B 2 THE BOLOGNA PROCESS – AN INTERIM ASSESSMENT

Innovations require well-educated personnel. The Expert Commission reports from 2008 and 2009 made clear that Germany's education system is at best average in OECD comparisons and in recent decades has lost the leading position it once held.

The weaknesses are known. Despite a rise, the entry rates to higher education in Germany remain lower than in other countries.[67] This applies in particular for mathematics, computer science, natural sciences and engineering. There is considerable selectivity in terms of social background, which is only in part related to performance and ability. Potential is remaining unused here. The drop-out rates from German universities are high, students take a long time to complete their studies, and there are obstacles in the way of changing to and from foreign universities. Packed timetables, poor supervision provisions and neglect of teaching mean that students do not enjoy optimum conditions and teaching staff has little time for good teaching and good research. Contacts between teaching and research and the business sector, which are so important for the innovation process, also remain underdeveloped.

In the course of the Bologna Process, German university teaching is being reorganised to confer bachelor's and master's degrees. The Expert Commission has been investigating whether the reform has yet been able to overcome any of the weaknesses in the German higher education system.

Bologna Process: Goals, hopes and fears

The Bologna Declaration of 1999 had the goal of introducing an internationally comparable higher education system with a three-level model: an undergraduate cycle (bachelor's degree) and a graduate cycle (master's degree) and a doctorate, which could be adapted to individual needs.[68] The degree awarded after the first cycle was to be relevant to the European labour market as an appropriate level of qualification. Internationally comparable degrees were intended to simplify and increase the worldwide mobility of students. German students should find it easier to study abroad for part of their course, and foreign students would have an extra incentive to study in Germany. This would improve Germany's position in the competition for talented students.

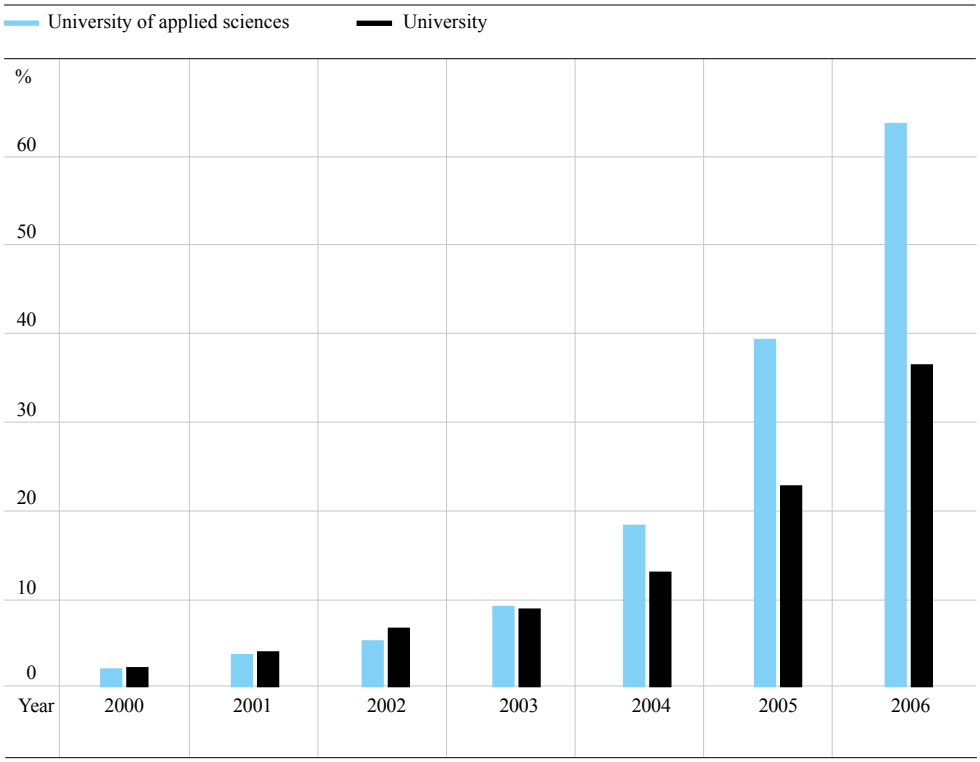
At the follow-up conferences, a social dimension was added to the original Bologna agenda. The reform should also lead to equitable access and completion.[69] Further hopes were raised by the Bologna Process, particularly in Germany. The updating and reorganisation of curricula, the decline in the numbers of drop-outs,[70] and also increased applications, especially for mathematics, computer science, natural science and engineering. To achvieve this last goal, emphasis was placed on recruiting increased numbers of women.[71] The reform proved controversial from the start. In the existing system with 'diploma' and 'magister' courses, students often had more freedom of choice than in the new bachelor's and master's courses. In addition, the new courses were shorter, and given the fact that at the same time the secondary education was reduced from nine to eight years, dispensing with an orientation year (studium generale) also met with criticism. The relationship between the new bachelor's degree courses and the system of dual vocational training remains unclear. Both take about three years and lead to occupational qualifications, but which function does each have? Equally, it is not clear how many graduates will go on to take a master's degree. As a result, warnings were expressed that the Bologna reform would lead to lower levels of education, and to poorer qualifications for graduates. The universities have drawn attention to the changing relationship between teaching and research, and they see the risk that higher teaching commitments could be detrimental to the research performance of university staff. These criticisms make clear that the frequently questioned acceptance of the new qualifications by employers may be only one of many indicators for the success or failure of the reform.

