

RESEARCH, INNOVATION
AND TECHNOLOGICAL
PERFORMANCE IN GERMANY

EXPERTENKOMMISSION
FORSCHUNG
UND INNOVATION

EFI

REPORT

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SUMMARY

CURRENT DEVELOPMENTS AND CHALLENGES

A 1 RESEARCH AND DEVELOPMENT – THINKING BEYOND THE THREE-PERCENT TARGET

Germany's research and development (R&D) intensity, i.e. the proportion of R&D expenditures of the gross domestic product (GDP), amounted to 2.82 percent in 2010. This is a solid interim result on the way to the three-percent target specified by the European Council in Barcelona, even though Germany failed to reach the target by EUR 4.7 billion. Yet other leading economies and innovation countries have long exceeded the three-percent target. In the future, Germany should orient itself towards the R&D intensity of these global leaders and not focus on the three-percent target alone. On a global scale, Germany can only reach or maintain a competitive edge if the German innovation system continually generates new knowledge and flexibly adopts fresh impetus while transforming it into innovation on the market. With regard to research and innovation policies, it makes sense to refer to the national R&D intensity as an orientation mark. In view of the Expert Commission, this is not a perfect means of measuring an economy's knowledge intensity; it is however a useful means.

A 2 ENHANCING INNOVATION AND PRODUCTIVITY IN ALL EU MEMBER STATES

On average, EU member states are less productive and considerably more heterogeneous than the US states – in spite of extensive use of resources from EU Structural Funds. While the Scandinavian countries are at the higher end of the productivity scale and surpass the three-percent target, the R&D intensity of the less productive southern European countries amounts to less than half of this value. The main reason for this is the low level of private sector investment in R&D. Considering the heterogeneous nature of the EU member states it seems that a universally applicable three-percent target does not lead to the desired results. Instead, those countries that lag behind should specify targets that can be duly implemented and measured within the framework of a national innovation strategy. In addition to that, these countries should expand the differentiation of their educational systems, strengthen collaboration between research organisations and businesses, develop more efficient administrative structures and improve institutional framework conditions. These measures would improve their competitiveness and attract foreign investment. The targeted use of EU Structural Funds should be reviewed on a regular basis.

CONTINUALLY IMPROVING THE ATTRACTIVENESS OF GERMANY AS AN R&D LOCATION

A 3

Germany has developed successful modernisation strategies for the manufacturing sector. At the same time, the country exhibits deficits in leading-edge technologies, a field that is becoming increasingly relevant on an international scale. In fact Germany is currently caught in a difficult position between emerging countries and classical leading-edge producers. In the context of an ongoing globalisation process in the field of R&D, attractive framework conditions for R&D are becoming ever more important – not only as an incentive for R&D investments, but also as a means of preventing a brain drain. In the past, foreign businesses have been making significant R&D investments in Germany. Yet Germany as a location for research and innovation (R&I) should be strengthened by further improving framework conditions for research and innovation. R&D tax credits, as has been strongly recommended in the previous reports, will have to be implemented as soon as possible. Furthermore, it should be ensured that research activities conducted abroad by publicly funded research bodies create a suitable backflow of knowledge.

THE ENERGY TRANSITION AS AN INNOVATION OPPORTUNITY

A 4

Germany's "Energiewende" (Energy Transition), which was adopted in the early summer of 2011, does not only provide for nuclear phase-out but also for a reduction in the use of fossil fuels and a reinforced expansion of renewable energy sources. This energy shift offers interesting economic perspectives for a high-tech location such as Germany, as the world market currently offers excellent chances for German businesses to position themselves in the field of sustainable power supply technologies. In order to transform this potential into real innovation leadership, all the stakeholders involved will have to commit themselves to take co-ordinated action. The Expert Commission has identified a quick response to the Energy Transition in some parts of the extra-university research system. The Federal Ministries are now obligated to provide an allocation of funding for energy research that is transparent and systematically adapts to the challenges ahead. The main task for the years to come will be to considerably enhance co-ordination between energy, environmental and innovation policies. This will help to make the most of the positive effects derived from the energy shift and avoid welfare losses.

CORE TOPICS

B 1 UNIVERSITY-BASED RESEARCH

Universities are an important pillar of the German R&I system. Over the last years, the introduction of numerous reforms and new programmes has created major challenges for German universities – not least since these challenges had to be faced against the background of dwindling funds. An upward trend can only be observed since 2006, and this is largely due to a significant increase in third-party funding.

The Initiative for Excellence has intensified a differentiation process in the German academic landscape: not only did the funded universities improve their international visibility, but the Initiative for Excellence also provoked and enhanced a thematic differentiation among the universities.

