



ERAWATCH Country Report 2009

Analysis of policy mixes to foster R&D investment
and to contribute to the ERA

Austria

Reinhold Hofer



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ERAWATCH COUNTRY REPORT 2009: Austria

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ERAWATCH Network – JOANNEUM RESEARCH

Reinhold Hofer

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Executive Summary

As highlighted by the Lisbon Strategy, knowledge accumulated through investment in R&D, innovation and education is a key driver of long-term growth. Research-related policies aimed at increasing investment in knowledge and strengthening the innovation capacity of the EU economy are thus at the heart of the Lisbon Strategy. This is reflected in guideline No. 7 of the Integrated Guidelines for Growth and Jobs. This advocates increasing and improving investment in research and development (R&D), with a particular focus on the private sector. This report aims at supporting the mutual learning process and the monitoring of Member States efforts. Its main objective is to characterise and assess the evolution of the national policy mixes in the perspective of the Lisbon goals, with a particular focus on the national R&D investments targets and on the realisation and better governance of the European Research Area. The report builds on the analytical country reports 2008 and on a synthesis of information from the ERAWATCH Research Inventory and other important available information sources.

In 2008, Austria's GERD was 2.63%. This figure sits well above the EU 27 average of 1.83% (2007), but is considerably lower than in some other European countries of a similar size, e.g. Finland or Sweden (Eurostat 2008). The growth rate of GERD in Austria between 2000 and 2008 was one of the highest in the EU and R&D expenditures grew faster than GDP at an average annual growth rate of 8.1% (Statistik Austria 2008). Business sector R&D intensity (BERD as a % of GDP) was 1.81% (2007) and well above the 1.17% average of the EU-27, representing an annual business R&D expenditure growth rate of 10.1% between 2000 and 2008 (Statistik Austria 2008).

This promising illustration of the Austrian research and innovation system is based on the evolution of structures and processes in the catching-up period during the last decade. Further successful developments, however, will depend heavily on strategic adaptations of the system in a way that can sustain Austria's position in the group of R&D top performing countries. The characteristics to be focused on in this remit include the orientation towards excellence and openness, the consequent exploitation of the already accumulated knowledge base, and sound policy measures to address emerging challenges.

While the 'old' weaknesses of the Austrian research and innovation system have largely been overcome (e.g. through the mobilisation of resources for R&D; improvements to the institutional organisation of public funding; the raising of science-industry cooperation; the extension and embedding of international R&D collaboration; and the reformation of institutional funding and governance of public universities), key challenges for future development exist in relation to human resources; the stabilisation and extension of funding; and the continued improvement of the governance of public R&D funding, designed in particular to address the coherence, efficiency and overall performance of the policy 'portfolio' ([Tiefenthaler B., 2009](#)).

Austria's contribution to the Lisbon Strategy, as represented in the National Reform Programme (NRP – Austrian Government, 2008), focused on seven strategic core areas (sustainable public budgets; labour market policy; R&D and innovation;

infrastructure; business locations and SMEs; education; environmental technologies), mostly by way of calling upon investments in the future in order to secure and increase prosperity in the long run. Accordingly, additional funds have been allocated in Austria to achieve advances in the fields of R&D, innovation, infrastructure and education, as well as environmental technologies and efficient resource management (e.g. through the implementation of the 'Austrian Climate and Energy Fund' ('KLIEN' - Austrian Government, 2007). Regarding the contributions of R&D and innovation expenditures, the evaluation of the Austrian NRP 2005, carried out by the Austrian Institute for Advanced Studies (IHS), estimated a long-term, permanent growth effect of roughly 0.1 percentage points of GDP (Berger, 2006).

Immediately following its inauguration in December 2008, the new government was confronted with the effects of the financial crisis on the existing R&D funding structures. Notably, the National Foundation for Research and Technology Development was unable to supply the funds expected for R&D. Furthermore, the preparation of the new budgets were accompanied by debates at universities and in the education sector about covering increasing costs resulting from structural changes (new employment schemes at universities and new models implemented for secondary schools). In spite of this, the objectives of the NRP and the ideas generated from the 'Research Dialogue'¹ provide clear signals for increasing the public funding of R&D. It cannot be assumed that the private funding of R&D, which is largely dependent on foreign resources, will follow this growth path. To sum up the argument, the financial crisis and the circumstances that followed demonstrate the risks associated with the sustainable funding of R&D if the objective of 'more than 3% target by 2020' (BMWF 2008b) remains. These constraints and risks thus require a shift in focus towards the coherency and efficiency of the implemented policy mix (often labelled the 'programme jungle') in order to maximise the yield from scarce resources. These issues, however, can be addressed only once the results of the ongoing system evaluation have been published.

In addition to the funding problems discussed above, the most pressing challenges involve human capital supply. A notable gap exists in the supply of science and engineering researchers. This can be attributed to the Austrian tertiary education system, which does not provide enough S&T graduates. With 'excellence' being among the highest priorities for becoming a 'frontrunner' in R&D, this is especially alarming. Actions that have already been taken to address this, such as opening the labour market for researchers or implementing doctoral colleges at universities, must be complemented by additional efforts if 'excellence' remains an objective.

Governance can also be improved. For instance, while R&D policy makers are still trying to solve 'everything' within the realm of R&D policy, interactions between other policies or the impacts of other policies in many fields often receive less attention. Here, it is only the weak signals of interactions between policy domains that can be observed, as in thematic policy measures like KLIEN in the case of the environment, or the matter of opening up the labour market for researchers. Additionally, the high degree of complexity in the system (several ministries being responsible for one agency) could be seen as questionable when faced with the structural reforms necessary to achieve the objective of becoming a 'frontrunner' country.

¹ The 'Research Dialogue' has been an initiative of the Austrian government (led by Minister for Science and Research in cooperation with Ministry for Transport, Innovation and Technology and Ministry for Economy and Labour) to develop ideas for an 'Austrian RTI strategy 2020' performing participative events.

Despite the detrimental implications of the financial and economic crisis on R&D funding in the short run, the long-term challenges of relevant human capital formation must not be neglected. The provision of human capital with relevant R&D skills is crucial for maintaining the attractiveness of Austria as a R&D location. Finally, systems of governance incorporate some challenges; especially those concerning system transformation towards structures typical among the group of R&D 'frontrunners'.

Barriers to R&D investment	Opportunities and Risks generated by the policy mix
Funding structures	<p>The Austrian R&D funding structures show highly exposed shares of private funding coming from abroad and public funding that is highly dependent on annual budgets.</p> <p>For these reasons, both streams of finance for R&D are influenced by the existing financial crisis. While private funding from enterprises abroad may be reduced presently in the light of squeezed cash-flows, measures implemented to make public funds more sustainable – such as the National Foundation for Research and Technology Development – have not produced the intended effect. Likewise, budget constraints are also affecting the R&D landscape.</p> <p>Nevertheless, due to the broad consensus on the necessity of developing R&D and innovation it is important to renew efforts to meet targets. This becomes even more important during the preparation of a new strategy, the initial gathering of ideas ('Research Dialogue') and analysis of the public policy portfolio (system evaluation).</p>
Human capital	<p>One of the most pressing challenges for the Austrian R&D system in its attempt to position itself as a 'frontrunner' in R&D concerns gaps in the supply of S&T graduates. The Austrian tertiary education system, which has undergone significant institutional change, needs additional reform and clear strategic positioning in order to provide more young academics in S&T fields.</p> <p>Recent initiatives to make children aware of science and technology and actions taken to ease the flow of researchers, whether by opening up the labour market or by supporting mobility, suggest positive development and a serious effort to solve these problems.</p>
Governance	<p>The governance system, despite institutional changes over the last decade, still needs to be improved in order to function more efficiently and effectively – resolving, for instance, problems associated with complex organisational structures, insufficient coordination and interaction between ministries, and the separation of responsibilities between ministries and agencies. In addition, advisory structures are not used sufficiently. Furthermore, the coherence and efficiency of the R&D policy portfolio (the 'programme jungle') needs attention if the target of 'more than 3% by 2020' is to be approached via the more efficient use of resources.</p> <p>The 'Research Dialogue' and system evaluation are important preparatory steps in the development of a new strategy, with increased discussion providing opportunities to make the governance system more effective and efficient. This should involve the development of clear perspectives about strategically relevant issues and their treatment.</p>

The 'Policy Mix Project' (UNU-MERIT et al, 2006) identifies six ways or routes by which R&D expenditure levels can be raised (promoting and establishing new R&D performing firms; stimulating greater R&D investments in R&D performing firms; stimulating firms that do not perform R&D to initiate R&D activities; attracting R&D performing firms from abroad; increasing extramural R&D carried out in cooperation with the public sector or other firms; and increasing R&D in the public sector). The Austrian policy mix broadly addresses all six routes via the use of a variety of instruments. This represents an approach in which every single opportunity to mobilise the given potential of R&D is considered, but which bears the risk of being less efficient and effective when it is not part of an overall strategy. Consequently,

recent initiatives (the ‘Research Dialogue’) and evaluations (the CREST peer review in 2008 and the ongoing system evaluation) are central to a more focused approach that will find its representation and guidance through the development of a new strategy. With this in place, it will become possible to find solutions for the growing concerns about the coherence and efficiency of the policy mix.

	Short assessment of its importance in the ERA policy mix	Key characteristics of policies
Labour market for researchers	<ul style="list-style-type: none"> • Facing gaps in the supply of human capital, Austrian government decided to open up the labour market for international researchers from all countries. • Mobility of researchers and incentives for women to participate in science are increasingly being addressed. 	<ul style="list-style-type: none"> • Opening up of the labour market to researchers from abroad • Supporting the careers of women • Supporting researchers’ mobility
Governance of research infrastructures	<ul style="list-style-type: none"> • Excellence and internationalisation became important elements • Mostly participations in international organisations, but also including Austrian large infrastructure (AUSTRON) or top research institutions (ISTA) 	<ul style="list-style-type: none"> • Participation in international organisations • Installation of institutes/infrastructure (e.g. AUSTRON, ISTA)
Autonomy of research institutions	<ul style="list-style-type: none"> • After the University Act 2002 within which autonomy was given to universities, now other public research organisations (e.g. Academy of Sciences, ARC etc.) are preparing to receive performance contracts. 	<ul style="list-style-type: none"> • Extension of performance oriented institutional funding to non-university PROs • Performance agreements for institutional funds
Opening up of national research programmes	<ul style="list-style-type: none"> • Following ongoing initiatives, the further opening up of national research programmes is to be expected; but no common strategy is observable. 	<ul style="list-style-type: none"> • Ongoing reforms

The ERA dimension still plays a relatively small role in both the general national research policy debate and the government’s programme (Austrian Government 2008), even though Austria’s policy makers have fully adopted the Lisbon and Barcelona objectives for Austrian R&D policy,

ERA is only briefly referred to as 'a vital frame of reference'. Nonetheless – and although no systematic assessment of the impacts of ERA in Austrian R&D policy has been performed yet – it can be safely concluded that European policies and activities related to R&D and innovation have had a significant effect in Austria. For instance, this is visible in the programme and evaluation culture that has been developed in Austria throughout the last decade; in the increasing number of thematic funding programmes; and in the debate about 'excellence'.

The importance of international co-operation, mobility and competition has become widely accepted and Austrian companies, universities and PROs are particularly active in cross-border projects. These projects are supported by substantial R&D policy measures that stimulate and foster participation in international programmes and facilitate international mobility. Moreover, many funding programmes have been broadened to include the participation of organisations located abroad. Joint programming at European level has, thus far, taken place primarily in the form of joint calls within ERA-NET projects, within which Austrian organisations are well represented. In order to realise real common-pot programmes that include joint evaluations and joint funding decisions at European level, legal barriers related to decision making power would have to be overcome ([Tiefenthaler B., 2009](#)).

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1 Introduction

As highlighted by the Lisbon Strategy, knowledge accumulated through investment in R&D, innovation and education is a key driver of long-term growth. Research-related policies aimed at increasing investment in knowledge and strengthening the innovation capacity of the EU economy are thus at the heart of the Lisbon Strategy. This is reflected in guideline No. 7 of the Integrated Guidelines for Growth and Jobs.² This advocates increasing and improving investment in research and development (R&D), with a particular focus on the private sector. For the period 2008 to 2010, this focus is confirmed as main policy challenge and the need for more rapid progress towards establishing the European Research Area, including meeting the collective EU target of raising research investment to 3% of GDP, is emphasised.

A central task of ERAWATCH is the production of analytical country reports to support the mutual learning process, the monitoring of Member States' efforts in the context of the Lisbon Strategy and the ambition to develop the European Research Area (ERA). The first series of these reports was produced in 2008 and focused on characterising and assessing the performance of national research systems and related policies in a comparable manner. In order to do so, the system analysis focused on key processes relevant for system performance. Four policy-relevant domains of the research system have been distinguished, namely resource mobilisation, knowledge demand, knowledge production and knowledge circulation. The analysis within each domain has been guided by a set of generic 'challenges' common to all research systems, which reflect possible bottlenecks, system failures and market failures that a research system has to cope with. The analysis of the ERA dimension remains exploratory.

The country reports 2009 build and extend on this analysis by focusing on policy mixes. Research policies can be a lever for economic growth if they are tailored to the needs of a knowledge-based economy suited to the country and appropriately coordinated with other knowledge triangle policies. The policy focus is threefold:

- An updated analysis and assessment of recent research policies
- An analysis and assessment of the evolution of national policy mixes towards Lisbon R&D investment goals. Particular attention is paid to policies fostering private R&D and addressing its barriers.
- An analysis and assessment of the contribution of national policies to the realisation of the ERA. Beyond contributing to national policy goals, which remains an important policy context, ERA-related policies can contribute to a better European level of performance by fostering, in various ways, efficient resource allocation in Europe.

