HEFCE Fundamental Review of Research Policy and Funding

Sub-group to consider the role of selectivity and the characteristics of excellence

Final report
Executive summary

- The terms of reference of the group were to consider the role of selective funding, and the appropriate degree of selectivity required to support existing and developing excellence. In particular to address the following questions: What has been the effect of the selective allocation of funding by HEFCE and its predecessors? What is the desired outcome of selectivity and is the current approach delivering it? How does our selective approach to funding compare with that in other countries? What is the most appropriate basis for selectivity to meet the future needs of the research base and the stakeholders in it? How selective should the HEFCE be to meet the future needs of the research base and stakeholders? What is critical mass? How can selectivity facilitate the development of centres of excellence? and How can selectivity best support excellence in research training as distinct from excellence in research activity?

- We have found that the present funding regime has led to the improvement of the quality of research and its management. Ample evidence of this exists, and in particular of the improvement in the quality of research in the UK, compared with other countries.

- In the past ten years the degree of selectivity has increased: the proportion of HEFCE funding going to higher rated departments has increased relative to that going to lower highly rated departments. At the same time, because of the aggregation of highly rated departments in a relatively small number of higher education institutions (HEIs), research funding overall has also become increasingly concentrated. However, this has occurred as a consequential effect of the policy of selective funding rather than as the result of a deliberate policy of concentration. International comparisons suggest that the UK research base is not less selective or less concentrated than in the USA. In fact the USA has become less selective in the last decade.

- We considered whether a case existed for the further, explicit, concentration of research funding, that is, limiting funding for research to a specific group of institutions. Selective funding by subject has already led to high degree of concentration: 75 per cent of HEFCE’s research grant goes to only 28 institutions, and the degree of concentration of Funding Council grant is broadly similar to that of Research Councils and industry. Also, the UK is a dynamic system, with new areas emerging and developing, often in ways that could not have been foreseen and not necessarily within established ‘centres of excellence’. Therefore, to exclude the majority of institutions from research funding would run the risk of choking off possibly outstanding research being developed within them. It is important that good research should be able to flourish, and be supported, where ever it takes place. We recommend that the HEFCE should continue with its policy of selectivity based on subject excellence wherever it is found, rather than move to an explicit policy of institutional concentration.

- There is a trade-off between on the one hand encouraging and rewarding established excellence to enable the country’s best research to remain world class, and on the other encouraging the development
of promising new research and new subjects for research. We have to do both, and the HEFCE’s research funding policies must bear both in mind. However, the balance lies firmly with the former.

- We modelled alternative approaches to selectivity, but there are serious disadvantages with either a significantly more selective or a significantly less selective approach to funding. In particular, greater selectivity could only be achieved by removing virtually all funding from departments with emerging research activity and from good departments very widely. We recommend that the present level of selectivity should be maintained.

- We considered whether different levels of selectivity are appropriate for different subjects. It is undoubtedly the case that different characteristics of excellence apply to different subjects, and that some subjects, especially the experimental sciences, require very selective funding to develop their subjects to the highest levels. A differential approach to selectivity would be appropriate if the Funding Councils wished to fund individual subjects, as most institutions broadly follow the HEFCE resource allocation model. However, since the Funding Councils allocate a block grant, and expect institutions to take informed decisions about how to allocate it internally most effectively, the case for different approaches to selectivity for different subjects is unclear.

- Although unconvinced that there are benefits in differential degrees of selectivity between disciplines, we recommend there should be greater recognition of the differences in the characteristics of excellence between cognate areas. A recognition of the acknowledged diversity in the characteristics of excellence would be permitted by increased credibility of the Research Assessment Exercise (RAE) since it was established in 1986. In particular, we recommend that definitions of the characteristics of excellence should encourage applicable research. This does not require fundamental changes in the assessment and funding basis, but can be achieved through building on the changes for the 2001 RAE.

- In addition to producing concentration, current policies are reinforcing critical mass, though there are many examples of groups functioning at the highest levels that do not appear to be large. Since current policies are proving effective, without constraining those small groups who can compete at an international level, we believe it would be a mistake to seek to promote this directly. We recommend that the HEFCE should not take explicit cognisance of the fact that critical mass is significantly correlated with quality in most science-based subjects, particularly in the experimental sciences.