Ten years after Bologna: Initial findings

The transition to the new degree courses is now well under way. After a hesitant start, 45 percent of new students in 2006 were starting a bachelor's degree course (Figure 4).[72] By the summer semester 2009, more than 75 percent of courses were for the new degrees, with considerable difference between the Laender.[73] Five years previously the figure had been below 25 percent. The transition at the uni-

Proportion of all new students in a year starting a bachelor's degree course according to higher education institution

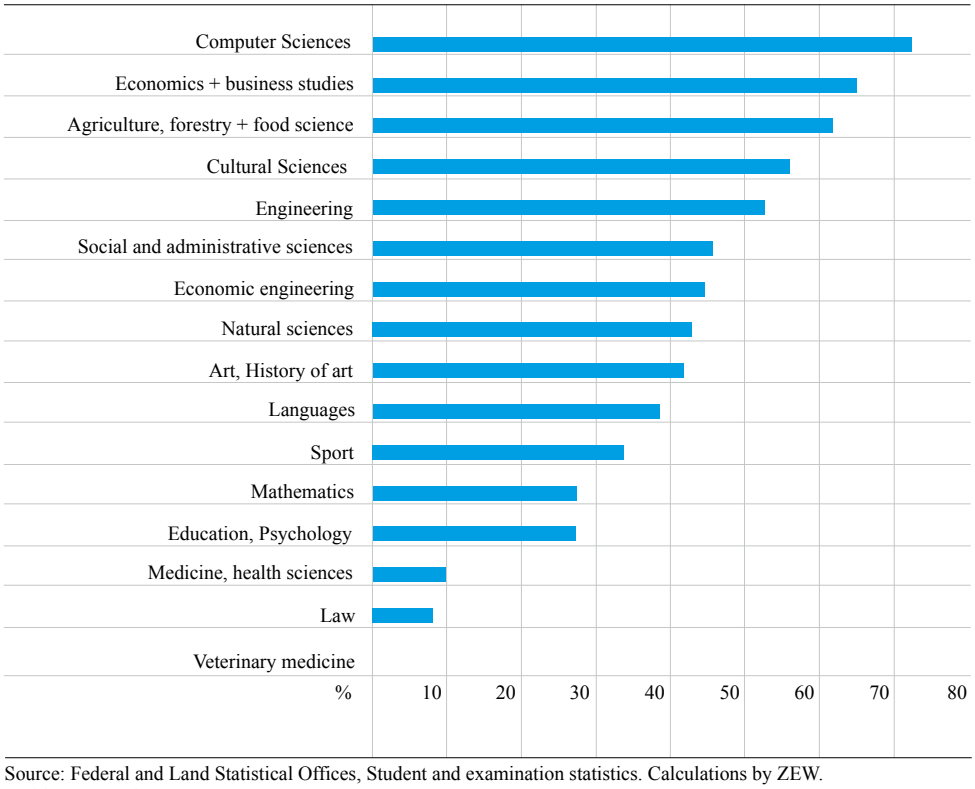
FIG 04



Source: Federal and Land Statistical Offices, Student and examination statistics, 2000 - 2006.Calculations by ZEW. Mühlenweg et al. (2010).

