

HEFCE Fundamental Review of Research Policy and Funding

Sub-group to consider the nature and purpose of HEFCE funding

Final report

May 2000

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- Overall, the UK research base is performing well. We have considered funding issues in the context of maintaining and enhancing this high level of performance over the next 10-15 years. We have broadly explored the range of funding approaches that might be adopted, the most appropriate response of public funders to the changing research landscape, the inter-relationships between funders, and the nature and purpose of HEFCE funding. We have concluded that there is evidence of a need for change in a number of areas, and have made recommendations as appropriate; these are summarised below.

Applicable research and knowledge transfer

- There is no basis for creating a separate funding stream to support applicable research. However, there should be continuing emphasis on ensuring that RAE processes do not disadvantage applicable research.
- There should be greater clarity in the roles of quality-related research funding (QR) and the Higher Education Reach-out to Business and the Community (HEROBC) funding in supporting research and knowledge transfer respectively.
- HEROBC should fund interactions that are more complex than large HEIs working with major industrial employers it should include, for example, technology transfer into small and medium enterprises (SMEs), the public sector, and the community
- There should be a more focussed approach to the allocation of HEROBC funding. The process adopted should ensure that excellence in knowledge transfer is rewarded, including making appropriate levels of funding available for institutions with a small research base but which demonstrably 'punch above their weight' in terms of the quality of their knowledge transfer activities.

Research Training and career development

- We recommend a direct link between HEFCE funding and research training and career development.
- It is the responsibility of funders and institutions to create an environment in which career development forms an integral part of research training.
- Institutions in receipt of QR funding should have policies in place to ensure that good practice is followed. Opportunities should be sufficiently flexible to meet the needs of those individuals with the potential to pursue productive careers in many different areas and roles, either within HE or outside.
- It may be of benefit to make Research Assessment Exercise (RAE) submissions include outline training and staff development plans.
- It would be possible to make the award of RAE ratings, or full QR funding, dependent on satisfying minimum criteria relating to the treatment of, and opportunities for, new researchers.
- Disciplinary and/or regional postgraduate training networks might be developed.

Increasing strategic focus

- There should be greater emphasis on strategic considerations within institutions, but a national strategic plan is not appropriate, as research is a fast moving and innovative activity.
- We recommend the establishment of a broadly based 'capability-development' mode of funding to enable the HEFCE, through institutions, to respond to strategic needs and address areas where there has been "market failure".
- 'Capability-development' funding would provide a framework for research that had a distinctive contribution but which might not be best supported by the current approach to selectivity:
 - emerging subjects requiring capability building
 - research of national, regional or local importance
 - research underpinning practice in areas where the research activity is very dispersed, such as nursing and social work.

Collaboration

- The research landscape is changing and funding mechanisms have to adapt to ensure that new forms of research, which are increasingly collaborative, are not disadvantaged.
- It is probably not possible to develop a mechanism for the HEFCE to directly fund collaborative research networks in which the benefits would outweigh the potential for distortion.

Establishing a proper project / infrastructure balance

- An imbalance between project and infrastructure funding has arisen and it may be necessary to "hypothecate" a certain proportion of QR funding for infrastructure support
- Modifications to the funding method may be needed to remove the incentive to recruit staff and students at the expense of infrastructure
- The basis on which support is provided for projects sponsored by the charitable sector should be on an agreed and explicit basis, rather than by converting charitable income into a volume measure
- The Funding Council should consider the implications of the fact that funding for EU sponsored projects does not cover the full costs of undertaking the work.

Background

1. This report is structured around the terms of reference of the group and therefore, after establishing the rationale for public funding of research, moves logically from how the research base is currently performing, through what approaches will be required to sustain and enhance performance in the future (as the nature of research continues to change) to a consideration of the particular nature and purpose of HEFCE funding. The report therefore focuses on the discussions we have had relating to:

- The current performance of the UK research base
- How the nature of research is changing, and what is driving this change
- How complementary approaches by funders can maximise the value achieved by the research base
- What is the nature and purpose of HEFCE funding in this context
 - How should it be used to support strategic needs
 - What is the most appropriate funding method

2. The report concludes by reviewing these areas in the context of the 5 key issues that arose across the review – Supporting world class research, encouraging applicable research, recognising collaboration and research networks, developing research people and widening research. In exploring the specific role that HEFCE funding should play we have considered the range of funding approaches that might be adopted and the inter-relationships between funders - in the context of how the research base is likely to develop over the next 10-15 years. In undertaking this we have borne in mind some assumptions about the future of higher education:

- continued expansion
- focus on individual student needs
- growth of quality assurance systems
- profound role of communication & information technology (C&IT)
- greater competition between institutions
- importance of global and regional dynamics
- increased professionalism of research
- stronger links with industry.

3. We were also cognisant of the fact that research is one of a number of issues that make up a radical future agenda for higher education, including:

- widening participation
- innovation; the e-University
- business and the community
- collaboration and restructuring
- human resource development.

4. The report draws heavily of the evidence we have gathered as part of the review – both that generated to support the work of other sub-groups, which naturally fed into our considerations about the nature and purpose

of HEFCE funding and a study we commissioned to specifically support our work. The study we commissioned – an analysis of international approaches to research policy and funding from SPRU Science and Technology Policy Research, University of Sussex – ensured that our discussions and recommendations were fully informed by current and emerging trends in research policy evident in other countries.

5. These international comparisons necessarily included reviewing current approaches in the USA. However, there are many myths about the USA experience, and it is too simplistic to suggest that the UK could cherry-pick elements of the USA approach and expect to implement them here successfully in the short term. Nevertheless, we recognise that there are lessons to be learnt from experiences in the USA, and other countries.

6. We also recognise the rapidly increasing significance of the European dimension to research. In particular we are cognisant of the implications of the meeting of the EU Commission at the Lisbon summit in March 2000 which endorsed the drive to create a European research area. We note especially the endorsement at that meeting of the suggestion that, where appropriate, mechanisms should be developed for networking national and joint research programmes, on a voluntary basis around freely chosen objectives, in order to take advantage of the concerted resources devoted to R&D in the member states. We also note the suggestion to develop an open method of co-ordination for benchmarking national research and development policies.

7. We have concluded that the HEFCE should not fund collaboration between UK researchers explicitly and directly, as the UK research base has been demonstrated to be highly collaborative and because of the possible unintended distortions. However, this rationale does not extend to international collaboration where we believe there is a case for explicit support because of the need to develop collaborative mechanisms, nor to research training, the reasons for which we discuss in detail in the report.

8. Membership of the group is shown at Annex A, and terms of reference at Annex B

What is the rationale for public funding of research?

9. In its report, the National Committee of Inquiry into Higher Education (NCIHE) set out its view that higher education in the UK should undertake research which matches the best in the world and make the benefits of this research available to the nation. It saw four main roles for research, and reasons for supporting it in higher education institutions (HEIs):

- to add to the sum of human knowledge and understanding
- to inform and enhance teaching
- to generate useful knowledge and inventions in support of wealth creation and an improved quality of life
- to create an environment in which researchers can be encouraged and given a high level of training.

10. To this list we would add more explicitly the production of individuals who subsequently leave academia to pursue careers outside HE. In an increasingly knowledge-driven world, it is essential for the competitiveness of our nation that we have a highly skilled workforce who are able to manage the increasing penetration of research and technology into all aspects of our lives, and the increasing speed to market of scientific discoveries.

11. We would also highlight the role of the UK research base in maintaining a pool of knowledge on which the UK can rapidly and effectively draw, and which provides access to the community of researchers overseas and their work. We note that the UK accounts only for some 7 per cent of world research activity (and only 4.5 per cent of funding). Access to the other 93 per cent of world research activity depends, in part, on UK researchers being accepted as peers by researchers overseas. This is an important benefit which accrues from the public funding of research in the UK.

12. Like the NCIHE, we believe there is a need to recognise the different roles of research, and to ensure that each of them is supported appropriately. Later in this report we make specific recommendations about how research training and capability development can be better supported. We also note the growth of charitable funding and the impact that this has on the project infrastructure balance, and consider whether the current HEFCE funding approach in this respect is sustainable.

13. We believe that there are particular benefits of HEFCE funding, in sustaining research rigour and facilitating the 'joining up' of research funded by others. We are therefore particularly concerned that the recommendations we make in this review bring maximise the complementarity between HEFCE funding and that provided from other sources, in order to optimise the output of the research base.

How well is the research base performing?

14. The UK research base is performing extremely well.

15. First, as detailed in Table 1 below, UK researchers rate more citations per pound (or dollar) spent than any other industrialised nation. The UK is also highly productive, though it is interesting to note that it produces fewer papers per researcher than several other countries; this latter finding concurs with the view of the quality assurance sub-group that the RAE is unlikely to be responsible for promoting an undue proliferation of publications in the UK: rather it reflects a global trend to produce shorter sharper articles.

Table 1: Papers per \$ million, citations per \$ million, and papers per researcher for selected leading industrialised nations (1997)

	Papers per \$ Million ¹	Rank	Citations per \$ Million ²	Rank	Papers per Researcher ³	Rank
United Kingdom	16.0	1	70.5	1	11.2	4
Canada	14.7	2	61.0	3	10.9	5
Australia	13.9	3	48.3	7	10.2	6
Ireland	12.9	4	38.2	10	7.0	11
Spain	12.1	5	36.3	11	5.2	13
Sweden	11.3	6	52.3	4	15.7	1
Switzerland	10.9	7	65.7	2	15.3	2
Netherlands	10.3	80	48.7	6	11.3	3
France	9.8	9	38.3	9	8.4	9
Belgium	9.5	10	41.3	8	9.9	7
United States	9.2	11	49.0	5	9.2	8
Italy	9.0	12	34.0	12	5.6	12
Germany	7.9	13	31.9	13	7.2	15
Portugal	7.2	14	17.9	15	1.8	16
Austria	7.1	15	25.9	14	7.3	10
Japan	3.6	16	11.7	16	4.5	14

Source: Katz, 2000 – taken from OECD, Main Science and Technology Indicators, OECD Statistics, 1999 and ISI National Science Indicators

1. This number refers to higher education R&D expenditures in 1997 in \$ dollar PPP.

2. This number refers to number of citations per paper from ISI National Science Indicators

3. This number refers to number of papers per researcher, OECD sources.

16. Second, and even more conclusively, we note that work commissioned by the research review sub-group on selectivity (from the Higher Education Policy Unit in Leeds University (HEPU) – in association with ISI, the foremost source of information about scientific output) has demonstrated the increasing effectiveness and productivity of the UK research base, and indicated that this is due, at least in part, to the HEFCE policy of selectivity and the mechanism that supports it, the RAE.

17. The key conclusions of the HEPU study are:

- a. An explicit policy of selectivity, underpinned by the RAE, has produced major changes in attitude and more strategic approaches to research. Selectivity, and the RAE, have acted as a major stimulus to more conscious research management and served as effective tools for senior management to lever institutional change, though it is likely that would have occurred anyway. Direct management of detailed research strategy is rare and is generally considered to be unproductive in the context of university research.
- b. Selectivity and the RAE have also acted as an incentive to improve research training, since universities and colleges have recognised the need to sustain and develop their research potential. Research training has been enhanced by an increase in both the financial and management resources devoted to it, and by the development of more systematic skills-orientated approaches.
- c. The principle of selectivity in funding and research management is as widely accepted in the social sciences and humanities, as amongst the natural sciences.
- d. Institutions have established structures that ensure better financial and management accountability, and enable a more strategic view of the development of research policy (e.g. research committees at both institution and department level).