- We considered whether the current funding approach fosters emerging, particularly interdisciplinary, research or whether it reinforces conservative notions of research. There is no evidence that interdisciplinary research is discriminated against, but we recognise the concern. To ensure that researchers are confident that such work will be properly assessed, we recommend that where the characteristics of excellence in a research area of significant size that crosses a number of disciplinary boundaries may be more easily demonstrated on a thematic rather than a disciplinary basis, an appropriate thematic unit of assessment (UoA) might be created.
• The output of trained people is also a characteristic of excellence, and this may not be sufficiently well recognised in the current approach. Therefore, we recommend that greater attention be given to the assessment and funding of the research training environment to acknowledge the significance of the production of trained people as a characteristic of excellence. We were struck by the level of support in the consultation conducted as part of this review for some concentration of postgraduate research training. We believe that this suggestion should be explored further, but recognise there would be dangers in over-concentrating research students.

• We considered the case for developing specific funding for collaborations. There is no evidence that collaboration between UK researchers is inhibited by the current funding arrangements (on the contrary, collaborative research in the UK appears to be widespread and growing). We are inclined to the view that specific funding for collaboration could result in a number of unintended effects, as institutions seek to maximise their income by ‘games-playing’. However, we recommend that the HEFCE consider this issue further, in view of the importance of ensuring support to researchers who have found that their activities are enhanced through developing research networks.
Background

1. A policy of selectivity has developed in parallel with the evolution of the RAE, although the University Grants Committee (UGC) operated a policy of selective funding prior to establishment of the RAE through its subject-based sub-committees. Selectivity is not part of a published strategy that seeks to produce an explicitly agreed distribution of funding. Instead, it arises implicitly from the HEFCE's mission to 'promote and fund high-quality, cost-effective... research, meeting the needs of students, the economy and society', that is, to balance the demands for research funding from a diverse sector. The degree of selectivity is agreed by the HEFCE Board after each RAE, in the light of ratings achieved by institutions for their submissions and the available funding. Selectivity can change quite markedly, as it did towards the end of the UGC-period and again following the 1996 RAE.

2. The need for selectivity arises because the demand for research funding, in the UK as elsewhere, significantly outstrips supply. The increase in demand has been driven primarily by the growth of volume - both from the increased funds available from charities and the Research Councils, and from the increased number of teacher-researchers accompanying the expansion of undergraduate education over the last 10 years. There has also been a significant increase in the cost of undertaking world class research in many disciplines.

3. The aim of selectivity is to balance support of established excellence with support to nurture and develop emerging excellence.

4. This report explores both the role of selectivity and the characteristics of excellence, in order to consider the appropriate degree of selectivity required to support existing and developing excellence. Membership of the sub-group is shown at Annex A, terms of reference are at Annex B.
What has selectivity meant and what has it achieved?

5. As part of our work, we commissioned a systematic and wide-ranging exploration of the effects of selectivity and the characteristics of excellence from the Higher Education Policy Unit (HEPU) at the University of Leeds. The findings indicate that the application of a policy of selectivity over a long period has stimulated a constructive and coherent response by institutional managers, who have become more strategic in their approach to research management. It has also produced an increase in the concentration of research funding. As a result of these influences, the output of the most active institutions has both increased and improved: they are delivering more, better research. Since both the volume and the quality of research have increased at a faster rate than the funding inputs, there has been a significant increase in efficiency.

6. The timing of these changes in the productivity of the research base can be demonstrably linked to the inception of the RAE cycles and seems, therefore, attributable both to the policy’s funding effects, as Funding Council funding has been targeted to encourage and reward high quality research, and to better management of resources within institutions.