Proportion of all new students in 2006 starting a bachelor's degree course according to subject

FIG 05



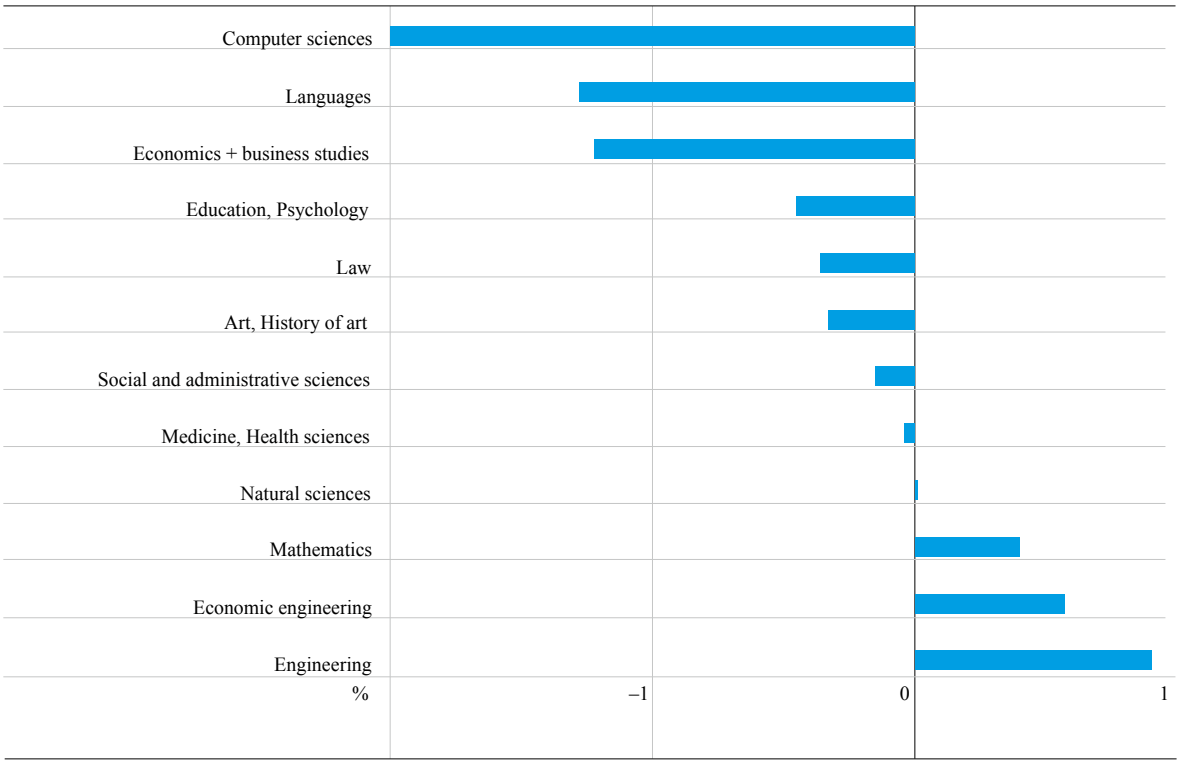
Source: Federal and Land Statistical Offices, Student and examination statistics. Calculations by ZEW. Mühlenweg et al. (2010).

versities of applied sciences (Fachhochschulen) was particularly quick. In 2006, 63 percent of students were studying for a bachelor's degree. At universities, in contrast, the figure was only 36 percent. There are considerable differences between subject groups (Figure 5). In computer sciences and engineering the changes have been implemented faster than the average.

The developments have so far proved disappointing for those who expected that the introduction of the bachelor's degree (generally offering an occupational qualification after six semesters) would significantly increase both tertiary education entry rates and the numbers of graduates. Nor have the changes appreciably reduced the numbers of drop-outs. In fact the drop-out rates from bachelor courses between 2000 and 2004 were at a level, which is comparable with those for diploma courses, and they seem to be stable.[74]

