A CURRENT DEVELOPMENTS AND CHALLENGES

A 1 PRIORITIES AND RECOMMENDATIONS FOR RESEARCH AND INNOVATION POLICIES OF THE NEXT LEGISLATIVE PERIOD

With the federal elections approaching in autumn 2013, the Expert Commission comments on major developments of recent years and identifies priority fields of action that should be addressed by the political stakeholders in the next legislative period.

Taking stock: major positive developments – high international reputation

With regard to its R&I policies, Germany has made important progress, which has been highly acclaimed internationally.

- A significant increase in national R&D intensity has been achieved in recent years, following a period of stagnation that started in 1991. With a national R&D intensity of 2.9 percent in 2011, Germany managed to close in on the United States, while almost reaching the Federal Government's three-percent target. Other indicators also suggest that Germany has improved its position considerably – particularly with regard to the export of R&D-intensive goods.
- Based on new funding instruments (especially those of the Leading-Edge Cluster and the Excellence Initiative), competition between German regions and between German tertiary education institutions has been strengthened. Available funding for non-university research has been increased, and the German Research Foundation's research support funds have also been increased.
- Several other promising approaches have been implemented, among them the "Research Campus – Public-Private Partnership for Innovation" funding scheme. The Expert Commission attaches great importance to this initiative in particular as the projects supported by this public-private partnership could increasingly tap new impulses from research for economic purposes.
- At the international level, the Federal Government's realignment of R&I policies towards a mission orientation, and strengthened coordination of

BOX 01

Priorities for R&I policies of the next legislative period

- setting ambitious R&D and educational budget targets for the year 2020;
- enabling participation of the Federal Government in institutional financing of university research and education;
- applying a uniform financing key to non-university research institutions;
- expanding the Freedom of Science Act to tertiary education institutions;
- developing funding concepts for research following expiry of Higher Education Pact, Pact for Research and Innovation and Excellence Initiative;
- supporting innovation financing via R&D tax credits for companies;
- improving framework conditions for venture capital financing;
- further modernising the patent and copyright systems;
- developing and implementing a systematic approach for R&I policy evaluation;
- focussing the High-Tech Strategy 2020;
- improving coordination of climate, energy and innovation policies;
- facilitating immigration of highly qualified foreigners;
- improving utilisation of the potential of women in business and research.

the key players within the High-Tech Strategy's research union, is regarded as a sound governance model for the R&I system.

Only little progress in other key areas

The above mentioned achievements should not give great occasion to celebrate, as major political issues have not been adequately addressed, and policies of the current legislative period have failed in key areas. Here, the most important areas include:

- Venture capital financing has not yet experienced a breakthrough in Germany. Even if it is the case that Germany's political stakeholders recognise the importance of the topic, the implementation of changes in the framework conditions keeps failing due to resistance within some of the federal ministries. In this area, a primacy of politics seems to be lacking altogether.
- The introduction of R&D tax credits, which had been announced in the coalition agreement, has not been implemented. It seems that the political will for implementing this measure is lacking.
- The correction of the Federalism Reform I, an issue now deemed as necessary by almost all of Germany's political parties, is still pending. General agreement has been achieved at least with regard to the Federal Government's support of tertiary education institutions. Yet it seems that the reform and its design have been turned into a political football by the parties.
- The reform of the German education system is progressing with difficulty.[1] The most recent results (December 2012) on the situation in primary schools[2] confirmed that Germany has only an upper middle ranking. In the long run, such a position is dangerous as it will hinder the further development of Germany as an innovation location.
- To date, major weaknesses in key areas of cutting-edge technology have not been addressed convincingly, among them information and communication technology (ICT) and life sciences.

Priorities and recommendations for the next legislative period: measures for the long-term development of R&I at national and EU levels

In spite of considerable fiscal challenges, the Federal Government must continue to pursue its ambitious targets in education, research and innovation and ensure that these targets are clearly defined. The Federal Government has to be re-enabled to participate in the institutional funding of tertiary education institutions and schools.

- Germany will be faced with major fiscal challenges with the introduction of the debt ceiling in 2016 and the expiry of the Solidarity Pact in 2019. Important R&I institutions, such as tertiary education institutions and non-university research institutions, will be affected by the expiry of the Excellence Initiative (post 2017), the Joint Initiative for Research and Innovation, and the Higher Education Pact 2020 (post 2015). The Eurozone crisis is likely to further aggravate existing budgetary constraints. Against this background, it is essential to make a long-term commitment to the priority areas of education, research and innovation. The Federal Government aims to achieve the three-percent target for national R&D expenditure and the seven-percent target for national education expenditure by 2015. If Germany wants to be on par with the leading innovation nations, it will have to commit to a more ambitious target[3] and invest 3.5 percent of its GDP in R&D and 8 percent of its GDP in education. In the years to come, public expenditure will have to be at least stable at this level.
- Also at the EU level, greater priority must be attached to research and innovation. The downsizing of agricultural subsidies in favour of investment in Europe's future is progressing very slowly and sometimes not at all. The resources available for R&D will have to be used more efficiently; while the budget for the EU Framework Programme for Research 2014 – 2020 may not be subjected to cuts.[4] Moreover, industry participation in projects of the framework programme will have to be increased. EU research policy should be committed to the goal of "smart specialisation". The Expert Commission would like to reiterate its proposal to launch an Excellence Initiative for consortia of European tertiary education institutions, which would receive administrative

