

THE INTERACTIONS BETWEEN RESEARCH AND TEACHING

ANNEX D

Three international perspectives

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ACTIVITIES: THREE INTERNATIONAL PERSPECTIVES

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Introduction and methodology

- 1.1 Each national system of higher education is unique in its structure and modes of operation and funding. However, international practice, and related comparisons, often provide potential benchmarks for a variety of activities as well as examples of innovative approaches. Thus, one aim of the overall project was to *review international evidence of how best to promote research activity synergistically with the promotion of higher quality teaching and other activities.*
- 1.2 Three case studies were commissioned with a view to illuminating current policy and practice in other countries. In the interest of continuity and comparability it was felt that the countries selected should be drawn from those being examined in detail through another of the Fundamental Review project strands, namely the review of international approaches to research policy and funding. Subsequently, authors were commissioned in Germany, France and the United States to produce case studies based on a series of questions.
- 1.3 Desk-based research formed the basis for initial thinking and writing the brief for the case development. The writing brief requested authors to respond to a series of questions aimed at illuminating policy and practice within their countries that either hindered or created a synergy between teaching, research and other activities. For the purpose of the study, references to ‘research funding’ were to funding which would be considered as ‘core funding’, versus more specific project funding from Research Councils or similar bodies. Where appropriate, authors were asked to differentiate between undergraduate and graduate provision when exploring the links between research and teaching. Authors were asked to address the following questions:
- Where research and teaching are funded together, is there a (relatively) standard approach as to how institutions determine their internal allocations between research and teaching?
 - Where research and teaching are funded separately, is it done by one agency or by separate agencies? If the same agency, are there interconnections between the methodologies?
 - What link is there between funding judgements and any national quality assurance or peer review systems for either research or teaching?
 - Is there any evidence of an imbalance in the ‘status’ of teaching in relation to research in the sector (for example through discrepancies in pay or promotion)? If a discrepancy exists, is it the result of national mechanisms or strategies?
 - Are there any national or regional *incentives* to develop or foster linkages between research, teaching and other activities?
 - How do institutional structures or policy impact on the synergy between research, teaching and other activities (for example: the distribution of roles with research taking place in units physically and intellectually separate from teaching activities; or strategic development of interdisciplinary research and teaching teams)?
 - Are you aware of examples of ‘good practice’ in fostering linkages between research, teaching and other activities on a national or institutional basis?

- 1.4 In addition to the case studies, two further sources of data contributed to the development of this paper. The project team of the aforementioned international study (from the Science and Technology Policy Research Unit – SPRU – at the University of Sussex) undertook a series of interviews as part of their methodology. That project team’s interim report served as a basis for triangulation for the case studies as well as supplementing their basic data. The SPRU team also agreed to include two questions in their interview schedule that explored respondents’ perspectives on the interface between teaching and research. The findings from those interviews are reflected in this report.
- 1.5 This Annex begins with a descriptive summary of the three higher education systems on which the case studies are drawn, followed by key points raised in each of the country papers in relation to the interface between teaching, research and other activities. The three case studies are then presented in their entirety.

Characteristics of the systems

- 1.6 In order to understand the context of policy and activity in relation to teaching, research and other activities, it is helpful to explore the basic characteristics of the higher education systems in the countries from which the case studies are drawn. The three countries represent diverse higher education systems in terms of the overall size and the different missions and aims of the institutions.

The United States

- 1.7 By far the largest higher education sector of the case countries studied is the United States, where some 3,681 institutions – both public (1,594) and privately (2,087) funded – offer post-secondary provision (HEP 1996). The US institutions have varied missions and purposes ranging from colleges offering two-year vocational programmes to large research universities. Other types of institution include four-year universities and colleges as well as institutes of technology and polytechnic institutes.
- 1.8 A classification system was introduced in 1970 by the Carnegie Foundation for the Advancement of Teaching that aimed to group institutions in relation to mission and level of education provided. The Carnegie Classification is being updated in 2000 with a view to lessening a ‘league table’ mentality that had built up around it. The new edition has moved from seven categories to five, namely:
- Doctoral/Research Universities I – with 50 or more doctorates per year across at least 15 disciplines
 - Doctoral/Research Universities II – with 10 or more doctorates per year across at least 3 disciplines, or 20 or more doctorates per year overall
 - Baccalaureate (Liberal Arts) Colleges I – at least half of the undergraduate awards are bachelor’s degrees and half are in liberal arts fields

- Baccalaureate Colleges II – at least half of the undergraduate awards are bachelor's degrees and less than half are in liberal arts fields
- Associate Colleges – less than half of undergraduate awards are bachelor's degrees.

1.9 The author of the case study indicated that the previous classification system had served to drive a 'tournament mentality' that saw institutional policy makers realigning resource allocations with a view to moving up the classification system. However, it is anticipated that the new classification will relieve some of that pressure.

Germany

1.10 The German higher education system by comparison is much smaller in scale, with some 335 institutions of which 113 are considered university status and are publicly funded. Of the total 335, there are 65 higher education institutions (HEIs) that are privately funded. Approximately 90 universities are considered 'scientific universities' and are active in fundamental research and teaching. A second, and larger grouping, known as Fachhochschulen, are more vocational in mission and are not in receipt of core funding to undertake research. For the purposes of this paper, the emphasis is on the 'scientific universities' rather than the latter unless otherwise stated.

1.11 German universities are founded on the Humboldtian principle that teaching and research have equal status and that 'universities are obliged to integrate them in some form of "science-based" or "science-related" education.'

France

1.12 The higher education system in France is the smallest in scale with some 160 institutions of higher education. The system has a number of different categories of institution including the Conference of Grandes Ecoles, considered to form the elite of the sector. The Conference comprises 28 engineering schools, 27 management schools and 14 specialised schools that traditionally have not been considered to be highly research active. The number of students entering the Grandes Ecoles represents approximately 9.5 per cent of the total number of students enrolled in higher education.

1.13 The largest proportion of students (approximately 61 per cent) study in the universities, with the balance (29.5 per cent) found in technical, paramedical and social workers schools. Within the university sector a number of professional institutes have been established, such as the Institute of Engineering (IUPS), the Institutes of Technology (IUTS) and Institutes for Professional Education. These Institutes are located within the university structure while considered to be fully autonomous. They have grown significantly in enrolment over the past decade, with students looking for a shorter period of study that is more vocationally focused.

1.14 The French university system involves a very close relationship with publicly funded laboratories whereby academic staff have the status of civil servants and can move relatively freely between the EPST (a public institution of science and technology) and the universities. While located in a university, academic staff have a requirement to teach

and undertake research, whereas if they are seconded to the EPST, they do not have the obligation to teach.

Approaches to funding

- 1.15 Funding mechanisms across these three heterogeneous systems do not vary widely in substance, with governmental funding forming the core in all instances. Differences among the three are found in terms of the overall proportion that government support (both federal and regional) represents in the overall expenditure and also in terms of where the balance of funds comes from. (As the related SPRU report addresses the specific approaches to funding for research in higher education, this section will provide only a brief précis.)
- 1.16 In the US, the federal government supports public institutions through appropriated funding. However, the proportion of the overall budget these appropriations represent in public research universities is approximately 30 to 40 per cent (Slaughter and Leslie 1997). Individual states allocate funds to higher education as well, with the formula varying from state to state. Finally, income is drawn from other sources including student tuition fees, research grants, charitable donations and endowment funds.
- 1.17 Funding for research comes primarily from federally funded project grants, with 71 per cent provided by the National Institutes of Health (NIH) and the National Science Foundation (NSF). A significant amount (94 per cent) of the federal government funding on research went to only 200 institutions in 1995 (Millar and Senker) and the top 100 universities claimed nearly 80 per cent.
- 1.18 There are no national ranking systems in the US equivalent to the RAE or the TQA. There are, however, a number of 'unofficial' publications that provide rankings. The most comprehensive of these, prepared by the National Research Council, serves as a de facto rating scale and often tacitly influences peer review and other agencies judging research proposals. It provides information on doctoral programmes including ratings of faculty quality, ratios of publications to faculty and ratios of citations to faculty.
- 1.19 Institutional budgetary procedures follow the traditional models of centralised and decentralised allocation and are therefore difficult to characterise in any meaningful manner. In the latter instance academics are often 'rewarded' for successful 'grantsmanship' and student recruitment, as the extra revenue garnered through successful grants and extra tuition fees provides a certain level of autonomy from the central administration in terms of being able to cover graduate student stipends and research costs.
- 1.20 The German situation is largely similar to the US at the federal level as the government provides all universities with a 'core funding' allocation for both teaching and research, which represented 59 per cent of expenditure in 1994 (Millar and Senker). The second largest contributor of funds in relation to research is the German Research Foundation, responsible for some 31 per cent of research income in 1994 (Millar and Senker).

- 1.21 The internal mechanisms for allocating funds in Germany are becoming more decentralised, with funding going directly to the various faculties rather than being centrally determined. This has been combined with a more managerial culture in some institutions, including the development of performance indicators such as completed dissertations and number of successful examinations for determining funding allocations.
- 1.22 The 'core funding' does not differentiate between teaching and research and is meant to cover all costs for the academic endeavour. Once the faculties have designated funds available to the institutes and individual professors, it is in their gift to determine whether the money is spent on student assistance for research or for teaching assistants.
- 1.23 The funding mechanisms in France reflect a strong governmental influence. The Ministry of National Education, Research and Technology is directly responsible for funding higher education and research. The core funding provided to the universities is primarily for teaching, with research funding coming mainly from the research centres and other external funding sources.
- 1.24 Core funding is based on defined criteria including the number of students and number of disciplines and covers salaries for the 'enseignants chercheurs' who have the double role of teaching and research, as well as those academics with a teaching-only remit. It also covers the basic infrastructure maintenance and operating expenses for the institution.