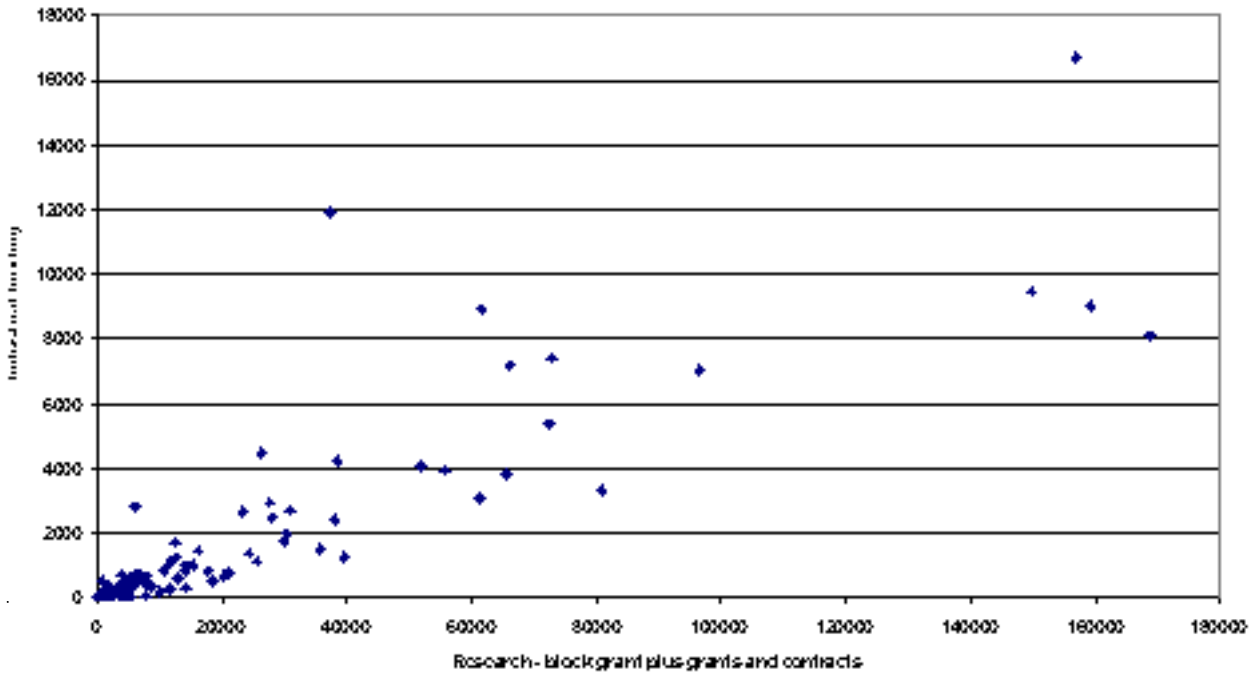
18. We note that interviews with senior managers, undertaken as part of the study commissioned from the Policy Research in Engineering Science and Technology (PREST) Unit at the University of Manchester by the group reviewing quality assurance and evaluation as part of this review, suggests that institutions with a number of low-rated departments often seek to increase quality by merging less successful departments with those that are highly rated. Exposing the low-rated departments to the new culture and management is expected to raise the overall level of the merged entity, thus creating viable and dynamic units capable of securing appropriate on-going levels of research funding. This has the added benefit of creating broadly based, often interdisciplinary, academic units.

19. Universities with a high-quality research profile tend to focus attention on, and invest in, areas with potential for improvement to the highest levels of performance; alternatively, they invest disproportionately in already research strong departments to build on these areas of strength.

Applicable research

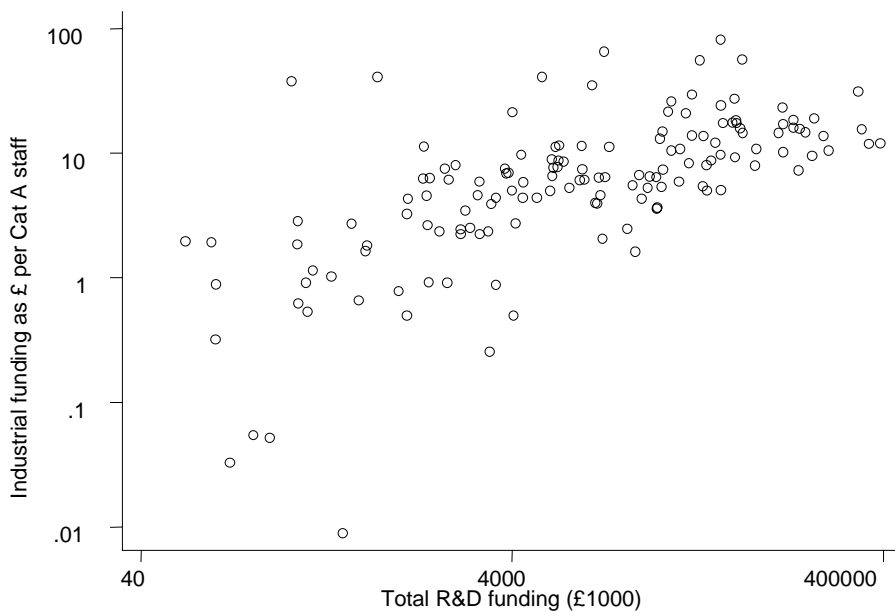
20. Some commentators believe that the success of the research base has been at the expense of engagement with users, and industry in particular. The treatment of applicable research in the RAE is often cited as a barrier to researchers wishing to undertake relevant research: the pursuit of peer-reviewed awards is held to distract academics from engaging with industry. However, evidence from HEPU (below) shows that the relationship between research excellence and collaboration with users is particularly strong in the UK. The correlation between public and industrial funding in the UK, in fact, is significantly closer than in the USA (although the average industrial funding of USA universities is higher – 11 per cent of the level of public funds, while it is about 8 per cent in UK).

Figure 1: Industrial funding plotted against public funding for UK HEIs (£000's, $r = 0.86$)



It is also clear from the HEPU work that industrial funding per capita category A staff returned to RAE96 increases as total research funding increases, as shown in Figure 2 below.

Figure 2: Industrial funding per Category A member of staff versus total R&D funding for UK HEIs



21. Finally, HEPU have shown that citation impact and industrial funding are broadly correlated.
22. There is, therefore, no evidence of a separation of excellence and application.

23. We recognise the concern that the current success of the UK research along these various dimensions reflects past investment. However, the HEPU study has indicated that UK performance is currently increasing rather than declining.

24. Notwithstanding this, we consider there to be a need to encourage more applicable research. We welcome the substantial changes to the assessment processes for the 2001 RAE, which will go some considerable way to meeting this need. However, we believe that further enhancements to the assessment mechanisms and changes in the approach to funding of research are required. In respect of the former we welcome the proposals made by other sub-groups, and in respect of the latter we make proposals later in this report.

Funding levels and the dual support system

25. Although the UK research base is performing well, without further investment the increasing competitiveness of the global research base will see a fall in the relative performance of the UK. We identify three particular areas of concern below:

i) Deterioration in research infrastructure is a particular concern in relation to our continued ability to compete effectively. We welcome the recent injection of capital funding by the Government and the Wellcome Trust via the Joint Infrastructure Fund (JIF), to which the HEFCE also contributes. However, we see a continuing need for further capital and recurrent support and a need to establish a proper and sustainable project/infrastructure balance.

ii) Another area of concern is the environment for, and experiences of, research trainees, who may be working in less than optimal conditions.

iii) We also believe that financial constraints have prevented the development of an appropriate research base in a number of significant emerging areas.

26. However, we believe that the evidence above, and elsewhere in this report, demonstrates that the mechanism of funding – dual support – has been extremely effective in promoting and sustaining high levels of performance, despite the funding constraints. The model has proved extremely resilient, despite the strains, and continues to support plurality, diversity and dynamism. Unfortunately, there is no mechanism to determine how much more successful the UK could have been if the system had been better funded.

27. We note that SPRU has found that most countries, including the USA, employ a dual support system of some form, though its nature and the balance between the two arms varies considerably (we have also heard evidence that this model is employed in corporate research laboratories). The findings of the SPRU study demonstrate that the USA research base has been effective not because it is a solely project-based system – it is not - but because there is a well funded dual-support system in place. Table 2 below lists the main factors that have been cited in the published literature as contributing to research competitiveness amongst USA universities.

Table 2: Factors cited as contributing to research competitiveness amongst USA HEIs

Rank	Factor
1	Facilities, modern instrumentation, staff to run and maintain equipment and the willingness of administrators to provide resources for investigators.
2	Flexible administrative practices to foster timely responses.
3	A good support staff, including secretaries and contract administrators.
4	An active capital development office.
5	Discretionary resources to fill in the gaps left by funding agencies.
6	High calibre students (to run equipment and bring staff up to date on newest techniques).
7	Access to administrators.
8	Support from department heads for junior staff in getting them exposure, and protection of junior staff from extraneous activities.
9	Creation of an intellectual climate.
10	Support and collaboration with colleagues, including co-operation in the use of facilities.
11	Lighter and/or reduced teaching loads.

Is the nature of research changing and, if so, to what extent is this responding to, or facilitated by, current approaches to research funding?

28. Current HEFCE goals in funding research are:

- to provide an optimum research environment through competitive selective funding
- to encourage world class centres of research
- to enable institutions to support project research (dual support)
- to support emerging areas of research and research strengths
- to take account, to an appropriate extent, of national needs and strengths
- to fund fairly.

29. These objectives are supported by a policy of selectivity, which HEPUs have shown has brought about concentration in research funding. The basic principles are:

- separate funding of teaching and research
- virtually all (around 98 per cent) of funding allocated on a quality basis
- quality determined by periodic evaluation exercises
 - peer review against published criteria, largely output based
 - seven grades; five of which are funded
 - units of assessment are funded – not institutions – but there is a wide variation in institutional funding results
 - continuous evolution of the process
- strategic planning and management are encouraged.

30. The Research Assessment Exercise (RAE) is the key mechanism to support this policy. Although it began in 1986, it would currently be regarded as a classic quality assurance mechanism with a hierarchy of enhancement, standards, assessment and audit. Funding determined by the RAE has been allocated increasingly selectively, in order that the total amount available, which has not kept pace with the growth in project funding, continues to support established research excellence.

31. The reliance of a growing project funding effort on a, proportionately, declining infrastructure base is illustrated by Table 3 below.

Table 3: Sources of research funding for UK HEIs

	1984	1991	1997
Funding Councils	58.8%	47.8%	35.1%
Research Councils	17.2%	20.3%	24.1%
Other Government departments	7.5%	6.4%	10.4%
UK Industry	5.6%	6%	7%
Overseas	n/a	5.5%	8.5%
Charities	6.7%	11%	13.6%
Other	n/a	3%	1.3%
Total (£M)	859	1989	2942

32. We believe, therefore, that to the extent that there have been problems, they have arisen largely as a result of the absolute quantum of research funding rather than the overall organisation, or general basis, of research funding.