² COM(2007) 803 final, "INTEGRATED GUIDELINES FOR GROWTH AND JOBS (2008-2010)", http://ec.europa.eu/growthandjobs/pdf/european-dimension-200712-annual-progress-report/200712-annual-report-integrated-guidelines_en.pdf

2 Characteristics of the national research system and assessment of recent policy changes

2.1 Structure of the national research system and its governance³

Austria is a small country with only 1.7% of the total EU population. GDP per capita is nearly 30% above the EU 27 average and unemployment rates are low with only 4.4% unemployed in 2007 versus the EU average of 7.1% (Eurostat 2008). In 2008, Austria's GERD was 2.63%. This figure sits well above the EU 27 average of 1.83% (2007), but is considerably lower than in other European countries of similar size, e.g. Finland or Sweden (Eurostat 2008). The growth rate of GERD in Austria between 2000 and 2008 was one of the highest in the EU and R&D expenditures grew faster than GDP at an average annual growth rate of 8.1% (Statistik Austria 2008). Business sector R&D intensity (BERD as a % of GDP) was 1.81% (2007) and well above the 1.17% average of the EU-27, representing a trend in the annual business R&D expenditure growth rate of 10.1% between 2000 and 2008 (Statistik Austria). All major R&D financing sectors, especially government, business and abroad, have contributed to this growth, though at different rates.

Main actors and institutions in research governance

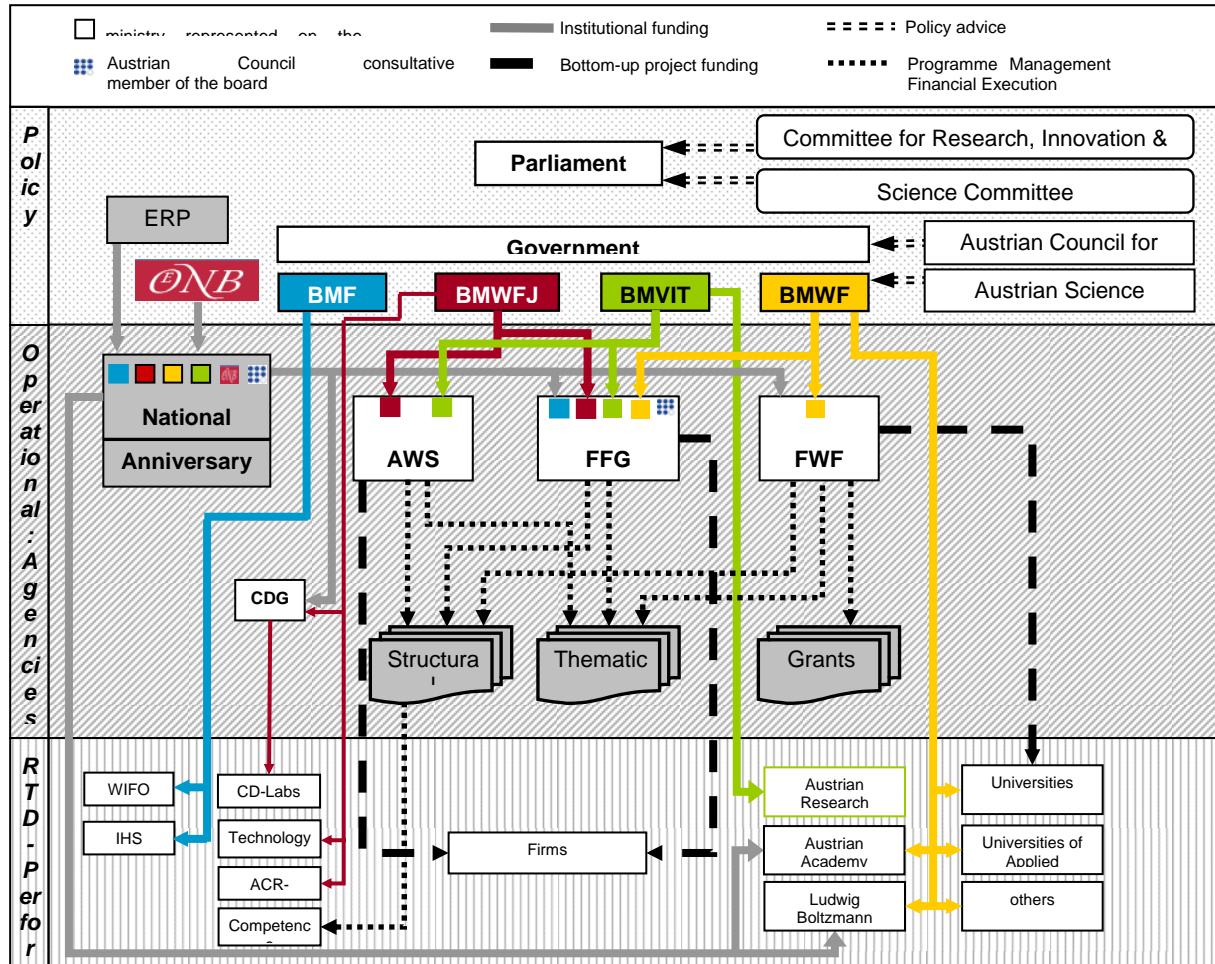
Figure 1 below shows the Austrian research system at a national level. Three ministries are responsible for research and technology policy: the Federal Ministry of Science and Research (BWF) is responsible for tertiary education and for basic research, i.e. for universities, universities of applied sciences and for non-university research institutions such as the Austrian Academy of Sciences and the Ludwig Boltzmann Society. It is also responsible for the Austrian Science Funds (FWF) and represents Austria at the European level on issues related to research and university education. The Federal Ministry of Transport, Innovation and Technology (BMVIT) is in charge of the biggest public budget in applied research. It holds a stake in the Austria Wirtschaftsservice Gesellschaft (AWS) and in the Austrian Research Promotion Agency (FFG), to which it contributes the majority of application-oriented research funding. It is the majority shareholder of the Austrian Research Centres (ARC). The Federal Ministry of Economy, Family and Youth (BWA) is responsible for innovation support, technology transfer and the promotion of entrepreneurship; it holds the remaining 50% of the FFG and the AWS and it supports the Christian Doppler Research Association (CDG). The Federal Ministry of Finance (BMF) is not directly responsible for R&D policy but it governs the allocation of financial resources and it directly handles the national institutional funding for some research institutions. In recent years the Ministry of Finance's influence on Austrian R&D policy has increased because it sets standards for the design, implementation and monitoring of programmes. The activities of other, sectoral ministries (e.g. for agriculture, health etc.) are comparably small and they are basically focused on contracting research required by the respective ministry for the fulfilment of its responsibilities.

The Austrian Parliament wields legislative power. Two committees deal with research related matters: the Committee on Science and the Committee on Research, Technology and Innovation was newly established by the current coalition

³ This part follows largely [ERAWATCH Country Report 2008](#).

government in 2007. In practice, the policy debate and the development of new policy measures takes place outside the parliament to a large extent and the main driver is at the administrative level within the ministries in charge.

Figure 1: Overview of the governance structure of the Austria's research system



Source: ERAWATCH Research Inventory 2009, [Structure of the Research System](#); see page for a list of abbreviations

There are two major advisory bodies: the Austrian Council for Research and Technology Development (Austrian Council) advises the government in all matters related to research, technology and innovation and the Austrian Science Council is the main advisory body in all university-related matters.

At the operational level, most of the funding for R&D and innovation is managed by three agencies on behalf of the ministries: the Austrian Science Funds (FWF) is the most important body for the funding of basic research, the Austria Research Promotion Agency (FFG) funds applied research and development, and the Austria Wirtschaftsservice (AWS) is specialised in funding start-ups and innovation projects in companies. This structure is the result of an organisational reform of the funding system that was performed some four years ago. In addition, the Climate Change and Energy Fund (KLIEN) was implemented in 2007. It provides funding, among other things, for R&D projects that develop sustainable energy technologies.

The institutional role of the regions in research governance

Austria's administrative structure is based on the constitutional principles of federalism and local self-administration of municipalities and it comprises administrative bodies at three levels:

- at national level the Federal Government,
- at regional level the federal state administrations of the nine Federal States ('Bundesländer') of Burgenland, Carinthia, Lower Austria, Upper Austria, Salzburg, Styria, Tyrol, Vorarlberg and Vienna;
- at the local level the municipal administrations of 2,359 Austrian municipalities.

Although research and technology policy traditionally is the responsibility of the national government, most of the federal states have developed or increased their engagement in this domain. This process began in the mid 1990's and was triggered by EU membership and the availability of Structural Funds, as well as by the availability of additional money mainly from the privatisation of energy utilities and banks. In total, the Federal States together account for approximately 5% of the total Austrian R&D expenditures (Statistik Austria 2008). Some big national funding programmes, e.g. K-plus, K-ind / K-net and COMET or the Austrian NANO-Initiative, are co-financed by the Federal States; the programmes, however, are primarily governed by the federal institutions.

Main research performer groups

The main R&D performing sectors are (1) the corporate sector, (2) the higher education sector and (3) the government sector. In terms of volume, about two thirds of the total R&D in Austria is performed within the corporate sector, mainly by companies in-house; the corporate sector also contains the co-operative sub-sector, a group of non-university applied research institutes organised as limited companies and, therefore, allocated to the corporate sector. They perform applied research and development and provide R&D services for industry (to various extents). Together they account for approximately 6.6% of R&D performed in Austria. The largest player in this group of non-university applied research institutes is the Austrian Research Centres (ARC). The 'Competence Centres' are a special case in this group, as they are 'temporary institutions' linking partners from science and industry in jointly defined strategic research programmes for up to seven or ten years; more than 30 Centres have been established since 1998. The higher education sector, above all the universities, accounts for nearly 27% of R&D performed in Austria. The government sector is a relatively small R&D performer, accounting for approximately 5% of the total volume, and the private non-profit sector's contribution is less than 0.5%.

2.2 Summary of strengths and weaknesses of the research system

The analysis in this section is based on the ERAWATCH Analytical Country Reports 2008, which characterised and assessed the performance of national research systems. In order to do so, the system analysis focused on key processes relevant to system performance. Four policy-relevant domains of the research system have been distinguished, namely resource mobilisation, knowledge demand, knowledge production and knowledge circulation. The analysis within each domain has been guided by a set of generic 'challenges', common to all research systems, which

reflect possible bottlenecks, system failures and market failures that a research system has to cope with. The Analytical Country Report for each specific country can be found on the [ERAWATCH web site](#).

During the last decade, the Austrian research and innovation system has gone through a catching-up phase and many 'old' weaknesses have been overcome, e.g. the mobilisation of resources for R&D, science-industry co-operation, international R&D collaboration, and – at least partly for the public universities – institutional funding and governance.

Table 1: Summary assessment of strengths and weaknesses of the national research system

Domain	Challenge	Assessment of strengths and weaknesses
Resource mobilisation	Justifying resource provision for research activities	R&D has become – and remains – a policy priority supported by all political parties in Austria. R&D expenditures have grown substantially and GERD has surpassed the EU average, though further efforts will be needed to reach the 3% target in 2010. On the downside, the R&D funding system has become 'overcrowded' with too many overlapping or isolated measures, many of sub-critical size, jeopardising the justification of additional resources for R&D. The structural reform of R&D funding agencies provides the institutional basis for an efficient implementation of funding measures in the context of increased public funding, but the division of responsibilities and tasks between ministries and agencies is still unsettled. Moreover, there is a lack of leadership on the strategy side.
	Securing long term investment in research	Annual budgeting cycles in public R&D funding have been a major obstacle to long-term planning. However, the universities have been given far-reaching autonomy and more planning security through three-year global budgets with the reform of the University Act 2002.
	Dealing with barriers to private R&D investment	Business R&D expenditures have grown substantially during the last decade, and so have the number of R&D performing companies and R&D investments from foreign companies. This growth can be observed in (nearly) all branches.
	Providing qualified human resources	A scarcity of human resources is expected to be the key obstacle for the further development of the Austrian research and innovation system; the most visible challenges are the low participation of women in research and the low share of tertiary education graduates, especially in natural sciences and engineering.

Domain	Challenge	Assessment of strengths and weaknesses
Knowledge demand	Identifying the drivers of knowledge demand	Knowledge intensity has increased throughout all sectors of the economy.
	Co-ordination and channelling of knowledge demands	The Austrian set of thematically open funding mechanisms successfully enables the bottom-up articulation of knowledge demand. Regarding the design and implementation of policy measures, however, the supply side of innovation is overemphasised, while the matters of user requirements and application contexts are neglected. Moreover, R&D policy is too heavily oriented towards funding, whereas links to general innovation conditions, sectoral policies and societal inputs are weak.
	Monitoring of demand fulfilment	The culture of evaluation is fairly well established now. Together with a 'programme culture' in R&D funding, this has led to more quality orientation. The fuzzy distribution of competences between ministries produces overlaps and 'blind spots', in particular with regard to the consideration of institutional aspects in funding. These have been neglected, especially when compared to the competitive funding of projects.
Knowledge production	Ensuring quality and excellence of knowledge production	The new governance of public universities provides a good basis for ensuring academic knowledge quality through performance contracts. The new autonomy also enables universities to embark on new scientific opportunities in a more flexible manner. For most other publicly funded non-university research institutes, new governance is being discussed.
	Ensuring exploitability of knowledge	A new culture of science-industry collaboration has been created through targeted measures, especially the competence centres programmes. These have proven effective in enabling the demand-driven matching of specialisations through the funding of strategic long-term R&D collaboration; thematic programmes provide additional opportunities. Existing funding instruments work well as enablers for the demand-driven matching of specialisations.
Knowledge circulation	Facilitating circulation between university, PRO and business sectors	The improved co-operation culture is a good basis for the circulation of knowledge between R&D performing companies and the scientific community. Policy makers have realised the importance of knowledge circulation, and a large variety of new support measures at national and regional level aim at improving knowledge circulation at all levels and in all sectors. The efficiency of this mix of instruments and the quality of policy delivery still need critical assessment.
	Profiting from international knowledge	Austrian R&D performing institutions are open to international co-operation and participate actively in European Framework Programmes and other international initiatives.
	Enhancing absorptive capacity of knowledge users	The Austrian education system does not provide for enough S&T graduates and leaves behind significant parts of the population, especially people with an underclass or migration background. Moreover, the general conditions for human resources do not encourage intersectoral mobility, which is an obstacle to the circulation of knowledge.