The interface between teaching, research and other activities

Status and distribution of effort in teaching and research

- 1.25 Teaching and research in the European case studies are positioned as being of equal status within the university setting with little, if any, consideration of the impact of 'other' activities on either teaching or research. Indeed, in France and Germany, where the academics are considered civil servants, it is contractually their responsibility to undertake both teaching and research in equal measure. The US experience, however, is similar to the UK model whereby research, which is increasingly valued over teaching and other activities, brings kudos and potential financial resources.
- 1.26 In the US, the relative status of teaching and research could arguably be said to differ depending upon the type of institution under consideration (drawing on the Carnegie Classification) and also the level of study in question, be it undergraduate or postgraduate. However, for the most part achievement in research is more highly valued and rewarded than excellence in teaching. This has led to academic and journalistic reports claiming that undergraduate students are bearing the brunt of a decline in research-informed teaching, while the professorial ranks concentrate on bringing in ever-larger research funds.
- 1.27 The findings of a national survey undertaken in 1993 (NSOPF 1998) indicate that there is a significant difference as to how academics allocate their time between teaching and

research, be it at postgraduate or undergraduate levels. The study found that doctoral scientists and engineers engaged in teaching only undergraduate students spent approximately 65 per cent of their time teaching and 22 per cent undertaking research, whereas those teaching at a postgraduate level spent only 34 per cent of their time on teaching and 38 per cent on research.

- 1.28 Another survey (NSF), asked doctoral scientists and engineers to define their primary work responsibility. This study found that over the period between 1985 and 1995 there was a considerable increase in the number of academics reporting research as their primary function. This (not surprisingly) was predominant in the research-intensive institutions and varied also between disciplines.
- 1.29 As civil servants, academics in German higher education are obliged to undertake teaching and research in equal measure regardless of their relative status (e.g. newly appointed versus long-standing). A recent review of professorial activity has shown that those who teach the most also research the most, and those who teach the least, research the least (Millar and Senker [b]). At the moment there is no assessment of research or teaching performance and, as a result, non-performance carries no real penalty, although this is set to change.
- 1.30 Research professorships are not part of the system; therefore all professors are expected to teach. While this may be the rhetoric, the reality appears rather closer to the UK experience. In terms of promotion and mobility within the system, high quality research is far more important than quality performance in teaching. The increasing need to bring in external funding through successful research grants also means that academics wishing to emphasise teaching in their portfolio may potentially be relatively disadvantaged.
- 1.31 The German system is experiencing extreme pressure in managing the Humboldtian balance of teaching and research. The large influx of students in the past decade has meant that academics are straining to maintain their teaching responsibilities *as well as* undertaking significant research. The funding mechanism is such that there are no guidelines that identify a base-line of funding for either research or teaching. Therefore, it is posited that research is coming under pressure from teaching as universities choose to allocate their core funding to teaching and look for external sources of funds to underpin research.
- 1.32 Activity that could be categorised as ‘other’ is acknowledged as being insignificant in Germany, as the official stance is that institutions are not in a position to impose further responsibilities on the present contract to undertake research and teaching. The result is that there is very little continuing professional development or short-course activity for external clients being developed. However, there is so much consultancy that the volume of external work undertaken by academics has been limited by law to ensure that teaching duties are not neglected.
- 1.33 In the French context, there are primarily two types of academic in the university setting. There are those (the ‘enseignants chercheurs’) who are expected to balance their activities equally between research and teaching. A second cohort of university teachers, with no

responsibility for research, is drawn from a variety of sources such as postgraduate students, technical experts, those with industrial expertise and secondary school teachers with a special diploma to teach.

- 1.34 However, a law passed in 1984 dictates that the researchers/lecturers *'also have the task of knowledge diffusion in connection with the economic, social and cultural environment, international co-operation and the administration and management of the university'*. This mandate is creating added pressure to balance the research and teaching loads as increasing student numbers demand more time.
- 1.35 There is currently considerable debate as to whether the French system should create another tier within the university sector whereby some institutions become teaching only for the first two years of tuition. Academics (both research and teaching oriented) are apparently opposed to such moves, as the perception is that the link between teaching and research is already too weak in the current system (Millar and Senker [b]). This is not seen to be the case at the postgraduate level where there is interaction between the CNRS laboratories and PhD students.
- 1.36 'Other' activities through which French academics can supplement salaries or garner promotion are in supervision of doctoral students or undertaking administrative duties. Promotion via non-research routes is perceived to have less prestige than promotion through research activity; as a result, those younger enseignants chercheurs may be relatively disadvantaged in comparison with counterparts pursuing only research, by having to balance both teaching and research.

Evaluation of teaching and research

- 1.37 There is no single national quality assurance agency for higher education in the US that equates to the RAE or the TQA systems in the UK. There are various agencies that collate data on a variety of different axes (e.g. ratings of faculty quality, ratios of publications to faculty, ratios of citations, etc) but the findings do not equate directly to funding decisions due to the devolved State system and institutional autonomy. Institutions and external funding sources (and increasingly potential students and mobile academic staff) do use such ratings informally to make judgements of quality.
- 1.38 Evaluation of institutional performance in research and teaching has traditionally not existed in the German context. The only notional evaluation of research would be through relative success or failure in peer-reviewed grant competitions. This situation is set to change in relation to teaching when new laws in the university sector will introduce the requirement of evaluation of teaching. However, there will be no standardised procedure, which will result in different mechanisms between institutions and also within institutions as different faculties adopt individual practices. Thus, while formal evaluation will become mandatory, it will be undertaken in such a way as to render any comparison (potentially leading to a league table) impossible.

1.39 The Comité National d'Évaluation des Établissements Publics à Caractère Scientifique (CNE) was established in 1984 with the mandate to assess the quality of teaching and research in French higher education. The CNE is answerable directly to the President and is therefore able to act without interference from the Minister of Education. The role of the CNE has been expanded to include evaluation of the institutional contracts submitted for approval to the Ministry for funding. The evaluation looks at both research and teaching as well as institutional management, student experience and engagement regionally, nationally and internationally. General indicators (both quantitative and qualitative) are used, with reports then being peer reviewed before recommendations are fed back to the institutions for implementation of change.

Policy and initiatives to create synergy

1.40 In the US, the National Science Foundation (NSF) has taken the lead in promoting the synergy between research and teaching through the introduction of a number of key initiatives. The NSF places a *'high value on the synthesis of research and education as integral to stimulating the discovery and learning process'*. In pursuing this aim, it offers a wide variety of grant programmes to foster creative activities that bridge research and education in schools (through Teaching Fellowships), and throughout higher education.

1.41 The largest of these programmes is the Integrative Graduate Education and Research Training (IGERT) Programme. One aim of the programme is to provide *'a framework for integration of research and educational activities and for collaborative efforts in training that span disciplinary areas'* (NSF 1999b). The emphasis of the IGERT Programme is to encourage multidisciplinary and often multi-institutional research and training, with a view to developing a cadre of PhD graduates able to engage in a broad spectrum of activities linking science and education across disciplinary boundaries.

1.42 Another of the NSF's programmes known as CAREER supports young academic staff early in their career development by providing grants of between \$200,000 to \$500,000 for four to five years' duration. The projects undertaken are meant to stimulate younger academics dedicated to *'stimulating the discovery process in which the excitement of research is enhanced by inspired teaching and enthusiastic learning'* (NSF 1999a). Like the IGERT, this project covers a wide spectrum of multidisciplinary areas including education and human resources, biological sciences, social, behavioural and economic sciences, as well as computer and information science and engineering.

1.43 The NSF has two further programmes with allied aims. The Programme of Research Experiences for Undergraduates supports projects which give undergraduate students direct experience in research projects. Another programme aimed at increasing research predominantly at the undergraduate level is the Research in Undergraduate Institutions, which provides funds for infrastructure purchases and research proposals.

1.44 The author of the US case study believes that the impact of these initiatives, and a recognition of the need to rethink the balance between teaching and research by current HE

leaders in the country, suggests that: *'The belief is growing among American higher education leaders that excellence in teaching, not as easily measured as federal funding for research, deserves more respect and more attention from administrators, planners and policy makers. The impact of the Carnegie Foundation shift will be felt throughout the academic community in the coming years in more emphasis on teaching and greater integration of teaching and research. The pendulum is swinging.'*

- 1.45 National initiatives have also been undertaken by the German government to raise the relative status of teaching within higher education. Three examples are:
- the introduction of teaching awards by state government and institutions to recognise excellence in teaching
 - training courses to enhance young academics' skills and pedagogical understanding
 - increasing consideration of teaching expertise in promotion processes.
- 1.46 There have been a series of recent studies in France exploring both internal and external structures and policies across the higher education system. Recommendations resulting from these reports may well have a positive impact on the synergy between research, teaching and other activities. Key messages from the reports include:
- a desired increase in mobility between young research-active academics in universities and in research institutions
 - a focus on different career paths and incentives for younger researchers
 - a desire to see more integration between higher education, research and industry.