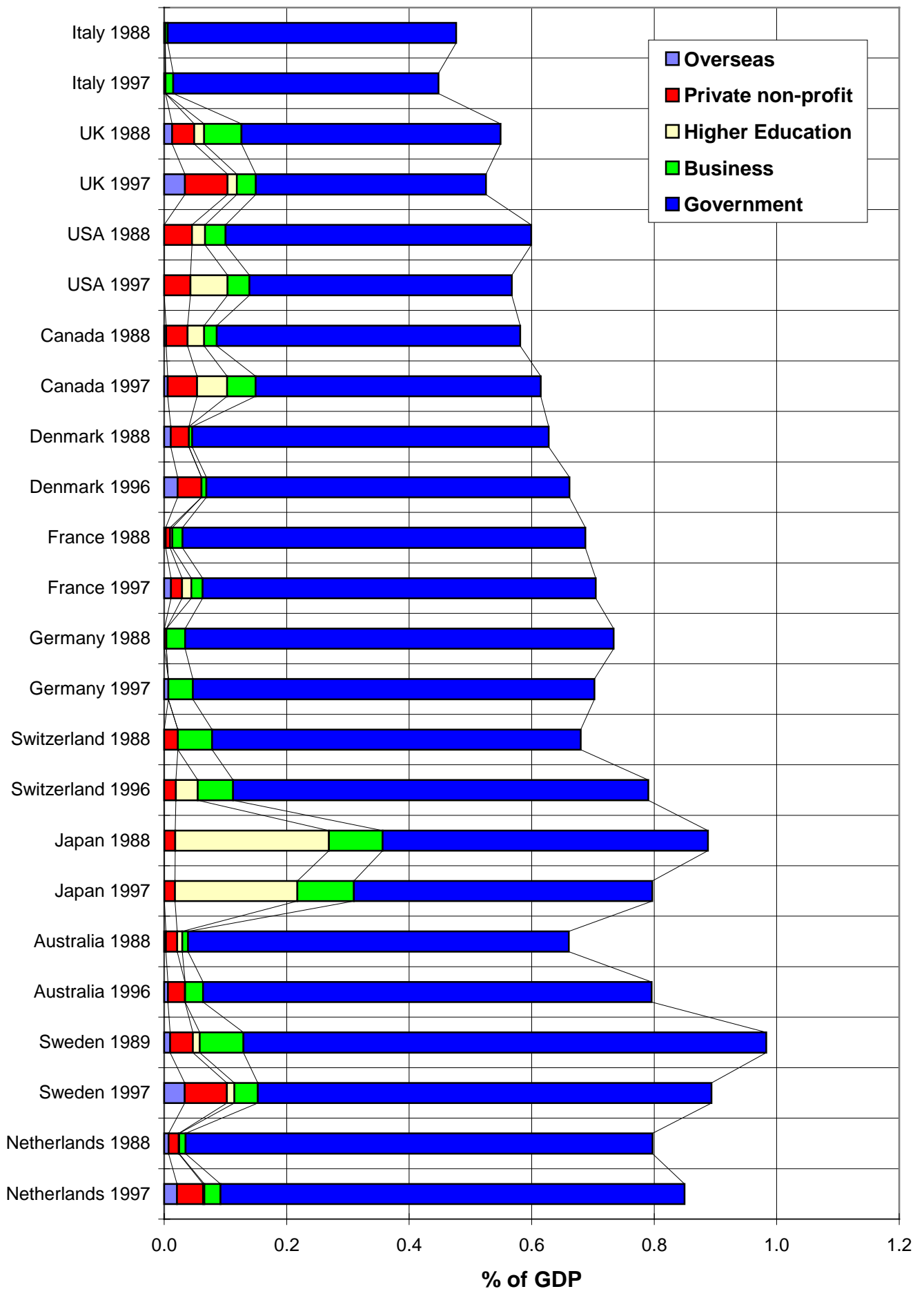
33. International comparisons of a variety of funding measures, extracted from OECD statistics, are shown at Annex C. We have extracted those that most dramatically illustrate difference between the UK and other countries and shown them in Table 4 below.

Table 4: Gross Expenditure on R&D (at purchasing parity prices) for 1997 in the UK, Germany, France, and Italy

Research funding	Total (£ bn at PPP)	Proportion of research funding provided by Government	Research funding as a proportion of GDP
UK	14.7	30.8	1.80
Germany	29.3	35.0	2.39
France	19.2	41.5%	2.26%
Italy	8.2	47.9%	1.05%
USA	140.3	31.6%	2.64%

34. A more extensive data set, for 1988 and 1997 and including a number of other countries is represented graphically in Figure 3.

Figure 3: Source of funds for science base R&D expenditure in 1997 versus 1988 as percentage of GDP



Is the nature of research changing and, if so, to what extent is this responding to, or facilitated by, current approaches to research funding?

35. PREST found a number of common themes emerging from their analysis of the changing research landscape. The trends most frequently cited are listed below:

- continued growth in interdisciplinary research
- increased collaboration
 - internationally
 - in the use of expensive research equipment and infrastructure
- increased 'user' involvement
- further growth in applied research
- growing importance of research teams/groups vis-à-vis departments
- emergence of more virtual research teams and the use of remote data gathering
- a further drift towards short-term research both in terms of employment contracts and the type of research work undertaken.

37. There were differing views about whether the size of research group would become an issue of greater significance. There was a view that, in the case of biosciences, larger teams would become more important, while in other subjects such as social sciences size may become less important as IT-mediated forms of collaboration increased. It was clear that a number of interviewees from the arts and humanities believed that the model of the single scholar working on his or her own was gradually dying out in favour of working more collaboratively with other researchers. As a consequence of increased collaboration and joint working, virtually all respondents believed that multi-authorship would continue to grow.

38. A number of these UK themes are reflected in international trends, as demonstrated by the report on 'International approaches to research policy and funding' commissioned from SPRU (a summary is shown at Annex D).

39. It has been suggested that the RAE and the HEFCE research funding model do not appropriately reward new models of research, in particular collaborative research, and interdisciplinary research, and that they create distortions in academic behaviour. The evidence to support this assertion has been tested by the research review sub-group on quality assurance, and found to be lacking. In addition, we believe that in many instances commentators have failed to appreciate the significance of changes that have been put in place for the 2001 RAE:

- a three-fold increase in user representation
- enhanced assessment mechanisms for interdisciplinary and multidisciplinary research
- international peer review of 5 and 5* research gradings
- thematic sub-panels
- greater representation of women on panels
- better arrangements for dealing with staff transferring between institutions

40. In addition, we make number of recommendations in this report to further enhance assessment and funding approaches, so they will continue to be fit-for-purpose in the future.

41. We also note the findings of the quality assurance sub-group that the RAE is not, as sometimes asserted, a leaden process that fails to reflect the dynamism of the research base and results in little change in funding. It is true that changes in funding at the sub-sector level (pre-1992 versus post-1992 institutions) are small; however, changes at the institutional level can be quite large, often around 10 per cent even for research-led institutions - sufficient for the HEFCE to agree with institutions a basis to moderate the changes over time. At the unit of assessment (UoA) level, changes in rating result in funding changes of 20 per cent – or 25 per cent if one includes grades that were no longer funded after the 1996 exercise. If one includes changes associated with the RAE, but not driven by it (volume and quanta changes), around 50 per cent of funding may be considered to be moved around by the RAE. We believe that these funding changes are evidence that the RAE, and research funding allocations dependent on it, are able to follow the dynamic development of the research base.

42. It is recognised that the cost of the RAE is not insignificant. However, we are inclined to the view that the financial and management cost of quality assurance is small given the sums invested, and that it supports a credible and necessary system. We have discussed three general forms of institutional stress arising from the RAE in the context of the funding that is provided:

- compliance
- uncertainty
- presentation.

Compliance

43. There is a need to ensure that the RAE does not seek information for its own sake, that all the data requested are necessary to the process, and that as much use as possible is made of existing data. However, we believe that, given the sums of public funding involved, the compliance burden is reasonable.

Uncertainty

44. We acknowledge that uncertainty about the outcome is the downside of a competitive system that has produced a significant change in the quality and productivity of the research base. However, we believe that the level of risk is manageable by institutions, and the HEFCE does intervene where necessary to help institutions manage reductions in funding. On balance we believe that the level of financial uncertainty is not inappropriate.

Presentation

45. We recognise that many departments feel under pressure to construct an elaborate submission to maximise the RAE ratings they achieve. This can turn a modest data requirement into a considerable task and may produce distortions both in the content of submissions and, more significantly, in how departments operate, particularly in respect of recruitment and the requirements made of staff. We recognise the need to demonstrate as far as possible that the assessment process, and the associated funding, is not open to manipulation by presentation and we welcome the recommendations of the quality assurance sub-group in this respect. We believe that the formal data requirement associated with the RAE is modest and that the level of resources

institutions are prepared to devote to attempting to secure good results is a function of the rewards available, not a consequence of the process itself.

46. Notwithstanding our concern to minimise the burden upon those submitting to any assessment exercise, we concur with the view of the quality assurance sub-group that a facility to consider personal statements from researchers in lieu of published outputs is necessary to ensure fair treatment of young researchers and those returning from career breaks. While we believe that every care should be taken to structure the data request so as to minimise the risk that effort will be expended in collating and presenting irrelevant information, we believe that the need to ensure equal and appropriate treatment for all researchers within the assessment process must be considered.

Perceptions and proposed changes

47. We recognise the widespread perception that there is a staff transfer market, and that this causes concern for institutions. We note that the quality assurance sub-group have found no substantive evidence to support the suggestion that there is a disruptive and unhealthy level of movement, rather that the level and pattern of staff movement may be insufficient to support an appropriate level of dynamism. However, we acknowledge that it is important that staff recruitment practices reflect sustainable departmental strategies rather than the tactical pursuit of research funding.

48. The evidence suggests more generally that many of the supposed distorting effects of the RAE are myths. However, we recognise the powerful effect of perceptions, and believe that there is no room for complacency. We therefore welcome the changes being proposed by the other sub-groups, particularly the quality assurance sub-group.

49. We particularly support the idea that consideration should be given to the establishment of new UoAs as the research landscape changes and evolves. This will provide researchers in new areas with a better choice about where to submit their work so that its excellence may be recognised. We also believe that, since institutional resource allocation models generally follow the HEFCE research funding model, it will provide a better basis for financial support of these new areas. It will also send a strong signal to researchers that the Funding Councils are committed to assessing and funding new forms of research rather than reinforcing conservative notions of research.

50. We welcome the suggestion that there should be increasing recognition of disciplinary differences in the assessment process and, in particular, a greater appreciation of the importance of people as a research output. Research users have repeatedly told us that the 'people outputs' of the system are as important to the economy and society as other research outputs, and that the assessment process needs to reflect this more explicitly.