First results also fail to nurture the hope that the shorter, more practically oriented degree courses would attract more students from socially disadvantaged homes than the longer traditional alternatives. There is no evidence that the level of parental education makes students more likely to choose in favour of the new degree courses rather than the traditional ones. The reform has not resulted in more students enrolling for mathematics, computer sciences, natural sciences and engineering. The proportion of potential applicants choosing these subjects did increase from 1995 to 2000, but has since stabilised. The rate of transition[75] to computer science actually fell from 2000 to 2006; in contrast, the rate increased for engineering (Figure 6). It is worrying that the drop-out rates for mathematics, sciences and engineering have risen continuously since 2000. Nor has there been any fundamental change in the ratios of male and female students in these subjects as a consequence of the new courses.[76]

FIG 06 **Development of the rates of enrolment in higher education courses 2000 – 2006**



Source: Federal and Land Statistical Offices, Student and examination statistics, 2000/2001, 2002/2003 and 2007/2008. Calculations by ZEW. Mühlenweg et al. (2010).

Academic qualification and employment situation approx. 1.5 years later TAB 04

	Type of qualification in percent						Total in percent
	BA-FH	MA-FH	DI-FH	BA-U	MA-U	DI/M-U	
Regular employment	58	79	83	20	56	59	59
Job training	1	2	2	2	7	3	3
Degree and employment	12	12	6	22	26	26	21
Only degree	22	1	4	50	7	7	12
Looking for employment	4	2	2	3	2	3	3
Others (family work, etc.)	2	2	2	3	3	2	2
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Number	485	203	4367	2730	1044	13744	22573

BA-FH, MA-FH , DI-FH: Bachelor's degree/Master's degree/Diplom at university of applied sciences (FH):
BA-U, MA-U, DI/M-U: Bachelor's degree/Master's degree/Diplom (or Magister) at a university (U).
Source: INCHER-Kassel. KOAB Graduate survey 2009 (2007 cohort). Alesi et al. (2010).

The reforms have not yet been linked to any significant increase in the proportion of foreign students at German universities.[77] Indeed both the proportion and the absolute numbers of foreign student enrolments have fallen since 2002. Even in the master's degree programmes, which have by far the highest proportion of foreign students, the figures have clearly been falling since 2001. The proportions of foreign students in the bachelor's degree courses are similar to those for diploma degree courses, and have also decreased slightly since 2001.

Even though the tertiary education reforms have not solved the problems of high drop-out rates, social selectivity, a lack of interest in sciences and engineering, and a low proportion of foreign students – it has not produced inadequately qualified graduates, as some feared. One and a half years after obtaining a bachelor's degree, 72 percent of university graduates and 34 percent of graduates from universities of applied sciences (Fachhochschulen) are studying further, mostly for a master's degree at the same type of higher education institution (Table 4: Graduates who are studying + those who are studying and employed). The numbers going on to study for a further degree vary considerably according to subject. The figures at universities are about 55 percent in economics and 86 percent in mathematics and the natural sciences, and at universities of applied sciences they range from 14 percent in the humanities and social sciences to 58 percent in engineering. After obtaining a master's degree at a university, as many go on to study for a further qualification or a doctorate as did in the past after obtaining a traditional qualification.[78] There has been an increase in the numbers going on to further studies after obtaining a master's degree at a university of applied sciences.[79]

Few changes have been made to course contents during the reform. Initial studies suggest that there are no grounds for the fears of some employers that the new degree courses would prove to be very different, but the hopes of others that the course content would be adapted to be more suited to the demands of the working world are also unfulfilled. A study commissioned by the Expert Commission on the changes in nine courses[80] indicates that the opportunity has not been used to introduce any fundamental didactic changes or to revise the contents. Instead, structural reforms and formal changes were made with strict attendance rules, and point deductions. The measures are now often criticised as "over-regulation" or "bureaucratisation"[81] On the whole, more changes have been introduced for the curricula of the master's degree programmes, but in general these are reforms to details, apparently also introduced in the course of quality assurance and accreditation procedures. Whether this is generally the case cannot be established empirically, but there are probably considerable differences from subject to subject and also between universities. Where there is excessive bureaucracy in a faculty or a university, the Expert Commission recommends a "spring

clean" so that examination offices and students do not find themselves faced with insurmountable challenges.[82] The Expert Commission also regards it as important that students should be offered scope to organise their own course of studies.