Summary

- 1.47 There is little indication across the three case studies that the interface between teaching, research and other activities is seen as high on institutional or government agendas. It is acknowledged in all three systems that promotion and recognition follow success through research and not teaching. In the German context, both government and the institutions are beginning to address the imbalance of status between teaching and research through implementing schemes recognising quality teaching and through promotion opportunities for quality teaching. In France, the picture is less clear as to whether institutions or government are necessarily concerned about the interface of teaching and research in any explicit manner.
- 1.48 The US is taking the most direct approach to influencing academic staff to explore the interface between teaching and research. The National Science Foundation (NSF) has introduced a series of initiatives to strengthen the involvement of scientists and engineers in both research and educational activities. Two of the projects encourage academics and institutions to seek multidisciplinary and collaborative opportunities to integrate research and teaching. Two other projects are aimed specifically at introducing opportunities for undergraduate lecturers and students to have more experience of research. Initiatives such as these are part of a continuum of activities trying to *'plant the seeds of change, in culture, institutional structure, and in a new generation of multi-faceted scientists and engineers'* (NSF 1999b).
- 1.49 Examples of activities such as those of the NSF, suggest that it is possible for funding agencies and institutions to support, and indeed influence, activities to enhance the synergy between research and teaching. Financial incentives that encourage the development of excellence in both teaching and research may well 'plant the seeds of change' necessary to make the value of the interface between research and teaching more transparent.

Sources

The commissioned case studies provided the primary source of data on which this summary is based. Where specific sources from those case studies are quoted in this summary, the references follow. Other sources of data are also listed.

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NCIHE (1997) *Higher Education in the Learning Society – Appendix 5 Higher Education in other countries*

NSF (1999a) – National Science Foundation web-site: <http://www.nsf.gov/od/1pa/news/press/99>

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<http://www.nsf.gov/home/crssprgm/igert/colwell.html>

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2 Interface between teaching and research in the United States

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An overview of the higher education system in the United States¹

- 2.1 Higher education institutions in the United States are not as easily classified as their counterparts in many other countries. In 1995, there were reported to be 3,681 (1,594 public and 2,087 private) institutions in the US offering education beyond the secondary school level. These institutions, which range from two-year vocationally-oriented community colleges, to four-year colleges, to research universities with a full array of graduate and professional schools, enrolled 14.4 million students in that year and awarded 2.2 million degrees, almost one-quarter of which were in science and engineering.²
- 2.2 The two-year colleges award associate degrees and offer curricula more or less equivalent to the first two years at a four-year college or university. Four-year colleges, in general, offer complete academic courses in a variety of fields leading to the baccalaureate degree. Some, in addition, offer graduate training at the master's degree level. Universities offer programmes in a wide range of fields at the undergraduate and graduate levels including opportunities for doctoral and, often, postdoctoral study. Many, in addition, include professional schools such as medicine and law. Institutes of technology and polytechnic institutes are generally similar to universities, except that they focus on science and engineering and most do not have affiliated law or medical schools.
- 2.3 Institutions at all levels may be public – that is, controlled and funded by governments, generally at the state or local levels – or private. Some of the private institutions are controlled by churches, while others are independently endowed and controlled by their own boards of trustees. Both public and private institutions range in size from a few hundred students to many tens of thousands. Among the public institutions, some are independent, while others are part of large state university systems that include many campuses.
- 2.4 A key to understanding this system is to recognise that it is not governed or funded by any single central authority or policy-making body. While the shape of higher education is influenced by the policies and budgetary decisions of the federal government, particularly as these decisions relate to research, the federal government does not control the system. Public institutions are funded in part by state (or in some cases, local) government appropriations, by tuition funds, by research grants from the federal government and foundations, as well as by charitable donations and, in some cases, by

¹ Portions of this section are adapted from Albert H. Teich and Jill H. Pace, 'Higher education and academic science,' chapter 5 in Albert H. Teich and Jill H. Pace, eds., *Science and Technology in the USA* (London: Longman, 1986).

² Data from Higher Education Publications, *The HEP 1996 Higher Education Directory* (Falls Church, VA: HEP, 1997). Cited in National Science Board, *Science & Engineering Indicators—1998* (Arlington, VA: National Science Foundation, 1998), p. 2-10.

endowment income. Private institutions (with a few exceptions) do not receive state appropriations and thus derive larger shares of their support from the other sources. The shares of public university budgets that come from state appropriations vary widely among institutions. For many, these appropriations represent the bulk of their funding. For some of the larger and more research-intensive public universities, appropriated funds are a relatively modest part of their budgets.³ Each state has its own budgeting system and policies toward higher education. Most states allocate their funds primarily for education and expect the federal government to pick up the tab for much of the research done at their universities.

Federal funding and academic research

- 2.5 The framework for government-university relations in research was established during and immediately following World War II. Prior to that time, government funding for academic research was relatively limited and concentrated in a few specific areas, especially agriculture. During and after the war, support for scientific research came to be viewed as a legitimate and important role of government. Universities were regarded as a natural home for this research, since their faculties and research laboratories were well-established and they had a steady supply of advanced students who could receive their training while assisting in the research. Further, the US had not developed the same type of government institutes and centres for research that had emerged in other countries, and that might have provided a ready alternative for conducting federally-sponsored basic research. Finally, the prevailing ideology and preferences of the leading scientists who influenced policy formation favoured adding as little as possible to government bureaucracy while providing academic scientists with funds to continue and expand research in their own university laboratories.
- 2.6 The greatest emphasis on research is, of course, at the universities that offer graduate degrees, particularly those that confer doctorates. Of the 3,681 institutions mentioned above, some 235 award doctoral degrees, and 126 have been classified by the Carnegie Foundation for the Advancement of Teaching (a private foundation with a great deal of influence in higher education policy) as 'Research Universities I and II.' These institutions offer a full range of undergraduate programmes, are committed to graduate education, and give high priority to research. Research Universities I award 50 or more doctorates a year and receive at least \$40 million a year in federal research support. Research Universities II also award at least 50 doctorates but receive less federal research support – between \$15.5 and \$40 million a year.⁴

³ Sheila Slaughter and Larry L Leslie write (in *Academic Capitalism: Politics, Policies, and the Entrepreneurial University* (Baltimore, MD: Johns Hopkins University Press, 1997, p. 239) that 'most public research universities receive about 30 to 40 per cent of their resources from state governments; yet, the states . . . regulate them essentially as though they were 100 per cent state funded.'

⁴ In October 1999, the Carnegie Foundation announced major changes in its system of classifying institutions of higher education for reasons that are highly pertinent to this paper. These changes are discussed at the end of this paper.

- 2.7 The federal government is the principal source of funds for academic research in the United States. In 1998, it provided nearly 60 per cent of the support for research⁵ performed in universities and colleges. About 19 per cent of research support came from institutions' own funds (including appropriated state and local government funds at public institutions as well as endowment income and tuition fees) and the remainder came from industry (about 7 per cent) and other sources (mainly foundations and voluntary health organisations).
- 2.8 By far the largest share of federal funding for research in universities is distributed in the form of project grants to individual researchers or teams. The National Institutes of Health (NIH – the largest funder of academic research), for example, spends about three-quarters of its extramural R&D funds on such grants. The pattern at the National Science Foundation (NSF – the second largest funder) is similar. Larger grants that support centres or institutes are another popular funding mechanism. In general, both project and centre grants are awarded through a peer or merit review process⁶, although there has been a growing tendency in recent years for institutions to bypass such review by enlisting the intervention of Members of Congress⁷. The Department of Agriculture, the oldest federal agency supporting academic research, does award some of its funds in the form of 'block grants' according to a formula, but these grants are concentrated in agriculture and represent only a small fraction of federal support for academic research.
- 2.9 Federal support for research at colleges and universities, which totalled \$15.1 billion in 1998, comes from 18 government departments and agencies, but the largest share (about 71 per cent) comes from just two: the NIH and the NSF. The top six agencies, which include the Department of Defense (DOD), the Department of Energy (DOE), the Department of Agriculture (USDA), and the National Aeronautics and Space Administration (NASA), together account for over 95 per cent of the total. The federal government provides very little direct support for teaching, except in a few select institutions (e.g. historically black colleges and universities), but it does contribute to the general support of colleges and universities through subsidies to undergraduate student aid and graduate fellowships and traineeships.

The status of teaching versus research

- 2.10 Research and education, particularly graduate education, are widely regarded as complementary, and the co-location of research and graduate education in US universities has frequently been cited as a unique source of strength for American science. As economist Roger Noll of the Brookings Institution put it, 'The uniqueness of US research universities derives from their integration of teaching and research.'⁸ Shephard et al

⁵ We will use the term 'research' for convenience. These statistics actually refer to 'research and development', but the amount of development work at universities is quite small in comparison to the amount of research.

⁶ The terms 'peer review' and 'merit review' are used here as synonyms.

⁷ See James D Savage, *Funding Science in America: Congress, Universities, and the Politics of the Academic Pork Barrel* (New York: Cambridge University Press, 1999).