Source: [ERAWATCH Country Report 2008, Austria](#)

The key challenges for future development are mainly of a cross-cutting nature. These include the issue of human resources, the governance of public institutional R&D funding, and the coherence and performance of the 'portfolio' of R&D promoting

instruments. These kinds of challenges require greater coordination between different policy domains and the policy makers responsible. Yet R&D policy makers are prone to trying to solve 'everything' within the realm of R&D policy and funding programmes; they tend to ignore interactions with other policies or even the fact that other policies, especially regulations, may set the pace in many fields, e.g. economic policies in competition, regulation or conditions for start-ups, sectoral thematic policies in thematic R&D priorities such as environment, energy or health, and immigration policies, regulations for right of residence, policies for equal opportunities and education policy in relation to human resources.

2.3 Analysis of recent policy changes since 2008

The contribution of research and research policies to the goals laid out in the Lisbon Strategy (as well as to other societal objectives) goes beyond the fostering of R&D investment. And it is also important to analyse how other shortcomings or weaknesses of the research system are addressed in the research policy mix. This section focuses on analysis of key recent policy changes, some of which may impact the four policy-related domains.

2.3.1 Resource mobilisation

After parliamentary elections in autumn 2008, a new coalition government was formed in December. Despite its new composition, R&D policy remains high on the agenda and the government follows most R&D policy objectives and priorities identified by its predecessors. The government continues the aim of having 3% by 2010 as well as reaching 4% by 2020. This would indicate a change in Austria's development path from "followers" to "innovation leaders". In terms of quality, the primary objective is to accomplish a structural transformation of the Austrian research and innovation system; the aims of this transformation are excellence and higher shares of knowledge intensive services and high-tech products. Therefore, infrastructure enhancements are necessary to meet both the best R&D performers' needs and internationalisation (Austrian Government 2008).

Changes in National Reform Programme regarding the role of research in the broader economic growth strategy

With a new government, inaugurated in December 2008, the recommendations given in the "Second Austrian Reform Programme for Growth and Jobs, 2008-2010" become non-binding.

Nevertheless, the role of research and innovation continues to be vital in the future. And the following measures regarding the knowledge triangle are being expected to be implemented with this in mind:

- Modernisation of the education system
- Investment in knowledge triangle – research/training/innovation – will be continued to reach the R&D target of 3% by 2010.
- A coherent strategy (for R&D) must be prepared for the period between now and 2020.

(Austrian Government 2008)

The first preparatory steps have been made in 2008 to mobilise resources for the adjustments needed to create a regime of 'innovation leaders'. These steps include the commissioning of the system evaluation and the presentation of the results of the highly participative 'Research Dialogue'. Both actions are intermediate inputs into the preparation of a new strategy. The following occurrences are among the most important in 2008:

- (i) To reach the goal of 3% of GDP spent on R&D by 2010 has been and still is the major quantitative objective of Austria's R&D policy and the government has announced that it will spend an additional 'billion for research' between 2007 and 2010. At a 'Research Dialogue' Meeting in December 2007, the Minister for Science and Research called for an additional quantitative goal: to increase the budget for basic research to a level of 1% of GDP by 2020 (in 2007 the rate was 0.4%); the appropriateness of the goal was nevertheless questioned by Policy Mix Peer Review Process by CREST (CREST 2008).
- (ii) The portfolio of public R&D funding measures in Austria is highly diversified and complex. In order to increase the efficiency as well as the 'legibility' and the accessibility of this portfolio, the Federal Government launched an overall evaluation of government R&D funding in early 2008. Interim results were presented in summer 2008 (Aiginger 2008). The evaluation addresses the portfolio of all direct and indirect funding instruments, while leaving institutional financing untouched.
- (iii) At the Technology-Summit in Alpbach in 2008, the Minister of Science and Research presented the results of the 'Research Dialogue', a dialogue-programme inviting all interested parties to discuss topical issues relevant to the Austrian research system. The initiative consisted of a series of workshops and conferences organised in different towns in Austria, as well as an open discussion forum on the initiative's website. The Research Dialogue is also expected to provide ideas for the government's R&D related strategies in the future (BMWF 2008).

Alongside these preparations for a new strategy, there are additional initiatives involving resource mobilisation. These include human resources initiatives, addressing non-research performing SMEs, and activating additional funding for R&D with a newly established fund (KLIEN).

In the case of human resources, a major step forward was taken when all legal restrictions for foreign scientists working in Austria were cancelled. This has enabled the freer flow of researchers in and out of the country. Because of other existing barriers to the supply of researchers, however, these measures may not have the desired affect. Possible barriers include, for instance, the limited attractiveness of career models at Austrian universities, or the 'glass ceilings' for women doing research in Austria. Actions taken by the Austrian government, such as 'Forschung macht Schule', which was implemented to attract Austrians to research careers in their early life stages, are unlikely to bear fruit until the above-mentioned barriers have been overcome.

In addition, long-standing difficulties mobilising SMEs to conduct research, which include efforts to encourage a path of continuously performed research activities through the reduction of barriers to cooperation with research institutions, are being addressed by means of a new measure – the 'innovation cheques'. This measure has found broad acceptance among SMEs and is regarded as highly successful in addressing the specific needs of SMEs (BMVIT, BMWF, BMWA 2008).

Concerning efforts to mobilise resources, the government showed clear signs of willingness to support R&D by increasing public R&D spending once more in 2008. KLIEN (Klima- und Energiefonds 2008) offers a good example of these efforts. It was created in support of the Austrian climate strategy, and involves spending €500m between 2007 and 2010 to create sustainable energy supplies and reduce greenhouse gas emissions accompanied by R&D activities. In addition to this thematic-oriented approach to increase R&D, a sectoral-oriented measure was implemented that promotes the ‘creative’ industries. The ‘Evolve’ programme, as it is called, should both strengthen and exploit the innovation potential within this sector.

While these initiatives, whether of a horizontal, thematic or sectoral kind, are all in accordance with the National Reform Programme and do contribute to the mobilisation of resources, a lack of coherency and efficiency in policy mixes remains, which could waste some of the potential inherent in R&D.

Table 2: Main policy changes in the resource mobilisation domain

Challenges	Main Policy Changes
Justifying resource provision for research activities	<ul style="list-style-type: none"> • KLIEN (Austrian Climate Research Programme) • Programme ‘evolve’ addressing creative sector
Securing long term investments in research	<ul style="list-style-type: none"> • No major changes
Dealing with uncertain returns and other barriers	<ul style="list-style-type: none"> • Innovation cheques for SMEs to foster cooperation with research institutes
Providing qualified human resources	<ul style="list-style-type: none"> • Forschung macht Schule • Laura Bassi excellence centres (amongst fforte initiative) to support women in science

2.3.2 Knowledge demand

It is widely accepted that the Austrian catching-up phase is coming to an end and Austria is becoming a top R&D performer in the EU. This means that the drivers of knowledge demand are expected to change. From the ‘frontrunner’s’ perspective, staying on top of the quality ladder (‘to be excellent’) will become more important than achieving success through imitative behaviour. An increase in demand for ‘business knowledge’ is just one of the observable reactions. This results from growing business R&D expenditures, especially by medium- and high-tech manufacturing companies and knowledge-intensive business service companies. However, the recent financial and economic crisis may dampen (at least for the time being) the increase of business R&D spending. According to recent estimates of the statistical bureau of Austria (Statistik Austria 2009), business expenditure on R&D may decrease by about 1.3% in 2009.

As has been suggested, debates over the future orientation of Austrian R&D policy have already begun. This includes predecessors, such as the ‘WIFO-Weißbuch’⁴ and the ‘Excellence strategy’ in 2007, as well as more participatory processes, like the ‘Research Dialogue’ in 2008, within which the opportunities and demands of the research and innovation system have been discussed.

⁴ On behalf of the ‘Sozialpartner’ (including Austrian Chamber of Labour, Austrian Federal Economic Chamber, Austrian Chamber of Agriculture and Austrian Labour Union) the Austrian Institute of Economic Research (WIFO) prepared a study touching all policy domains in Austria – ‘White book’.

Together, these discussions have resulted in an orientation for the future involving expenditures of more than 3% of GDP on R&D, 2% on university research and 1% on basic research in order to achieve a ‘frontrunner position’ by 2020.

In order to guide the transformation of the policy portfolio, bringing it in line with the aforementioned goals, a comprehensive system evaluation of government R&D funding has been launched. Recommendations for policy action are expected to be published later this year in the evaluation. In addition, the recommendations provided by the CREST peer review in 2008 will also be taken into account.

In the government programme from December 2008, a new role for the Austrian Council for Research and Technology Development was also announced. Under this plan, the council will function as a strategic consultation unit, receiving new roles, competences and structures. One of these roles involves the preparation of a comprehensive research strategy for 2020 by the summer of 2009 (following the system evaluation and the ‘Research Dialogue’) (Austrian Government 2008).

Furthermore, the initial actions of KLIEN can also be identified as a public knowledge driver. In particular, one measure belonging to the so-called ‘new mission orientation’, establishes the integration of societal goals with the development of new energy technologies.

A change of government with the elections in 2008 also had an impact on changes in public administration. For instance, Austrian Science fund is undergoing a streamlining of the ‘principal-agent’ structures that define relationships between ministries and agencies. In the future, the Ministry of Science and Research alone will carry these responsibilities.

Table 3: Main policy changes in the knowledge demand domain

Challenges	Main Policy Changes
Identifying the drivers of knowledge demand	<ul style="list-style-type: none"> • Presentation of results of ‘Research Dialogue’ • KLIEN (first public calls)
Co-ordinating and channelling knowledge demands	<ul style="list-style-type: none"> • Change of public administration • Ongoing evaluation (system evaluation)
Monitoring demand fulfilment	<ul style="list-style-type: none"> • No major changes

2.3.3 Knowledge production

In terms of volume of R&D spending, there is growth in all sectors, with the enterprise sector taking the lead. This trend has been accompanied by a focus on excellence in the public research sector and the fostering of joint knowledge production between private and public research institutions. An important element was to broaden the research base in Austria by increasing the number of firms (especially SMEs) that perform R&D.

Several efforts encouraging excellence can be cited. One of the most important policy changes in this regard is based on the University Act of 2002. This act overhauled the governance of Austrian universities. A major milestone in the long process of its subsequent implementation was reached in early 2007, when the first performance contracts with the Ministry of Science and Research were signed. In this first phase, individual agreements between each university and the Ministry posed the main challenge for all parties involved. The implemented formula, on which 20% of the institutional funding is based, consists of indicators in three distinctive areas. The first area is based on indicators describing teaching activities (e.g. number of active students, number of graduates), the second area consists of R&D related

indicators (e.g. Ph.D.s, project volume financed by the Austrian Science Fund (FWF), project volume finance by industry or other sources), and the third is based on societal indicators (e.g. share of women in Ph.D. programs, participation on outgoing mobility programs, number of foreign graduate students). It is not clear however, what overall impact this formula may have on the orientation towards excellence. In addition, cross-cutting issues, e.g. interuniversity co-operation in teaching and research, shared infrastructures etc., have rarely been addressed. Perhaps they have even been neglected. An amendment of the University Act of 2002 is currently under discussion, which may address some of these concerns.

Another trend encouraging excellence reaches back to the 1990's: joint knowledge production initiatives. The COMET programme is one of these. It was launched in autumn 2006 as a follow-up to the successful competence centre programmes. COMET is expected to both continue and strengthen this development and, in addition, to fund larger and more (internationally) visible centres of competence for up to ten years. The first funding decisions were made in autumn 2007. Although the ex-ante allocation of particular 'levels of excellence' to the centres was somewhat artificial, the general objectives can nevertheless be achieved, provided that the standards of programme implementation reach the same level of quality as the preceding K-plus programme ([Tiefenthaler B., 2009](#)).

The new programme 'clusters for excellence' is an example of excellence and joint knowledge production-oriented policy. This programme was designed by the Austrian Science Funds (FWF) and the Ministry of Science and Research to support a limited number of internationally competitive research clusters. Such clusters are each expected to involve 50-100 scientists for a period of 8-12 years with an annual budget of €10-15m; the training of young researchers will be of particular importance. The programme design draws on both the FWF's profound knowledge of the Austrian science base and its funding experience.

Other new initiatives, like the 'Laura Bassi Excellence Centres' or 'Josef Ressel Laboratories', are following a similar trend. The reforms enacted on the programme 'Research Studios Austria' should also be seen as supportive in this regard.

As a final example, in 2006 the IST Austria (Institute of Science and Technology Austria) was set-up as a post-graduate academic institution. The institution will perform basic research at a world-leading standard and will open up and develop new areas of research. The first heads of departments were selected and the institute became operative in 2008.

Table 4: Main policy changes in the knowledge production domain

Challenges	Main Policy Changes
Improving quality and excellence of knowledge production	<ul style="list-style-type: none"> • Laura Bassi excellence centres to support women in science • Research Studios Austria was reformed • Josef Ressel centres to enhance universities of applied sciences in their research capability • Clusters for excellence initiative
Ensuring exploitability of knowledge production	<ul style="list-style-type: none"> • No major changes

2.3.4 Knowledge circulation

During the last decade cooperation and, therefore, the circulation of knowledge between the research actors in the Austrian research and innovation system has involved a broad variety of instruments.