In spite of various positive developments, e.g. in terms of university autonomy and remuneration law, the Expert Commission still sees considerable need for action:

- The Expert Commission emphasises the necessity to correct the reform of the federal system (federalism reform I): the Federal Government should be allowed to fund universities institutionally, i.e. as organisations. This would require amendments to Article 91b of the Basic Law.
- The provisions of the “Freedom of Science Act” initiative should also be extended to universities and technical colleges, so as to strengthen their autonomy. This should be conducted in close collaboration with the Federal States (Bundesländer). By extending the initiative to the higher education sector, universities and colleges would also establish an important prerequisite for advancing horizontal and vertical differentiation within the academic system.
- Although the availability of third-party funding has led to positive results, the Expert Commission sees an imbalance in the current funding structure of universities. Basic funding of universities should be increased, and financing by foundations should be further facilitated through German legislation.
- Universities have an obligation to make use of their autonomy and financial scope. The professionalisation of universities and the reduction of administrative activities carried out by academic staff in favour of research should be advanced.
- In Germany, it is difficult to plan a career in public research, particularly in university-based research. To complement existing junior professorships, tenure track models should be applied to a larger extent. In order to create opportunities for young academics, the number of W2 and W3 professorships should be increased.
- Basic research at universities should not be streamlined to the demands of application-related usage. Yet whenever application possibilities occur, these should be consistently promoted on the part of the university.
- Important research initiatives and academic bodies that have been launched within the framework of the Initiative for Excellence should be pursued so as to ensure the success of the measures in the long term. To achieve this, a suitable policy approach is required. New types of collaboration between universities and extra-university research organisations should be continually examined. In the event that the Federal Government decides to reintroduce institutional funding of universities, serious consideration should also be given to the idea of establishing federal universities.

SKILL SHORTAGES AND INNOVATION

B 2

Germany is facing major challenges as a result of demographic change and the economy's ever-increasing orientation towards knowledge intensity. These two factors are profoundly changing the economy's skill requirements and lead to structural changes in the labour market. Skill shortages in growth-oriented occupations must be expected along with an oversupply in other occupations. At the same time, guaranteeing a sufficiently qualified workforce that matches the economy's skill requirements is a necessary prerequisite to protect Germany's innovative power and competitiveness in the long term. Challenges are large and need to be tackled quickly and energetically. There are several policy areas that will help to solve the problems. Education and training to adjust the skill structure of the workforce; company-internal measures for retaining older employees' valuable skills; measures to increase the participation of the non-working but highly skilled (mostly female) employment population; and immigration policies that take account of the extensive reserves of skills available internationally. The Expert Commission thus offers the following recommendations to the relevant stakeholders:

- Germany's education policies must increasingly be oriented towards enhancing vertical and horizontal permeability in the educational system.
- Germany's vocational education and training system needs to be strengthened as youth cohorts are expected to decrease substantially over the coming years. To increase its attractiveness, vertical mobility also has to be improved. The latter requires that higher education institutions sharpen their profiles and that some of them put more emphasis on improving vertical mobility options.
- Higher education institutions should in the future highlight more clearly their individual comparative advantages and position themselves based on individually defined "roles and missions". Horizontal differentiation will become more and more important. While they have a broad spectrum of individual missions available, universities have to coordinate them with the available range of different financing options.
- Educational policy makers should support the development and implementation of bold new profiles by providing suitable financial incentives and regulatory clauses allowing for experimentation.
- In addition, all stakeholders in the educational system and the labour market must seek to enhance the attractiveness of study programmes that are ultimately conducive to innovation and economic growth – engineering sciences in particular. Special efforts should be made to increase female participation in the respective study programmes. Higher education institutions have to make their study programmes more attractive for female students, and companies have to adjust their workplace structures and working time conditions to make them more attractive for female graduates.
- The continuing vocational education and training system needs to be further developed with a focus on increasing the participation of groups that have always been underrepresented in the past.
- In the labour market, efforts have to be intensified to enhance integration of foreign employees on all qualification levels. We welcome the improvements enacted in immigration regulations for well-qualified foreigners and for foreigners in the education and training system. Particular focus should also be given to attract the best foreign graduates for the German labour market. Such activities must be flanked by measures aimed at fostering public awareness of the need for immigration and at promoting public support for the integration of foreigners.
- Concerted efforts must be taken to make better use of the non- or underemployed but highly skilled female employment population. Women must be given a clearer

message that they are needed and welcome at the workplace even with children. And men must be given a clearer message that they have to take on more responsibility in raising children and doing housework. Institutional regulations that provide incentives for women to work only part-time or not to work at all have a detrimental effect on Germany's innovative strength. These include e.g. the tax regulation that provides for splitting income taxation between married couples, which creates a disincentive to work mostly for females, and social benefits such as the planned child-care supplement for women staying at home.