⁸ Roger G. Noll, 'The American Research University: An Introduction,' chapter 1 in Roger G. Noll, ed., *Challenges to Research Universities* (Washington, DC: Brookings Institution, 1998), p. 19.

present a long list of ways in which faculty members' research improves their teaching, both at the graduate and undergraduate levels. Some examples from their list include:

- new courses, modules, and lectures
- classroom and laboratory examples
- keeping up to date with the latest theories, concepts, and technologies
- involving students directly in research.⁹

- 2.11 Nevertheless, there is little doubt that, in the leading US universities, achievement in research is accorded higher status and greater rewards than teaching. Critics of the US higher education system have charged that this imbalance has led to an over-emphasis on research and a decline in the quality of teaching in many of the nation's top-ranked universities. This situation has been the subject of discussion not only within the academic world, but in the popular media, evidenced by the popularity of books such as 'Profscam: Professors and the Demise of Higher Education' and 'Killing the Spirit: Higher Education in America'.¹⁰
- 2.12 A February 1995 investigative report on the leading US television news magazine, *60 Minutes*, brought the issue out of the ivory tower and into the public arena. Television reporters interviewed a 'teacher of chemistry at [the University of] Arizona [who] just got fired, denied tenure because of insufficient research output, despite years of glowing evaluations from his students,' and cited tenured full professors who, students claim, 'can't teach their way out of a paper bag.'
- 2.13 One faculty member spoke of the profession's 'dirty little secret': *'It's a profession in which, in large measure, if you are absolutely successful, you are promoted out of the possibility of having to teach. In other words, the ultimate success in the academic world is to be so important in getting grants, in writing articles, in writing books that you do virtually no teaching whatsoever.'*¹¹
- 2.14 The tone of the *60 Minutes* report and the popular books may have been somewhat hysterical, but many leaders of higher education would not disagree with their basic message. In the early 1990s, Donald Kennedy, then-president of Stanford University, made raising the status and quality of teaching on that campus one of the major aims of his presidency. And more recently, a special commission created by the Carnegie Foundation for the Advancement of Teaching and chaired by its former president Ernest

⁹ Mark S. Shephard et al, *Report of the Process Team on Fostering and Financing Scholarship* (Troy, NY: Resnsselaer Polytechnic Institute, 1994). Cited in Susan E. Cozzens, 'Changing Expectations for the Research University,' chapter one in Albert H Teich, ed, *Competitiveness in Academic Research* (Washington, DC: American Association for the Advancement of Science, 1996), pp. 21-22.

¹⁰ Charles Sykes, *Profscam: Professors and the Demise of Higher Education* (Washington, DC: Regnery Publishing, Inc., 1988), and Page Smith, *Killing the Spirit: Higher Education in America* (New York: Penguin Books, 1991).

¹¹ Transcript of *60 Minutes*, February 26, 1995, produced by Burrelle's Information Services, Box 7, Livingston, Jersey, 07039, pp. 10-12.

L. Boyer, issued a harsh indictment of undergraduate education at US research universities.¹²

- 2.15 The Carnegie Foundation report concluded that teaching takes a back seat to research at large universities, adding colourfully, 'Baccalaureate students are the second-class citizens who are allowed to pay taxes but are barred from voting, the guests at the banquet who pay their share of the tab but are given leftovers.'
- 2.16 While the report does not cite quantitative evidence, its description of the ways in which US universities define their own worth is telling:

*The primacy of research within the espoused missions of American universities is attested over and over within the academic world. The standing of a university is measured by the research productivity of its faculty; the place of a department within the university is determined by whether its members garner more or fewer research dollars and publish more or less noteworthy research than other departments; the stature of the individual within the department is judged by the quantity and quality of the scholarship produced. Every research university can point with pride to the able teachers within its ranks, but it is in research grants, books, articles, papers, and citations that every university defines its true worth.*¹³

Research and teaching: measuring faculty distribution of effort

- 2.17 Given this disparity in the treatment of teaching versus research, it is instructive to ask how faculty divide their efforts. This is not an easy question to answer. One of the relatively few sources of quantitative information on the balance between teaching and research activities among faculty is a survey conducted by the US Department of Education's National Survey of Postsecondary Faculty (NSOPF), which is reported in the National Science Board's *Science and Engineering Indicators – 1998*.¹⁴ According to this survey, 81 per cent of doctoral scientists and engineers employed in academic institutions as of 1993 were engaged in teaching. On average, these individuals devoted 50 per cent of their time to teaching and 25 per cent to research. Those who taught only undergraduates spent 65 per cent of their time on teaching and 22 per cent on research, while those teaching only graduate students distributed their time quite differently, spending roughly half as much time on teaching (34 per cent) and nearly twice as much time on research (38 per cent).
- 2.18 A different survey, conducted by NSF, asked doctoral scientists and engineers at universities to define their primary work responsibility. The responses indicate that while the number reporting teaching as their primary responsibility remained around 100,000 between 1985 and 1995, the number reporting research increased by nearly 50 per cent,

¹² Robin Wilson, 'Report Blasts Research Universities for Poor Teaching of Undergraduates', *The Chronicle of Higher Education* (April 24, 1998), p. A12.

¹³ Quoted from the overview section of the report, the full text of which is available online at <http://www.sunysb.edu/boyerreport>.

¹⁴ *Science and Engineering Indicators—1998*, pp. 5-27-28.

from 56,000 to 83,000 over this period. In research universities specifically, the number of those reporting teaching as their primary work activity has declined in recent years, while those engaged primarily in research increased. Considering those who report research either as a primary or a secondary responsibility, roughly 71 per cent of all academic doctoral scientists and engineers can be considered as engaged in research. This percentage varies considerably among fields, from 80 per cent in the environmental sciences to 60 per cent in psychology (where clinical work also plays a significant role).

- 2.19 In general, the more elite research universities have higher standards of research productivity for their faculty than do other institutions. To make this productivity possible, they allow their faculties to do less teaching and they provide other support in terms of laboratory facilities, libraries, information services, funds for graduate assistants, and the like. The faculty, in turn, are expected to seek outside (i.e. federal or foundation) funding for their research, and to cover a portion of their salaries and the stipends for their graduate assistants out of the grants they receive. In less research-intensive institutions, teaching loads are higher (in some state institutions, they may be set by state law) and expectations of research productivity are lower. Faculty receive fewer grants, on average, and the share of internal, institutional money devoted to research is also lower. These differences are readily perceived by the faculty involved. One professor from a second-tier institution in a rural area, interviewed by the author a few years ago, used a sports league metaphor to describe the differences: 'You're looking at the majors and the minors.'¹⁵

Balance between teaching and research: impacts on funding

- 2.20 Indeed, the differences between the 'major leagues' and the 'minor leagues' are clearly evident in terms of the distribution of research funding among institutions. In 1997, R&D expenditures of the top ten universities represented over 18 per cent of *all* academic R&D spending, the top 100 universities laid claim to nearly 80 per cent. The share of federal funding for academic institutions received by these institutions is even higher (22 per cent and 82 per cent, respectively).
- 2.21 The institutions that receive the lion's share of federal funding are the same ones that rank most highly on virtually all measures of academic quality and prestige. Because of the decentralised nature of the higher education system, there is no 'official' national quality assurance or peer review system for institutions or academic departments. However, various groups and publications periodically publish unofficial department rankings. By far the most comprehensive and important of these is that prepared by the National Research Council (the operating arm of the National Academies of Science and Engineering and the Institute of Medicine) which looks at research-doctorate programmes. Its most recent such study, published in 1995, provides information on 4,000 doctoral programmes in 41 sub-disciplines at 274 doctorate-granting institutions, including ratings of faculty quality, ratios of publications to faculty, ratios of citations to

¹⁵ Albert H Teich and Kathleen M Gramp, 'Competitiveness in Research: Perceptions of Practitioners,' in Teich, ed., *Competitiveness in Academic Research*, *op. cit.*, p. 87.

faculty, etc. The data in its massive report are used widely by other organisations to judge the relative standing of graduate departments.¹⁶

- 2.22 Because of the decentralised character of the US higher education system, these ratings do not translate directly into funding decisions at the national level, either for research or education. However, universities themselves certainly take them into account in allocating resources internally, and the rankings probably also become part of the mental calculus of grant peer reviewers and programme managers at federal agencies and foundations who must judge the merits of research proposals. This is not to say that an outstanding proposal from a researcher in a lower-ranked department cannot obtain funding, but only that, given two proposals of equal quality, the one from the more highly-ranked department will, in most circumstances, have the edge.

Research and teaching: internal institutional funding mechanisms

- 2.23 Budgeting systems and the procedures by which universities and colleges allocate funds among functions (e.g. teaching, research, administration, libraries, sports, buildings and grounds, etc.) vary greatly among institutions. Among public colleges and universities, there are wide differences in the ways in which state monies are provided to the institutions. At one end of the spectrum, the state legislature or the state-appointed board of trustees may specify in detail how the funds are to be allocated among functions. At the other end, the funds may be provided virtually as a lump-sum, with the college or university administration given great discretion as to their internal distribution. There are similar variations in the use of funds from other sources, such as tuition and revenues deriving from the indirect costs of research grants. In the absence of state support, private colleges and universities operate under fewer restrictions and generally set their own budget policies under the overall supervision of their boards of trustees.
- 2.24 Another key dimension of college and university budgeting is the degree of centralisation versus decentralisation within the institution. This was the subject of considerable debate and discussion on American campuses during the 1990s as institutions sought to cope with austerity in both federal and state budgets and pressures to restrain the growth of tuition. One model, known as 'responsibility centre management' or 'responsibility centre budgeting,' has received a good deal of attention.¹⁷ The basic notion is somewhat akin to the cost-centres approach among commercial firms.
- 2.25 The relative advantages and disadvantages of centralised and decentralised budgeting are well-described in the following excerpt from a 1995 report of the Budget Strategies Committee of the University of Illinois at Urbana-Champaign:

The spectrum of public university budgeting systems ranges from highly centralised to highly decentralised. In a centralised system, the Provost collects all tuition revenues and

¹⁶ Marvin L Goldberger, Brendan A Maher, and Pamela Ebert Flattau, eds, *Research-Doctorate Programs in the United States: Continuity and Change* (Washington, DC: National Research Council, 1995).

