RESEARCH AND DEVELOPMENT C 2

Overview

Research and development (R&D) is a key basis for new products and services. The benefits of research and development are not limited to the companies and state research institutions that pursue R&D; society as a whole profits significantly from R&D. Such indirect societal effects, in particular, will significantly affect competitiveness, prosperity and the numbers and quality of jobs in a given country or region. For example, over the past decade economic growth has tended to be particularly strong in those areas in which R&D capacities have been expanded the fastest. As a result, optimising the basis for execution of R&D will continue to be a central task for companies and policymakers alike.

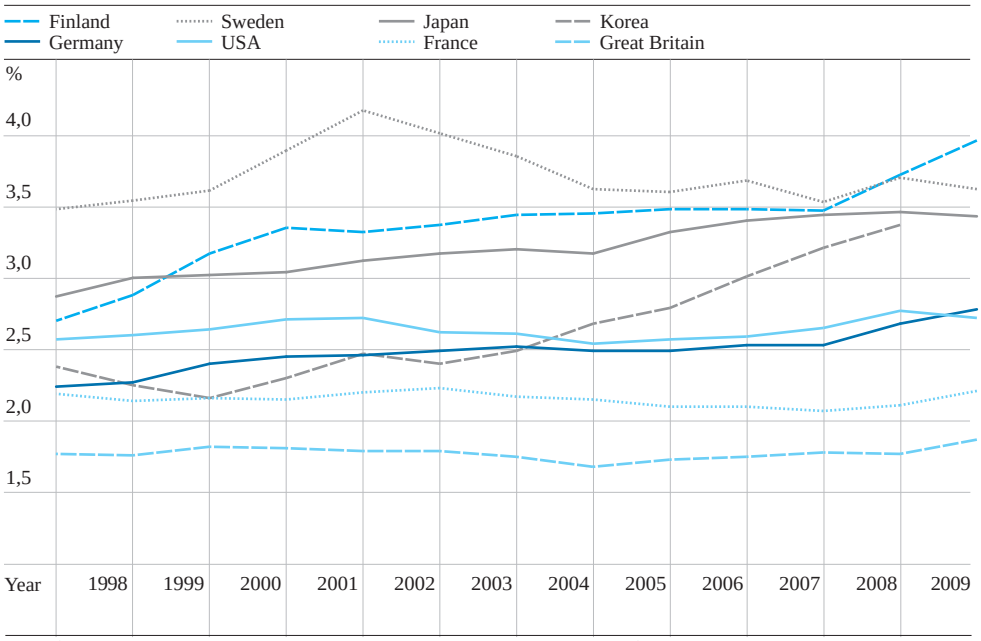
In major Western industrialised countries, expenditures for R&D tend to change procyclically. When growth stagnates, R&D expenditures stagnate as well. During the worldwide economic and financial crisis, therefore, it was thus feared that German companies would considerably curtail their research and development activities. As it happened, such effects materialised only in part. While the crisis did not leave the research and development sector untouched, it only slightly reduced industry's research investments. What is more, the R&D expenditures decrease seen in 2009, 2.4 percent, was considerably smaller, with respect to the corresponding figure for 2008, than the corresponding decrease in gross domestic product (nominal decrease of 3.4 percent). The crisis' impacts on research and development were relatively small thanks to state intervention, aimed at bolstering the economy, and thanks to many German companies' long-term orientation. What is more, state-financed R&D activities – such as R&D at universities and department research institutions – were not affected by cutbacks.

Most of the data evaluated in the framework of this indicator segment were taken from OECD sources (Main Science and Technology Indicators) and from the R&D survey of the Donors' Association for the Promotion of Sciences and Humanities in Germany (*Stifterverband für die Deutsche Wissenschaft*). The data published by the OECD include data on the organisation's 30 member countries, and on nine non-members, and they cover central resources available for R&D, patent data and figures on foreign trade in technology-intensive industries. The Stifterverband regularly surveys some 30,000 companies in Germany with regard to their R&D expenditures, their R&D workforces, their sources of financing for R&D, their R&D locations and their products.[342]

Indicators studied:

- Development of R&D intensity (R&D expenditures as a percentage of GDP), by countries
- Total private sector R&D-expenditure relative to turnover, compared internationally
- The state's civilian R&D investments
- Internal R&D expenditures of higher education institutions and non-university research institutions

C 2–1 R&D INTENSITY IN SELECTED OECD COUNTRIES



Some figures are estimates. Source: OECD. Eurostat database. *SV-Wissenschaftsstatistik*. Calculations and estimates of the NIW. In: Schasse et al. (2011).