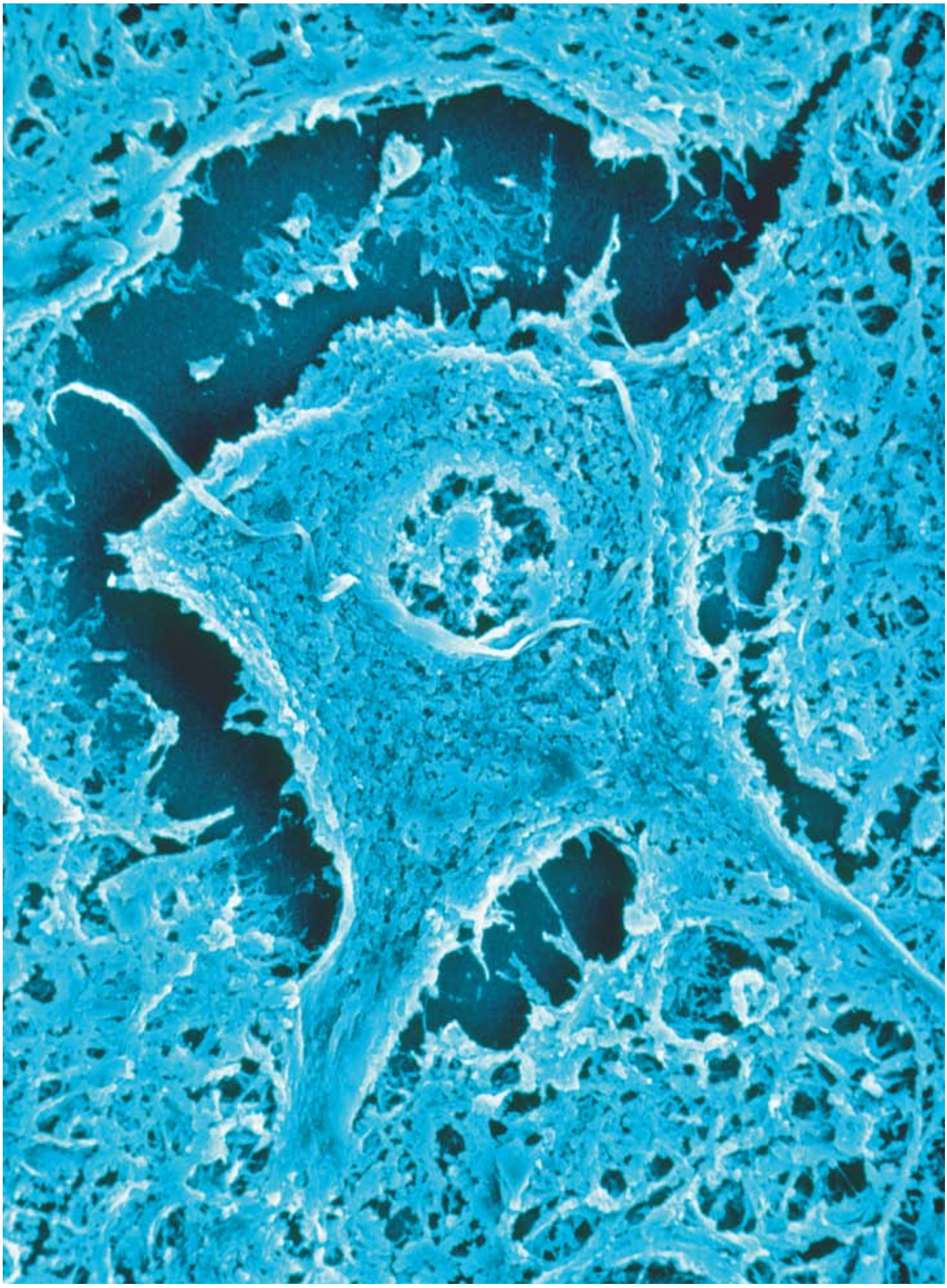
Overall, the course reforms have increased the burden on teaching staff, although here there are also considerable differences between subject groups.[83] The formal teaching requirements are mostly unchanged, but the overall workload has increased as a result of various courses still being offered in parallel (bachelor's, master's, diploma, etc), the need to organise and prepare new curricula, and and because of the increased numbers of students. The burden of setting and marking tests and examinations also increased, primarily due to the packed curricula.[84] The resulting workload of the university staff not only reduces the time available for research, it also reduces the time available for supervising students and is an obstacle to the development of good conditions for students.