¹⁷ E L Whalen, *Responsibility Center Budgeting: An Approach to Decentralized Management for Institutions of Higher Education* (Bloomington: Indiana University Press, 1991).

state subsidies and oversees all expenditures from these sources. As a result, the Provost has maximum ability to guide the institution and promote change. In this top-down approach, units look to the Provost for direction. The disadvantage of this approach is that it divorces fiscal planning and decision-making from the detailed knowledge of programs within each academic unit. Furthermore, units are placed in a powerless state as they await decisions from the top. Initiative and creativity are dulled, and bad decisions are often hidden, because program improvements and expansions are not clearly coupled to financial rewards.

In a decentralised budgeting system, academic units control essentially all of their own revenues and expenditures. The entire university budget is attributed to and divided between the units. This approach improves the coherence between program knowledge and financial decisions. It also increases the ability of units to reap the rewards of their successes, encouraging them to develop and promote financially successful programs while also causing units to experience directly the financial penalties of failure. But, decentralised budgeting also has some serious limitations. Among them are the potential for balkanization and diminished collegiality, for financial success to displace academic integrity in the campus value system, and for institutional change to be held hostage to [academic units'] financial interests.

*Most university budget systems lie somewhere between these extremes. . . .*¹⁸

- 2.26 In a decentralised budget system, academic units are generally rewarded (in terms of increased budget allocations) for their ability to attract more students and thus generate more tuition revenue. Successful entrepreneurship – i.e., obtaining grant support for their research – gives faculty members a considerable degree of financial independence from their university's administration, since their grants cover portions of their salaries, graduate student stipends, equipment, and other costs. Grants from federal agencies usually include an allocation for indirect costs based on a percentage of the direct costs of the grant. Presumably, these funds are intended to reimburse the institution for costs that support the research being done under the grant but cannot readily be assigned to it (e.g., libraries, heat and other utilities, building maintenance, administrative costs, etc.). In practice, many universities return some or all of their indirect cost revenues to the units which generate them. Because the use of those funds is unrestricted (within limits, of course), the return of indirect costs serves as an incentive to seek additional grants. The fraction of indirect costs returned to the generating unit (or the lack of such a policy in some institutions) is frequently the source of friction between faculty members and university administrators.¹⁹

Structure and policy: impacts on relations between research and teaching

¹⁸ *Budgeting Policy for the University of Illinois at Urbana-Champaign*, Report of the 1994-95 Budget Strategies Committee (May 1995). On the World Wide Web at <http://www.provost.uiuc.edu/budget/reform/bscrept.htm>.

¹⁹ See, for example, Peter Likins and Albert H Teich, 'Indirect Costs and the Government-University Partnership', chapter 9 in David H Guston and Kenneth Keniston, eds, *The Fragile Contract: University Science and the Federal Government* (Cambridge, MA: MIT Press, 1994).

- 2.27 Although, as discussed earlier, there are many synergies between research and teaching, there are also ways in which the needs of research in the university do not necessarily serve those of teaching. Many research universities maintain large laboratories that are not closely integrated into the educational lives of their institutions. Some are remote from campus; others focus on areas, such as military research, in which the educational links are tenuous and the work may even be classified. During the past 20 or 30 years, many of the military laboratories were 'spun-off' into separate bodies. However, in recent years, the major growth in federal funding has been in biomedical science, led by steady increases in the budget of the National Institutes of Health. Much of NIH's funding goes to medical schools and their associated hospitals and laboratories and, while these institutions play a major role in postgraduate medical education, they are as much divorced from the rest of their universities as the defence labs were in their day.
- 2.28 Another factor influencing the integration of research and education is what has been called 'academic capitalism' – the increasing participation of universities in commercially-oriented research, including collaboration with industry, establishment of commercial firms by faculty, increased use of business practices by administrators, and a focus on licensing patents and other intellectual property created in the university in order to augment the institution's revenues. Slaughter and Leslie, who studied this phenomenon in the US, Canada, the UK, and Australia, found that the impacts of such activities on teaching are (not surprisingly) both positive and negative.²⁰ Some faculty claimed that their commercial ventures enriched their teaching. Others said that most of their commercial research was too esoteric to serve their undergraduates. On the whole, the study concluded that entrepreneurial universities tended to spend less money on teaching and more on research and service.
- 2.29 Aware of the pressures that drive academic entrepreneurship, a number of prominent academic leaders have, in recent years, sought to direct their colleagues' attention toward undergraduate education. These leaders recognise that neglecting the university's teaching function can have serious negative consequences for the nature of the university as a community of scholars as well as for the well-being of future generations. They also recognise that tuition is a major revenue source for private universities (and increasingly for public universities) and that students must be treated as important clients, rather than taken for granted.²¹
- 2.30 Thus, Frank Rhodes, former president of Cornell University and a national science policy leader, has written:

'I believe it is time to state clearly and firmly that, while research and teaching both contribute to the strength and vitality of the US research university, it is undergraduate teaching, and learning, that is the central task. . . . [It] generates more revenue than any other activity. Almost everything else universities do depends on it. . . . It prepares the

²⁰ Slaughter and Leslie, *op. cit.*, especially pp. 233-242.

²¹ *Ibid.*, p. 237.

*nation's future leaders and voters. It is through undergraduate education that the public encounters the university most directly, and it is on undergraduate education that the health of the research university will stand or fall.*²²

- 2.31 Rhodes's views parallel those of Donald Kennedy, former president of Stanford University, mentioned earlier, and many others. Taken together, they represent the leading edge of a movement toward greater emphasis on teaching and more integration of teaching and research in US universities.

Fostering the integration of research and teaching

- 2.32 Responding to the increasing number of calls to improve the quality of teaching in research universities and to promote the integration of teaching and research, the National Science Foundation has established several new programmes in recent years. Of particular note is the IGERT (Integrative Graduate Education and Research Training) Programme. The goal of this agency-wide programme is 'to enable the development of innovative, research-based, graduate education and training activities that will produce a diverse group of new scientists and engineers well-prepared for a broad spectrum of career opportunities in industry, government and academe.'²³ IGERT grantees are expected to use multidisciplinary research themes to provide 'a framework for integration of research and educational activities and for collaborative efforts in training that span disciplinary areas.' The projects involve hands-on experience with state-of-the-art research instrumentation and methods, foster teamwork skills, and provide links with industry and national laboratories. Examples among the 22 projects funded so far include a multidisciplinary, multi-institutional programme at five New York institutions on nanostructural materials and devices; a multidisciplinary training programme in computational analysis of social and organisational systems at Carnegie Mellon University; and a neuro-engineering training programme at UCLA.
- 2.33 Two other NSF programmes bear mention: Research Experiences for Undergraduates (REU) seeks to provide opportunities for undergraduate students to participate in active mathematics, science, and engineering research experiences. Several thousand students take part each year. Projects may be either 'sites,' which are independent proposals for undergraduate research participation, or 'supplements,' which are added on to research grants. All of NSF's disciplinary units sponsor REU grants.²⁴
- 2.34 The programme of Research in Undergraduate Institutions (RUI) provides awards for research and research instrumentation to investigators in non-doctoral departments in predominantly undergraduate institutions. All NSF directorates participate in this

²² Frank H T Rhodes, 'The Place of Teaching in the Research University,' in Jonathan R. Cole, Elinor G. Barber, and Stephen R. Graubard, *The Research University in a Time of Discontent* (Baltimore, MD: Johns Hopkins University Press, 1994), pp. 180-81. Quoted in Cozzens, *op. cit.*, p. 17.

²³ *Integrative Graduate Education and Research Training Program*. Program Announcement 98-96 (Arlington, VA: National Science Foundation). Available on the World Wide Web at <http://www.nsf.gov/home/crssprgm/igert/start.htm>.

²⁴ Information available on the World Wide Web at <http://www.nsf.gov/home/crssprgm/reu/proganno.htm>.

- programme, which is intended to broaden the base of the nation's scientific and engineering research and education capabilities by strengthening the research capacity of faculty outside of the major research universities.²⁵
- 2.35 While these programmatic efforts are important because of the funding they provide, which will influence institutional choices throughout the country, a recent non-governmental initiative may prove even more important in terms of influencing universities' choices and attitudes toward research and teaching in the coming years. In October 1999, the Carnegie Foundation for the Advancement of Teaching, an independent policy and research centre, established in 1906 under a congressional charter, whose mission is '... to do and perform all things necessary to encourage, uphold and dignify the profession of teaching. . . ,' announced changes in its system of classifying institutions of higher education.²⁶ This may seem like a fairly arcane matter, but, in fact, the Carnegie Classifications have been a major factor in shaping how American higher education institutions see themselves.
- 2.36 The classification scheme was created in 1970 in order to group institutions by academic mission and 'to pull the attention of policy makers away from the nation's research institutions, and to emphasise instead the variety and social importance of the vast majority of institutions that were not research oriented.'²⁷
- 2.37 Ironically, in many instances it has had the opposite effect. As Alexander McCormick, a Foundation official, told a group of Washington, DC, higher education policymakers: '*Although the Carnegie Classification is not intended to confer status or to rank institutions, it is widely interpreted in those ways. It has also been adopted for a range of uses beyond research, some of which have important consequences for institutions. Both of these factors have led institutional leaders to have ambitions with respect to the Classification and in some cases to adopt "moving up the Carnegie Classification" as an explicit institutional goal.*'²⁸
- 2.38 McCormick later told *The Chronicle of Higher Education*, '*We are concerned about—particularly among doctoral institutions – the tournament mentality that has grown up around the classifications. This has led to an imbalance in the attention given to various components of an institution's mission.*'²⁹
- 2.39 The Carnegie Foundation does not want its classification system to encourage every university to model itself on Stanford, MIT, or the University of Michigan. To quote

²⁵ Information available on the World Wide Web at <http://www.nsf.gov/pubs/stis1994/nsf9479/nsf9479.txt>.