7. The key conclusions of the HEPU study are:

a. The explicit policy of selectivity, underpinned by the RAE, has produced major changes in attitude and strategy, and has increased the active management of the research environment. Direct management of detailed research strategy is still rare and is considered by interviewees generally to be unproductive in the context of higher education research.

b. The RAE and the consequential selectivity of funding have operated as a major stimulus to more conscious research management, and proved an effective lever to institutional change, although some change would have occurred anyway.

c. Selectivity and the RAE have also acted as an incentive to research training since HEIs have recognised the need to develop their research potential. Research training has improved as a result of increases in the financial and management resources devoted to it and through the adoption of more systematic approaches.

d. Selective approaches to funding and research management are as widely accepted in the social sciences and humanities as among the natural sciences.

e. Institutions have established structures that ensure better financial and management accountability, and which permit the development of more strategic approaches to research policy (for example, research committees at both institution and department level). For instance, HEIs with high quality research will focus
attention on, and invest in, 4-rated departments in an attempt to raise them to 5/5* status. Alternatively, institutions will invest disproportionately in the research-strong departments to build on their strengths. Interviews conducted with senior managers, by the Policy Research in Engineering, Science and Technology Unit at the University of Manchester (PREST) as part of this review, suggest 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 should 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 academic units.

8. In 1999, Professor Ewan Page completed a study for the HEFCE regarding the effects of the RAE and selectivity. His report indicated that the behaviour of the new universities overall appeared to be different from the pre-1992 ones. Post-1992 universities seemed prepared to encourage new submissions from small groups of staff in the hope of gaining some funding, whereas pre-1992 universities were more concerned to achieve higher ratings.

9. HEPU also noted that resource allocation mechanisms within institutions are more transparent now than 10 years ago (a finding confirmed by the related PREST study), are were generally characterised by three different approaches:

- funding is distributed to departments almost in direct proportion to the amount of quality-related (QR) HEFCE funding they have earned
- allocations reflect, but do not precisely mirror, the amounts earned under the HEFCE research funding model
- allocations bear no relationship to the amounts earned under the HEFCE research funding model. (This was evident in specialist institutions, which made a small number of submissions and whose departmental structure bore little resemblance to the UoA structure.)

10. Around three-quarters of HEIs use a research allocation model that is very similar to that used by the HEFCE in calculating funding. This indicates that, although the Funding Councils provide a block grant, the individual performance of departments in the RAE will in large part determine the institutional funding they receive.

11. Some institutions are significantly more selective than the HEFCE model. They target a considerable proportion of their resources to failing departments needing remedial action or to areas where there is a likelihood of improvement at the next RAE. Also, it is apparent that departments are frequently unselective with some part of their resources - for example, allocating equal teaching loads to all staff regardless of their research activity.
How does selectivity compare with that in other countries?

**Distribution of funding**

12. International comparisons undertaken by HEPU suggest that the UK research base is not less selective or less concentrated than in the USA. In fact the USA has become less selective in the last decade. In the UK, in 1980-81 the top decile of institutions (by research activity) received 46.5 per cent of the £205 million total recorded research funding, compared with 1997-98 when the top decile of institutions received 56.9 per cent of the £1.75 billion total recorded funding. In the USA, the top decile of institutions in 1981 (23 institutions) received $1.9 billion of federal R&D funds which corresponds to 47 per cent of the total $4.2 billion available, compared with 1997, when the top decile received 43 per cent ($5.5 billion) of the $12.75 billion total recorded federal funding.

**Commercial funding**

13. Findings from HEPU also indicate closer correlation between public and commercial funding (by which we mean research funding won from industrial and other commercial organisations, not income generated by HEIs from commercial activities which may of may not be related to research) in the UK than in the USA, although the average commercial research funding won by USA universities is higher (11 per cent compared with public funds, while it is about 8 per cent in the UK).

Figure 1: Public versus commercial research funding for UK HE institutions (£000, r=0.86)

14. Figure 1 shows that in the UK income for research from public sources including Research Councils and charities is broadly correlated across small and large institutions with income available for applied research from commercial sources, and this does not change much when small institutions are excluded (the correlation is 0.88 for all institutions, 0.86 after excluding minor research institutions). It appears, therefore, that the institutions most successful in attracting public research funding tend to be the same as those which
attract commercial funding. There is no evidence of a separation of innovation and application.

15. Figure 2 shows that in the USA, comparison between public and industrial R&D funding for 1997 produces a low level of correlation, with many publicly well-funded institutions attracting relatively little commercial income. MIT is exceptional in attracting a high level of both, but it is clear there are groups of institutions with high levels of public funding and low commercial income and vice-versa. Thus it would appear that there is more evidence of separation between innovation and application within the HE sector in the USA than in the UK. The correlation between public and commercial funding in the USA reduces significantly (from 0.6 to 0.38) if small institutions are excluded indicating that institutions with low research income are the primary determinant of the correlation.