R&D intensity: Expenditures for research and development, as a percentage share of an economy's gross domestic product.

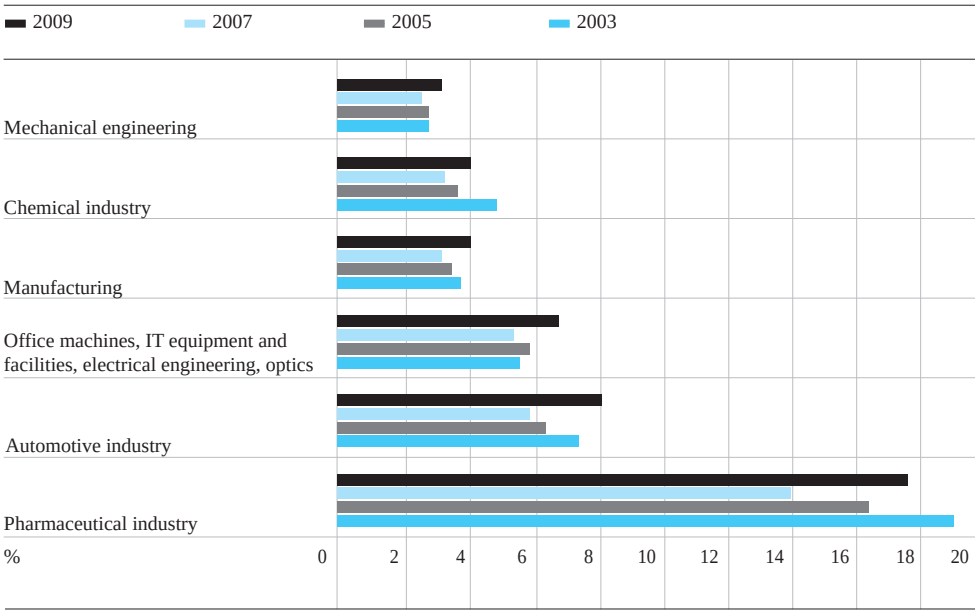
German R&D intensity stable in spite of the crisis

In Germany, both industry and the state have been intensifying their investments in research and development, following a lengthy phase of cutbacks in the late 1990s. While such efforts have failed to match R&D growth in the global economy, Germany has still been able to set itself apart somewhat from other major European economies. Nonetheless, Germany's relatively good performance in comparison with other European countries does not change the fact that Germany's R&D expenditures have lagged behind R&D investments of Asian economies such as Japan and Korea, and behind those of smaller European countries, such as Finland and Switzerland. Those European countries, largely free of the procyclical R&D trends in major Western industrialised countries, have been sharply increasing their real R&D expenditures since the beginning of the 1990s. The growth in German R&D expenditures that took place during the economic and financial crisis, to a level of 2.78 percent (2009), cannot be necessarily taken as indicative of a change of trend, however. It is primarily a statistical effect: it results in that gross domestic product, which serves as a reference for R&D expenditures, shrank significantly as a result of the global crisis (minus 3.4 percent).

On the positive side, however, both industry and the public sector in Germany have continued to invest vigourously in research and development, in spite of the crisis and of tight budgets – and in contrast to actions by industry and the public sector in many other industrialised countries. For example, Germany's R&D intensity in 2009 was higher, for the first time since reunification, than that of the U.S. (2.72 percent).

TOTAL PRIVATE SECTOR R&D EXPENDITURE RELATIVE TO TURNOVER

C 2–2



Through 2007, economic sectors differentiated pursuant to WZ 2003 classification of economic activities.
Sectors for 2009 differentiated pursuant to WZ 2008.
Source: *SV-Wissenschaftsstatistik*. Federal Statistical Office, *Fachserie 4, Reihe 4.1.1*, and unpublished data.
Calculations and estimates of the NIW. In: Schasse et al. (2011).