The 'innovation cheques' are a good example. These successful initiatives encourage non-performing firms, especially SMEs, to cooperate and exchange knowledge with public research organisations.

Other activities that enhance the participation rates of SMEs or that cope with networking for knowledge exchange are concentrated under the umbrella of COIN (cooperation and innovation). COIN involves the merger of formerly separate programmes. This type of reform was also carried out in the COMET programme.

The participation of museums has even been taken into account. A new measure was created – forMuse – to support research at museums (BMWF 2008c) and to increase accessibility and absorptive capacity.

The opening up of programmes to international applications (e.g. COMET and the Christian Doppler Laboratories – CDG) represents another path taken in the Austrian research and innovation system in the last decade. This path involves internationalisation and the aim of increasing international collaboration. This trend is not only observable in the high participation rates of Austrian researchers in EU programmes and joint technology initiatives, but also in specified programmes, such as Co-operation in Innovation and Research with Central and Eastern Europe (CIR-CE).

Overall, the strategy followed in the 1990's, which involves forcing interaction between actors and supporting internationalisation, is being continued.

Moreover, challenges relating to human resources and subsequent absorptive capacities have also been tackled. The ministries responsible for R&D have recently launched two new initiatives, both addressing the 'next generation' of scientists and researchers. 'Sparkling Science' has the long-term objective of breaking down barriers between school education and the science system, mainly through research collaboration between scientists and pupils; with this initiative, the Ministry for Science and Research pursues a dialogue-oriented approach to communication between science and the public. The Ministry for Transport, Innovation and Technology is responsible for the second initiative, 'Forschung macht Schule', which aims to attract more children to a career in natural sciences and engineering, e.g. through internships in companies and research institutes, or other educational measures ([Tiefenthaler B., 2009](#)).

Political debate over the future organisation and structure of the education system has been controversial and ideologically biased. At this point, the government has taken small initial steps towards reform. For instance, pilot projects for a new type of comprehensive secondary school were scheduled to commence in 2008.

With regard to accessing international knowledge, Austria became a member of ESO (European Southern Observatory), giving Austrian researchers the opportunity to use the infrastructure developed by this organisation.

Table 5: Main policy changes in the knowledge circulation domain

Challenges	Main Policy Changes
Facilitating knowledge circulation between university, PRO and business sectors	<ul style="list-style-type: none"> • Innovation cheques • proTrans (following protec) • COIN
Profiting from access to international knowledge	<ul style="list-style-type: none"> • ESO membership • JTI participation under the umbrella of FIT-IT, (ARTEMIS, ENIAC and ModSim Computational Mathematics)
Absorptive capacity of knowledge users	<ul style="list-style-type: none"> • Sparkling science and Forschung macht Schule • forMuse

2.4 Policy opportunities and risks related to knowledge demand and knowledge production: an assessment

Following the analysis offered in the previous section, this section assesses the ability of recent policy changes to (1) respond to identified system weaknesses and (2) take identified strengths into account.

The primary strengths of Austria's R&D policy are the budget increases for R&D in line with the target of 3% by 2010. As has been mentioned before, there is even the intention to proceed towards 4% by 2020. This would distinguish Austria as an 'innovation leader' – at least in Europe. Today there is a growing consensus in Austria that in order to achieve this ambitious goal a strategic change towards a 'frontrunner' strategy is needed. In the next decade, much more emphasis needs to be given towards the mobilisation of human capital resources. Several kinds of new or reformed measures have already been implemented to (1) integrate more actors in R&D activities (e.g. SMEs via 'innovation cheques' or museums via the 'forMuse' programme) and (2) to bring them together for joint activities (e.g. the COMET and COIN programmes). In addition, support for internationalisation is evident (e.g. the CIR-CE programme).

Nevertheless, this path has some pitfalls. For instance, opportunities for increasing R&D and public funding, based on a broad consensus in favour of following the excellence strategy (e.g. via the implementation of 'clusters of excellence' or the newly found ISTA) may be impacted by external influences like the existing financial crisis. To a large extent, the excellence strategy depends on increasing direct funding and requires sustainable funding mechanisms. Nevertheless, they are still largely dependent on actual budget opportunities. Existing external pressures on budgets, therefore, exert significant influence. Furthermore, a policy portfolio comprising a variety of instruments often equipped with relatively small budgets runs the risk of being inefficient.

Early signs of risk associated with the financial crisis are visible. For instance, the National Foundation for Research and Technology Development (a foundation implemented to generate more sustainable funds) has been plagued by limited financial resources for the beneficiaries, e.g. the Austrian Science fund, the Academy of Sciences, the Ludwig Boltzmann Society etc. Subsequent evaluation has shown that there is a lack of stability in the fund (Gonzales et al 2008).

Challenges involving human capital pose a similar problem in the future (see Haas 2008). Additional money is needed to implement the new collective agreement with the universities (the 'Kollektivvertrag'), which should enhance career opportunities. On the other hand, awareness of the human capital problem is high, and some

potential remedies (e.g. opening up the labour market for foreign researchers or making children aware of science) are already in place.

The introduction of new measures, such as the ‘Innovation cheques’ and the creation of a climate and energy fund (KLIEN), are supportive activities that offer new opportunities for increased performance. Until now, these initiatives have been developed under the responsibility of several different ministries. This has made it difficult to take their common effects into account.

In the end, the most important insights and ideas will be gained once the results of the ‘Research Dialogue’ and the systems evaluation, can be combined with the results of other reviews (e.g. the CREST peer review). These must be seriously discussed in order to improve the efficiency of both the ‘portfolio’ of measures and the entire system.

Major policy-related risks exist in the following areas: (1) sustaining public R&D funding through financial crisis and fluctuations in business and budget cycles; (2) human capital formation, especially increasing the supply of S&T graduates, (3) streamlining governance processes. But for each of these areas, opportunities also exist. At the core, there is clearly the willingness to support R&D activities and to develop a new strategy in order to increase the overall efficiency of the system.

Table 6: Summary of main policy related opportunities and risks

Domain	Main policy related opportunities	Main policy-related risks
Resource mobilisation	<ul style="list-style-type: none"> • Common understanding of all parties involved for necessity of R&D investments and announcements for advanced public funding 	<ul style="list-style-type: none"> • Financial crisis
Knowledge demand	<ul style="list-style-type: none"> • Results of ‘Research Dialogue’ • Reformation of Council of Research and Technology Development • Development of a new strategy 2020 	<ul style="list-style-type: none"> • Addressing ever smaller target groups through specific funding
Knowledge production	<ul style="list-style-type: none"> • Following the lines of excellence and internationalisation, e.g. implementing new ‘Excellence initiative’ • ISTA, extending ÖAW and Boltzmann Institutes • Setting up performance contracts with non-university Institutes 	<ul style="list-style-type: none"> • Giving less attention and funds to human capital building • Losing patience and persistence in reforms of universities and other public research institutes
Knowledge circulation	<ul style="list-style-type: none"> • Modernisation of education system • Establish a new culture of co-operation between school education and science 	<ul style="list-style-type: none"> • To let ideological arguments dominate facts in the debate on education

3 National policy mixes towards R&D investment goals

The aim of this chapter is to deepen the analysis of national policy mixes with a focus on public and, in particular, **private R&D investment**. The Lisbon strategy emphasises a **resource mobilisation objective** for 2010 of 3% of GDP for the entire EU. Two thirds of this should come from private investment. R&D investment is seen as an important yardstick for the capacity of an economy to turn the results of science and research into the commercially viable production of goods and services – turning knowledge into growth. Corresponding investment policies are pursued primarily at the national level and are characterised by their national focus.

This chapter is structured around five questions:

1. What specific barriers exist in a country that prevent its reaching the Lisbon goal? What barriers exist that prevent a country from reaching these specific targets, particularly in relation to private sector R&D investments?
2. Given the above, what policy objectives and goals of the government aim to overcome these barriers?
3. What Policy Mix routes have been chosen and what specific instruments and programmes are in operation to implement these policies?
4. What achievements have there been in reaching the above mentioned R&D investment objectives and goals?
5. What reasons are there for not reaching objectives, or for the changing of goals?

In answering these questions, this chapter captures the main dimensions of the national policies, especially with regard to private R&D investment. The Policy Mix approach offers a perspective geared towards investment in R&D. Here, analysis and assessment will follow a stepwise approach to the five questions listed above.

3.1 Barriers in the research system for the achievement of R&D investment objectives

The commitment to realising the 3% target by 2010 (established in Barcelona) has meant a rise in R&D investment levels in recent years, especially in the private sector. It is likely that the target will be reached. This is not certain, however, because challenges remain in the research system.

These challenges include short-term influences and impacts, such as modes and structures of R&D funding, and more medium to long-term impacts like human capital, governance and specific industry structures.

(1) Modes and structures of R&D financing

In Austria, we observe the following characteristics that threaten sustainable funding structures and R&D investments. Foremost are public R&D expenditures, which are highly dependent on annual budgeting cycles. Second, a large share of private R&D is financed from abroad. Both of these characteristics make R&D financing highly sensitive to business cycles.

A long-term commitment to public R&D expenditures has not been evident within regular budgets until recently. This can be observed in the uneven allocation of

additional funds for R&D purposes (e.g. from privatisation revenues) in annual budgets. R&D funding agencies have also experienced delays and considerable fluctuations in budgets available to them. Measures implemented to neutralise these fluctuations (e.g. performance contracts with universities or the development of the National Foundation for Research and Technology Development) have, moreover, not yet produced results. Hopefully the new medium-term budget cycle will provide increased stability of funding.

The private R&D sector has the most dynamic rate of all financing sectors in absolute and relative terms, exhibiting growth in R&D expenditures in nearly all industrial sectors, particularly in the medium-high tech sector and in the knowledge intensive sector. This explains the high figure for Austria, 1.81% of GDP compared to the 1.17% EU-27 average (2007). Yet nearly a quarter of all R&D performed in Austrian companies is financed by companies from abroad. This indicates a high level of sensitivity to foreign developments and decision making.

Taken together, the short-term dependency typical in Austrian R&D financing presents some risks for achieving R&D investment objectives vis-à-vis the financial crisis in the near future.

(2) Human capital

Providing qualified human resources for R&D is one of the key challenges for Austria. The share of graduates in science and technology sits lower than the EU average, while education expenditures lag behind the OECD average, especially for tertiary education. At the same time there is demand for highly qualified human resources as more companies reach the technological frontier; as the sector of knowledge intensive services grows; and as R&D activities expand.

In recent years this has been addressed primarily through launching measures to attract foreign researchers and expatriates, as well as supporting the mobility of Austrian scientists. Special measures have also been taken to address the problem of female researchers. The attractiveness of scientific careers suffered from the implementation of the University Act 2002 and the subsequent lack of tenure track opportunities or even clear career perspectives. A collective agreement for university employees – made between the association of Austrian universities and the labour union – will be implemented during the summer of 2009 if there are positive signals from the ministry that additional costs will be financed.

The differentiated system of secondary education and vocational training has produced a sufficient labour force during the catching-up period. However, this system appears less efficient in the context of the 'frontrunner strategy', even if aspects of this strategy have been questioned (CREST 2008).

As a consequence, the development of the Austrian research system may suffer from human resource constraints in the medium- to long-term.

(3) Governance

The Austrian governance system is among the most often cited barriers to a more efficient and coherent policy mix. R&D policy responsibilities are highly decentralised, and this causes coordination problems. While consultation with stakeholders ('Sozialpartnerschaft') has become a common practice in the development of R&D policy measures, consultation within and between ministries is often neglected. This leads to governance of R&D policy that is fragmented. Tasks and responsibilities are

not always clearly delineated among the ministries involved. There are no formal mechanisms of coordination between these ministries and, despite isolated efforts, the coherence of policy is a permanent challenge. This challenge has become even more pressing as the importance of R&D policy has increased and extended into the policy activities of other fields ([Tiefenthaler B., 2009](#)).

Ultimately, the complexity of the system is not seen as reason alone for major structural reforms (CREST 2008). Therefore, smaller adaptations in the institutional landscape and the 'programme jungle' have become vital to achieving the R&D investment objectives in an efficient and effective way.

3.2 Policy objectives addressing R&D investment and barriers

The government programme 2008-2013 (Austrian Government 2008), which was agreed upon by the coalition government of the two major parties, the Social Democrats and the Austrian People's Party, defined four broad goals for Austria's R&D policy:

1. Secure and strengthen competitiveness of RTI location Austria

The government aims to evolve from a 'follower' country to the category of 'innovation leader'. Consequently, the RTI policy and system is seen as central to this aim, and the government intends to spend considerable amounts of money and attempt to maximise the leverage effects on private R&D finance.

Foreseeable actions include the provision of additional public funds (for business cycle programmes, the amount of €50m for 2009 and 2010 is expected) in order to increase the share of national expenditures in R&D to 3% of GDP by 2010. Additional funding should address areas of weakness in the research system by focusing on thematic programmes. The results from the systems evaluation should also be used to increase the efficiency of the system. The extension and simplification of the tax allowance is also important.

In addition, other measures involving venture capital, SMEs and foreign companies are mentioned in the government programme. A special focus is placed on the theme of ICT.

2. Nurture excellence and improve the overall RTI system

Excellence initiatives are needed to bring the system in line with a 'frontrunner strategy'. This means drawing on measures supporting excellence and integrating horizontal measures that foster the broad development of the RTI system.

Prolonging competence centre programmes like COMET or CDG are foreseen, but a portfolio analysis should also look for bundling opportunities.

ARC (Austrian Research Centres) will receive a strategically new orientation and ACRI (Austrian Cooperative Research Institutes) will get increased support.

In order to support both excellence and the broad development of RTI, human resources receive significant attention. This means that issues with R&D careers and human resources for science and industry will be addressed by implementing new initiatives.

Internationalisation will also be an integral part of this strategy. Special emphasis is to be put on supporting Austria's research organisations in order to optimise the

application of EU framework programmes and deepen cooperation with international 'frontrunner' organisations.