Figure 2: Public versus commercial research funding for US HE Institutions ($000, r=0.6)

16. As Table 1 shows, the UK produces more papers per $ million spent (as a proxy of research productivity) than any other major industrial country.

17. Recent work has demonstrated different relationships between research activity, funding and performance in different countries. Some countries, such as the UK and the USA, have a diverse research base across which they perform fairly evenly (and in the case of these two countries, very well indeed). There is no greater impact in areas where investment, measured by relative activity, is greater. Other countries, such as France and Germany, are very different, with a direct relationship between research inputs and outputs. It is not certain whether the relationship is causal, though it may reflect the contribution of mission-orientated facilities such as the Max-Planck research institutes.

18. It would of course be possible to develop a policy-driven approach in the UK, to concentrate the provision of research funding in specific subject areas representing national strength or national need.
19. We consider the case for policy-driven changes in funding for particular research areas in the section below and later in the report. However, this issue was considered in some depth by the sub-group looking at the nature and purpose of HEFCE funding for research, and we do not wish to repeat the arguments at great length.

20. The majority of funds provided to institutions for research are to support research projects (flowing from the Research Councils, other Government departments, industry, charities and other providers of research grants and contracts) many of which reflect national priorities. Resources from the Funding Councils enable institutions to build up their research capability (more academic staff, research support and infrastructure provision and a greater proportion of time devoted to research), and institutions need to invest in developing capabilities in those areas in which they win grants and contracts. There is, therefore, a clear link under the dual support system between the allocation of resources from the Research Councils and the Funding Councils. It was primarily because of this link that the respondents to the recent consultation regarding the possible development of a policy factor held that it was unnecessary for the HEFCE’s grant to be explicitly modified to reflect national priorities. The respondents also felt that there was substantial merit in retaining a stream of funding which supported the judgements and decision making of institutions themselves.

21. If it were thought appropriate to produce a broader or longer-term change in the research base, QR allocations can be changed with respect to one another, so as to channel money to particular areas (as has happened in medicine recently).

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

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<th>Country</th>
<th>Papers per $ Million</th>
<th>Rank</th>
<th>Citations per $ Million</th>
<th>Rank</th>
<th>Papers per Researcher</th>
<th>Rank</th>
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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.
How selective should we be, and on what basis?

Figure 3: The distribution of HEFCE research funding between institutions following the 1992 and 1996 RAEs

22. The distribution of HEFCE research funding between institutions following the 1992 and 1996 RAEs is depicted in Figure 3. Each point on the X-axis represents a separate institution, with the total HEFCE grant for research shown on the Y-axis. This shows that the vast majority of funds go to a small number of universities: 75 per cent of QR went to 28 of the 105 institutions which in 1997-98 received any significant element of QR funding (ie more than £250,000). These 28 institutions account for 68 per cent of research volume (that is, staff submitted to the RAE).

23. The recent Call for Evidence issued as part of this review explored views on the current level of selectivity. A minority supported a further increase in selectivity, whereas the overwhelming majority of the pre-1992 sector supported something close to the current level.

24. However, post-1992 institutions were much more equivocal in their view of the current level of selectivity. There were particular concerns within the post-1992 sector that the current approach was too selective. It was argued that:

- much valuable research was undertaken in relatively low-rated departments
- selectivity does not recognise value-for-money considerations
• a high level of selectivity is appropriate only in subjects with high capital costs or which require critical mass.

25. It was also noted by some respondents that a significant increase in selectivity might lead to institutions developing more teaching-only departments.

26. Only small sums of money go to departments rated below 4. It is acknowledged that such departments can often be engaged in research of considerable significance: for example, the definition of the 3a rating is 'quality that equates to attainable levels of national excellence in over two-thirds of the research activity submitted, possibly showing evidence of international excellence'.

27. If this funding were withdrawn, it would lead to an unacceptable loss of regional research provision. This would be particularly significant in some disciplines. For example, if the funding of 3b-rated and 3a-rated departments were stopped, it would virtually eliminate QR research funding for the medical schools in the East Midlands, North-East, North-West and South-West.