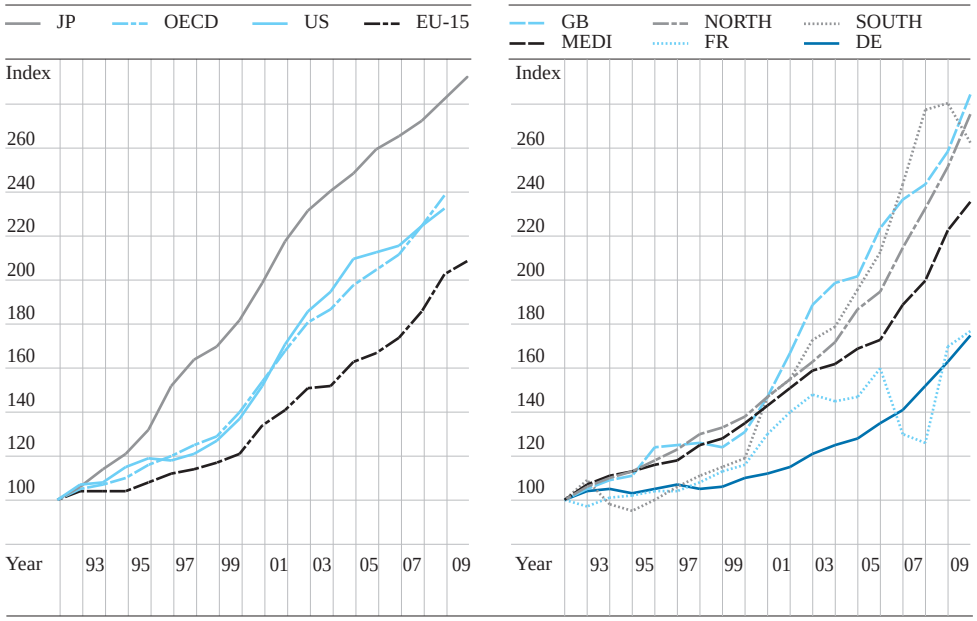
R&D intensity: Expenditure on research and development as a proportion of turnover of a company or a branch.

Strong R&D growth in the pharmaceutical industry – Automakers' predominance in R&D expenditures continues, however

Industry's R&D intensity increased again in 2009, in the first such increase following continual decreases that had begun in 2003. The increase, which at first glance would seem considerable, has to be put into perspective – it is due in large measure to temporary revenue decreases. One exception is provided by the pharmaceutical industry, which registered strong growth in R&D expenditures and only slight revenue decreases.

In spite of the pharmaceutical industry's strong R&D activity, the automotive, mechanical engineering and chemical sectors were the ones mainly responsible for the growth in R&D that occurred since the mid-1990s. In particular, growth in R&D capacities was especially high in the automotive sector. That sector accounted for over half of all growth in R&D capacities since 1995. A full 22 percent of automotive R&D capacities throughout the entire OECD are located in Germany. Consequently, the German innovation system has become more and more dependent on R&D in that industrial sector. Over the past decade, the country's mechanical engineering sector has been able to keep its share of worldwide R&D capacities at about the same level, and that sector remains a key hub of German R&D structures. In the chemical sector, Germany long enjoyed major advantages deriving from specialisation. Those advantages have clearly diminished, however.