²⁶ Kit Lively, 'Changes Planned for Carnegie Classifications', *The Chronicle of Higher Education* (November 5, 1999), p. A46, and Alexander C. McCormick, 'Why Carnegie Foundation Revised Its Classifications' (letter to the editor), *The Chronicle of Higher Education* (December 3, 1999), p. B10.

²⁷ Hugh Davis Graham and Nancy Diamond, *The Rise of American Research Universities: Elites and Challenges in the Postwar Era* (Baltimore, MD: Johns Hopkins University Press, 1997).

²⁸ Alexander McCormick, *Plans for the 2000 Edition of the Carnegie Classification*, October 26, 1999. Available on the World Wide Web at <http://www.carnegiefoundation.org/cc2000.htm>.

²⁹ Lively, *op. cit.* In his letter, McCormick also mentions that changes in NSF's data reporting played a role in the Foundation's decision.

McCormick once again, *'The drive to "move up" the classification can affect resource allocation and hiring, possibly at the expense of other components of institutional mission that are less finely measured or absent from the classification's definitions.'*³⁰ The new classification (see [table](#)) is intended to change these things.

- 2.40 Belief is growing among American higher education leaders that excellence in teaching, not as easily measured as federal funding for research, deserves more respect and more attention from administrators, planners and policymakers. The impacts of the Carnegie Foundation shift will be felt throughout the academic community in the coming years in more emphasis on teaching and greater integration of teaching and research. The pendulum is swinging.

³⁰ McCormick, *Plans...*

3 **Research and teaching in German universities**

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Introduction

- 3.1 The following report gives a brief overview of the main features and the most crucial problems in the relation between research and teaching at German universities. Starting with a short description of the basic characteristics of the German university system (paragraphs 3.3-3.9), the report then deals with those questions set for the individual country case studies. Since some of the questions (e.g. question 2) do not – or not fully – apply to the German case, the report tries to integrate the questions into a problem-oriented treatment of the German situation. Paragraphs 3.10-3.18 deal with the internal allocation of funds between research and teaching (questions 1 and 2); paragraphs 3.19-3.25 analyse the evaluation of research and teaching at German universities (question 3); and paragraphs 3.26-3.29 focus on the status of teaching in relation to research (question 4). Paragraphs 3.30-3.33 treat a problem not directly asked in the questionnaire, namely the relevance of so-called 'other activities' at German universities. Paragraphs 3.34-3.39 describe activities which aim at strengthening the links between research and teaching in the German system of innovation (questions 5, 6 and 7); and, finally, paragraphs 3.40-3.44 present proposals which suggest a better separation of research and teaching in order to improve the effectiveness and efficiency of both.
- 3.2 The analysis is based on official reports and some of the most relevant academic literature on the subject published in recent years.

Basic characteristics of the German university system

- 3.3 In 1996, the German higher education system was composed of 335 public or publicly recognised institutions, among them 113 universities or university-like institutions, and is dominated by the state and by public institutions. Although 65 of the 335 higher education institutions were privately owned in 1996 (more than half of them by churches), private universities have played only a marginal role so far (BMBF 1998, 43). Competition between public and private institutions is almost non-existent as yet.
- 3.4 Total expenditure of German higher education institutions for research and teaching amounted to 33.9 billion DM in 1995, of which roughly two-thirds were spent by universities. Subdivided by scientific disciplines, the largest share (22.9 per cent) was spent in the field of medicine, 17.6 per cent for humanities and social sciences, 16.4 per cent for sciences, 14.5 per cent for engineering and 3.2 per cent in agriculture.³¹ Total expenditure of German higher education institutions for research and development (R&D) was 14.4 billion DM in 1995 (BMBF 1998, 44).
- 3.5 Constitutional responsibility for (higher) education is divided between the national government and the federal states (*Länder*) by the Basic Law. It is the responsibility of the national government to define the general legal framework for the higher education

³¹ The remaining 25.4 per cent were spent for central facilities not directly related to specific academic disciplines.

system (*Rahmengesetzgebung*). The federal states have the authority to shape and organise their universities within the limits of this general framework. Despite this (limited) autonomy of the federal states in higher education, competition between them and between state-owned universities has been very limited – if not completely absent. This has, among other things, been the result of an intensive horizontal and vertical co-ordination of political and administrative decision-making (*kooperativer Föderalismus*).

3.6 The following report concentrates on universities, leaving other institutions of higher education (e.g. *Fachhochschulen*) aside. German universities are, among other things, characterised by two basic principles relevant to the questions to be answered in this report:

- *The institutional integration of research and teaching* within the universities. In principle, research and teaching have equal rights and equal value and, what is more, they should not merely co-exist, but the universities are obliged to integrate them in some form of ‘science-based’ or ‘science-related’ education.³² Consequently, there are no research universities with a reduced educational function in Germany, and likewise, there are no teaching universities without research.
- *The universities’ strong reliance on self-organisation and self-administration*. This means that – within the framework of existing laws – the universities have the right to autonomously decide on all matters directly related to research and teaching, by own bodies and without outside interference.³³ This implies that the universities enjoy some degree of freedom in the internal allocation of resources (personnel, funding).

3.7 These principles date back to the early 19th century and they have been heavily influenced by Wilhelm von Humboldt, the founder of the University of Berlin; and, in a sense, they have become the basic features of the classical concept of the European university. As in other European countries (OECD 1998), these principles have been challenged in the last decades:

- universities have come under increasing pressure to respond more to social and economic demands both in research and in teaching
- the number of students has been increasing dramatically since the early 1970s, transforming universities into mass education systems
- despite an increasing teaching load, financial resources have been stagnating since the mid-1970s, which has caused a severe fiscal crisis in the German university system.

³² The new Bavarian university law, for example, states explicitly: “*Die Universitäten dienen vornehmlich der Forschung und Lehre und verbinden diese zu einer vornehmlich wissenschaftsbezogenen Ausbildung*” (Art. 2, Abs. 1 Bayerisches Hochschulgesetz vom 02.10.1998).

³³ According to the dominant opinion among scholars of German university law, autonomy in respect to German universities means “*die Kompetenz, alle Verwaltungsmaßnahmen, die mit Forschung und Lehre sachlich unmittelbar zusammenhängen, eigenverantwortlich weisungsfrei durch eigene Organe – freilich im Rahmen der Gesetze – wahrzunehmen*” (Knemeyer 1996, 245f.).

- 3.8 The federal government has responded to these challenges with two major reforms, in 1977 and in 1998. Both reforms aimed at modernising the internal organisation of the German universities and their relations to the state. However, they have not abandoned the basic principles of the German university system. In particular, Humboldt's ideal of an integration of research and teaching at the universities has been explicitly retained. Consequently, the material conditions (personnel, funding and equipment) for university research have been continuously deteriorating since the mid-1970s, and complaints about a replacement of research by teaching have been growing (Schimank 1995).
- 3.9 The strains resulting from this intensifying conflict between research and teaching have to some extent been mitigated by the fact that the German system of innovation and higher education is highly complex in a comparative perspective (Keck 1993). Universities are an important part of this system, but they neither enjoy a monopoly in the realm of public research, nor are they the only institutions responsible for higher education. In respect to research, the German system is characterised by a large number of public research organisations and institutions in addition to universities. In the field of basic research, which is the domain of university research, the Max Planck Society is the most important and renowned. These institutions and organisations have no teaching function at all, thus relieving the strain in university research to some extent. With respect to higher education, the universities' burden has been eased by the *Fachhochschulen*, whose function is higher education below the university level and in which research (mainly applied research and developmental work) is clearly subordinate to teaching tasks.

Internal allocation of funds between research and teaching

- 3.10 German universities finance their expenditures to a large extent by 'core funding' (*grundfinanzierung*). Core funding of the universities is the exclusive responsibility of the federal states. In addition to core funding, universities received 4.5 billion DM from external (public or private) funds for R&D in 1995, which was 31.2 per cent of their R&D expenditures (of 14.4 billion DM) and about 13 per cent of their overall expenditures for research and teaching (of 33.9 billion DM). Industry's share of the universities' R&D expenditures was 8.2 per cent (1.2 billion DM in total) in 1995 (BMBF 1998, 45).
- 3.11 The mechanisms for the assignment of financial resources to the universities and the internal allocation of funds have been changing in recent years. These changes have partly been prescribed by the new university law; some had already been introduced voluntarily by some universities. Consequently, variations between the universities' budgeting mechanisms are increasing. The new Bavarian university law even promotes this kind of administrative diversity by introducing a clause which gives the universities some room for experimenting (*experimentierklausel*).
- 3.12 Before 1998, core funding by the state governments was given on the basis of budget proposals submitted by the universities. These budget proposals were expected to cover the universities' needs, calculated mainly on the basis of input indicators (e.g. number of

students).³⁴ For the internal allocation of resources within the universities there were basically two mechanisms:

- *A centralised procedure*, by which the government funds were distributed by central university bodies to the institutes and chairs. The only function of the faculties under this rule was to distribute (and re-distribute) the personnel not directly assigned to the institutes and chairs.
- *A decentralised procedure*, by which the government funds were transferred to the faculties by the central university bodies and then distributed by the faculty decision to the institutes and chairs.