3. Improve overall governance of RTI system

Based on the results of the ongoing systems evaluation and conclusions drawn from the 'Research Dialogue', a new RTI strategy will be developed. This strategy is currently being developed by the Council of Research and Technology Development. However, the implementation of this on-going strategy formulation process is still not clear. The result of these evaluation efforts will be an increase in efficiency through the streamlining of programmes and the appropriate adaptation of the portfolio of measures. The governance of the Council will be restructured, but there are no decisions made yet about any details. The different agencies, likewise, should have new clear reporting lines to ministries.

4. Secure innovation by investing in basic research

A special emphasis is given to basic research. It will be important, then, that excellence initiatives are followed, including the foundation of excellence clusters and excellence teams as well as doctoral colleges. Furthermore, the national infrastructure (universities, PROs) should be developed in line with the ESFRI roadmap in order to foster cooperation with, and access to, top international institutions along.

Performance contracts with PROs and the adaptation of national laws will be used to improve governance. Both the facilitation of young academics and women in science in and the easing of mobility restrictions for researchers into and out of Austria will help to develop excellence in basic research. Mission-oriented research should be also supported, with emphasis given to human, social and cultural sciences alongside legal measures to enhance developments in biomedicine.

The policy objectives highlighted in the government programme clearly express an effort to create excellence and to support basic research, both of which are vital if Austria is to take a leading position in Europe.

Most of the barriers to sustainable R&D investments, as described above (see 3.1.), have been addressed, while the early effects of new measures are already observable (e.g. a new reporting line for the Austrian Science Fund FWF). Nevertheless, we are still waiting for the recommendations from the system evaluation, which alongside the 'Research Dialogue' will be important for future implementations.

3.3 Characteristics of the policy mix to foster R&D investment

This section describes the national policy and instrument mix chosen to foster public and private R&D investment. It also deals with its governance. While policy goals are often stated at a general level, a particular policy mix focuses on how these policy goals will be implemented in practice. The question remains, what tools and instruments have been set up and how do they help achieve policy goals in Austria? In the following sections several of these dimensions will be explored.

3.3.1 Overall funding mechanisms

The Austrian research and innovation system characteristically follows financial flow patterns (see figure 2):

- The private sector is highly self financing.
- In the public sector, funds are allocated primarily to the higher education sector and only partly to other public research organisations.
- Finally, an important funding flow – especially for the private sector – comes from abroad.

About two thirds of R&D in the corporate sector in Austria was self-financed in 2006 (approximately €2.95b) and another €831m came from abroad, with about 75% of this located in 'related firms'⁵. Combine this with the fact that about 70 large firms finance half of the private sector's R&D expenditures with less than 10% coming from public funds, and the dependency of Austria's R&D performance on private finance and financial resources from abroad is striking (Schiefer 2008).

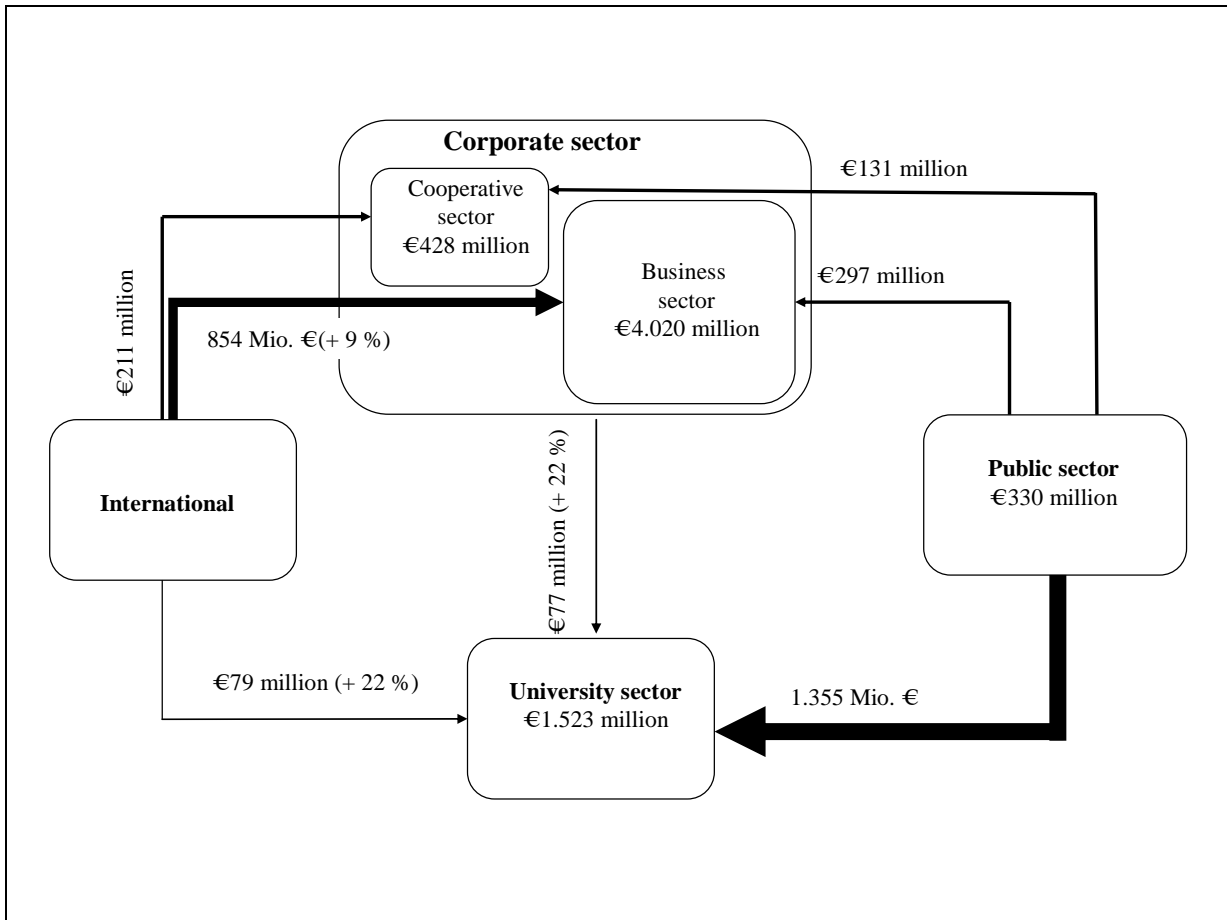
The Austrian public funding structure involves a combination of block funding of universities and non-university research centres ('institutional promotion'), competitive grants and project funding, infrastructure programmes, structural programmes addressing science-industry relationships (all 'direct promotion'), and increasingly, indirect funding through tax allowances ('indirect promotion').

A study published in 2005 found that the institutional support provided to research organisations in Austria is declining slightly (representing a share of about 63% of all measures in 2003). Indirect funding, meanwhile, showed substantial growth (Schibany, and Jörg 2005). According to this analysis, which was based on data from 2003⁶, 82% of institutional funding at the national level goes to universities, 6% to international organisations, 5% to the Austrian Academy of Sciences, 4% to non-university research organisations (mainly to the Austrian Research Centres ARC), and 2% to a number of smaller research institutes. In addition to federal funding, some public research centres are co-financed by the provinces. These include, in particular, Joanneum Research in Styria, Upper Austrian Research and Salzburg Research.

⁵ This means that financial flows exist between a holding or mother company and her affiliations.

⁶ Actual figures will be available when the ongoing system evaluation is published next month.

Figure 2: R&D funding flows in Austria, 2006



Source: Statistik Austria

According to the Austrian Research Promotion Agency's (FFG) multi-annual programme for 2006-2008, a total of €52m was allocated to thematic programmes by the ministries responsible in 2006. The largest allocations were made by the Ministry for Transport, Innovation and Technology. Overall, the budget was allocated to thematic priorities as follows:

- Transport and Space (several programmes): €20m
- The Austrian Nano-Initiative: €7m
- Thematic programme FIT-IT: €12m
- Thematic programme Security Research: €10m
- Thematic programme Technologies for Sustainable Development: €3m

For comparison: FFG manages a total funding budget of €383m, including generic measures.

Based on these observations, some general conclusions can be derived:

- The finance of Austrian R&D is to a large extent determined by the private sector and foreign sources, and this means a highly competitive milieu exists for R&D performed in the corporate sector.
- The Austrian portfolio of public measures is dominated by institutional funding, complemented by (1) large amounts of generic measures (e.g. 'bottom-up'

schemes for project funding) and (2) the remaining and relatively small parts of thematic funding. This is despite an increasing number of thematic programmes.

- For public funding, with its high-institutional promotion share, there is still room for more competitive funding. Nevertheless, a close look at implemented instruments also indicates a concern for excellence.
- On the other hand, several generic measures offer opportunities for relatively open developments.
- Regarding the implementation of new measures, an orientation towards sectoral supportive programmes (e.g. evolve for creative industries) and horizontal issues (e.g. Laura Bassi excellence centres to facilitate women's careers in science) can be seen.

3.3.2 Policy Mix Routes

The "Policy Mix Project" identified the following six 'routes' to stimulate R&D investment:

1. promoting the establishment of new indigenous R&D performing firms;
2. stimulating greater R&D investment in R&D performing firms;
3. stimulating firms that do not yet perform R&D;
4. attracting R&D-performing firms from abroad;
5. increasing extramural R&D carried out in cooperation with the public sector or other firms;
6. increasing R&D in the public sector.

The routes cover the major methods to increase public and private R&D expenditures in a country. Each route is associated with a different target group, although there are overlaps across routes. The routes are also not mutually exclusive. For example, competitiveness poles of cluster strategies make use of several routes simultaneously. The policy portfolio within a single 'route' will vary from country to country or from region to region depending on policy traditions, specific system needs etc.

The Austrian policy mix, which includes an ever growing assortment of measures, covers all routes (see Hofer 2007). This means that all research actors are being addressed by the instruments currently in place. Based on a selected number of policy instruments, which represent the most important ones and form a balanced sample, it can be said that there are slightly different weights given to the routes.

Route 1: Promoting the establishment of new indigenous R&D performing firms

A former policy consultant has expressed that 'in Austria there is a tradition of protection against competition rather than protection of competition'. And several studies have acknowledged too little entrepreneurial behaviour and firm formation in the industry sector. To remedy this perceived fault, the Austrian government began to support the entry of innovative and technology-oriented firms with a host of different policies in the last decade (TC 2008).

Initial activities to support the formation of R&D performing firms were centred on the creation of technology, innovation and start-up centres that are now residing under

the umbrella organisation known as the Austrian Association of Technology Centres (VTÖ). Later on, measures were implemented to support entrepreneurial behaviour (e.g. with the AplusB impulse programme) and instruments for financial support during start-up and early growth. These are now covered by the AWS ('Austria Wirtschaftsservice').

The AplusB programme referred to above encouraged academics at universities to create spin-offs and, at this time, can be seen as a success story. The target group will be expanded to include academics in general in the future, showing there is still room for improvement here as well (Heydebreck and Petersen 2008).

The scheme offered through AWS includes support measures for young entrepreneurs. Measures include: 'Gründungssparen'; 'Unternehmensdynamik'; double-equity guarantees; support of IPR protection and exploitation; and i2-market for business angles. Also included is a new programme for the promotion of the development and establishment of innovative companies (JITU). It consists of three modules: PreSeed; Seed Financing; and Temporary Management. Additionally, the regional branches of the Austrian Federal Economic Chamber offer equity guarantees to high-tech SMEs as well as a firm-formation service (BMF, BMWA 2008). As can be seen, there is a broad spectrum of financial instruments in place in Austria.

Recent evidence revealing an increase in entry and exit activities in Austria (Hölzl et al 2007) in the last decade illustrates a shift towards more competitive circumstances with more firm-formation activity. This activity is, however, not always confined to R&D intensive firms. In particular, it may represent the process by which people are forced to found their own enterprises due to outsourcing activities. This indicates that the entrepreneurial attitude is not always the driver behind start-ups and, therefore, the intent to grow cannot be assumed. To cope with this, start-ups should be assessed by their growth orientation and capacity to expand in order to gauge their lasting contribution to the overall system. Finally, the milieu for creating and supporting entrepreneurial behaviour needs to become more supportive of such activities.

Overall, promoting the establishment of new R&D performing firms is one route that has been addressed well in Austria. Still, there is potential for improvements, particularly regarding the duration of legal procedures, minimum capital requirements and administrative costs (Jung et al. 2008).

Route 2: Stimulating greater R&D investment in R&D performing firms

Stimulating instruments for R&D performing firms is a clear strength in the Austrian portfolio of R&D policies. Most direct measures and funds allocated, whether generic or thematic in orientation, support this route. The reformed tax allowance acts as an additional instrument giving support in this regard. Overall, this route is one of the most developed and comprehensive of the six in Austria.

The General Programme of the FFG is Austria's most important source of public funding for R&D carried out by industry in terms of: funding budget; efforts to promote R&D in all economic sectors and branches; areas of technology; and sizes of companies. This broad spectrum of activities is unified by the aim of improving the innovation performance of Austrian companies (FFG 2008). Its predecessor, established in 1967, along with the Science Fund, the FFG, was among the first project funding instruments to subsidise R&D in Austria.

This route is also addressed by thematic programmes, such as FIT-IT, TAKE-OFF or NANO:

- FIT-IT is an initiative of the Federal Ministry for Transport, Innovation and Technology. It focuses on projects with a time-to-market in the 3-8 years range, with compulsory participation from both industrial and academic partners.
- TAKE-OFF is also an initiative of the Federal Ministry for Transport, Innovation and Technology to strengthen the research-, technology- and cooperation competence of Austrian players in the aeronautical sector. It promotes strategic research projects, which in turn lead to significant technological innovations. Furthermore the programme promotes educational measures and know-how transfer in the fields of aeronautics.
- The Austrian NANO initiative coordinates NANO measures on the national and regional levels and funds collaborative research. The establishment of a national research programme was driven by the fact that most peer countries as well as the EU-framework programmes use the label Nanotechnology.