51. In addition, we have considered the potential benefits to lengthening the planning and funding horizon for the best departments (those rated 5 and 5*) which might include:

- institutions and researchers engaging in riskier, but potentially more innovative, research
- increasing the emphasis on staff development, training and strategy
- increasing emphasis on potential performance.

52. We note that the quality assurance sub-group explored the pros and cons of providing a longer planning and funding horizon to high performing (5 and 5*rated) units by exempting them from the need to submit to every other RAE. However, like them, we are concerned about how such an approach could be put into practice, and whether it would be even-handed in its treatment of different research units: the current RAE is predicated on open competition on a consistent and transparent basis.

53. We recognise that as the demands on HEFCE research funding increase, there will be increasing pressure to implement a policy factor to focus the research endeavour in areas of national strength and/or national need. However, the UK, along with the USA, is different from other countries in showing a relatively even level of performance across disciplines.

54. We note that the HEFCE recently consulted widely on a basis for developing a policy factor but found little support for the proposal. It was resisted both because there was no systematic basis for determining which areas should be preferentially funded, and because of the recognition that the research base is already directed to a considerable extent. HEFCE funding forms only a third of available research funding; the other two-thirds is provided by project funders, most of whom allocate substantial proportions of their funding on a strategic basis. If researchers are to undertake substantial research programmes, institutions need to invest HEFCE funding to underpin research projects funded by these other organisations.

PhD production

55. As we state above, we believe an advanced modern society needs a significant number of people with higher degrees. The number of PhD graduates is one important indicator of R&D capacity. Such graduates are needed to underpin teaching in universities and colleges, particularly for third year work at bachelors level and for postgraduate programmes. They are also of course needed to carry out research in universities, industry and the wider economy.

56. For many subjects the flow of doctoral graduates is substantial but threatened by low stipends and debt carried over from undergraduate studies. The Engineering and Physical Sciences Research Councils (EPSRC) has seen a softness in demand in recent years which has been partly countered by modest increases in stipend. The Wellcome Trust has been much more aggressive in paying significantly higher stipends for research that it funds.

57. Taking 1997-98 as the last year of fully compiled statistics, the UK produced 258,800 first degree graduates and 11,000 doctorates. There were 54,000 other higher degrees awarded. On average there are 4.2 PhDs produced for every 100 first degree graduates.

58. Assuming an academic teacher is in post for 30 years, he or she will be responsible in FTE terms for 100-150 graduates. Allowing for the relatively high proportion of research postgraduates who are from overseas, the academic profession probably needs between 0.5 and 1.0 per cent of the first degree output to qualify as doctorates in order to "replenish" itself.

59. For many subjects, this poses no immediate problem, as a significant proportion of undergraduates go on to postgraduate level study - although the general lack of appeal of academic salaries and conditions of service now causes growing concern. But for disciplines which compete head on with outside professions there is a serious shortfall of individuals doing PhDs who could go on to become research-trained university and college teachers.

60. This is illustrated in Table 5 below. The first part of the table gives the number of PhDs produced in some well established subjects; the second part gives the disciplines where the PhD production is less than 3 per cent of the first degree production.

Table 5: Proportion of undergraduates going on to undertake a PhD, by discipline

Subject	PhDs	1 st degrees	Percent PhD/1 st degree
Chemistry	927	3,393	27.3
Physics	558	2,320	24.0
Biology	444	4,104	10.8
Maths	244	3,372	7.2
Mechanical Engineering	254	3,913	6.5
Classics	31	530	5.8
Politics	158	3,247	4.9
History	251	5,562	4.8
Electronics	175	3,853	4.5
English	231	6,086	3.8
Ophthalmics	16	550	2.9
Information Science	15	535	2.8
Architecture	49	1,840	2.7
French	34	1,247	2.7
Computer Science	263	9,991	2.6
Production Engineering	60	2,332	2.6
Audiology	2	82	2.4
Music	52	999	2.3
Medical Technology	11	573	1.9
American Studies	11	589	1.9
Transport etc.	9	509	1.8
Environmental Technology	5	289	1.7
Business & Management	220	17,323	1.3
Land & Property	6	456	1.3
Physical Education	17	1,388	1.2
Building	37	3,759	1.0
Law	102	9,889	1.0
Marketing	13	1,301	1.0
Communication	9	1,309	0.7
Nursing	27	4,812	0.6
Drama	16	2,378	0.6
Cinematics	4	796	0.5
Social Work	8	1,595	0.5
Media	4	999	0.4
Catering etc	13	3,502	0.4
Accountancy	6	3,614	0.2
Fine Art	7	3,326	0.2
Design	6	9,633	0.1
Journalism	0	443	0.0

61. We believe that there is evidence of a real problem here, both for the sustainability of academia, but also in the production of trained manpower for business. We believe that this argues for a funding stream to support capability development in those areas where there is a clear need to enhance the research base. This is explored further in the last section of this report.

How can complementary funding approaches by stakeholders maximise the value achieved from the research base?

62. As detailed above, one of the major problems facing HEIs is the imbalance between project and infrastructure funding. The impact on institutions of the growth in project funding, which has promoted a disproportionate increase in the numbers of staff engaged in research, has to an extent been offset by improved operational and financial management of research and some deterioration in the existing physical infrastructure. Unfortunately, the latter resulted in the development of a significant infrastructure gap.

Contract research

63. We have considered the indirect costs of contract research. Institutions might not necessarily wish always to seek full cost recovery, for instance where they are seeking to build a partnership with a user organisation. However, there is a suspicion that institutions are not recovering indirect costs to the extent that they might. We believe that compliance with the recommendations of the Transparency Review will enable institutions to recover an appropriate level of costs from users.

Research Councils and the dual support system

64. We have also considered the indirect costs which institutions incur in carrying out Research Council projects and have noted that the HEFCE has established a group jointly with the Office of Science and Technology (OST) to develop a clearer understanding of their respective responsibilities. This should enable the development of an agreed basis on which to sustain an appropriate project/infrastructure balance for publicly funded research.

Charitable, EU and other sources of funding

65. However, the imbalance between project and infrastructure funding has in large part arisen from the growth in funding from sources which do not provide the same level of overhead contribution as that from the Research Councils. EU funding secured by UK HEIs is generally won on a basis that provides a substantially lower overhead than UK public funding, and therefore UK institutions have become victims of their success in securing EU grants. More significant still has been the growth in charitable funding, which is usually provided without any contribution to overheads. Many charities hold that the public purse is the appropriate source of funding for research infrastructure, though it is recognised that they may be generous in their contribution to specific buildings: the Wellcome Trust in particular has made a very large contribution to UK research infrastructure through its £300 million support for JIF.

66. This situation causes significant problems for institutions, particularly those in receipt of substantial funding from the medical charities. This is illustrated in Table 6 below which shows the growth in charitable funding received by medical schools.

Table 6: Income for UK medical schools from UK based charities

Institution	Income from UK-based charities (£)	Ranking	Proportion of charity income to overall research grant income	Ranking	Total research grant income (£)	Ranking	Proportion of total UK- based charity income per HEI	Ranking
University of Birmingham	10,391,000	14	21%	14	48,589,000	8	2.60%	14
University of Bristol	12,076,000	11	30%	5	40,277,000	11	3.02%	11
University of Cambridge	27,740,000	4	28%	7	99,986,000	4	6.95%	4
University of Edinburgh	14,849,000	5	25%	10	58,855,000	5	3.72%	5
University of Glasgow	13,758,000	7	28%	7	48,373,000	10	3.45%	7
Imperial College of Science, Technology and Medicine	33,403,000	3	29%	6	117,163,000	1	8.37%	3
Kings College, London	12,100,000	10	25%	10	49,292,000	7	3.03%	10
University of Leeds	11,453,000	12	24%	13	48,474,000	9	2.87%	12
London University Institutes	12,317,000	9	63%	1	19,657,000	14	3.09%	9
University of Manchester	13,378,000	8	25%	10	53,437,000	6	3.35%	8
University of Newcastle	10,554,000	13	28%	7	37,438,000	12	2.64%	13
University of Oxford	38,069,000	2	33%	4	114,449,000	2	9.54%	2
United Medical & Dental Schools	13,885,000	6	50%	2	27,920,000	13	3.48%	6
University College London	40,650,000	1	39%	3	104,241,000	3	10.18%	1
Totals	264,623,000				868,151,000		66.29%	

67. This growth has had significant consequences for the way in which these institutions are operated. In particular, the increase in short-term funding increases the risk profile of institutions. The Association of Medical Research Charities (AMRC) estimates that anything up to £600 million will be spent by charities on HEI research in the UK this year, of which a large majority will go on short-term funding and mostly on staff. This means that the institutions in receipt of this funding have a larger proportion of staff on short-term contracts. It also means they are reluctant to invest to build capability for the future, even when there appears to be strong demand, in case the recurrent funding dries up – as charities need to respond to what may be rapidly changing priorities in public giving. However, perversely, the level of risk associated with this funding undermines the ability of institutions to develop the capability required to best meet the needs of charitable funders. It should also be noted that the influx of funding, in particular from the Wellcome Trust, has changed the balance between disciplines producing a large increase in work funded in the bio-medical sciences.

68. The AMRC has suggested that charities need to look at rebalancing their investments towards longer-term funding and away from responsive mode. It was recognised that this would not, in every case, involve very long-term investments, but that the funding emphasis on the delivery of specific projects would need to be moderated. The activities that were suggested as being supportable included:

- development of people, either directly through studentships and fellowships or indirectly
- development of groups and their research agendas
- other forms of capacity building, such as recruitment
- knowledge development and knowledge transfer
- production of research tools (databases, bibliographies, literature reviews)
- publication

69. We believe that the complementary provision of new funds for development programmes relevant to institutional strategies and national and regional priorities, as outlined in this report in the section beginning at paragraph 97, would provide direct support for capability building in some of the key areas receiving charitable support.

70. The contribution that charities make to the UK research base is substantial and supports activity that would otherwise need to be met from the public purse (or go unsupported), particularly in areas such as bio-medicine. In fact, the lead that the UK has in this area may in large part be ascribed to the contribution from charities. The basis for the HEFCE providing complementary support in some form is therefore clear.

71. However, given concerns about the project/infrastructure balance, it is not clear that it is appropriate for charitable funding to be converted into a volume equivalent to feed into the HEFCE funding model. This also has the effect of quality-weighting the contribution; again it is

unclear whether this is appropriate, given that most charities have peer review systems in place themselves.

72. We show in Table 7 below the increase in the proportion of HEFCE funding determined by the charitable funding volume weighting factor, as a result of the growth in charitable funding.