support from the European Research Council (ERC).[5] Financial support of the ERC must be secured and increased.
– Article 91b of the Basic Law has to be amended to enable the Federal Government to financially support the Länder governments with regard to research.[6]
– Education can be considered as the Achilles' heel of Germany's R&I system; even more so than research. The Expert Commission expressly welcomes the federal states' competition in the field of education. Yet it must be avoided that differences in educational outcomes – due partially to financial constraints – are cemented in the long term. The Federal Government should be re-enabled to participate in the financing of education measures and should push for the comparability of educational outcomes in particular.

Science system

Competition must be further strengthened in the entire science system, and the system has to become more flexible.

– The Expert Commission reiterates its proposal according to which federal and *Länder* governments should support non-university research institutions on the basis of a uniform financing key, apportioned at an approximate 70:30 ratio.[7] To strengthen future research of tertiary education institutions in international competition and to avoid non-university research institutions being disadvantaged, the Expert Commission recommends gradually expanding the provisions of the Freedom of Science Act to tertiary education institutions, to be implemented in close collaboration with the federal states.
– There is an urgent need to develop policies to support tertiary education institutions after the expiry of the Excellence Initiative. In this regard, Germany must continue to strive to establish select universities at the international forefront of research and scientific training.
– Federal and *Länder* governments must continue to pave the way for a vertical and horizontal differentiation of the tertiary education sector, e.g. by allowing for experimental clauses and maximum autonomy of institutions, while also providing financial incentives for profile-building activities.[8]
– The transfer of knowledge and findings must be strengthened in order to make research contributions available to the private sector and provide impulses for the progress of the science system.[9] Knowledge transfer is a topic that is met with only little interest and support on the part of university managements. Here, it is essential to achieve a culture shift and overcome the "ivory tower" mentality that still prevails at some of Germany's tertiary education instututions.
– Patent exploitation at non-university research institutions and tertiary education institutions has to be improved significantly. The existing systems have to be made more flexible so as to cater for the needs of researchers at the individual institutions.[10]
– Framework conditions for foundation financing and foundation law in Germany have to be developed further so as to strengthen private financing within the science system. The Expert Commission thus welcomes the current slackening of the endowment ban, which could facilitate the creation of endowed chairs at tertiary education institutions.[11]

Research and innovation in the private sector

Germany's economy is powerful and innovative. Nevertheless, there is considerable need for enhancing the development of R&I in the private sector.

– The introduction of R&D tax credits must be initiated at the very start of the new legislative period. R&D tax credits are the appropriate tool for supporting R&D activities of SMEs in particular. When introducing R&D tax credits, the Federal Government's project funding should be systematically aimed at specific thematic fields. These two instruments are not substitutes, but instead complement each other.
– Germany widely supports the founding of new enterprises through public funding. Special attention should now be placed on enhancing private investment incentives so as to bridge the gap between initial public start-up support and the consistent commercial implementation of new forms of value creation. Here, the public sector should not take on the role of financier, but instead provide smart, future-oriented framework conditions for venture capital financing. Among other things,

this could be achieved by introducing a less restrictive tax treatment of loss carryforwards and a legally clear-cut classification of venture capital firms' activities.[12]

Tax competition and protective rights to promote R&I

The Federal Government can heavily influence Germany's framework conditions for innovation by designing patent and trademark protection systems and developing copyright law.

- The Federal Government should act upon avoiding and limiting opportunistic tax competition – such as the setting up of "patent box systems" – at EU level and beyond. Germany should fully support international efforts (e.g. by the OECD) to regulate the valuation of intangible assets and transfer prices.[13]
- The introduction of the unitary EU patent is a success for the common internal market.[14] Yet, in the long run, a patent system will generate innovation incentives only if it carefully assesses submitted applications and if it sets high quality standards for inventions. The development of the patent system thus continues to be a key task of R&I policy for the years to come.
- The digitalisation of the economy and society is progressing continuously. Copyright law policies should be aimed at supporting innovation and not at preserving existing structures. Efforts to provide the printed media with inventory protection do not sufficiently take into account technological progress and may indeed hinder innovation activities. What is needed is a reasonable balance between facilitating the availability of scientific information and protecting copyright.[15]

R&I policy processes and instruments

In the upcoming legislative period, R&I policy instruments will have to be systematically evaluated and refined.