28. In addition, the work undertaken by HEPU has confirmed the findings of Professor Ewan Page in his 1999 report for HEFCE on the effects of the RAE and selectivity. Departments with low RAE ratings often secure similar levels of external funding, pound for pound, as more highly rated ones, though the sector average is lower. This demonstrates both the 'need' of industry for this type of research and the effective gearing that the small sums of public funding provide.

29. There is also some evidence that relatively small amounts of research funding can be significant in prompting students to consider a research career. Figure 4 plots HESA data on PhD intentions against research funding. As expected, there is a general correlation at high levels of research intensiveness, but there is also a clear relationship at low levels of research funding, maybe even a disproportionate propensity of students in some institutions to consider going onto a research career. It may be argued that if these low levels of funding were withdrawn these students would be lost to the world of research.

![Figure 4: Effect of research intensiveness on PhD intensions](1994-95)
30. It is also clear that if the changes in funding associated with different grades were too large it might precipitate the closure of departments with a significant teaching-research role, or strip them entirely of their presence in research. It also might reduce the opportunity for the performance of fading units to be re-established (and for the emergence of new ones) because the investment required before any return was recouped would be too great. PREST interviews with senior managers of institutions have identified that it can already be difficult to attract excellent staff to grade 4 departments.

The effects of changes in selectivity
31. We modelled the funding effects of policy-driven and other changes in selectivity. Their effects are shown in Annex C.

Less selective approaches
32. The patterns of change that these approaches produce are broadly similar, and differ significantly only in the degree to which they move money from Russell Group institutions (an affiliation group of 19 institutions comprising those that are most research intensive and that receive the majority of UK research funding) to the post-1992 institutions. Funding also moves out of the London region, the Eastern region and the South-East. All other regions see a small increase. Although the overall shifts in funding arising from some of the scenarios are small, the effect on individual institutions can be quite large. This tends to be most pronounced in small HE colleges, especially if they are specialist institutions. However, the shifts in funding can also be of the order of 10 per cent of QR funding in some pre-1992 non-Russell Group institutions, depending on their disciplinary and rating mix. Even some Russell Group institutions can suffer large falls in funding, though as the overall level of QR funding is higher the proportional change is smaller.

33. We do not support a wholesale reduction in selectivity because of the success that has accompanied the current approach. However, we do not wish to reject out-of-hand the suggestion that selectivity might be lower in some areas where the case exists for more evenly distributed research funding, and therefore activity. This might arise if there are different public policy reasons for funding research in certain areas (such as developing or greatly widening a national capability in certain disciplines). On the other hand, although public policy reasons for funding research might indeed differ, applying differential levels of selectivity could be said to undermine the block grant principle, which has proved to be a significant long-term factor in underpinning the success of the UK research base.

More selective approaches
34. A number of more selective approaches have been modelled, some modest, some radical and possibly too extreme. The most selective approach modelled produces a pattern of change from the current distribution (by region, by RAE score and by institutional type) which is almost a mirror image of that produced by the least selective approach.

35. A further approach which would increase selectivity, but which is not detailed further here, would be to split the current 4-rating into ‘a’ and ‘b’ levels as was done with the 3-rating grade. In principle this approach
could discriminate between 'aspiring 5s' and departments that were not on a development trajectory, and reward the former appropriately.

36. Given that the selective funding approach to date has been very successful in improving the peak performance of the UK research base, and encouraging institutions to manage their activities more effectively, it may be argued that there should be a yet further increase in selectivity. However, it is not clear that institutions could in fact continue to deliver significantly greater efficiency and better management of their research resources simply through an increase in selectivity. As discussed above, there is considerable evidence that substantially increased selectivity in research funding would, in fact, be damaging to the research base overall, and therefore inconsistent with the needs of the nation as a whole. We therefore feel that the current level of selectivity is about right.

37. Work from HEPU supports this view. Although the UK's peak performance has significantly improved, HEPU found that the average impact of UK output has not changed. This does not mean a lack of absolute improvement overall - but the research competitiveness of other nations has also improved, particularly in Asia, and there is much greater anglophone output from other research-strong nations in Europe, so the general improvement in the performance of the UK research base has not been reflected by bibliometric measures based on world comparisons. It would seem rather that there has been a divergence in the performance in the constituent parts of the research base, with the less strong performers (although keeping pace with overall improvement in international research performance) lagging behind peak performers. Figure 5 shows this clearly, with a rise over time of the index of disparity in performance between institutions for key disciplines (The variable recorded on the Y axis is the mean square error of impact for each year – a measure of the aggregate difference between expected and actual citation rates.)

