	82	2002–2010
Publication quality	10.92	12.50	87	1.15	1.10	2.25	51	2004–2008
International co-publications	1,179.88	1,333.73	88	12.70	10.58	12.15	104	2002–2011
ERC Grants per 1,000 researchers	1.05	1.31	81	-5.35	17.56	22.08	20	2007–2012
University ranking research performance***	14.29	28.47	50	n.a.	n.a.	n.a.	50	2000–2009
Competitive funding	15,735.28	25,286.65	62	-0.53	1.08	5.20	9	2000–2009
Employed postgraduates*	23.87	100.00	24	3.10	n.a.	15.40	20	2010–2011
Knowledge intensity economy	14.00	15.85	88	0.48	0.84	2.30	21	2008–2011
Knowledge intensity Export**	3.18	2.37	134	6.43	5.16	9.97	148	2002–2011
Knowledge intensity Service-Export	62.21	64.31	97	0.44	0.07	0.40	110	2004–2011
R&D intensity economy	0.42	0.53	80	21.90	13.10	17.93	122	2000–2007
Export quality	89.38	91.98	97	-0.30	-0.12	0.18	63	1999–2010
R&D carrier*	2,946.00	3,375.00	87	6.13	n.a.	1.24	493	2002–2009
Innovative SMEs	42.20	49.23	86	-2.58	1.18	3.05	46	2004–2008
Foreign funded R&D**	16.20	7.49	216	-1.83	8.34	6.95	80	2000–2011
Foreign-owned patents**	25.67	25.63	100	-2.79	4.64	-2.77	1	2000–2010
Innovation revenue	7.50	8.00	94	1.89	-1.38	6.47	29	2004–2008
Business-Science Links LCU**	54.62	48.25	113	7.11	1.75	8.45	179	2004–2010
Business-Science Links SME**	29.78	23.86	125	13.66	3.07	16.21	181	2004–2010
Technological significance patents	5.11	8.87	58	4.50	-0.64	4.00	113	2001–2009
Venture capital intensity	0.11	0.48	22	-24.70	-13.44	8.94	42	2007–2011
Business start-ups material goods*	7.61	3.00	254	7.61	n.a.	3.00	254	2010
Business start-ups services*	-5.61	3.00	39	-5.61	n.a.	3.00	39	2010
Competition politics (I)***	2.76	2.00	73	n.a.	n.a.	n.a.	73	2003
Start-up regulation (I)	134.00	60.50	45	10.40	14.94	-0.79	93	2007–2013
Priority setting patents	1.30	1.97	66	3.09	-0.65	3.43	90	2001–2009
Return flow rate***	126.00	118.00	107	1.94	n.a.	n.a.	107	2002–2012
Participation in Framework Programme***	131.00	94.25	139	n.a.	n.a.	n.a.	139	2012
Personal interest Science***	21.00	34.93	60	n.a.	n.a.	n.a.	60	2005
Use Science Economy***	53.97	52.58	103	n.a.	n.a.	n.a.	103	2005
Positive attitude Science***	44.43	58.86	75	n.a.	n.a.	n.a.	75	2005
R&D rate*	2.75	3.76	73	3.26	n.a.	3.54	92	2000–2011
Private R&D*	61.25	66.00	93	-0.11	n.a.	0.83	12	2000–2011

* national goal

** Target achievement chance of Innovation Leaders (probability of catching up by Austria) >100: Austria remains at the front,
<100: Austria drops back

*** Target achievement chance accepted with goal distance

Goal distance = Actual value AT / Actual value Innovation Leaders and Actual Value AT / Target AT

Target achievement chance = Growth AT / leading growth

attachment

Attachment 3: Assigning indicators to the priority fields of action

Priority fields of action	Composite indicators	Single indicator
Private funding share	Private funding share	Private funding share
Mission orientation	Priority setting environment	Priority setting environment
	Priority setting environment	Greenhouse gases Energy intensity Resource productivity
	PZ-Health/life quality	Better Life Healthy life expectancy (F) Healthy life expectancy (M)
	U business start-ups	Business start-ups material goods Business start-ups services
Business start-ups		
Women in N&T	Gender research	Share of women in research Share of women in natural sciences Share of women in engineering Glass Ceiling Index EU
Performance universities	Quality research	Publication quality International co-publications ERC Grants per 1,000 researchers University ranking research performance
	BT-quantity	University graduates University graduates (incl. ISCED4a)
	BT-quality	Student-staff ratio University
	Career structure University	Employed postgraduates
	Competitive funding	Competitive funding University expense rate University expense rate per student
Performance of education system	BS-quantity	PISA-share bad reading PISA-share bad mathematics PISA-share bad science PISA-share good-reading PISA-share good-mathematics PISA-share good-science
	BS-quality	Secondary school graduates Language knowledge migrants
	BS-Social selectivity	Education inheritance 1 Education inheritance 2
	Lifelong learning	Lifelong learning
	BFK-Quality	Children-staff ratio early childhood