These programmes indicate that there is public interest in following a 'frontrunner strategy'. It also means that firms already performing R&D are promoted and that structural change continues to focus on these firms – the intra-firm changes, such as upgrading the R&D intensities of their products. To a lesser extent the focus is also on new firms. Because it makes growth heavily dependent on firms' growth opportunities, it is important to determine how long this path can be followed to increase the R&D investments.

Route 3: Stimulating firms that do not perform R&D yet

Companies, especially SMEs not yet performing R&D, are among the most 'wooded' target group for R&D and innovation policy in Austria. They are being addressed by a large number of technology centres, incubators, national and regional funding bodies, regional development agencies and business advice providers ([Tiefenthaler B., 2009](#)).

The General Programme of the FFG is a bottom-up, generically-oriented instrument and, for this reason, serves this category of firms well. Evidence clearly indicates that new firms and especially SMEs have high shares in this programme.

Furthermore, a new measure, the 'innovation cheques', has been implemented to support SMEs and reduce barriers to cooperation with research institutes. The innovation cheque is a funding programme designed to help small and medium-sized enterprises in Austria to initiate research and innovation activities. This cheque enables enterprises to enlist the services of research institutions (non-university research institutes and universities). It also funds these services up to a maximum limit of €5,000. This approach has been successful, as 2000 new applications have been filed, 80% of which are from newcomers to the funding agency.

Overall, increasing numbers of R&D performing firms of all sizes show the positive impact of the Austrian research and innovation policy activities in the last decade. That measures to stimulate non-performing firms have proven successful is particularly good news.

Route 4: Attracting R&D-performing firms from abroad

The fourth route is essential, because about one quarter of financial resources for R&D performed by enterprises is funded from abroad. Primarily, this occurs when Austrian R&D is affiliated with a multinational company (Statistik Austria 2008). This seems to indicate that Austria has become an attractive research location. And to some extent this may be attributed to research policy efforts that have prioritised this route.

The so called 'Headquarter Strategy – R&D', a prominent element in the General Programme of FFG, is of particular importance here. The strategy's prominent role is shown by the large amount of funds allocated from the General Programme. It stimulates the location and development of Multinational enterprises' R&D laboratories in Austria. The aim of the programme is to both strengthen and augment these engagements. This is crucial, considering that Austria has profited greatly from the R&D investments of Multinational companies in recent years.

Furthermore, the building up of infrastructure (e.g. the Campus Vienna Biocenter) and public private partnerships (e.g. the Institute of Molecular Biotechnology, a partnership between Austrian Academy of Sciences and Boehringer Ingelheim located at the Campus Vienna Biocenter), as well as cooperation programmes like CIR-CE and COIN, contribute to this objective. The reformed tax allowances can also be considered supportive in this regard.

Even though this route is given priority, decisions made on whether or not to perform R&D in Austria will often be based on local resources and expertise (human capital) and excellence in specified scientific areas. Therefore, cultivating the general 'R&D milieu' is a very important aspect of this route. Measures to foster excellence (e.g. the Institute for Science and Technology Austria - ISTA), the support of science-industry linkages (e.g. with the COMET programme and CDG laboratories), reforms in the university sector and measures to promote the accumulation of human capital are major determinants in this route.

Route 5: Increasing extramural R&D carried out in cooperation with the public sector

Beginning with the identification of weak links between science and industry in the mid 1990's as one of the main shortcomings of the Austrian research and innovation system, a set of measures has been implemented. It has resulted in a fifth route that could be described as 'overcrowded'. The Christian Doppler Laboratories and competence centre programmes, such as K-plus and K-ind/K-net and their follower COMET, as well as cooperation requirements in nearly all thematic research funding programmes represent a wide range of supportive measures.

In addition, several new initiatives focus explicitly on cooperation. The Josef Ressel centres, which should enhance cooperation between the universities of applied science and regional industry, offer one prominent example. The 'Laura Bassi Centres of Expertise' are similar, but concentrate on supporting women. Ultimately, the promotion of linkages between science and industry is highly differentiated in Austria. While less money is spent on this route, results remain significant.

Overall, a deficit in cooperation has been overcome with public funding instruments that have experienced considerable success. Respective programmes have, in most cases, reached their goals and science-industry cooperation is no longer a major obstacle. For instance, 58% of Austria's innovating companies collaborate with

universities and other HES institutions, which is the second highest rate in the OECD (OECD 2007).

Route 6: Increasing R&D in the public sector

The largest share of institutional funding in the public sector goes to universities and to several public research institutes (see figure 2). Recent changes in governance (e.g. the University Act 2002), which involves a new-mode of performance-oriented institutional funding, is an important break with the past in the Austrian research system. With these changes, public research organisations have become more exposed to competition.

New measures managed by the Science funds (FWF) account for much of the growth in public funding. Among these measures are the 'Clusters of Excellence' initiative and the reimbursement of overhead costs in other cases of project funding. Some instruments, such as the 'Special Research Programmes' and 'National Research Networks', provide substantial medium- to long-term funding for locally or nationally concentrated research efforts (FWF 2008).

The importance of this route is also underscored by the establishment of ISTA (Institute for Science and Technology Austria). This post-graduate academic institute lists excellence and international visibility as its primary aims.

With regard to Structural Funds (SF), Austrian provinces spent on average approximately 14% of their SF budget on R&D and innovation measures; although figures vary between 6% and 25% in different regions (Ohler 2006). The main activities funded at the regional level include cluster initiatives, incubators and competence centres. In terms of volume, SF play a minor role compared to total R&D expenditures in Austria. For instance, between 2000 and 2006 approximately 14% of SF (around €143m) was spent on R&D. This was, however, only 1.2% of all public spending and merely 0.4% of the total R&D expenditure during the period ([Tiefenthaler B., 2009](#)).

Overall, route 6 receives considerable attention in the Austrian research system, yet the focus remains primarily on institutional funding.

The importance of education and innovation policies

Austria suffers from a low share of graduates in science and technology, making human capital one of the most pressing challenges for the Austrian system ([Tiefenthaler B., 2009](#)). Continuing deficits in human resources will have a negative influence on R&D investments and could lessen the attractiveness of Austria as a R&D location.

The existing education system is partly to blame for these deficits. Today's weaknesses in human capital formation are a consequence of the emphasis on primary and secondary vocational education systems. It has been argued that graduates leave these schools with skills similar to tertiary education graduates in other countries. However, the focus of these schools is on vocational rather than on high general skills, which are particularly relevant for the diffusion and adoption of advanced technologies and as a basis for careers in R&D (OECD 2007). Past human resource policy proved successful during Austria's catching up phase, but there are signs that a turning point may have been reached. Demand structures in industry and public research units, for instance, place more emphasis on qualifications from tertiary education.

Based on these observations, which were articulated clearly in the 'Research Dialogue', policy actions will follow. Moreover, some helpful restructuring of governance has already taken place. For instance, primary and secondary education were separated from tertiary education in governance structures after the election in 2007, which split competences between the Ministry of Education and the Ministry of Science and Research. While it may have lessened coordination between vertical levels of education organisation, it has allowed the research and the tertiary domain to assume a more prominent role. Additional efforts to make science and engineering studies more attractive will have to take place nonetheless.

To develop human potential and to raise the awareness of the importance of R&D for the society as a whole, initiatives like 'research goes to school' or 'science days' have been implemented to spark interest in research at an early age. Additionally, life-long learning initiatives in the form of 'training sabbaticals' are also important contributors (TC 2008).

Overall, there is a growing awareness in Austria that the education system is a crucial pillar in a competitive innovation system. However, more effort is necessary. For instance, the provision of PhD and Post doctoral positions in combination with adequate career opportunities is still problematic. Special attention must be given to science and engineering disciplines.

In terms of innovation policy, the current discourse has highlighted the fact that gaps continue to exist in the availability of early-stage venture capital and that poor use is made of demand-side policies (CREST 2008). Discussions are beginning about how best to fund innovative service companies, which are an increasingly important sector in the Austrian economy. Subsidies as a share of GDP are very high in Austria, but there is no discussion about the ways in which this might distort competition or on how this will affect structural change (TC 2008).

In conclusion, awareness of the challenges and issues exists and actions are being taken. Nevertheless, the tertiary education sector, especially, is still in need of further refinements. Career options, for instance, are among the most important things to provide in the future.

Assessment of the importance of policy mix routes and their balance

In light of this overview of instruments, the Austrian system appears to broadly address all six routes. One major disadvantage may arise from the lack of a clear overall strategy. In terms of budget allocations, emphasis is given to routes 2, 5 and 6. The other routes, especially 1 and 3, are addressed with a bundle of instruments, but their impact is limited due to low levels of entrepreneurial behaviour and risk-averse attitudes.

Route 4 has not been neglected by R&D policy makers. Still, the general conditions for performing R&D, the availability of expertise and highly qualified ('excellent') human resources are just as important as funding. Initiatives like IMP (Institute of Molecular Pathology), which is sponsored by Boehringer Ingelheim and national and international research grants, and the development of ISTA, will contribute to this route.

Table 7: Importance of routes in the national policy and recent changes

Route	Short assessment of the importance of the route in the national policy	Main policy changes since 2008
1	The instruments implemented underscore the importance of establishing new R&D-performing firms. Nevertheless, the allocated funds have only slightly impacted the development of more entrepreneurial behaviour in Austria.	No major changes
2	This route has been heavily addressed with a broad range of measures. Most prominent among these are the general funds, but thematic and structural programmes and the indirect tax allowance are also notable.	Climate and Energy Funds – first call
3	Several instruments have been implemented, especially to encourage SMEs to engage in R&D. But even with the large number of structural measures (incubators, technology centres etc.), the response has been weak in terms of R&D intensity.	Innovation cheques
4	With an eye on the importance of R&D funding from abroad, special programmes (Headquarter programme) have been developed to take advantage of this. The most important factor is the excellence of research resources (e.g. human capital or expertise in specified areas).	Opening CDG for international participation
5	Of all the routes, increasing cooperation between science and industry has been addressed most prominently in the last decade. As a consequence, this route may be ‘overcrowded’ with instruments, which mostly run on small budgets.	Laura Bassi excellence centres Josef Ressel laboratories
6	In order to increase R&D in the public sector, attention has been paid primarily to the higher education sector (i.e. universities). Tools used this include the general funds (FWF).	Laura Bassi excellence centres Josef Ressel laboratories ISTA becoming active

3.4 Progress towards national R&D investment targets

Substantial progress in R&D investments can be observed. Austria’s contributions to R&D have increased in accordance with the Barcelona target of 3% in recent years. Several figures (including an R&D intensity of 2.65% in 2008, with 34.2% of this financed by the government and 54.5% by business enterprises, with an additional amount of almost 9% from abroad) suggest that Austria is approaching the targeted ratio of 1/3 public expenditure and 2/3 private expenditure. From 2005 to 2007, GBOARD increased to 1.43% of general government expenditure, within reach of the EU-27 average of 1.55% (Eurostat 2008).

With regard to Structural Funds (SF), the Austrian provinces spent on average approximately 14% of their SF budget on R&D and innovation measures. This varied between 6% and 25% in different regions. The main activities funded include cluster initiatives, incubators and competence centres. In terms of volume, SF play a minor role compared to total R&D expenditures in Austria. For instance, between 2000 and 2006 approximately 14% of SF, equalling approximately €143m, was spent on R&D. This was, however, only 1.2% of all public spending and merely 0.4% of the total R&D expenditures during the period ([Tiefenthaler B., 2009](#)).

The Austrian policy mix addresses all routes and uses a variety of instruments. The process of ‘catching-up’ has been important in Austria, helping the country reach a leading position in terms of R&D intensity. The substantial growth of business R&D in

particular is at least partially related to increases in public funding and the instruments discussed above. Nevertheless, there is growing concern about the coherence and efficiency of the R&D policy mix. As a consequence, initiatives like the system evaluation and ‘Research Dialogue’ have been setup to identify risks and opportunities in the Austrian system.

Challenges identified and discussed here include the provision of human capital and the long-term stability of public funding. Both function as barriers to increasing R&D investments and, in particular, private R&D investments. The financial crisis is expected to accelerate these trends, as companies experience squeezed cash-flows and pressures on public funding build up. Ultimately, this may cause stagnation in R&D funding and reduce incentives and opportunities for human capital. The impacts of the recent financial and economic crisis can be observed in the Austrian R&D funding structure today. Of most significance, the National Foundation for Science and Technology was hit hard by the crisis and was, therefore, unable to provide foreseen donations due to a lack of investment profits. As a result, the Austrian Science Fund (FWF) and some other beneficiaries have been heavily affected and haven’t been able to allocate funds to new research project funding as originally planned. This last point indicates the current relevance of governance issues.