In contrast, the transition to the employment system is much less problematic than expected. The direct comparison between those with master's degree and those with a diploma or magister qualification one-and-a-half years later shows that the career prospects with the new qualification are by no means worse. Considering the universities of applied sciences, 91 percent (79 + 12) with a master's degree and 89 percent (83 + 6) with a diploma are fully employed or employed in addition to studying. The comparable figures for universities are 82 percent (56 + 26) for the master's degree and 85 percent (59 + 26) for the traditional qualification (Table 4). For graduates with a bachelor's degree the difference is slightly greater: 20 percent from universities and 58 percent from universities of applied sciences are fully employed. Including those who are in employment while studying for an advanced degree or in occupational further training, the figure for bachelor's degree graduates from universities rises to 42 percent (20 + 22) and from universities of applied sciences to 70 percent (58 + 12). In all cases, the proportion looking for employment is low (2 to 4 percent). If qualitative indicators are included, such as the time spent looking for a job, or job satisfaction, there are still no differences between those completing the new degree courses and those taking the old courses. In terms of income, full-time employment, and qualification for the job (in terms of the level of the qualification and the use of the learning acquired) graduates from universities with a bachelor's degree do only slightly worse than all others. However, in terms of short-term employment and relevance of qualifications for the job, they are at a clear disadvantage compared with all other groups.[85] A look at the various degree subjects individually shows considerable differences in some cases.[86]

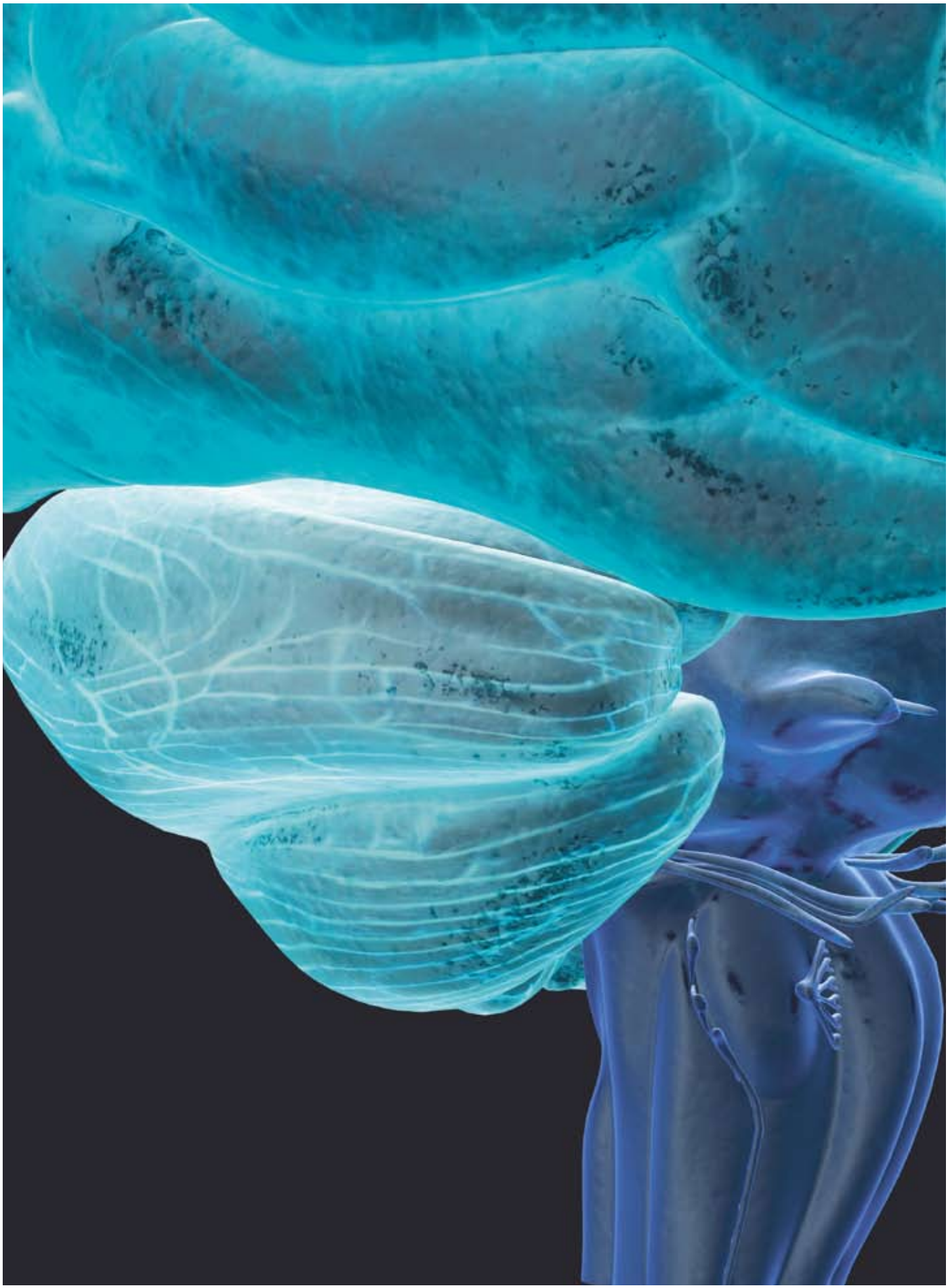
Surveys of employers indicate that they have not yet had much experience with the "new" graduates. As a result there is some uncertainty, but not general rejection. Employers do not complain about a basic lack of qualification. Their evaluation of the risks and opportunities of the new courses relative to the old ones depends more on the specific job requirements, which can vary widely between sectors.[87] A common wish among employers is that the shorter bachelor's degree courses should retain a link to practical requirements, and that students should have the opportunity to gain practical experience as part of their studies.[88]