3.13 Because of variations in the federal states' university laws, both mechanisms can be found. In practice, before 1998, these variations made almost no difference since the financial autonomy of the universities had been very limited for at least two reasons. First of all, government funds had been strictly earmarked (*Zweckbindung*), and in addition, a significant share of the budgets had been directly negotiated by the professors as part of their position. Thus, the universities' capacities to allocate funds according to their own priorities and preferences have been small.

3.14 Recent changes to the national university law and the university laws of some federal states aim at a significant increase in the universities' financial autonomy, by relaxing the earmarking and by abolishing the commitments given to professors as part of their position. In Bavaria, for example, these commitments will expire in the year 2001. Within the universities, both the central administration and the faculties have strengthened their position in the process of resource allocation. On the one hand, the university leadership has strengthened its position by securing a budget of its own;³⁵ on the other hand, the distribution of core funding has been decentralised and is now mostly decided on by the faculties.

3.15 The standard approach to the internal allocation of funds between research and teaching has been partially affected by these changes. Some universities meanwhile have employed performance-based indicators to calculate the budgets of their faculties and their institutes. In their calculations, they distinguish between research (e.g. research grants, dissertations, habilitations) and teaching (e.g. number of new students, number of

³⁴ These input-indicators have been standardised in joint commissions established by the federal states in this field. Thus, there are no variations between the federal states in the parameters used for the calculation of their universities' budgets. For example, the differences between the financial requirements of students of different academic disciplines (e.g. between humanities and engineering) have been adjusted by a standardised coefficient (*Curricular-Normwert*). On the basis of these practices, governments then had two options to adjust the universities' budgets to the growing number of students: they could either raise the budget or they could change the coefficients – the stagnating budgets indicate that they had a certain preference for the latter.

³⁵ For example, at the Technische Universität München, 10 per cent of the resources devoted for research are deduced from the budgets of the institutes and are now centrally distributed, according to the goals and priorities of the university's leadership.

- successful examinations). In addition, they have started to calculate the costs of rooms, equipment etc, in order to base expenditure decisions on real costs.
- 3.16 However, these changes have yet to affect the use of the resources or the monetary spending. Neither the faculties nor the institutes and chairs have had to spend funding according to the relative share as calculated for both activities. As a result of the integration of research and teaching, German universities still do not differentiate between these two activities in their spending. Core funding covers staff salaries and general running expenses. Universities still work on the assumption that all academic staff engage (at least in principle) in both teaching and research, and their institutes have a single budget covering all the operating costs for both research and teaching. This means, in fact, that the institutes and individual professors decide how to allocate funds. For example, it is up to them whether they employ student assistants for research or for the support of teaching, and it is also up to them whether they invest their money in textbooks for teaching or in journals for research. Since it would often be difficult – if not impossible – to distinguish between both activities in practice, there are good reasons not to regulate spending to any further extent.³⁶
- 3.17 The existing solution strengthens the principle of self-administration and self-organisation; however, it has its problems as well. Most problematic is that there are no institutionalised safeguards for adequate financial support of research. It is very possible that, as a consequence of the rising number of students and the increasing teaching load at German universities, research has been subordinated to teaching. At least there is some empirical evidence that there are a number of institutes which use their core funding mainly for teaching and have to secure external (public and private) research grants to finance their research (Schimank 1995). As a result of these developments, research at German universities has become more dependent on external financing.
- 3.18 As a side note, the lack of any separation between research and teaching in the spending of core funding also leads to severe difficulties for R&D statistics in Germany (as in other countries without separate accounting procedures for research and teaching). German figures on national spending on R&D, in particular on the R&D spending of universities, are not based on real expenditures, but are statistical artefacts calculated by means of indicators developed by the major public organisations (among others the federal ministry for education, science and research, the national science council, and the conference of the state ministries responsible for science and education).

Evaluation of research and teaching

- 3.19 Until recently, there has been no systematic measurement of the performance of German universities in either research or teaching. There has been no peer review system to evaluate the research performance of universities, academic disciplines, faculties or

³⁶ The earmarking of funds as part of core funding also made no distinction between research and teaching. Earmarking was related only to subject categories, e.g. telephone costs. However, it was possible of course to devote funds to special purposes either in teaching or in research. Examples in teaching are tutorials for beginners; examples in research are funds for the organisation of research symposiums, etc.

- institutes; and even within the universities, the performance of academic staff in research has not been evaluated or measured. Apart from the presentation of publications and spectacular scientific achievements in their yearbooks, the universities had no need for such a measurement, since performance had hardly any effect on either the size of their overall budget nor on the internal allocation of resources. However, there have been indirect measurements of performance in research, most importantly the successful competition for peer-reviewed research grants and research contracts.
- 3.20 As a consequence of the recent shift to a more performance-based system for the allocation of funds both among and within universities³⁷, the universities have identified a number of indicators for the measurement of research performance. However, no standardised set of indicators exists which would allow a systematic comparison. In addition, systematic evaluations of entire universities or individual institutes within universities, or of academic disciplines on a national or *Länder* level have become more frequent, and they are used in the restructuring of institutes, faculties or universities. However, these evaluations have been done on an *ad hoc* basis and have not been part of a system of regular evaluations. As a consequence, for example, there is still no official ranking of German universities according to their research performance.
- 3.21 As mentioned above, some universities have meanwhile introduced measures for the evaluation of their research performance. Internal funds for research are partly distributed on the basis of these performance measures. However, the approaches chosen are rather idiosyncratic. The Technische Universität München, for example, which has just been named the most reform-minded German university, does not include peer-reviewed publications among the indicators employed for the measurement of the research performance of its academic staff.
- 3.22 Moreover, research performance has no direct impact on the individual salaries of the academic staff nor on the teaching load of individual professors.³⁸ Salary increases of German professors, like any other civil servant in Germany, are related to years of service, and not to his/her actual performance. The federal government is planning to change this rule as part of its effort to improve the efficiency of the universities.
- 3.23 The evaluation of teaching is also a recent development in German universities. For years this has been the domain of weekly news magazines, and the universities themselves have been very reluctant to introduce evaluations of teaching. As in the case of research, there is still no common, standardised approach to the evaluation of teaching, although the new university laws have made evaluations of teaching mandatory. In practice, this means that it is up to the universities and their academic bodies to decide on the procedures and instruments used for the evaluation of teaching. The result is that the evaluation of teaching varies not only from university to university, but also within the universities

³⁷ For example, it is a major goal of the new Bavarian university law to promote the universities' performance by introducing a distribution of resources based on actual performance and needs (*leistungs- und belastungsbezogene Mittelverteilung*).

³⁸ However, there are some indirect consequences. For example, they are important for a professor's appointment to another university.

from faculty to faculty, sometimes even within a faculty between its various fields of study. It seems as if this diversity serves a very specific purpose, namely to make the results of evaluations unique and therefore not comparable.

- 3.24 In most cases, these evaluations have rather symbolic functions. They are not yet used for budgetary decisions, and there are even serious doubts whether any use of evaluations for such a purpose would be in conformity with the constitution.³⁹ As in the case of research, the results of teaching evaluations have – apart from some rather symbolic donations – no consequences on the individual salaries of the academic staff.
- 3.25 In summary, existing knowledge of the performance of German universities both in research and in teaching is clearly insufficient, and is definitely inappropriate for decisions on the allocation of (financial) resources.

Status of teaching in relation to research

- 3.26 Formally, research and teaching have equal status within German universities. Teaching is an integral part of the universities' tasks. Every professor is obliged to teach and the teaching obligation (eight hours a week) is equal for every German professor, irrespective of age, research performance or academic discipline. Unlike UK universities, there are no research professorships (i.e. chairs without – or with limited – teaching obligations) in Germany, and it is impossible for German professors 'to buy out' of their teaching obligations with research money.
- 3.27 In practice, however, the relative status of teaching is inferior for various reasons. Some of these reasons (for example the higher public reputation of scientific achievements) are general characteristics of any modern university system. Others are more specific to German universities. Among them are the following:
- *First*, excellence in research is the most important criterion for an academic career at a German university. The doctoral degree and the habilitation, the two formal preconditions for a German university career, are awarded (almost) exclusively on the basis of research performance. Especially in the early stages of a university career, too much effort put into teaching at the expense of research can be harmful to an academic's career.
 - *Second*, it is almost impossible to secure additional funding strictly for teaching. Grants and contracts are mainly given for research and on the basis of previous achievements in research. Too much effort in teaching at the expense of research can thus be a competitive disadvantage. Given the fact that research funding (in addition to core funding) is becoming ever more important, this competitive disadvantage of teaching has become more serious.

³⁹ The main argument is that an evaluation of teaching by the public employer is generally not in conformity with the constitution because of the professor's constitutionally granted freedom from instructions and judgements (*Weisungs- und Beurteilungsfreiheit*). This implies that any sanctions linked to evaluations would be illegal (cf. Krüger 1996, 321).

- *Third*, for professorial appointments in Germany, achievements in research are regarded as more important than experience and excellence in teaching. This is always the case with first appointments, but also for future ones. Since job offers from other universities are the only possibility for German professors to negotiate an improvement of their core funding and an increase in their basic salary, there are strong incentives for a German university professor to give a larger concentration to research activities even after his/her first appointment.
- 3.28 In recent years, there have been some efforts by the national government, the state governments and the universities to improve the status of teaching at German universities. Among the various measures taken have been:
- teaching awards – prizes awarded by state governments or individual universities for excellence in teaching
 - special training courses for young researchers to improve their teaching performance
 - more emphasis on teaching experience and the quality of teaching in the nomination procedures for professors.
- 3.29 There are considerable imbalances in the status of teaching in relation to research, to the detriment of teaching. However, these imbalances are not the result of a formal inequality or of a national strategy; rather, they are the (more or less intended) consequence of some structural features of the German university system. The various measures introduced in recent years with the goal to strengthen the status of teaching in German universities have not been able to change this situation thus far.