Table 7: Proportion of HEFCE funding determined by the charitable funding volume weighting factor

	1997-98	1998-99	1999-2000	2000-01
Income which HEIs receive from charities, as it feeds into the QR model (average of the last two years, £)	270,634,162	294,305,842	317,760,251	340,129,289
HEFCE QR funds attributable to HEIs' income from charities (£)	52,711,280	60,341,353	69,451,165	74,252,518
Total HEFCE mainstream QR funds (£)	684,000,000	714,378,894	737,696,702	748,394,812
HEFCE funds attributable to HEIs' income from charities as a proportion of total HEFCE mainstream QR funding	7.7%	8.4%	9.4%	9.9%

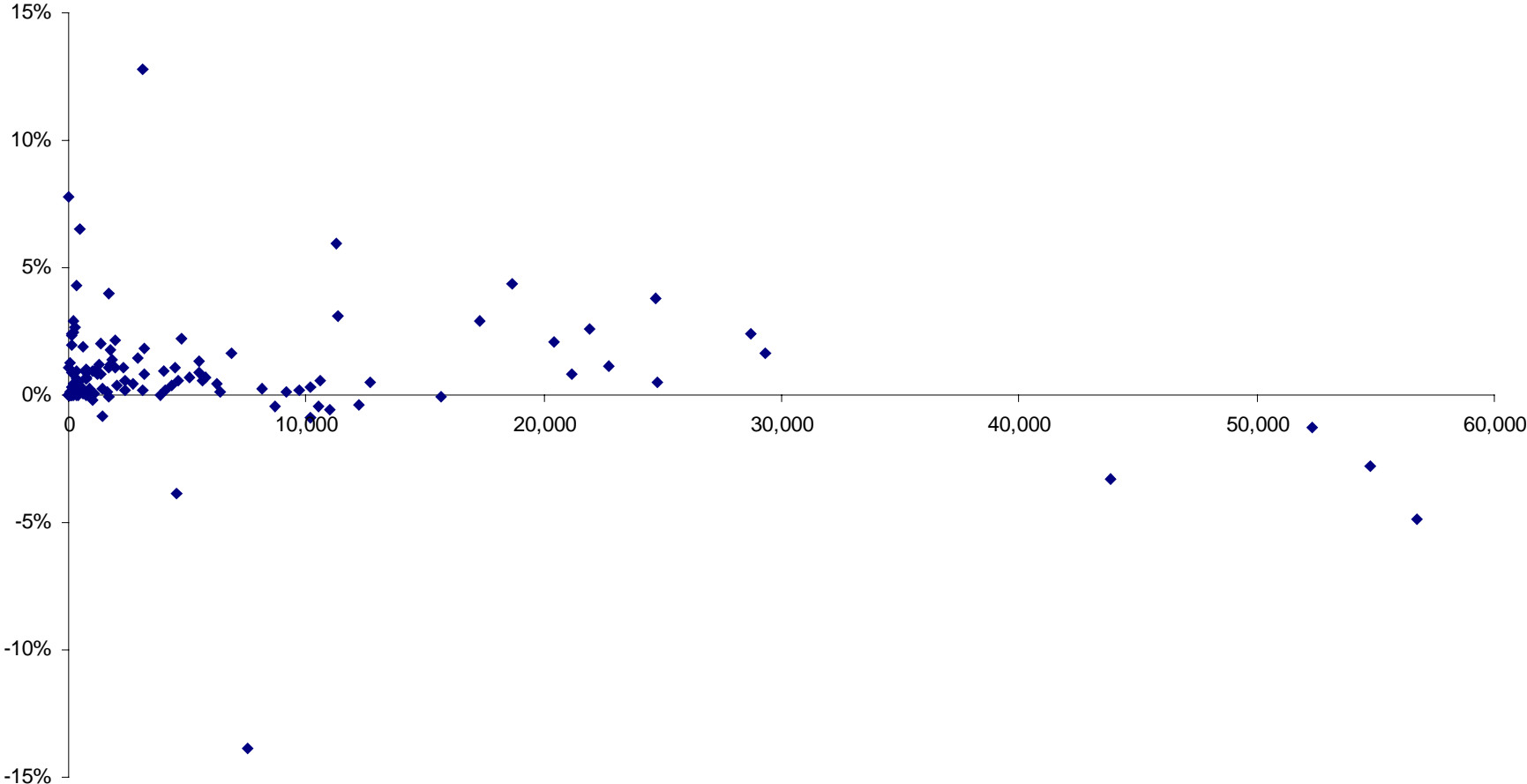
73. We believe it is right to strike a balance between supporting overheads on projects funded by charities and avoiding disadvantaging research in subjects without major charitable funders. Table 8 below shows how funding would be affected if there was a flat rate of overhead for charities income.

Table 8: Effect on HEFCE funding of moving to a flat rate overhead for charities income

Cost band	HEFCE mainstream QR funds attributable to HEIs' income from charities (£)	Income which HEIs receive from charities – average of the last two years as used in QR model (£)	Rate of funding per £ of income received from charities (£)
A	69,571,705	310,707,817	0.22
B	1,873,688	9,600,180	0.20
C	2,807,125	19,821,292	0.14
Total	74,252,518	340,129,289	0.22

74. We have not made any assumptions about what the right overhead rate should be for HEFCE support of charitably funded projects, and there may be a case for a differential rate to reflect the contribution that different charitable funders make to the research base. The effect on allocations to institutions of moving to a flat rate is graphically represented in Figure 4 below, where each point indicates the effect on the QR allocation of a given institution (in percentage terms) of moving to a flat overhead rate for charities income.

**Figure 4: Percentage change in institutional QR versus current QR (£m, 2000/01)
as a result of moving to a flat overhead rate for charitable income**



Sustaining the project infrastructure balance

75. We have considered how to sustain an appropriate balance between project and infrastructure funding. We believe the simplest and most effective approach is to identify an appropriate target range for the amount of HEFCE QR funding that should be invested in infrastructure support. The band, or bands, would need to be flexible, to accommodate different types of institution, different subject mixes, and changes in requirements over time. However, information generated as part of the Transparency Review should be sufficiently detailed for an appropriate range to be established for grouped institutions, and to enable monitoring by institutions of the on-going level of investment against target.

Enabling work

76. In addition to support for buildings, equipment, and libraries, it is essential that appropriate support is provided for other facilities and activities that are crucial to the sustainability and dynamism of the research base, but which are enabling rather than primary sources of research output. These may include:

- collections of material
- specialised technical staff essential to the running of equipment and facilities
- input into multidisciplinary projects where the ground-breaking work is done by researchers in other disciplines
- curating activities
- data archives
- learned activities such as editing journals
- production of reference works.

77. We believe that the output of individuals engaged in these activities should be submissible to the RAE, and that it is appropriate for the costs of some of these activities to be set against the element of institutional spending that would be required on infrastructure. However, we would envisage a system whereby such staff, activities and investments would be set *either* against the required level of infrastructure investment *or* could form part of an RAE submission.

Work with industry

78. We have noted that the Government's strategy to increase the academic-industry interface has been supported by the development of a number of initiatives:

- Co-operative Awards in Science and Engineering (CASE)
- LINK
- Teaching Company Scheme
- Faraday Partnerships

- University Challenge
- Enterprise Centres.

79. The HEFCE has made its own contribution through the Joint Research Equipment Initiative (JREI) and HEROBC. Industrial investment in the UK research base is growing strongly at almost 10 per cent per annum in recognition of the added value provided by the UK research base.

80. We welcome the changes to the assessment process for the 2001 RAE, and those proposed by the quality assurance sub-group for any future exercise, as they will further encourage applicable research.

81. However, we do not believe that the assessment or funding processes should provide a premium for work with industry. Rather, we note the benefits of increasing HEROBC funding to support knowledge transfer. From evidence of the comparable level of business R&D spend in different OECD countries (shown in Table 9 below), we also note the need for an increase in the capacity of UK industry to engage in research and knowledge transfer.

Table 9: In-house business R&D as a proportion of GDP (1997)

UK	1.2%
Germany	1.6%
France	1.4%
Italy	0.6%
Japan	n/a
Canada	1.0%
USA	2.0%

Research training

82. As mentioned above, one of the key outputs from the public funding of research is highly trained postgraduates who can pursue academic or other careers.

83. We are concerned about the quality of the training experience for many of these individuals, particularly those in receipt of studentships funded by institutions. We believe therefore that there should be a much more explicit link between the quality of research training and HEFCE funding.

84. This could involve a funding stream for research training and/or a separate assessment process. However, we are conscious of reduction in institutional flexibility and the increase in the accountability burden that such an approach might bring.

85. We believe that the best approach would be an assessment process, linked to the RAE but drawing more widely on information available (from the Research Councils, charitable funders, industry, etc) that establishes whether an agreed minimum standard has been achieved, with the expectation that this minimum would rise over time. Not meeting this standard would provide a basis for the HEFCE to withhold funding, if that was necessary. However, we believe that most institutions would respond positively to a failure to meet these standards, and HEFCE funding could be provided on condition that remedial and developmental activity was started. This would effectively separate the funding of research training from research activity, without an additional administrative burden. Assessment of training quality might also incorporate novel elements including:

a. Results of student surveys. We note that a recent survey of research training in the USA proved valuable in highlighting a number of issues that need to be addressed there (enhancing research training is a global concern). We also note that EPSRC requires supervisors to report on the destinations of students. We believe that if the HEFCE were to develop such a tool, it would be welcomed by institutions. In the same way that staff attitude surveys in a commercial setting help companies to meet the expectations of their staff better, we believe surveys could be an effective source of information from which to develop mechanisms to raise the quality of their research training. They could also feed into a research training assessment process.

b. Results of surveys of employers of individuals with PhDs

c. Independent assessment of management arrangements.

86. We acknowledge that prior to any formalisation of new mechanisms for the assessment of research training and development, there would need to be a clear statement about what was expected from institutions. We also believe that if this change is to have the desired effect, it would need to bring about a cultural shift, so that principal investigators regarded the learning and development of their research students and junior researchers as a crucial measure of their own competence. We therefore welcome the fact that the research review sub-group on teaching, research and other activities have developed three models of how research training might be enhanced.

87. We have considered whether, if a separate funding stream were developed for research training, it should be quality weighted. The effect of adopting a flat rate approach is shown in Table 10 below.

Table 10: Effect on HEFCE funding of adopting a flat rate for research student support

Cost band	HEFCE mainstream QR funds attributable to HEIs' PGR students (£)	PGR students (2nd and 3rd years) FTEs	Rate of funding per FTE (£)
A	83,747,483	14,525	5,766
B	12,981,954	2,838	4,575
C	31,517,275	8,601	3,665
Total	128,246,712	25,963	4,940

88. If such an approach were to be considered, we would suggest that a flat rate has some merit as it reduces the incentive to grow volume.

89. Another alternative approach we considered was to eliminate PhD students and other minor volume measures from the research funding model completely. This has a disproportionate financial effect on those institutions currently receiving the highest levels of QR, but might be of benefit to the sector as a whole by reducing the incentive to grow volume to a greater extent than simply providing funding at a flat rate.

Supporting diversity

90. Some commentators feel that the RAE perpetuates gender imbalances within the sector. We have noted the suggestion of the quality assurance sub-group that the RAE reflects, rather than causes, the under-representation of women in senior posts.

91. We welcome the fact that for the 2001 RAE women will make up 20 per cent of panel members compared with the 10 per cent of professorial positions they occupy. We also welcome the efforts that have been made as part of the 2001 RAE to fairly assess the outputs of researchers taking career breaks, by obliging panels to include in the criteria a statement that career breaks will be taken into account in considering an individual researcher's work.