Reforming the reform

Since the start of the Bologna process, the implementation of the reforms has been accompanied by public debates, stimulated by the student protests in 2009. The Standing Conference of the Ministers of Education and Cultural Affairs of the Laender (Kultusministerkonferenz - KMK) admitted that there was "not inconsiderable scepticism in parts of the academic community concerning the Bologna Process".[89] At the Bologna follow-up conference in Leuven/Louvain-la-Neuve in April 2009, numerous criticisms were raised, which were taken up in October and December 2009 by the Standing Conference. It was decided to revise the joint structural provisions for the Laender for the accreditation of bachelor's and master's courses and to change the requirements for the introduction of credit point systems and modularisation. The objective is to create good conditions at the universities, which contribute to making courses more flexible and which increase the accessibility of the higher education system.[90] The Expert Commission welcomes this approach, but urgently warns against any over-hasty implementation. Given the differences between specific subjects and disci-



Human neuron cell body



Side view of the cerebellum and brain stem

plines, appropriate adjustments are required in each case. While integrating the students in the development process, it is important to promote measures, which ensure effective study opportunities. Course contents, structure, and duration must be harmonised, as well as the relationship between compulsory courses and options, and students must be able to make individual choices. Further improvements should be made to the student grant system (BAföG) and the student services set-up responsible for the social concerns of students. There is also a need to improve the acknowledgement of course work and credits between universities (nationally and internationally), to increase international university partnerships and study programmes, as well as to involve employers and alumni more in the development of degree courses.

Conclusion: Bologna alone is not enough

When evaluating the Bologna Process for the innovation location Germany it is necessary to distinguish between specific objectives and more far-reaching hopes. It has to be taken into account that problems encountered in tertiary education may have their origins in earlier phases. Social selection mechanisms begin in early childhood and the choice of degree subjects is influenced by the school system.

From the beginning, expectations were raised by the reforms associated with the Bologna Process which could not be achieved in the short term without the back-up of additional resources and other measures. The review of the first consequences of the reform highlights the need to overcome many weaknesses if the structural reform is to strengthen the innovation location Germany and Europe as a whole.

The Expert Commission recommends the following measures concerning the Bologna Process:

– More autonomy for the universities. A general problem with universities in Germany is that they are not allowed enough freedom to make their own decisions when implementing the reforms. Universities should be able to use all available options when organising new degree courses. Bachelor's degree courses can last six to eight semesters, and master's degree courses two to four semesters. The Expert Commission welcomes the decision of the Standing Conference (KMK, 10 December 2009) to make corresponding amendments to the joint structural requirements for the accreditation of new courses. Instead of fine control, the Laender should offer the universities more scope, while striking a balance between target agreements and the allocation of resources.