The (in)significance of 'other activities' at German universities

- 3.30 'Other activities', that is activities which directly support the mission of a university but which are not part of its research and teaching functions, deserve special treatment in the case of German universities. Whereas these activities – among them consultancy work, special training courses, knowledge transfer – have become more important in other countries, they are still almost insignificant in German universities, at least as part of the institutions' official functions.⁴⁰
- 3.31 This is not to say that the academic staff of German universities, its professors in particular, restrict their activities to research and teaching. However, the status of German university professors is unique in two respects. On the one hand, their official duties are generally restricted to their research and teaching activities. If not otherwise agreed upon, it is impossible to impose other duties (e.g. consultancy work, community services) on them as part of their regular job. On the other hand, they enjoy quite generous legal

⁴⁰ The situation of university professors in medicine is an exception here. They would deserve special attention, since in their case hospital treatment is also part of their official duties. In addition, they also enjoy extraordinary possibilities for earnings on the side.

possibilities for private sideline activities (*Freizügigkeit der Nebentätigkeit*).⁴¹ They are even permitted to use the resources of their university for these sideline activities, and are only obligated to reimburse the costs of usage.

- 3.32 The consequences of this are obvious. On the one hand, German university professors have been very busy in activities which can be categorised as 'other activities' according to this study. Contract research, consultancy reports, expertise (among other things) are natural – and in some cases very rich – sources of supplementary income for German university professors. On the other hand, it has turned out to be very difficult to make new activities part of the official mission of a university. This is especially true in the case of teaching. For example, German universities have been very reluctant to offer additional (short) courses, for example for former graduates, as part of a policy of lifelong learning. This is mainly because such activities would either be at the expense of existing teaching activities (which is impossible both for practical and for legal reasons) or they would have to be offered voluntarily by the academic staff (which would be rather unlikely).
- 3.33 As a result, German universities have been very conservative in the scope of their activities. Considering their long-lasting financial crisis, this reluctance is even more noteworthy. Quite obviously, they have neither been willing nor able to exploit new activities to overcome the financial shortcomings from which they have been suffering for years.

Linking research and teaching in the German system of innovation

- 3.34 Because of the close and institutionalised integration of research and teaching in German universities, public debates and national and state policies have rarely focused on linkages between research and teaching within the universities. These linkages are taken for granted since the academic staff are obliged to perform both functions at the same time. The main interest of state governments has been to make sure that the academic staff, professors in particular, actually fulfil their teaching obligations. For example, in recent years they have tried to regulate the professors' presence at their universities in order to improve their availability for students.⁴² Measures like these indicate, however, that the problem has been identified as an individual one (if at all) and, consequently, the solutions offered by German science policy are targeted at the level of the individual.
- 3.35 Most of the time, public debates and activities have concentrated on linkages between academic research and research activities in public research institutes on the one hand, and on the links between academic research and industry on the other. The goal of all these activities has been to improve, to intensify and to accelerate the transfer of knowledge from the universities to those locations where it is expected to be best utilised. This is not to say that links between university and industry have not previously existed

⁴¹ The legal possibilities for private sideline activities of the universities' academic staff have been limited since the 1970s as a consequence of frequent complaints that academic staff would neglect their duties, primarily their teaching duties, despite a growing number of students.

⁴² Most rigid are new regulations of the federal state North-Rhine Westphalia, which (among others) oblige their professors to be present at their university for four days a week during the semester.

- in Germany. Some industries, such as the chemical and the mechanical industries, have for a long time been famous for their close links to universities, and recent empirical analyses have shown a 'considerable impact of industry on academic research' in Germany (Meyer-Krahmer/ Schmoch 1998: 835).
- 3.36 As in other industrially advanced countries, there have been a large number of activities by national and state governments as well as by the universities themselves in the last two decades in an attempt to intensify university-industry linkages. Among them are:
- the funding of co-operative R&D projects integrating companies, universities and research institutes (Lütz 1993)⁴³
 - the establishment and funding of institutions for the transfer of technologies or knowledge⁴⁴
 - the support of start-up companies founded by academics or graduates
 - the encouragement of exchanges of R&D personnel between companies and universities.
- 3.37 Obviously, these activities have been mainly addressed at the research function of universities. University teaching has not been the prime target of public activities to improve university- industry linkages.
- 3.38 This is not to say that the educational function of universities has been ignored by industry. The companies, in particular the larger ones, are well aware that educated personnel are highly important for them. The companies have also realised that the universities have some difficulties in taking up and in re-directing resources (personnel, money) into new fields of research. For this reason, a growing number of companies have begun to sponsor chairs in German universities for limited periods, usually for about ten years. The money is granted on the condition that the universities will continue to finance the post afterwards. As a consequence, industry has gained a more direct and active influence on the universities' teaching activities.
- 3.39 In addition, the federal and state governments have tried to promote co-operation between universities and public research institutes as part of their programmes to improve the effectiveness and efficiency of research in recent years, e.g. through joint appointments. Although these measures have mainly been targeted at research, they have also contributed to the better integration of research and teaching. They allow researchers at public research institutes the opportunity to experience teaching, while strengthening the research profile of university teaching by facilitating the transfer of scientific personnel to academic positions. This has become increasingly important in recent years for those universities which have shifted the priority of their activities towards teaching, thus

⁴³ In the 1980s, joint research projects have become the predominant mode of financial support granted to companies by the national research ministry, in particular in information technology and in mechanical engineering (cf. Grande/ Häusler 1994).

⁴⁴ The most interesting example in this respect is the Steinbeis Foundation, an agency established by the state government of Baden Württemberg in the 1980s. Its main function is to help small and medium-sized companies to find the necessary knowledge in Fachhochschulen and universities.

losing some of their ability to provide a more demanding science-based education as required by Humboldt's ideal.

Proposals for separating research and teaching at German universities

- 3.40 Most public activities aim for a better integration of the various actors, organisations and institutions relevant in the German system of innovation, and most are targeted at the research process and at the flow of knowledge. However, these activities hardly address the relation between research and teaching, and, what is more, they do not target the serious structural problems in this relationship.
- 3.41 In recent years, in-depth studies of university research in Germany⁴⁵ reached the conclusion that German universities do not suffer from an insufficient integration of research and teaching, rather, the problem is that both activities are integrated too tightly. Given the strong financial pressures and the inescapable obligations in teaching, German universities have suffered from an intensifying conflict between their two basic functions. The result has, by and large, been a slow replacement of research by teaching. Strategies to cope with this problem have mainly been undertaken on the individual level by professors. Among other things, they have responded to these pressures by intensifying their efforts to acquire research grants and even to use research money and personnel for teaching purposes; or they have standardised their courses, thus making teaching less time consuming. However, these individual coping strategies have been clearly insufficient and they are not suited to solve the underlying problem.
- 3.42 To date, the policies of the national and state governments have not addressed this problem sufficiently. Recent university reforms aim at improving the effectiveness and efficiency of teaching, but it is doubtful whether they will suffice to relieve the existing tensions. Since significant additional financial support is rather unlikely, existing proposals which aim at some kind of institutional separation of research and teaching within the universities deserve more attention. The most promising measures in this respect are:
- On an *individual level*:
 - (i) the establishment of research professorships with reduced teaching obligations; or at least the possibility for a temporary reduction of teaching obligations for professors who are very active in research (e.g. buying out of teaching with research funds)
 - (ii) the re-establishment of tenure positions with significantly higher teaching commitments;⁴⁶ or at least the possibility of a significant increase in teaching obligations for those who are no longer active in research.

⁴⁵ Most valuable and most explicit in this respect is Schimank (1995).

⁴⁶ Tenured positions for academic staff below the level of professors have mostly been abandoned at German universities as a result of the university laws of the late 1970s. This holds in particular for those with the status of civil servants (*Akademische Räte*).

- On an *organisational level*:
 - (i) the establishment of research departments in addition to the existing faculties which, so far, are structured mainly on the basis of their teaching activities⁴⁷
 - (ii) the establishment of research institutes under the leadership of the universities, but outside of their jurisdiction (*An-Institute*).⁴⁸
- 3.43 These proposals do not aim at a complete disintegration and separation of research and teaching. They would guarantee the future co-existence of research and teaching in German universities, but would mitigate some of the negative consequences of this co-existence caused by the transformation of universities into mass universities and of the lasting lack of financial resources.
- 3.44 It is rather unlikely, however, that these measures will be taken in the near future. It should be noted that this is not only the failure of (national or state) governments, which have been very reserved indeed in the reformation of universities. Some of the proposals could have already been realised by the universities, but only a few of them have actually made use of this possibility. This indicates that the conservatism of German universities is also the result of their internal structures and decision-making processes based on the principle of self-organisation and self-administration, which obviously have a tendency to protect the status quo.

⁴⁷ The establishment of departments (instead of faculties) has already been possible under the former university law. However, the universities have made no use of this possibility. One of the very few examples has been the physics department at the Technische Universität München, which was founded in the 1970s on the initiative of Rudolf Mösbauer, a nobel prize winner in physics.

⁴⁸ The university laws of some federal states already offer the possibility for universities to establish research institutes based on private law, but still associated with the universities (*An-Institute*). This separation of research activities allows them to be more flexible in the use of resources.

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