Table 8: Main barriers to R&D investments and respective policy opportunities and risks

Barriers to R&D investment	Opportunities and Risks generated by the policy mix
Funding structures	<p>The funding of R&D in Austria is characterised by high shares of the private business sector with a significant share coming from abroad (mainly foreign firms with Austrian subsidiaries). Thus a high impact of the economic and financial crisis on the level of R&D expenditures is to be expected. While private funds from enterprises coming from abroad may be reduced due to squeezed cash-flows at the moment, measures to make public funds more sustainable – such as the funds from the National Foundation for Research and Technology Development – have not produced the intended effects.</p> <p>Nevertheless, because a broad consensus exists on the need to develop R&D and innovation, opportunities to achieve targets in these areas still exist. Currently, a process of strategic reformulation is under way. The detailed analysis of the public technology policy portfolio (systems evaluation) as well as a new strategic plan carried out by the Austrian Council for Research and Technological Development will be important inputs for this process.</p>
Human capital	<p>Amongst the most pressing challenges for the Austrian R&D system in its quest to become a ‘frontrunner’ in R&D is the shortage of S&T graduates. The Austrian tertiary education system, which has undergone significant institutional change, requires additional reform and clear strategic positioning to supply more young academics in S&T fields.</p> <p>Recent initiatives to make children aware of science and technology and actions taken to ease the flow of researchers, whether by opening up the labour market or by supporting mobility, suggest positive development and a serious effort to solve the problems. Furthermore, the attraction of women into these fields is a part of these efforts.</p>

Barriers to R&D investment	Opportunities and Risks generated by the policy mix
Governance	The governance system, despite promising institutional changes during the last decade, still needs refinement to function most efficiently and effectively when complex organisations, insufficient coordination and interaction between ministries and the separation of responsibilities between ministries and agencies are involved. In addition, advisory structures are not used sufficiently. Furthermore, the coherence and efficiency of the R&D policy portfolio (the 'programme jungle') needs attention, if the target of 'more than 3% by 2020' is to be approached through the efficient use of resources. The 'Research Dialogue' and system evaluation are important preparatory steps to developing a new strategy. This should involve clear perspectives about strategically relevant issues and their treatment.

4 Contributions of national policies to the European Research Area

The ERAWATCH country reports 2008 provided a succinct and concise analysis of the ERA dimension in the national R&D system of each country. This Chapter develops this analysis further for Austria and provides a thorough discussion of the national contributions to the realisation of the European Research Area (ERA). An important background policy document for the definition of ERA policies is the Green paper on ERA,⁷ which comprises six policy dimensions (the so-called six pillars of ERA). This chapter, which is based on the Green Paper and complements other ongoing studies and activities, investigates the primary national policy activities that contribute to the following four dimensions/pillars of ERA:

- Developing a European labour market of researchers by facilitating mobility and promoting researcher careers
- Building world-class infrastructures accessible to research teams from across Europe and the world
- Modernising research organisations, in particular universities, with the aim to promote scientific excellence and effective knowledge sharing
- Opening up and co-ordination of national research programmes

In the ERA dimension, the *wider context of internationalisation of R&D policies* is also an issue related to all ERA policy pillars and is typically present in the dynamics of national ERA-relevant policies in many countries.

4.1 Towards a European labour market for researchers

There are indications that providing qualified human resources for R&D is one of the key challenges faced in Austria: the 9.8% share of graduates in science and technology is lower than the EU average of 12.9%. This is particularly so for females at 4.6% vs. 8.2% (Eurostat 2008). Moreover, education expenditures are below the

⁷ Commission of the European Communities: Green paper: The European Research Area: New perspectives. Brussels 4.4.2007, COM(2007) 161final (see http://ec.europa.eu/research/era/pdf/era_gp_final_en.pdf).

OECD average, especially for tertiary education. To overcome these deficiencies, Austria could try harder to inspire both schoolchildren and women to pursue research careers (see 3.3) and generate higher participation rates (see 4.1.2) in research. Immigrants present another possible supply source.

Elaborating on the last option, the attractiveness of Austria as a location for foreign researchers should receive more critical attention. There are some weak signs that the attractiveness has increased in recent years. For instance, successful research teams exist at several renowned research institutions (e.g. the Institute of Molecular Biotechnology (IMBA) of the Academy of Sciences in the field of biomedical research, or the newly founded Max Perutz Laboratories (MFPL), formed out of a merger of three institutes of the Medicine University of Vienna).

According to a study on the remuneration of scientists in Europe (European Commission 2007), Austria has the highest remuneration level in Europe. This nearly equals the level of the US (considering the cost of living). However, despite this high average, there are significant variations in the employment status of researchers in the Austrian science system⁸. While some researchers are given civil servant status (e.g. professors at universities), with relatively high levels of income (particularly due to their age), most young scientists and researchers in non-university organisations receive less favourable remuneration. Moreover, these are often stuck in precarious contracting situations with constrained career perspectives.

It is possible to observe an evolution of research infrastructures in Austria towards a model that fosters international interaction and migration. Some policy measures, especially the withdrawal of legal restrictions on researchers working in Austria - even from outside the EU, facilitate this process of increasing internationalisation. To receive a permanent residence permit, it is now only necessary to have a contract with an Austrian university or research institution. This, however, only holds for researchers. Others have been less generously treated (something that often affects researchers' spouses). This could be solved by simplifying administrative procedures and by removing other obstacles to the immigration of researchers (OECD 2007). Again, initial measures have already been implemented, and family members of researchers can now acquire both residence and working permits

4.1.1 Policies for opening up the national labour market for researchers

The pressing challenge of human capital shortages requires solutions from Austrian R&D policy. Initial observations indicate a double strategy is being followed. On the one hand, there are efforts being made to increase the number of young academics and to attract foreign students. On the other hand, actions have been taken to attract more established researchers by creating a supportive R&D milieu. For both strategies to succeed, the opening up of labour markets and unlimited mobility are necessary ingredients.

To accomplish this, Austrian R&D policy has opened the labour market up, increased the opportunities for international researchers and students to participate in several R&D programmes and doctoral programmes, and has provided both grants and an 'information offensive' to foster mobility in and out of Austria.

In order to attract doctoral students from abroad, doctoral education is undergoing reform. In the past, doctoral education in Austria has been dominated by individual

⁸ This is also the case for other European countries.

monitoring, rather than by systemic and structured training. Accordingly, the Austrian Science Fund (FWF) has provided funding for graduate schools for more than a decade. The University Act 2002 provides a new legal basis for the reform of doctoral education in Austria. This shift is also made in response to the Bologna Process. The Federal Ministry of Science and Research, together with the Austrian Science Fund, is planning to launch a new funding scheme for doctoral schools in order to improve the qualifications of young scientists.

With regard to the mobility of researchers, Austria was among the first European Countries to adopt both the EC directive concerning researchers' visas and to install a Mobility Portal. Moreover, Austria is actively supporting the Bologna process. A national contact point has been established in the Ministry for Science and Research (BMWF), which is responsible for universities and tertiary education. A wide range of measures aim to provide support for the international mobility of researchers, aiding incoming as well as outgoing persons. In recent years, special emphasis has been placed on attracting expatriate researchers back to Austria. On the other hand, because highly qualified researchers are highly mobile, attractiveness of place does not depend primarily on measures calling for mobility. Rather, the existence of internationally visible and attractive research institutions becomes essential; for instance, in some Austrian K-plus Centres of Competence, the share of international researchers has reached more than 30% (Schibany et al 2005).

Alongside these programmes, the installation of OST (Office of Science and Technology) at the embassy of Austria in Washington D.C. and ASCINA (Austrian scientists and scholars in North America) will facilitate interactions across the Atlantic and support the mobility of researchers.

A few information instruments have been implemented thus far. These include the Austrian Researcher's Mobility Portal and the database, <http://www.grants.at>. Another is the programme Brainpower Austria, which aims to present career perspectives in the field of research and development in Austria, to establish ties between researchers abroad and the Austrian scientific community, and to provide information about innovation in Austria.

Different kinds of grants, managed by a variety of organisations, support increased mobility (e.g. grants from Forschung Austria for non-university researchers; MOEL plus providing 3-6 month scholarships for Austrian researchers in CEE and SEE countries; AAS-CEE (Austrian Academy of Sciences Central and Eastern European Fellowship); APART and Max Kade US grants from the Austrian Academy of Sciences; Fulbright grants from the Fulbright Commission; Schrödinger and Lise Meitner grants managed by the FWF (Austrian Science Fund) and Marie Curie grants from EU).

Overall, both the mobility of researchers and support for internationalisation through the opening up of the labour market for researchers are well developed in Austria.

Researcher-friendly social security and supplementary pension systems, health insurance, and scientific visas for third countries

Some issues influencing scientific careers in Austria require attention beyond the scope of R&D policies, e.g. immigration policies and regulations for right of residence, policies for equal opportunities, and education policy. All of these issues have been addressed recently. For instance, the introduction of a general permission for unlimited residence for foreign researchers, irrespective of their home country, was necessary. In addition, there are no longer legal restrictions for a researcher

coming from outside the EU to work in Austria, as long as a contract with an Austrian university or research institution exists (Federal Ministry of the Interior, 2008).

There is, however, no special treatment of foreign researchers in terms of social security, pensions or health insurance. All of this is included in a general insurance programme in Austria. Eligibility for social security benefits from insurance is dependent on the employment contract. Length of stay and the type of contract held determine the type of social security applied in each case. All kinds of information relating to these matters can be found via EUROAXESS.

To sum things up, the Austrian system has fully opened itself up to foreign researchers concerning residence and work permits, but does not distinguish between researchers and other employees when it comes to social security.

4.1.2 Policies enhancing the attractiveness of research careers in Europe

As mentioned above, there are weak signs that Austria has become more attractive to foreign researchers as a destination. This is at least partly affected by R&D policies. Nevertheless, supply shortages of researchers, especially in science and engineering, may also be caused by the limited attractiveness of research careers in Austria. One of these limitations is definitely the lack of long-term development perspectives for young researchers at universities. This may change in near future, however, when a new collective agreement for researchers ('Kollektivvertrag') will be signed.

Uptake of the Charter of Researchers

Austria was among the first European Countries to both adopt the EC directive on researchers' visas and install a Researchers' Mobility Portal. About 14 Research organisations have already signed the charter for researchers (EUROAXES). The portal serves as a pragmatic and useful tool for researchers to access all relevant information regarding research careers in Europe. A more in-depth assessment cannot be made, however, as there are no available evaluations or reviews of these measures to date.

Remuneration policies

As mentioned earlier, a study on the remuneration of scientists (European Commission 2007) lists Austria as offering the highest remuneration level in Europe, nearly equalling levels in the US (considering the cost of living). However, even though the migration report (Österreichischer Integrationsfonds 2009) notes that there is a high percentage of academics amongst immigrants to Austria, especially from EU member states and the US, conclusions concerning the magnetic attraction of high overall remuneration levels cannot be drawn. Detailed studies and figures on the international movements of researchers are not available.

A closer look at the remuneration situation in universities offers some insights. The development of the Austrian higher education sector has generated different kinds of employment. In the 'old' regime, most academic staff at universities eventually received, following temporary employment contracts and a kind of tenure status, the status of civil servants with life-long employment ('Beamtenstatus'). Others received public contracts based on law ('Vertragsbedienstete'). Both were paid in accordance with the law on civil service ('Gehaltsgesetz'), i.e. they received wages based upon a pre-defined scheme and not upon individual merits.

Following the University Act in 2002 the 'civil service route' was no longer open to new academics (beginning in 2004). Currently contracts are based on 'Vertragsbedienstete', which do not foresee a tenure track. Universities are also free to contract researchers based on private law. As long as there is no collective agreement for researchers, the conditions of 'Vertragsbedienstete' are also applicable to the contracts based on private law. As a result, researchers are often confronted with somewhat perilous employment prospects with only limited long-term perspectives. The inauguration of a new agreement is still pending because of a disagreement about additional costs arising from it (BMWF 2008a).

Ultimately, the unsolved remuneration situation at universities is a real constraint to career perspectives and, as a consequence, may limit the attractiveness of Austria as an R&D destination – at least within universities.

Promotion of women

Issues pertaining to female researchers are particularly challenging. Although more than half of all university graduates and nearly 42% of all PhDs are women, their level of participation in research careers is among the lowest in the EU. This is especially the case in the business sector, where only 10% of all researchers are female in Austria (the EU 25 average is 18%). It is also the case in terms of representation in leading positions. Only 9.5% of all university professors are women compared to an EU 25 average of 15.3%. This 'leaky pipeline' phenomenon is blatantly visible in Austria. According to the 'She Figures 2006', Austria has one of the five thickest 'glass ceilings' in the EU (EC 2006), although a look into other economic or societal sectors reveals that this is not limited to careers in R&D.

A number of measures have been launched under the umbrella of an inter-ministerial action programme 'fforte' ('Women in Research and Technology'), but it is too early to evaluate the results. Given the modest budget for these measures and the cross-cutting nature of the problem, it is unlikely that the condition for women in research will improve significantly unless Gender Mainstreaming becomes standard in all R&D policy measures – and beyond ([Tiefenthaler B., 2009](#)).

The most recent initiative under the umbrella of 'fforte' is the 'Laura Bassi Centres of Expertise'. This initiative programme, the only one of its kind in Europe, is committed to equal opportunities and establishing a new research culture. The six planned 'Laura Bassi Centres of Expertise' will be located at the interface between science and industry. At each centre, the position of research director will be held by a woman, and women should also be adequately represented in the composition of the research team.

4.2 Governing research infrastructures

With regard to the ESFRI roadmap for research infrastructures (ESFRI 2006), the Ministry for Science and Research is currently developing a corresponding national strategy for (1) the safeguarding and development of the Austrian research infrastructure within the ERA context and (2) Austrian membership in international infrastructures. The strategy is expected to be published in early 2009. Actions already expected to be part of it include the new ESO membership and the planned membership in the Facility for Antiproton and Ion Research (FAIR).

Austria invests approximately 6% of all institutional funding into several internationally shared infrastructures and initiatives. This amounted to €56.2m in

2003 (Schibany et al 2005). The largest single contributions go to the European Space Agency (ESA) and the European Organisation for Nuclear Research (CERN). Moreover, Austria is a member of (EUMETSAT), the European Molecular Biology Conference (EMBC), the European Synchrotron Radiation Facility (ESRF), the Synchrotron Light Laboratory (ELETTRA), and other international organisations. After decades of indecision, the Federal Minister for Science and Research has finally in the spring of 2008 resolved that Austria will join the European Southern Observatory (ESO). The main rationale for these international memberships is to provide Austrian researchers with access to relevant infrastructures. Considerations of foreign affairs and political cohesion also play an important role, especially in the cases of CERN and ESA. The Austrian ESA membership is governed mainly as an issue of R&D policy and it is accompanied by a corresponding R&D funding programme at national level. That said, a considerable share of the ESA activities actually go into procurement rather than R&D; an aspect has not been adequately considered in the management of the Austrian ESA membership (Pfirrmann et al 2008). To date, Austrian membership in the various international initiatives has been managed by different ministries and agencies, with little exchange and mutual learning at a policy level.