Anhang 4: Abkürzungsverzeichnis

ACR Austrian Co-operative Research
AHS Secondary school of general education

AIT Austrian Institute of Technology

AUF Außeruniversitäre Forschungsorganisationen;
Non-university research organisations

AplusB Academia plus Business

AVCO Austrian Venture Capital Organisation

AWS Austria Wirtschaftsservice; Austrian Economy Service

BHS Berufsbildende Höhere Schule; Secondary
vocational school

BMUKK Bundesministerium für Unterricht, Kunst
und Kultur; Federal Ministry for Education,
Arts and Culture

BMVIT Bundesministerium für Verkehr, Innovation
und Technologie; Federal Ministry for Transport,
Innovation and Technology

BMWF Bundesministerium für Wissenschaft und For-
schung; Federal Ministry for Science and Research

BMWFJ Bundesministerium für Wirtschaft, Familie und
Jugend;
Federal Ministry of Economy, Family and Youth

BRIC Brasil, Russia, India, China

BRIDGE FFG Programme for the promotion of
knowledge transfer between science and economy

CDG Christian Doppler Forschungsgesellschaft;
Christian Doppler Research Community

COMET Competence Centers for Excellent Technologies

CPDC Conflict – Peace – Democracy – Cluster

EFRE European Fund for Regional Development

EIB European Investment Bank

ERC European Research Council

ESFRI European Strategic Framework for Research
Infrastructure

ETZ Europäische Territoriale Zusammenarbeit;

ETC European Territorial Cooperation

EU European Union

EVCA European Private Equity and Venture Capital
Association

R&D Research and Development

FET Future and Emerging Technologies

FFG Forschungsförderungsgesellschaft;
Austrian Research Promotion Agency

FWF Fonds zur Förderung der wissenschaftlichen
Forschung (Wissenschaftsfonds);
Austrian Science Fund

GDP gross domestic product

GmbH Gesellschaft mit beschränkter Haftung;
LLC Limited Liability Company

GSK Geistes-, Sozial- und Kulturwissenschaften;
Humanities, Social and Cultural Sciences

IFK Internationales Forschungszentrum
Kulturwissenschaften; International
Research Center for Cultural Studies

IMBA Institute of Molecular Biotechnology

IMP Institute of Molecular Pathology

ISCED International Standard Classification of Education

ISTA Institute of Science and Technology Austria

IUS Innovation Union Scoreboard

JEI Jeune Entreprise Innovante (France)

JITU Junge, innovative technologieorientierte
Unternehmen; Initiative to Build Young,
Innovative, Technology-Oriented Companies

SME Small and Medium-Sized Enterprises

KICs Knowledge and Innovation Communities

LBG Ludwig Boltzmann Gesellschaft;
Ludwig Boltzmann Community

LCU Leading Competence Units

MIT Massachusetts Institute of Technology

NEUFÖG Neugründungs-Förderungsgesetz;
New Companies Promotion Act

NMS Neue Mittelschule; New Secondary School

ÖAW Österreichische Akademie der Wissenschaften;
Austrian Academy of Sciences

OECD Organisation for Economic Co-operation and
Development

OST Offices for Science and Technology

PEEK Projekte zur Entwicklung und Erschließung
der Künste; Program for Arts-based Research

PIRLS Progress in International Reading Literacy Study

PISA Programme for International Student Assessment

PCT Patent Cooperation Treaty

RTI Forschung, Technologie und Innovation
Research, Technology and Innovation

STEM Science, Technology, Engineering, and Mathematics

TIMSS Trends in International Mathematics
and Science Study

TU University of Technology

UG 2002 University Act 2002

USA United States of America

WBSO Law on reduction of wage taxes and premiums
of premiums of insurances (Netherlands)

WIFO Österreichisches Institut für Wirtschaftsforschung;
Austrian Institute of Economic Research

attachment



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