C 2–3 STATE BUDGETS FOR CIVILIAN R&D IN SELECTED WORLD REGIONS



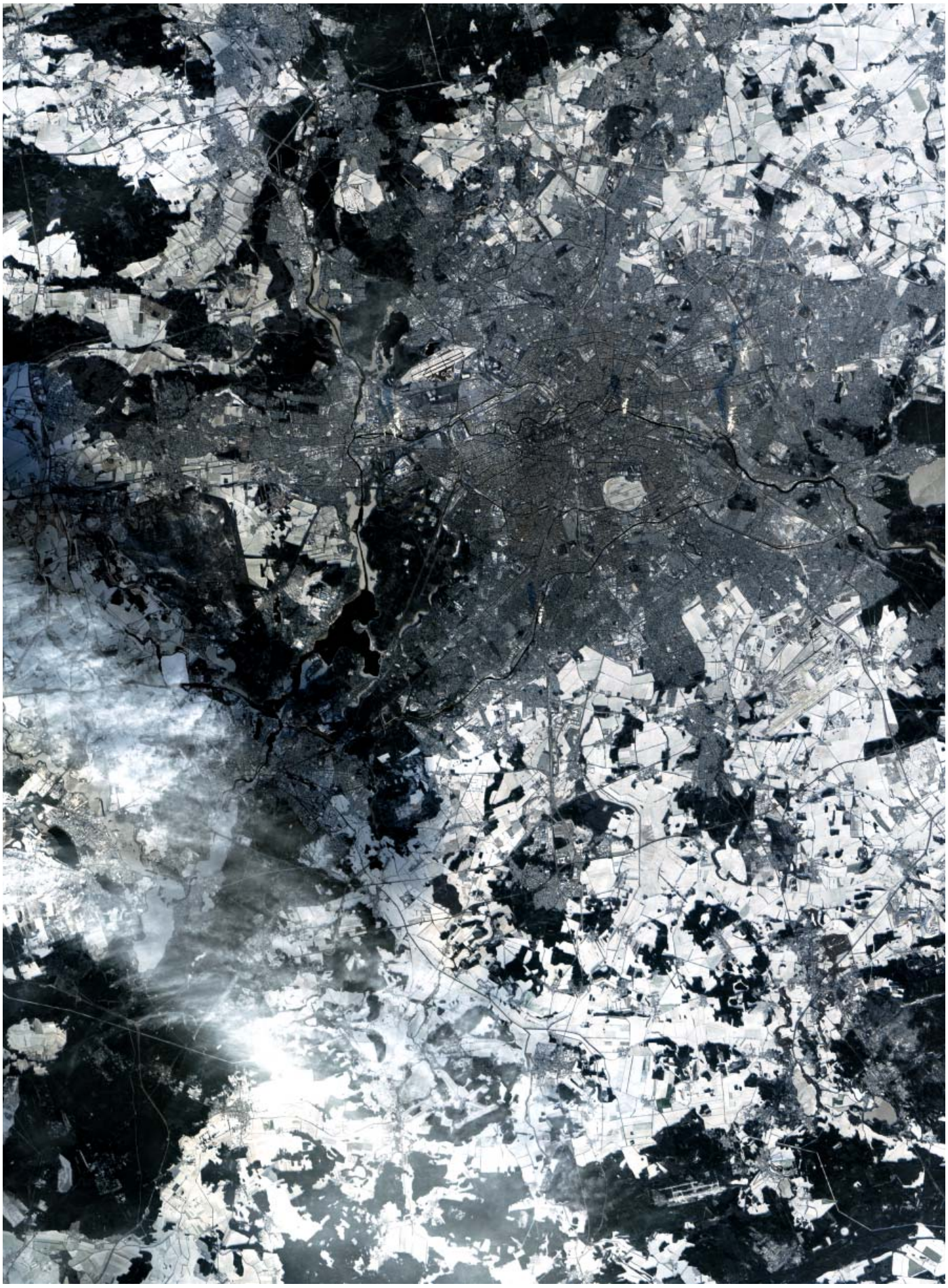
Index: 1991 = 100. Semi-logarithmic scale. NORTH: SE, FI, NO, DK, IE, IS.
SOUTH: IT, PT, ES, GR. MEDI: BE, NL, AT, CH. Source: OECD. *Eurostat Datenbank.*
Calculations and estimates of the NIW. In: Schasse et al. (2011).

R&D budget: Includes budgetary plan allocations available for financing R&D.

The state's investments in research and development keep growing, in spite of the crisis

Germany's public-sector budgets have sharply increased their allocations for R&D, in spite of the economic and financial crisis. In 2009, budgetary allocations for R&D registered nominal growth of 5.9 percent, more than had been seen in years. With that expenditures increase, not only has the state made up for the crisis-related decline in industry's R&D investments, it has also brought about slight growth in German R&D expenditures overall. Those expenditures increased to EUR 66.7 billion, from the previous year's level of EUR 66.5 billion. With that growth, the public sector's share of Germany's total R&D expenditures also increased in 2009, to 32.3 percent, up from the previous year's level of 30.7 percent.

The development of state R&D investments in Germany, development that an OECD comparison casts in a positive light, is quite a recent phenomenon, however. For nearly all of the 1990s, R&D expenditures registered meager annual growth of only 0.5 percent, i.e. practically stood still. As of 1998, the R&D budget began to increase by a full 2.5 percent annually. By the middle of the last decade, they increased even more strongly. From 2004 to 2008, German R&D budgetary allocations increased by an average of 5 percent per year, while the corresponding increases throughout the OECD were less pronounced, amounting to only 3.6 percent per year. R&D growth for the OECD as a whole was modest, having been constrained primarily by the U.S., the largest R&D investor throughout the OECD. As of 2004, following sharp increases in its budgetary allocations for R&D at the end of the 1990s, the U.S. cut back its expenditures considerably, thereby driving down the R&D-expenditures rate for OECD countries overall.