– Obstacles to mobility can be overcome by more generous recognition of previous coursework and credits and the reliable specification of equivalents in course regulations. This is highlighted by a KMK resolution.[91] It is also important to actively promote student mobility. This should include more comprehensive and more generous financial support for student mobility, and cooperation between universities in Germany and other countries. The Expert Commission also sees possibilities for an increase in English-language courses, which are particularly attractive for foreign students. Existing programmes should be evaluated to identify examples of good practice.

– Reducing drop-out rates. The Expert Commission already pointed out in the previous report that the drop-out rates in the natural sciences and engineering are particularly high. This is expensive, inefficient and problematic for the innovation location Germany, even if high drop-out rates are not a uniquely German problem.[92] Studies show that there are a range of reasons why students drop out.[93] Inadequate conditions for studying are more significant than other factors, such as attractive educational or occupational alternatives. Complaints concern the poor lectures and seminars, inadequate teaching skills, a lack of optional courses and tutorials, and poorly organised timetables and exam schedules. Some find the demands of university are incompatible with other obligations, such as looking after children, part-time employment, or illness. A bundle of measures is required in order to lower the high numbers of course drop-outs: grants and loans for students, options to organise courses flexibly or to study part-time; information, advice and preparatory courses prior to committing to a subject or in the initial phases of a degree course; higher quality of teaching, and better course organisation. It is also important to include checks on performance at an early stage and give detailed feed-back, and univer-

sities which have introduced these have already been able to achieve initial success with reducing drop-out rates in languages, and cultural and social sciences.[94] However, these mechanisms must be coordinated with other measures and as well as making demands of students, they must also be supported. In particular, faculties with high drop-out rates should make greater efforts to develop selection and admission procedures, with tests to establish the suitability of applicants.Developing systems of funding.

– Student fees are an important component of university finances in some Laender and they make sense when the receipts are invested in the teaching. But they must not act as a disincentive to young people who want to study.[95] The Expert Commission believes that in particular students from low-income households must be offered the best possible financial conditions. This includes expanding and increasing the student grant system (BAföG), without age restrictions.[96] The current regulations are too restrictive. Student grants are generally only available for those under thirty years of age. Special conditions apply for those who have qualified for tertiary education through adult education schemes, or who have children. However, the students must begin studying immediately after obtaining the qualifications or when the impediment no longer exists. The Expert Commission welcomes the announcement by the Federal Government that they intend to raise grant levels and parental allowances, and to increase the age limit for master's degree students in 2010 to 35 years. But further changes are needed. In addition to government support, the mobilisation of private sources of funding for university education can also be improved, analogous to the strategy of the Federal Government for expanding the grant system, or along the lines of the grant system in North Rhine-Westphalia.[97]

– Including the supervision of doctoral students as part of the teaching duties of professors. The supervision of doctoral students in structured programmes such as the DFG postgraduate colleges should be included as part of the teaching duties. The Expert Commission points out that the time spent in this way by professors is to the detriment of research, active institutional involvement, individual career counselling, and the supervision of student organisations.

RESEARCH AND INNOVATION IN EASTERN GERMANY B 3

The 20th anniversary of the fall of the Berlin Wall last year and of German unification this year have once against raised the question about the state of development in the new federal states and appropriate support strategies. The Commission of Experts for Research and Innovation wishes to contribute to answering this question. It seems appropriate to start with a short review of the historical roots of the current situation in the new federal states and in Berlin. What happened in the course of the transformation process and which innovation policies were implemented?

Transformation process and the collapse of industrial R&D in eastern Germany

At the time of the fall of the Berlin Wall, the GDR had a well-developed research and university landscape and a high proportion of highly-qualified personnel in the workforce.[98] However, in the socialist planned economy, research and innovation could not power economic development.
The innovation process organised by the planning authorities was linear. New technologies were generated by scientific research and passed on for implementation to the 'state holding companies' (kombinat) or specific companies. There was thus controlled transfer of knowledge and technology, with hardly any direct feedback from the users of the products. The contents and goals of scientific research were largely derived from plan targets for production. The research and innovation system was not organised to develop new potential for value creation and in this way to continuously renew the structure of the economy. There was no innovation competition, and measures to maintain existing structures were dominant. In addition, the work of scientists was considerably impeded by supply shortages and the lack of opportunities to develop new ideas.

Industrial research and development in the GDR was carried out in special company departments and in legally independent industrial research institutions. The R&D departments were responsible for supervising production processes and for introducing new products and processes, through to series production. The relatively large industrial research