38. We considered the implications of these data for the policy of selectivity. In addition to the concerns about the effects of increasing selectivity mentioned in paragraphs 34 to 36 above, it was noted that bibliometric data were only one measure of research quality and output, and work relevant to users might have no, or low, bibliometric impact. Low-rated departments win similar proportions of non-public income, pound for pound, as highly-rated departments - work of this type was therefore obviously valued. Moreover, it was not possible to show from the data whether this low-impact work was being funded by QR, as it might be the output of units with no QR funding. Conversely, it was possible, although unlikely, that this was poor work coming out of otherwise highly-rated units. Noting the overall trend to divergence, we felt that a further increase in selectivity could fatally undermine the research effort in a group of institutions that, although not performing at peak levels, were nevertheless engaged in research that was highly valued (including by users) and whose improvement was at least keeping pace with the global increases in research quality.
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Figure 5: Trends in between-institution variance in the impact of research outputs.
The Y axis shows the mean square error of impact between institutions for each year – a measure of the aggregate difference between expected and actual citation rates. Data are for five-year moving windows. The last two points should be disregarded as the citation base is not sufficiently well established.
Grade movement

39. The increase in grades that has accompanied successive RAEs is sometimes referred to as 'grade drift', with the implication that the change is not real, but a result of better presentation by HEIs of their research portfolio and strategy. The study by HEPU demonstrated convincingly that in fact the research base has shown a real improvement in performance since 1986; we consider this to be evidence that the changes in RAE grades reflect a real improvement in research quality.

40. We modelled the effect of a pattern of change in grades similar to that seen in the 1996 exercise: 30 per cent of 2 rated departments were increased by one rating; 40 per cent of 3b and 3a rated departments were increased by one rating; 30 per cent of grade 4 departments were increased by one rating, and 20 per cent of grade 5 departments were increased by one rating. As can be seen from the figure depicting Scenario J in Annex C, the changes in funding allocations brought about by likely changes in performance are very large and are of a similar level to those being modelled as part of potential policy changes.

41. We therefore recommend that the Funding Councils consider at an early stage the funding implications of the ratings changes likely to result from the 2001 RAE. In particular we are concerned that the expected changes in grades and/or volume will require significant additional QR funding in order to maintain the current unit of resource.

42. To understand more about funding dynamics, we commissioned a more sophisticated analysis of the combined effect of the grade movement and volume growth that is expected for the 2001 RAE (Scenario K in Annex C). This clearly demonstrated that, with the expected level of grade movement and volume growth for the 2001 RAE, an additional £58 million in QR funding will be required to maintain the unit of resource for 5/5*-rated units.

43. We have calculated that maintaining the unit of resource for 5/5* units in the face of grade movement and volume growth in the absence of additional funding would require a dramatic increase in selectivity. Instead of 50 per cent increments from 3b to 5 and a 20 per cent premium for 5*, almost 100 per cent increments from 3b to 5 and nearly a 50 per cent premium for 5* would be required – almost doubling selectivity compared with the current level (this approximates to Scenario H in Annex C).

QR model based on Super-UoAs

44. We also examined the suitability of a funding model which uses larger subject groupings: the 12 broad subject groups, 'Super-UoAs', defined by HEPU in their bibliometric study 'Benchmarking of the international standing of research in England' (shown in Annex C).

45. The advantages of moving to Super-UoAs might include enhanced assessment of interdisciplinary research, although even then some themes would continue to cross boundaries, such as research integrating the social and medical sciences. Another advantage might be that the assessment process would more clearly be seen to rely on objective measures of research quality, as the heterogeneity of UoAs would
mean narrow disciplinary-based judgements would not be possible. One important disadvantage is that morale, leadership and management in an HEI is not at the level of the Super-UoA.