92. However, in view of the importance of this issue, we were keen to explore what additional measures could be developed. We consider that the recommendation of the quality assurance sub-group that, where appropriate, researchers should be able to provide a

personal statement as part of the submission, has considerable merit. This would not only enhance the assessment of those who have had a career break, but also of other staff, for instance because they are new to a research career, or are engaged in long-term work.

93. In addition, we welcome the fact that an additional sub-group has been established to look at human resource issues. This will ensure that these issues are addressed coherently, and at an appropriate level of detail, given their importance and complexity.

How should HEFCE funding be used to support strategic needs? What funding method is most appropriate given the purpose and nature of HEFCE funding?

94. We believe there are three separate, though related, bases on which the HEFCE should be provided to support the UK research base:

Researcher-driven

95. Work driven by the curiosity or interests of individuals or teams, though influenced by institutional strategies and priorities of project funders: this activity is currently supported by the HEFCE through QR funding.

User-driven

96. Research undertaken to meet the needs of users. The transfer of knowledge generated by those engaged in applicable research is currently supported by the HEFCE through HEROBC.

Capability-development

97. We propose that there is, in addition to funding supplied under QR and HEROBC, a need for a moderate amount of money to directly support capability development in areas of research related to national, regional or local need, but where these strategic priorities are defined by institutions themselves. The HEFCE could, if appropriate, publish a list of flagged areas where proposals would be particularly welcomed.

98. Many institutions in receipt of small amounts of QR funding are already concentrating that funding on areas where they feel able to develop excellence and/or meet real needs. However they, and institutions receiving larger sums of funding, are sometimes constrained from strategically developing capability to better meet future needs. In some instances this is a result of the transparency of the HEFCE funding model, which for other reasons is highly valued. The case for a capability-development funding stream is therefore twofold:

- to support strategic decision making in institutions to meet national, regional or local need
- to develop capability within institutions so they can engage more effectively with the research agenda.

99. The activities it could support are discussed below.

Emerging subjects

100. In some emerging subjects it is necessary to build capability ahead of demand. The proposed funding stream would make it possible to fund capability building both where there is an expectation of future increased demand and/or where the distributed nature of activity means that HEIs are not currently able to respond to the potential level of demand from project funders. Emerging areas of health-related research might be considered examples.

Research focused on national, regional, local and other particular needs

101. It is clear that some research is not on a development track towards international excellence. Rather, it is focused on meeting local, regional or national needs and the primary driver of development is to meet these needs better, not necessarily to achieve international research excellence. Levels of user investment (and unmet needs as identified by consultations with users) demonstrate clearly that this research meets a real need. We consider that the development of this type of research might be best supported through a capability-development research funding stream.

Practice-based research

102. It is sometimes held that disciplines with strong links to practice are not well served by the current system. This probably varies by discipline: well-established areas such as medicine manage the link between practice and research well; however, in other, often emergent, areas it may be appropriate to support the development of practice-based research through a capability-development approach providing:

- incentives for academics to maintain links with practice
- capability for research to the benefit of the local community
- support for applicable research
- support for research which potential users may be unable to fund or develop appropriately, particularly in public sector professions.

Applicable research

103. We hope that substantial extra funds will be found for HEROBC under the current government spending review. If so, the scheme will be able to fund further knowledge transfer. However, this would be most effectively done alongside a capability-development research funding stream. Such an approach would enhance the ability of research that is relevant to the wider community to impact on society and the economy.

Development of new applications of existing knowledge

104. It is clear that business and the community may derive significant benefit from researchers developing new applications for existing knowledge. In a sense, this parallels the value that comes from systematic reviews. It could be part of the role of a capability-development funding stream to promote the extraction of value from activities of this sort.

Conclusion

105. We have discussed the basis on which a capability-development stream of funding might be allocated. We are clear that such funding should not be determined on an institutional basis, rather it should be an allocation available to all institutions. We conceive of the funding stream as being independent of QR, and believe that the most appropriate basis on which to determine institutional allocations would be in relation to headcount. There would be a case for some form of institution-level peer review, encompassing management practice as well as research quality, but it is unlikely that the level of selectivity would need to be as high as QR.

106. We would expect that, over time, areas initially supported by this capability-development stream would develop into areas of self-sustaining excellence, funded through user-driven or researcher-driven support mechanisms (or both).

107. We believe that there is a particular need to be clear about the activities that would be supported by a capability-development funding stream and those supported by HEROBC. This would be aided by a move to a qualitative assessment mechanism for the distribution of HEROBC. However, it was recognised that such an assessment process might increase the administrative burden on institutions.

Conclusions

Supporting world class research

108. We noted the findings of the HEPU study, commissioned to support the work of the sub-group exploring the role of selectivity and the characteristics of excellence, that the UK research base is performing well. The peak performance of the UK research base against that of other countries has improved, and we believe that the RAE and selectivity have been the principal drivers of this significant improvement in quality.

109. The RAE has forced departments to consider their own strategies and to focus their efforts where they are most productive, while allowing them more freedom, with fewer burdens, than other competitive sources of funding. Evidence gathered for the review also demonstrates that the RAE is an important influence on grant-awarding bodies, demonstrating its key role both as a benchmark and as a driver of change in research culture.

110. We have considered the potential benefits to lengthening the planning and funding horizon for the best departments (those rated 5 and 5*):

- institutions and researchers engaging in riskier, but potentially more innovative, research
- increasing the emphasis on staff development, training and strategy
- increasing emphasis on potential performance.

111. We note that the quality assurance sub-group also explored the pros and cons of providing a longer planning and funding horizon to high performing (5/5*rated) units by exempting them from the need to submit to every other RAE. However, like them, we are concerned about how such an approach could be put into practice, and whether it would be even-handed in its treatment of different research units: the current RAE is predicated on open competition on a consistent and transparent basis.

112. However, we welcome the proposal of the selectivity and characteristics of excellence sub-group that there should be greater recognition of diversity in the characteristics of excellence. This will ensure that the quality of new forms of research is properly assessed.

113. We considered whether there should be a move towards a centralised, strategic, national plan for research. We are not in favour of this suggestion, but we are inclined to believe that there should be greater emphasis on strategic considerations within institutions, with greater cognisance taken of the need for them to engage coherently with the multiplicity of roles they undertake.

114. We considered the idea of using institutional business plans as a basis for making all the funding decisions, but are inclined to the view that, as currently suggested – with all

institutions making submissions in respect of all their activities – such an approach would be unworkable. However, we do recommend establishing a capability-development funding stream to support capability building in areas of national, regional or local strategic needs.

115. We noted the importance of clarity in the dual support arrangements and believe that it is necessary for the roles of funders to be more transparent. We welcome the fact that the Department of Health is clarifying its research role, and hope that this is the beginning of a wider process. We are also concerned to ensure that a sustainable balance is achieved between project and infrastructure funding, and propose that guidance should be provided to institutions on the appropriate level of HEFCE funding to invest in research infrastructure (including non-physical support such as technical staff).

Encouraging applicable research

116. We are confident that the changes introduced for the 2001 RAE will ensure that applicable research is properly assessed, though we recognise that this will not become evident until after the exercise.

117. It is entirely appropriate that high quality applicable research should continue to be assessed through the RAE and supported through QR funding: there is no basis for creating a separate funding stream for applicable research. However, there should be a clear distinction between the purposes of QR and HEROBC funding, with funding mechanisms appropriate for the purposes of each. HEROBC should continue to be focused on supporting knowledge transfer, but an increase in the level of funding provided by the scheme should enable it to encompass a broader range of activities related to knowledge transfer.

118. In making HEROBC a success, it will be essential that institutions with a smaller research base, but which demonstrably 'punch above their weight' in terms of facilitating relationships with users, are rewarded for their excellence in this area.

119. It is clear that HEROBC should fund interactions that are more complex than HEIs working with major industrial employers. Technology transfer also needs to occur into SMEs, the public sector, and the community.

Recognising/supporting collaboration and networks

120. The research landscape is changing and funding mechanisms have to adapt to ensure that new forms of research, particularly inter- and multidisciplinary research and collaborative activities, are not disadvantaged.

121. We note the changes in the assessment process for the 2001 RAE, which will ensure that panels assess inter- and multidisciplinary research and collaborative work on the same basis as other research. We also note that there is evidence of greater confidence in the sector about the equal treatment of inter- and multidisciplinary research and collaborative work by the panels in the 2001 RAE.

122. However, there is no room for complacency, and in particular the Funding Councils must ensure that the referral of submissions across boundaries for the assessment of the contributions of others must be undertaken coherently and the process well understood by both panel members and those making submissions.

123. We considered the merits of funding self-identified research groups, given the importance of research networks and collaboration. However, there are dangers in encouraging collaboration for its own sake, and we considered that it was not possible to develop a funding mechanism in which the benefits outweighed the potential for distortion. Given that the RAE in 2001 will be sufficiently flexible to assess such activity appropriately, and reward it through the block grant, we consider that the explicit identification and direct support of such networks is best undertaken by the Research Councils, who are able to assess where such groups have made a compelling case for additional support. However, we believe that there are 2 exceptions to this general rule – firstly, the facilitation of links between high performing UK units and overseas centres of excellence and, secondly, research training.

Development of research people and production of PhDs

124. In considering the purpose of HEFCE funding, we recognise that we need to address the funding mechanisms required to support the activities and development of new researchers.

125. We acknowledge the general concern of new researchers about opportunities for, and support of, career development. In some cases they are expected to balance research, teaching and administrative responsibilities for which they may not be well prepared.

126. This is by no means a universal experience: the new researchers workshops indicated that there is much good practice in the sector. Those in receipt of Royal Society awards, for instance, enjoy a level of autonomy and support which rivals anything offered elsewhere in the world. In contrast, many PhDs do not receive sufficient support and advice on career development either inside or outside academe.

127. It is clear that the terms and conditions for new researchers vary enormously depending on the stage in their career and the source of the award. However, it is not a question of a deficiency in a particular sector or on the part of a given funder, and our concern is to spread best practice. Both EPSRC and the Wellcome Trust were noted as offering courses on career development. Unfortunately the enthusiasm of students for these opportunities is not always shared by the senior staff within their institution. As long as such opportunities are seen as marginal, uptake will be low, and it is the responsibility of funders and institutions to create an environment in which such opportunities form an integral part of a research student's training.

128. We believe that discussion of research training issues should not be confined to the treatment of PhDs. It should encompass:

- postgraduate training
- development of postdoctoral researchers
- development of junior lecturers (those starred in RAE submissions).

129. We believe unequivocally that the development needs of PhDs, postdoctoral research associates, and junior lecturers must be prioritised by institutions. We would expect institutions in receipt of QR funding to have policies to ensure that good practice is followed. Such opportunities should be sufficiently flexible to meet the needs of individuals with the potential to have productive careers in many different areas and roles, either within HE or outside.

130. At present, there is no explicit recognition of the quality of research training or staff development in the allocation of QR funding. RAE panels take account of research culture in the assessment process, but the approach and weighting they give to it varies, and the process tends to concentrate on research activity rather than development opportunities. Given that QR contains an element of funding for research training and given the inadequacy of support in many areas of research training and staff development, it is inappropriate that research assessment does not explicitly reflect these issues.