Berlin under a snow cover
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Great Britain and Ireland
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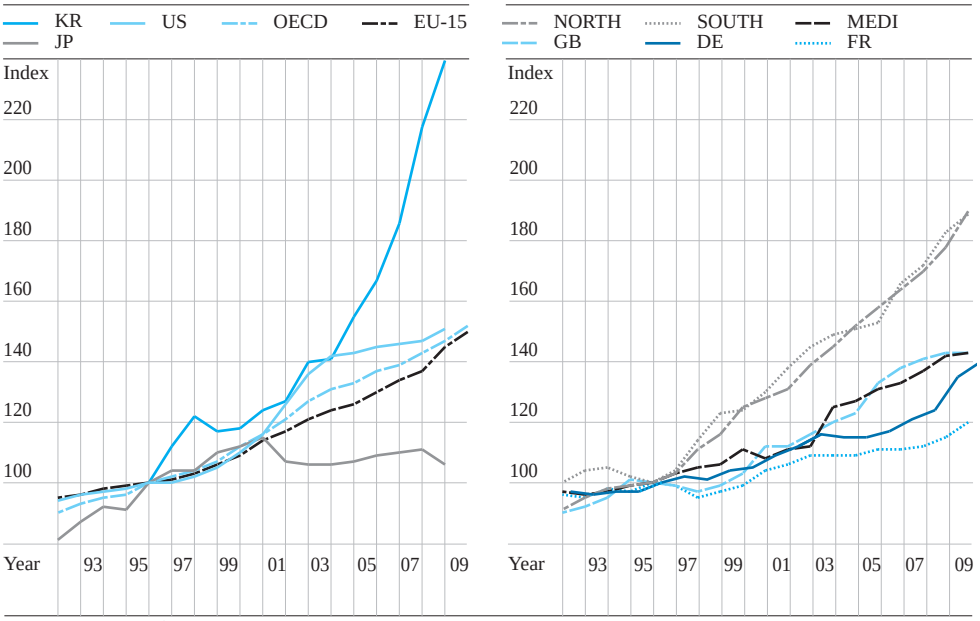
INTERNAL R&D EXPENDITURES OF UNIVERSITIES AND NON-UNIVERSITY RESEARCH INSTITUTIONS*, IN CONSTANT PRICES, ACCORDING TO WORLD REGIONS

C 2–4



*Including non-profit private organisations. Index: 1995 = 100. Semi-logarithmic scale.
Some figures are estimates. NORTH: SE, FI, NO, DK, IE, IS. SOUTH: IT, PT, ES, GR. MEDI: BE, NL, AT, CH.
Source: OECD. *Eurostat Datenbank*. Calculations and estimates of the NIW. In: Schasse et al. (2011).
Internal R&D expenditures: financial outlays for R&D staff, for R&D equipment and for investments in R&D within a company's own organisation.

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State investments in the education sector cause universities' R&D expenditures to rise

Since the early 1990s, public-sector R&D expenditures have grown by 35 percent in Germany, or considerably less than in the Nordic countries (93 percent) and in southern Europe (83 percent). Growth in public-sector R&D expenditures was also considerably higher in the UK and the U.S., at 58 percent and 61 percent, respectively, than it was in Germany. The comparatively low growth seen in Germany is a result of expenditure decreases since the beginning of the last decade. Not until 2005 did public-sector R&D expenditures return to the level they had had in 2002. At the end of the decade, then, expenditures increased considerably. The factors in that growth included the creation of 90,000 additional study places in the framework of the "Higher Education Pact" (*Hochschulpakt*).

In addition, public commitments grew in training providing scientific and engineering qualifications, as did state assistance for financing of R&D and innovation projects in the private sector. The impacts of the R&D-expenditures growth have included accelerated expansion of teaching and research capacities at higher education institutions. Engineering sciences have profited especially from that effect; their teaching and research workforces began increasing again as of 2004, following a decline that had begun in the mid-1990s.