- Scientifically sound R&I policy measure evaluations[16] and the provision of data for research will have to be advanced further. Evaluations should be regarded as an opportunity for gaining new insights and for improving existing funding instruments.
- The Expert Commission recommends conducting a system evaluation of all non-university research in Germany at an early stage of the new legislative period. Furthermore, the recommendations by the German Council of Science and Humanities on developing federal department research *(Bundesressortforschung)* should also be implemented.[17]
- The High-Tech Strategy 2020 has to be further developed. While the overall rationale is well targeted, there are still several areas that have not been developed in detail yet. The Science and Industry Research Union is an important committee for coordinating R&I policies at the interface of politics, science and business. All of the relevant stakeholders should be represented in this committee. Moreover, the integration of SMEs and new enterprises in the development of R&I policies should be further promoted. Attempts towards integrating citizens into the process of R&I policy-making – such as the "citizens dialogue" hosted by the Federal Ministry of Education and Research (BMBF) – have been encouraging and should be systematically pursued.
- Germany's strong position in the manufacture of innovative products has to be further strengthened – without losing sight of the future value creation potential of innovative services. R&I policy has to be designed in a sustainable way and be able to facilitate structural change; R&I policies should not try to protect the status quo of established companies or industries.
- In recent years, Germany's climate, energy and innovation policies have frequently overlapped, and the implementation of the Energy Transition has been progressing slowly. The promotion of renewable energy will have to be fundamentally redesigned. Furthermore, the Expert Commission recommends closer coordination of the responsible federal ministries as well as the bundling of competences.[18]
- The use of digital technologies is progressing continuously – also in Germany. Yet, based on international standards, Germany still suffers comparative disadvantages in the field of production and in the use of information and communication technology (ICT). The Energy Transition and public support for electromobility could be used beneficially to soften Germany's disadvantages, such as those in the field of ICT.[19]

Opening Germany's borders to the world's innovation elite

Germany must continually open its borders and facilitate the immigration of qualified workers.

- The immigration of skilled workers such as scientists, entrepreneurs and highly qualified experts must be facilitated. Germany is in urgent need of a political and social consensus on the necessity of attracting and integrating highly skilled workers from abroad. Countries such as Canada have established targeted systems to systematically attract and integrate highly qualified personnel. Germany can learn from these countries.[20]
- The Expert Commission suggests providing simplified immigration regulations – e.g. in terms of residence and work permits – for non-German entrepreneurs who aim to substantially invest and create jobs in Germany.[21]
- Efforts to improve the integration of foreign workers in the German labour market must be strengthened at all skill levels. The Expert Commission welcomes the improvements in the immigration regulations for graduates, qualified workers and those participating in training, as well as the improvements in information policies.[22]
- The recognition of foreign professional qualifications – e.g. in the context of the "Integration through Qualification" programme – has not led to the desired results yet.[23] Efforts to improve the recognition of foreign professional qualifications have to be further strengthened.

Improving the utilisation of the potential of women in business and science

In all areas of business, research and innovation, gender equality has to be enhanced.

- Germany is still characterised by an insufficient utilisation of the potential of women in all areas of research and innovation. Here, political stakeholders, businesses, associations and research institutions are called upon to participate in solving this issue.[24]
- In the field of engineering, an increased participation of women in academic degree courses, doctoral programmes and subsequent occupational paths must be ensured – particularly with regard to professorships.[25]
- Raising girls' interest in research and technology will have to be a priority issue in pre-school and school education.[26]
- Ultimately, the Expert Commission also considers the introduction of quotas for leading positions in the research system and the private business sector as an appropriate means to accelerating a transition towards greater gender equality.[27]

OPEN ACCESS A 2

Outstanding role of publications in the R&I process

Research and development processes in business and science are often cumulative, i.e. they build on the findings of previous research. In many disciplines, the most important means of distributing information are publications in scientific journals. The most frequently used method of ensuring the quality of publications are assessment procedures in which external, anonymous experts provide a written review on the quality of an essay, thereby supplying the journal's editor with valuable information. Based on this, the editor will decide whether, and under which conditions, an article is to be published in the journal. Commercial publishing houses will then publish the approved text, either in print or electronic form. In some cases, the distribution of publications is carried out by the scientific organisations themselves. In recent decades, the concentration of suppliers in the commercial scientific journal market has increased significantly.[28]

Calls for open access are getting louder

The ongoing market concentration is accompanied by significant price increases for products offered by publishing houses (such as journals or full-text downloads). In the fields of medicine, science and technology, prices of publications have quadrupled in certain areas over the last 20 years, while budgets of academic libraries are stagnating.[29] The expected passing on of cost advantages resulting from digital publishing of research findings[30] is not yet to be