An Austrian initiative that deserves to be mentioned is AUSTRON, which is both an ion therapy centre against cancer and a centre of research in this area, built up in Wr. Neustadt. It is being implemented in collaboration with CERN.

The legal basis of another institute, the I.S.T. Austria (Institute of Science and Technology Austria), was established in May 2006. The idea was proposed in 2002 by eminent Austrian researchers. Fuelled by a concern that the new institute would reduce resources available for (and needed by) the public universities, and by a fear that (politicians') expectations regarding I.S.T. Austria's ability to evolve into an institution of outstanding scientific merit were unrealistic in terms of scope, costs and timing, a controversial debate emerged around its planning and decision making. The Federation of Austrian Industry played a facilitating role during the preparation phase and it has also announced unconditional funding for the project. This is a remarkable development, especially because industrial sponsoring of science has no tradition in Austria, unlike in other countries such as the United States. To date, the management structures of I.S.T. Austria are in place (with strong industrial participation) and a search for researchers has begun.

4.3 Research organisations

As mentioned in chapter 2, the governance of Austrian universities has undergone a drastic change with the University Act 2002. Universities, for instance, were granted autonomy as legal persons under public law and were given both a new organisational structure and full decision-making power and responsibility. All universities have been required to work out strategies for their long-term development ('Entwicklungsplan'), which have in the meantime served as important references in competition for funding (e.g. for research infrastructure or temporary professorships). Performance contracts between each university and the Ministry of Science and Research were signed in 2007. These contracts define the services that are to be provided by each university. These include: teaching, research, mobility of researchers and students, co-operation, strategy, specialisation etc. Institutional funding is now provided through three-year global budgets; 80% are allocated as a basic budget and 20% depend on the achievement of performance indicators

('formula-based budget'). The recent CREST evaluation stated that these targets should become more ambitious in the future or excellence in the system will be endangered (CREST 2008).

Finally, and of particular importance in this context, evaluations of research and teaching have become compulsory, and intellectual capital reports will be used as a main tool for the monitoring of each university's performance and the achievement of their goals. This new mode of performance-oriented institutional funding can be considered an important step towards securing quality of knowledge production in Austrian universities. The first performance contracts have been signed for the years 2007-09. It is too early, therefore, to assess the effects of this new governance mechanism, and all parties – the ministry in charge and the universities alike – will need a good deal of patience and endurance until they will have grown into their new roles and responsibilities.

At present, the 21 public universities are the only research institutions benefiting from financial security and autonomy (and struggling with the burdens of transformation) based on the (aforementioned) three-year performance contracts. Yet the Ministry of Science and Research has already taken initial steps towards negotiating comparable agreements with the Austrian Academy of Sciences. This academy runs more than 60 research units with over 1.000 scientists in different locations in Austria. The Academy has grown substantially in recent years and an ongoing reform brings the organisational and management structures in line with the requirements of a modern research institution, especially in terms of decision making, quality management and internationalisation. Meanwhile, the Austrian Research Centres, the largest non-university research centre jointly owned by the Ministry of Transport, Innovation and Technology and a consortium of companies, has not yet taken this important step – and this is the case for almost all other research organisations receiving public institutional funding, which so far exist largely without systematic and transparent mechanisms for quality control.

Overall, there is a clear trend towards multiannual performance contracts for institutional funding aimed at higher degrees of quality and excellence. Still, the question remains how to embed those performance contracts in a coherent long term strategy for the university research system as a whole.

4.4 Opening up of national research programmes

The internationalisation of Austrian R&D activities is visible not only in terms of increased participation in European projects, but also in terms of the opening up of national funding instruments to international applicants. Both elements complement each other, especially when international research collaborations are well-defined. It makes sense to open up national research programmes to facilitate an international climate that will benefit all. It cannot be forgotten that Austrian researchers participate readily in European projects.

The level of participation of Austrian R&D actors in ERA-NET-projects is a quite high. However, the extent to which programmes are open to foreign partners is generally decided at the programme level for every project. In other words, there is no common strategy to deal with this situation. Austrian organisations were also successful as participants in joint initiatives at European level. A gain of €4m from national sources and €2.2m from FP7 through ARTEMIS is worth mentioning (2008). ENIAC has

become another site of participation, among others. In addition, Austrian researchers have quite successfully participated in framework programmes.

With growing cooperation with internationally-linked and networking researchers, the integration of foreign researchers or organisations in Austrian projects (nationally funded) is also increasing. Projects in many funding programmes (e.g. thematic programmes) are open to foreign participants, but these tend to be ineligible for funding. COMET, a large programme that funds science-industry co-operation in 'centres of competence', is one exception. Here, international partners are actively involved. In fact, their involvement is compulsory if the highest level of public funding is desired.

In addition, the CDG laboratories are open to international partners, whether this involves cooperation between an international member company, with an Austrian research organisation or between an international research organisation and an Austrian company.

One of the most advanced examples of national research programmes opening up to international participation is the DACH initiative. It involves basic research projects funded by Austrian Science fund (FWF). A cooperation agreement between Science fund (FWF) from Austria, SNF from Swiss and DFG from Germany allows the transfer of research grants to other countries when the decision is made to locate activity outside the grant-giving country. This 'money follows research' approach is applicable to individual research projects, to special research programmes ('Spezialforschungsbereich') and to national research networks ('Nationale Forschungsnetzwerke').

Despite numerous initiatives aimed at opening up of national research programmes and to increased cooperation at an international level, most R&D policy activities are still geared towards national plans. Creating joint programming across borders is simply not the first priority at this point in time. Most policy instruments are designed for the Austrian context, and only occasionally take into account a European perspective. On the contrary, the situation is guided through a 'bottom-up' process based on demands articulated by the research-performing actors.

4.5 National ERA-related policies - a summary

Even though Austrian policy makers have fully adopted the Lisbon and Barcelona objectives for Austrian R&D policy, ERA continues to have a minor role only in the national research policy debate. The government's programme mentions ERA only briefly as 'a frame of reference'. Government support is oriented towards gaining the maximum benefit for Austrian R&D performers from European initiatives. This means getting the most out of European research programmes and Austrian participation in JTI, EIT and joint programming (Austrian Government 2008). ERA-related issues are discussed primarily by policy 'insiders', i.e. by experts located within ministries and agencies rather than by the members of the R&D community itself.

At regional level, the Structural Funds have significantly shaped R&D and, especially, the innovation-oriented activities of regional policy makers. However, despite their similar content, federal R&D policies, ERA-related activities, and the SF are rarely treated as mutually related activities (Ohler 2006).

In recent years, in reaction to shortages in human capital, special emphasis has been given to opening up the national labour market for researchers (new immigration act). In addition, steps have been taken to open up national research programmes (e.g.

COMET, CDG; DACH agreement). Generally speaking, a process aimed at facilitating international cooperation, and this includes the work of ERA, is observable.

Preparation of a national action plan to expand career opportunities, enhance the mobility of researchers by the end of 2009 (“Excellence Initiative”) and remove the barriers faced by excellent students and researchers from third countries is now well underway. The opening up of the labour market, which took effect on 1 January 2008, represents the initial step of this plan.

Table 9: Importance of the ERA pillars in the ERA policy mix and key characteristics

	Short assessment of its importance in the ERA policy mix	Key characteristics of policies
Labour market for researchers	<ul style="list-style-type: none"> • Due to shortages in the supply of human capital, the Austrian government decided to open the labour market up to international researchers from all countries. • The mobility of researchers and incentives for women to participate in science are increasingly being addressed. 	<ul style="list-style-type: none"> • Opening of labour market • Supporting women • Support of mobility
Governance of research infrastructures	<ul style="list-style-type: none"> • Primarily involves participation in international organisations, but large Austrian infrastructure initiatives (AUSTRON) and top research institutions (ISTA) also exist. 	<ul style="list-style-type: none"> • Participation in international organisations • Installation of institutes/infrastructure
Autonomy of research institutions	<ul style="list-style-type: none"> • After the University Act 2002, autonomy was given to universities. Now the other public research organisations (e.g. Academy of Sciences, ARC etc.) going to get performance contracts. 	<ul style="list-style-type: none"> • Extension of performance-oriented institutional funding to non-university PROs • Performance agreements for institutional funds
Opening up of national research programmes	<ul style="list-style-type: none"> • Ongoing initiatives to open up of national research programmes are to be expected. 	<ul style="list-style-type: none"> • Ongoing

5 Conclusions and open questions

5.1 Policy mix towards national R&D investment goals

Despite a development path that involves almost reaching the Lisbon goals, Austrian R&D investments are still very dependent on budget and business cycles. In the end, intended increases in R&D funding may be threatened by the financial crisis, especially private R&D investments, which are mostly dependent on foreign funding. Public funding may also be limited; some potential problems, at least, are observable due to actual budgeting.

The most important factor in the extension of R&D activities in Austria is the supply of qualified human capital. Taking demographic evolution and the low share of participation in tertiary education into account, R&D investments may be hindered.

To cope with this, recent measures offer support for increasing awareness of science in the early stages of education, facilitating women's careers in science and creating incentives to attract foreign researchers.

In terms of instruments used to date, the Austrian system addresses all routes. In terms of budget allocations, emphasis is given to routes 2, 5 and 6. The other routes, especially 1 and 3, are addressed via a bundle of instruments, but their effectiveness is compromised by factors such as low levels of entrepreneurship and a high degree of risk aversion in the general milieu in Austria. Increasing the amounts of money allocated to these routes is thus secondary to the need to transform particular attitudes. The general approach for Route 4 is to enhance the attractiveness of Austria as an R&D location through generic and endogenous measures, i.e. providing human capital equipped with the relevant skills, a high quality public science sector with strong ties (and incentives) to engage in co-operation with the private business sector and a supportive R&D funding system through indirect (tax related) measures as well as direct R&D funding. Initiatives like IMP (Institute of Molecular Pathology), which is sponsored by Boehringer Ingelheim and national and international research grants, and the development of ISTA will contribute to this route.

In conclusion, the policy mix is well developed and has played an influential role during the 'catch-up' phase of the Austrian research and innovation system over the last decade. Reform may be needed, however, if the new objective of becoming a 'top-performer' in Europe is to be realised.

Today, Austria is well equipped with a variety of different instruments addressing all routes, which may influence and foster R&D activities. The general consensus in Austria leans now towards improving the interplay of these various measures and maximizing the overall efficiency of the system of supporting measures (i.e. by avoiding parallel structures and unnecessary redundancy, enhancing the co-operation between different policy stakeholders and actors etc). The systems evaluation of the Austrian technology policy system is a fine example of this approach towards fine-tuning the policy system and continuous policy learning.

5.2 ERA-related policies

The Austrian Reform Programme 2008-2013 (Austrian Government 2008) characterises the ERA as a vital frame of reference. The goal is to move university institutes and other public research organisations, as well as companies that are based in Austria, into Europe's top league. In order to do this, initiatives will be formed that optimise participation in European research programmes and EIT, joint technology initiatives and joint programming activities.

Concerning their European orientation, Austrian researchers have performed successfully and there are high participation rates in European initiatives (Rietschel et al 2009). Nevertheless, this is not so much driven by notions of participating in a 'larger research area' as it is rooted in interpreting funds from the EU as additional opportunities.

In conclusion, Austria is a participant in many ERA-Nets and the opening up of national programmes to foreign researchers is an ongoing process. The importance of contributing to ERA is clear, but it is also clear that meeting national interests and challenges continue to be at the core of Austrian R&D policy.

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List of Abbreviations

ACRI	Austrian Cooperative Research Institutes (Vereinigung der kooperativen Forschungsinstitute)
ARC	Austrian Research Centers
Austrian Council for RTD	Austrian Council for Research and Technology Development
AWS	Austria Wirtschaftsservice GmbH
BMF	Federal Ministry of Finance
BMWF	Federal Ministry of Science and Research
BMWFJ	Federal Ministry of Economy, Family and Youth
BMVIT	Federal Ministry of Transport, Innovation and Technology
CDG	Christian Doppler Society
CD-Labs	Christian-Doppler-Laboratories
ERP Fond	European Recovery Programme Fund
FFG	Austrian Research Promotion Agency
FP	European Framework Programme for Research and Technology Development
FWF	Austrian Science Fund
HEI	Higher education institutions
HES	Higher education sector
IHS	Institute for Advanced Studies
KLIEN	Austrian Climate and Energy Fund
NRP	National Reform Programme
ÖNB	Austrian National Bank
PRO	Public Research Organisations
R&D	Research and development
SF	Structural Funds
S&T	Science and technology
WIFO	Austrian Institute of Economic Research

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**Joint Research Centre – Institute for Prospective Technological Studies
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Title: ERAWATCH Country Reports 2009: Analysis of policy mixes to foster R&D investment and to contribute to the ERA: Austria

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Abstract

The main objective of the ERAWATCH Policy Mix Country reports 2009 is to characterise and assess in a structured manner the evolution of the national policy mixes in the perspective of the Lisbon goals, with a particular focus on the national R&D investments targets and on the realisation and better governance of the European Research Area. The reports were produced for all EU Member State and six Associated States to support the mutual learning process and the monitoring of Member and Associated States' efforts by DG-RTD in the context of the Lisbon Strategy and the European Research Area. The country reports 2009 build and extend on the analysis provided by analytical country reports 2008 and on a synthesis of information from the ERAWATCH Research Inventory and other important available information sources.

This report encompasses an analysis of the research system and policies in Austria.

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