B 3 CONDITIONS FOR GROWTH AND CONSTRAINTS ON GROWTH FOR START-UP BUSINESSES

The number of business start-ups in Germany is relatively low by international standards. This is also true for start-ups in knowledge-based fields of business. Overall, many young businesses in Germany are not sufficiently funded. Often enough, attempts to financially restructure young businesses that have a workable business model but are facing temporary liquidity problems caused by external factors are not successful. Therefore the Expert Commission recommends the following:

- The legal form of a European limited liability company should be introduced as soon as possible. This would enable companies from all member states to act within the same legal framework regarding the launch and the operation of a business. This would considerably decrease the administrative effort of setting up an international business.
- German insolvency law should have a stronger focus on restructuring and maintaining businesses.
- The current legal uncertainty regarding the classification of the activities of venture capital companies must come to an end. A binding legal framework should be established that would define venture capital companies as asset management companies.
- Tax incentives to promote private investments in venture capital funds should be introduced.
- The restrictive treatment of carried-over losses should be abolished so as to increase the willingness of venture capital providers to invest in German technology-based business start-ups.
- The recent suggestion of the European Commission to introduce a regulation that would provide Europe-wide specifications for marketing risk capital funds would give German policymakers the opportunity to restructure the framework conditions for venture capital. After ten years of hesitation and failures in this policy area, consistent action is now required.

B 4 ECONOMIC ASSESSMENT OF PUBLIC R&D FUNDING

Long-term growth and a sustainable increase in productivity can only be achieved via a high level of R&D investment. Over the last ten years, many countries have employed specific state support measures to achieve a particularly expansive R&D dynamic in their economy. In Germany however, the largest part of public R&D funds is still being allocated to public research, while the proportion of government funds for privately implemented R&D activities remains comparatively low.

One method of public R&D funding that is employed by the majority of OECD and EU member states is R&D tax credits. Various evaluation studies have confirmed that R&D tax credits result in an increase in private R&D expenditures. Yet Germany has not made use of this method of funding to date.

Scarce public resources should be used efficiently and effectively. Since innovation research is still lacking a systematic impact analysis, the question arises of how public funding measures can be monitored effectively. Thus the Expert Commission recommends the following:

- It is time for the government to introduce R&D tax credits, a measure that is long overdue. R&D tax credits will facilitate R&D projects for small and medium-sized businesses and further enhance the international appeal of Germany as an R&D location.
- Funding measures in the field of R&I should be generally evaluated according to academic standards. A reliable, coherent data infrastructure for documenting the impact of public research should be introduced and advanced as soon as possible.

THE CHALLENGE OF CHINA

B 5

Over a period of a few years, China has risen to become one of the world's major economies and scientific locations. The Chinese government is pursuing an offensive innovation strategy that aims at turning China into one of the world's leading innovation locations before the year 2020. The rise of China poses major challenges to the economic and research system of Germany. Due to state-controlled influence on businesses and research organisations in particular, China is conquering more and more fields of expertise that have always been highly relevant to Germany. Among other things, the situation is aggravated by the fact that the Chinese government makes market access of foreign businesses dependent on their readiness to relocate their manufacturing and R&D activities to China. At the same time, foreign businesses are subjected to disadvantages due to the weak Chinese patent jurisdiction and the existing practice of standard setting. Based on this, the Chinese government has managed to significantly decrease the country's technological deficit. Yet, in order to reach a more balanced collaboration, framework conditions should be re-organised so as to be more reliable and beneficial for China and Germany alike.

Against this background, the Expert Commission recommends the following:

- A decisive factor for advancing the Chinese innovation system and the quality of collaboration between China and its foreign partners lies in the development of the Chinese patent system and a functioning system for the protection of intellectual property. The Federal Government should monitor China's progress in the field of intellectual property and report on their findings on a regular basis.
- The Expert Commission considers the development of norms and standards an important starting point for advancing innovative projects in both countries on equal terms.
- The Federal Chancellery, the heads of the respective Federal Ministries and the academic bodies, as well as the Federal Government's advisory committees should, on a regular basis, announce co-ordinated strategies for suitably dealing with the challenge of China.

- When training future management personnel in the field of engineering, natural sciences, law and economics, more attention should be paid to building up expert knowledge on Asia – and China in particular – at an early stage.
- The Expert Commission recommends strengthening the co-ordination of the foreign science policy with regard to China in order to improve visibility of German research organisations. However, too generous a transfer of academic results into application-oriented areas should be avoided.
- In view of the Expert Commission, China, and not Germany, is building up a leading market in the field of electromobility. Germany still has the chance to establish itself as a major technology provider in this market. In order to achieve this, it is crucial to develop a co-ordinated strategy between German industry, government bodies and research organisations, e.g. by means of the National Platform for Electromobility.

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The Commission of Experts wishes to emphasise that the positions expressed in the report do not necessarily represent the opinions of the aforementioned persons.

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