131. We note that excellence in research training is not always synonymous with excellence in research activity. We therefore recommend separating the assessment and funding of training and staff development from the assessment of research quality, to ensure its importance is properly recognised. This does not necessarily imply removing it from the RAE (although that is one option). However, it does imply that funding outcomes must reflect training and development practices as well as research outputs.

132. In the 2001 RAE, those parts of the submission in which HEIs provide contextual information (RA5 and RA6) will be more structured and contain more details on recruitment and research strategy. One potential further change would be to make these forms include outline training and staff development plans, which could be considered against the following criteria:

- the quantity and quality of career guidance, and the development of a culture in which young researchers are encouraged to take advantage of the guidance provided
- provision of training which embraces generic and transferable skills which will help postgraduates successfully undertake roles within or outside HE
- provision of training in teaching and management
- the extent to which general personnel systems supporting staff (e.g. training, appraisal, guidance) are made available to postgraduate and postdoctoral staff
- ability of research students to access high quality research facilities and research expertise
- the implementation of recruitment strategies which emphasise the development and sustainability of excellent research.
- demonstrable commitment of the institution to equal opportunities for staff at all levels.

133. We debated the following options for enhancing research training through the RAE:

- making the award of RAE ratings dependent upon the satisfaction of certain minimum criteria relating to the treatment of, and opportunities for, new researchers
- making a proportion of the QR allocation dependent upon satisfactory arrangements for training and career development
- demerging funding associated with the support of new researchers and allocating it separately based on an assessment of the opportunities for training and career development.

134. We are disinclined to suggest developing a separate assessment and funding process outside the RAE. Rather we believe it will be effective to establish certain, agreed, minimum criteria and ask RAE panels, or sub-panels devoted to the assessment of research training, to establish whether these minimum criteria have been met. The HEFCE could

retain the right to withhold funding where this was not the case; however, we do not believe such a sanction would be necessary.

135. It is not the purpose of this proposal to focus on research and researchers at the expense of teaching and teachers - in many cases they will be the same individuals. Rather this reflects our concern to ensure that staff new to, or contemplating, an academic career are equipped with the necessary skills, including teaching skills, and that these skills are transferable to careers outside academe.

136. We noted the widespread support within the sector for concentration of graduate training, shown in the response to the Call for Evidence. However, we believe there is great benefit in, and therefore a need to preserve, the current situation in which a range of institutions contribute to the training of postgraduates. There is research excellence in the new universities, and it would therefore be inappropriate to exclude such departments from participating in research training. We believe that disciplinary postgraduate training networks might be developed, which might be formal collaborative graduate schools or more informal arrangements depending on the circumstances.

137. The Research Councils are increasingly focusing on enhancing postgraduate training, though they are each taking different approaches. The Economic and Social Research Council (ESRC) has been particularly active in reviewing and recognising research training in HEIs; EPSRC has focused upon providing external support for those gaining studentships; the Medical Research Council (MRC) has been active in building partnerships with institutions, part of which involves developing plans for postgraduate training.

138. We note that the teaching, research and other activities sub-group have considered this issue in some detail and in particular:

- how to provide incentives for the development of collaborative links between institutions to enhance the research training environment and experience
- how to reflect regional or disciplinary needs in any proposed structure.

139. We do not believe that there is any evidence to suggest that the RAE discourages the recruitment of researchers who have recently embarked on a research career. However, we recognise that there may be a perception that panels may not always make proper allowance for staff who have not had time to establish a track record or who have taken a career break. We therefore welcome the suggestion from the quality assurance sub-group that personal statements should be permitted in respect of such individuals, which would contribute to the assessment of the department as a whole.

140. Moving to assessment based on a broader view of the characteristics of excellence could have benefits for other specific groups, including individuals joining institutions from outside the sector and researchers in the arts and humanities, some of whom believe the current approach foists a scientific model of assessment on them.

141. However, there are substantial issues to be addressed before such an approach could be considered:

- it would probably entail a substantial increase in workload for RAE panels
- common approaches do enhance the transparency of the system
- an explicit assessment of individuals by the RAE could lead to pressure from institutions to release details of individual assessment (which would have to be resisted)
- anxiety about the known basis of assessment may be replaced by anxiety that the basis of assessment is not known.

Widening research

142. The response to the Call for Evidence indicated considerable support from the pre-1992 sector for the role of selectivity in rewarding the development of effective research strategies by institutions. However, it is also clear from the Call for Evidence that the views of post-1992 universities are more equivocal. Textual analysis of the responses showed that this was in large part a reflection of dissatisfaction with the rewards available for emerging excellence and disciplines.

143. We recognise the aims underlying the proposal from some commentators for a national plan for research – there are some areas where the research base is not sufficiently well developed to meet the needs of users and society more generally. However, we do not believe that fast moving and innovative research areas would benefit from the development of what would inevitably be a leaden central management function.

144. The HEFCE has a scheme to support developmental research activity within post-1992 institutions – CollR funding. However, we are in favour of establishing a more broadly based 'capability-development' type of funding, independent of the type of institution.

145. Such an approach would seek to provide a developmental framework to support research which made a distinctive contribution to the research landscape but which was not as well supported as it might be by the current approach to selectivity. This could include:

- a. *Pockets of excellence and emerging subjects* – lone researchers and small groups undertaking high quality research in otherwise poor research areas. At present such activities can be 'buried' within a submission, so the individuals or groups concerned are not recognised by the assessment mechanism. Neither flagging nor exclusion of other research active staff from the submission to artificially 'promote' the significance of this activity is a sufficient or appropriate response.
- b. *Research of national, regional or local importance* – it is essential that regions continue to have complementary strengths, though we do not propose that an explicit and devoted regional research fund should be developed.
- c. *Research underpinning practice in areas where the research activity is very dispersed* – we believe that the current funding approach may not support the required level or rate of development in areas where the creation of research capability is essential such as nursing and social work.

146. The objectives for such a new approach might include:

- supporting the development of new areas
- encouraging institutions with a relatively small research base to concentrate in areas where they can make a distinctive contribution
- achieving better value for money within the sector by providing relatively small sums to enable teacher researchers in teaching-led institutions to carry out research in strategically relevant areas
- funding research plans which demonstrate a commitment to the regional agenda.
- enabling a needs-based approach to research development
- funding practice-based research.

Annex A

Membership of the sub-group

Sir Brian Fender (Chair)	Chief Executive, HEFCE
Sir John Pattison	Head of Research & Development Department of Health
Dr John Taylor	Director General of the Research Councils Office of Science & Technology
Clare Matterson	Head of Policy Research in Science and Medicine (PRISM) Unit Wellcome Trust
Michael Hipkins	DfEE
The Baroness Warwick of Undercliffe	Chief Executive CVCP
Professor Ron Amann	The Cabinet Office
Sir Robert May	Government Chief Scientific Adviser Office of Science and Technology
Professor Anthony Ledwith	Chairman of EPSRC, Formerly of Pilkington PLC
Bahram Bekhradnia	Director of Policy, HEFCE
Dr David Pilsbury	Head of Research Policy, HEFC

Annex B

Terms of reference

To consider the purpose of HEFCE funding, to review its role in securing the benefits of having a range of funding types, and to consider how it can most effectively complement, rather than duplicate, the aims of other funding agents.

In considering these issues the group will wish to address the following questions:

What is the rationale for public funding of research?

- What is the objective of funding research from the public purse?
- Does publicly-funded research have to have an objective or tangible potential benefit or can it be considered an end in itself?
- How much blue-skies research should be supported by public funding?

How well is the research base performing?

- Is publicly-funded research meeting the needs of users?
- How does the performance of the research base compare with that in other countries?
- How does the performance of the HE research base compare with the private sector?
- How has the output of the research base varied as funding sources and levels have changed?

Is the nature of research changing and, if so, to what extent is this responding to, or facilitated by, current approaches to research funding?

- Is the nature of research changing, as a result of growth in applied research for example?
- Are the growth in charitable funding, increasing levels of investment in HE research by the private sector and global research resourcing significantly changing the funding environment?
- Are changes in activity and funding complementary?
- Are changes in the nature and role of HEFCE research funding required to better support interdisciplinary and collaborative research?

How can complementary funding approaches by stakeholders maximise the value achieved from the research base?

- How can the international competitiveness of the research base be maintained, while ensuring that institutions respond to the needs of the users of research, and particularly to industry?
- Is it necessary to maintain competency and awareness in a wide range of fields? If so, whose responsibility is it and how is it best achieved?

- How can the right balance between project and infrastructure funding be determined and most appropriately funded?
- How can the high quality infrastructure required to do internationally competitive science be safeguarded?

Should HEFCE funding be used to explicitly support strategic needs?

- Should HEFCE money explicitly reflect the objectives of government initiatives such as Foresight?
- Should HEFCE research policy and funding particularly encourage work with SMEs or companies in the 'new' economy?
- Should the HEFCE be active or reactive in defining and promoting strategies?

What funding method is most appropriate given the purpose and nature of HEFCE funding?

Annex C

OECD Science and Technology indicators

	UK	Germany (1)	France (2)	Italy (3)	Japan (4)	Canada	USA (5)	
Gross Domestic Product (GDP) (6), (£ billion at ppp) (7)								
1988	479.1	560.2	488.7	463.6	1056	263.3	2807.5	
1989	522.4	623.6	544	511	1186	288.7	3106.8	
1990	562.7	699.8	592.8	555.5	1326.2	306.4	3345.2	
1991	589.8	865.6	661	619.8	1507.1	329.3	3625.7	
1992	612.6	917.7	671.6	634.3	1543.4	328.1	3715.2	
1993	647.2	958.9	686.3	644.2	1643.9	356.3	4041.9	
1994	685.8	1038.3	720.3	689.9	1712	383.6	4339.7	
1995	722.9	1122.4	775.6	747.5	1844.2	416.6	4713.3	
1996	764.6	1171.6	810	774.4	1973.6	435.3	4987.5	
1997	812.1	1229	(e) 850.9	(e) 806.1	(e) 2040.8	(e) 462.9	(e) 5315.4	(e)
GDP growth rate 1988 to 1997 (8)	6.1	9.3	(e) 6.4	(e) 6.4	(e) 7.7	(e) 6.5	(e) 7.4	(e)
Gross Expenditure on R&D (GERD), (£ billion at ppp) (7)								
1988	10	16	11.1	5.6	28	(e) 3.7	78	
1989	11.1	17.9	12.7	6.3	32.8	(e) 4	84.8	
1990	12	19.2	14.3	7.2	37.9	(e) 4.5	93	
1991	12.1	22.6	15.9	7.7	42.5	(e) 5	102	
1992	12.7	22.7	16.3	7.6	42.6	(e) 5.1	102	
1993	13.5	23.2	16.8	7.3	44	(e) 5.7	105.6	
1994	14	24.1	17.1	7.3	45.1	(e) 6.2	109.1	
1995	14.2	25.8	18.1	7.5	51	(e) 6.8	123	
1996	14.4	26.8	18.8	8	(p) -	7.1	130.8	(p)
1997	14.7	29.3	(e) 19.2	(p) 8.5	(p) -	7.6	(p) 140.3	(p)
GERD growth rate 1988 to 1997 (8)	4.3	7.1	(e) 6.3	(p) 4.8	(p) 9.1	(e) 8.4	(p) 6.8	(p)

	UK	Germany (1)	France (2)	Italy (3)	Japan (4)	Canada	USA (5)	
GERD as a percentage of GDP								
1988	2.09	2.86	2.28	1.22	2.7	(e) 1.39	2.78	
1989	2.12	2.87	2.33	1.24	2.8	(e) 1.39	2.73	
1990	2.13	2.75	2.41	1.3	2.9	(e) 1.47	2.78	
1991	2.06	2.61	2.41	1.24	2.8	(e) 1.53	2.81	
1992	2.07	2.48	2.42	1.2	2.8	(e) 1.55	2.74	
1993	2.09	2.42	2.45	1.14	2.7	(e) 1.61	2.61	
1994	2.05	2.32	2.38	1.06	2.6	(e) 1.62	2.51	
1995	1.96	2.3	2.34	1.01	2.8	(e) 1.62	2.61	
1996	1.88	2.29	2.32	1.03	(p) -	1.63	2.62	(p)
1997	1.8	2.39	(e) 2.26	(p) 1.05	(p) -	1.64	(p) 2.64	(p)

Percentage of GERD financed by Government

1988	35.4	34.2	49.9	51.8	18.1	(e) 44.5	47.8	
1989	35.3	34.1	48.1	49.5	16.8	(e) 44.7	45.6	
1990	34.4	33.9	48.3	51.5	16.1	(e) 44.3	40.8	
1991	34.1	35.8	48.8	49.6	16.4	(e) 43.4	38.7	
1992	33.4	35.9	43.5	48.5	17.5	(e) -	37.9	
1993	32.5	36.5	43.5	51.3	19.7	(e) 40.3	37.6	
1994	33.2	37.1	41.6	50.2	19.5	(e) -	37.1	
1995	33.2	36.8	41.9	53	20.9	(e) 35.4	35.6	
1996	31.8	37.2	41.5	48.8	(p) -	-	33.6	(p)
1997	30.8	35	-	47.9	(p) -	32.3	(p) 31.6	(p)

	UK	Germany (1)	France (2)	Italy (3)	Japan (4)	Canada	USA (5)
R & D performed in the Business Enterprise Sector (BERD), (£ billion at ppp) (7)							
1988	6.9	11.6	6.6	3.3	20.4	2	55.8
1989	7.7	12.9	7.7	3.7	24.4	2.2	60.3
1990	8.3	13.8	8.6	4.2	28.6	2.4	66.1
1991	8.1	15.7	9.8	4.3	32	2.7	74.3
1992	8.5	15.6	10.2	4.2	31.3	2.8	73.4
1993	9.1	15.5	10.4	3.9	31.3	3.2	74.8
1994	9.2	16	10.6	3.9	32.1	3.6	77.2
1995	9.3	17.1	11.1	4	35.9	4	88.5
1996	9.4	17.7	11.6	4.3	(p) -	4.3	95.7 (p)
1997	9.6	20.1 (e)	11.8 (p)	4.6 (p)	-	4.8 (p)	104.4 (p)

	UK	Germany (1)	France (2)	Italy (3)	Japan (4)	Canada	USA (5)
BERD as a percentage of GERD							
1988	69	72.4	59.5	57.8	72.7 (e)	55.2	71.6
1989	69.1	72.2	60.3	58.8	74.3 (e)	54.1	71
1990	69.4	71.9	60.4	58.3	75.5 (e)	53.8	71
1991	67.1	69.3	61.5	55.8	75.4 (e)	53.3	72.8
1992	66.9	68.6	62.5	55.8	73.5 (e)	54.1	72
1993	67	66.9	61.7	53.7	71.1 (e)	56.5	70.9
1994	65.5	66.3	61.8	52.9	71.1 (e)	58.3	70.8
1995	65.3	66.4	61	53.4	70.3 (e)	59.9	72
1996	65	66.2	61.5	54.4	(p) -	60.8	73.2 (p)
1997	65.2	68.4	61.2 (p)	54.5	-	63.4 (p)	74.4 (p)

	UK	Germany (1)	France (2)	Italy (3)	Japan (4)	Canada	USA (5)	
BERD as a percentage of GDP								
1988	1.44	2.07	1.35	0.7	1.93	0.77	1.99	
1989	1.46	2.07	1.41	0.73	2.06	0.75	1.94	
1990	1.48	1.98	1.46	0.76	2.15	0.79	1.98	
1991	1.38	1.81	1.48	0.69	2.13	0.79	1.98	
1992	1.39	1.7	1.51	0.67	2.03	0.84	1.98	
1993	1.4	1.62	1.51	0.61	1.9	0.91	1.85	
1994	1.34	1.54	1.47	0.56	1.87	0.95	1.78	
1995	1.28	1.53	1.43	0.54	1.94	0.97	1.88	
1996	1.22	1.51	1.43	0.56	(p) -	0.99	1.92	
1997	1.18	1.63	(e) 1.38	(p) 0.57	(p) -	1.04	(e) 1.96	(e)

Industry financed BERD as a percentage of GDP

1988	1.03	1.79	0.94	0.52	1.9	0.55	1.37	
1989	1.02	1.78	0.98	0.56	2	0.55	1.4	
1990	1	1.71	1.01	0.56	2.1	0.58	1.47	
1991	0.96	1.58	0.98	0.53	2.1	0.58	1.59	
1992	0.99	1.49	1.08	0.55	2	-	1.57	
1993	1.01	1.44	1.11	0.49	1.87	0.66	1.49	
1994	0.97	1.37	1.11	0.44	1.84	-	1.45	
1995	0.89	1.36	1.09	0.41	1.91	0.7	1.55	
1996	0.84	1.34	1.08	0.45	(p) -	-	1.61	(p)
1997	0.83	1.46	-	0.47	(p) -	0.75	(p) 1.67	(p)

	UK	Germany (1)	France (2)	Italy (3)	Japan (4)	Canada	USA (5)				
HERD as a percentage of GDP											
1988	0.33	0.42	0.34	0.25	0.35	(e)	0.33	0.42			
1989	0.32	0.41	0.35	0.25	0.34	(e)	0.34	0.42			
1990	0.33	0.41	0.35	0.27	0.35	(e)	0.37	0.43			
1991	0.34	0.43	0.36	0.27	0.34	(e)	0.4	0.4			
1992	0.35	0.43	0.37	0.27	0.35	(e)	0.4	0.4			
1993	0.36	0.44	0.39	0.28	0.38	(e)	0.4	0.4			
1994	0.38	0.43	0.38	0.27	0.37	(e)	0.39	0.4			
1995	0.37	0.42	0.39	0.26	0.4	(e)	0.37	0.39			
1996	0.37	0.42	0.39	0.25	(p)	-	0.36	0.39	(p)		
1997	0.36	0.41	(e)	0.39	(p)	(p)	-	0.35	(p)	0.38	(p)

GOVERD as a percentage of GDP

1988	0.28	0.36	0.57	0.27	0.25	0.28	0.3				
1989	0.29	0.37	0.56	0.27	0.24	0.28	0.29				
1990	0.28	0.35	0.58	0.27	0.23	0.3	0.29				
1991	0.3	0.36	0.55	0.28	0.23	0.3	0.28				
1992	0.3	0.35	0.51	0.26	0.25	0.29	0.27				
1993	0.3	0.36	0.52	0.24	0.27	0.28	0.27				
1994	0.3	0.35	0.49	0.23	0.26	0.27	0.25				
1995	0.28	0.35	0.49	0.21	0.29	0.26	0.25				
1996	0.27	0.35	0.47	0.22	(p)	-	0.26	0.23	(p)		
1997	0.25	0.34	(e)	0.46	(p)	(p)	-	0.23	(p)	0.22	(p)

Notes:

- 1 There are breaks in series for all data between 1990 and 1991, and for GERD between 1991 and 1992.
 - 2 For government and business enterprise data there is a break in series between 1991 and 1992.
 - 3 There is a break in series between 1990 and 1991, and 1993 and 1994.
 - 4 Data for Japan are adjusted by OECD.
 - 5 Excludes most or all capital expenditure. There is a break in series between 1990 and 1991 for GERD.
 - 6 The measure of GDP used is at market prices.
 - 7 Amounts are converted to £ sterling using the purchasing power parities (ppp) developed by the OECD.
 - 8 The annualised percentage growth rate is shown.
- p = provisional.
e = estimate.

Source: OECD databank (March 1999) via ONS.

Annex D

Key findings of the SPRU study of research policy and funding in five countries

France, Germany, Japan, the United Kingdom and the United States

Patterns of funding

- Growing significance of university research within national research budgets.
- Prevalence of the dual support system as a mechanism for distributing research funds among universities.
- Development of new approaches to the allocation of project-based research funds to ensure a better match between resources and objectives.
- Implementation of initiatives to refurbish the research infrastructure (including laboratories and equipment).
- Increasing variety of funding sources and stakeholders in research.
- Use of 'mix and match' approaches to combine different funding streams together for research.

Recent reforms (to funding allocations and evaluation)

- Attempts to better co-ordinate the implementation of research policies.
- Growing interest in methods to link performance to the allocation of core funds.
- Increasing focus on the balance between excellence, efficiency (including public accountability) and equity.

Main issues and current initiatives

World class and applicable research are closely intertwined.

- Support for world class research also encourages applicable research.
- Growing appreciation of the synergistic relationship between basic and applied research.
- Increasing use of mechanisms to target funding to priority areas.
- Increasing focus on reward systems as a means to selectively stimulate behavioural change.
- Increasing recognition of interdisciplinarity; new research areas are typically interdisciplinary.
- Some recognition that a wider distribution of research funds can lead to the development of new areas of basic, world class research. It also provides a channel for universities to undertake applicable research of use to SMEs and firms in traditional sectors.

- Recognition, in almost all countries, that world class scientific research might be linked to an institution's ability to select the best young scientists, provide them with secure research positions, stable funding and the freedom to choose their own research topics.

Recognition of research networks

- Increasing focus of commercially funded research in the universities is coupled with a focus on issues connected with intellectual property.
- Flexible deployment of networking to facilitate research collaboration and co-ordination and so serve the goals of science, the regions, sponsors and overall efficiency (for example through sharing expensive pieces of research equipment).
- Efforts to revise and up-date traditional methods for technology transfer.

Career development and training

- Increasing recognition of, and attempts to remedy, the poor professional status of university researchers.
- New approaches to attract exceptional young researchers to careers in universities.
- Tendency for non-implemented rhetoric about promoting the participation of minority groupings (women, ethnic minorities, people with disabilities) in university research.
- Concern to raise (and measure) the quality of teaching practice.

Widening research

- Perceived widening of the number of universities involved in research as well as the research domains studied.
- Escalating use of mechanisms to identify and fund priority areas of research.
- The creation of new research facilities to facilitate interdisciplinarity and research co-operation.
- Increased recognition, for instance in Germany, of the need for structural reform of the universities to foster flexibility and responsiveness to change and the complementary requirements to build strong leadership capabilities at departmental and university administrative levels.