46. To examine the financial dynamics of the Super-UoA model, we perturbed it and compared the outcome with that for the current funding model. As shown in Annex C, the financial effects at a sub-sectoral level were generally similar, and it appears that the Super-UOA model is not intrinsically unstable. However, the Super-UoA model was associated with almost 30 per cent more financial turbulence than the current model when we perturbed it. We were unable, as part of the modelling, to replicate the complexity of changes in volume and ratings that are likely to accompany the 2001 RAE, but a theoretical analysis of the dynamics of the Super-UoA model estimated that the financial turbulence associated with it in actual operation could be up to 50 per cent more again than that associated with the simple scenario we modelled. It was also clear that the effect on individual institutions of employing the Super-UoA model was also sometimes very large, depending on their mix of research activities, with the allocations to one research-led institution changing by almost 20 per cent.

47. It is worth noting that one of the reasons for establishing sub-panels for the clinical medical subjects was to provide some basis to reduce the funding turbulence associated with changes in performance in these very large UoAs.

48. Another disadvantage of moving to a Super-UoA approach is the concern that areas of excellence will become submerged in less highly rated elements of the submission as a whole. As for medicine in the 2001 RAE, sub-panels could be constructed to overcome this, but if existing panels were simply ‘re-badged’ as sub-panels, it would undermine immediately the proposed benefits of the Super-UoA model.

49. A further problem with moving to a Super-UoA model is that the RAE has credibility because it is acknowledged to be a true peer review mechanism, and if panels were collapsed it might be difficult to sustain this proposition. It would be possible to establish a large ‘college’ of panel members for each Super-UoA, from which ad-hoc committees could be drawn to assess specific areas, but this would be administratively complex and might make it difficult to ensure comparability of judgement across the whole RAE process.

50. We have therefore decided not to recommend a Super-UoA approach, mainly because of concerns that such an approach could reduce credibility (one of the great positive features of the RAE process), but also because of scepticism as to whether the benefits would materialise. In addition, it might increase financial turbulence, and so undermine general support for the funding model.
Conclusion

51. We recognise the danger that a major increase in selectivity could reduce the number of research-led institutions to a level that would be inconsistent with the general health of the UK research base, in terms of both its economic and its social contribution. In supporting excellence, we believe that a significant increase in selectivity would undermine the dynamism of the system as a whole, leading to complacency and ossification. It could also undermine research of national, regional and local relevance that is highly valued by users, and the removal from many institutions of the beneficial effects of research on teaching and other activities that have been identified by the sub-group investigating teaching, research and other activities.

52. We conclude that for the benefits of HE research to have the greatest impact on the life of the nation, it is not only peak performance that should be supported, but also the 'average' quality of the system. This should be as high as is reasonably possible and well distributed geographically. Excessive attention either to peaks or to average performance could undermine effectiveness. This does not necessarily imply different funding and assessment mechanisms, but means that the roles and requirements of good research and the best research should be considered separately. This issue is discussed further below.

Selectivity and different funding bases

53. We considered whether it was appropriate to fund institutions according to their missions, but noted that to have a single, central body negotiating and agreeing the missions of well over 100 institutions in England alone would be a change with very significant constitutional implications. It would also create a significant extra level of regulation, of a sort that does not have a good track-record within the UK in enhancing the performance of organisations. The aim is to optimise market forces in research selectivity not to seek extreme, and possibly unworkable, solutions.

54. We believe that while there is an obvious priority need to support world class research, to do so in isolation of geographical considerations would have fewer benefits for the nation. The benefits of leading edge research performed both here and abroad should be available to all users of research (local, regional and national).

55. One of the ideas emerging from the review as a whole is for a separate funding stream to support 'capability development' to enhance this intermediary function. The purpose of this funding stream would not be to support specific areas of research over the long term, but rather to provide institutions or units with a better basis on which to develop more effective strategies for evolving their research activity.

56. Three bases are proposes for such a funding stream:

a. Ensuring effective and efficient engagement with industry in undertaking applicable research. In funding research directly such a funding stream would have a different purpose from the Higher Education Reach-out to Business and the Community Fund (HEROBC), which catalyses...
interaction with industry but does not fund research activity directly.

b. Supporting the development of new research areas, perhaps outside established centres of excellence.

c. Providing funding to develop significant research capability relevant to national, regional, and local needs.

57. We were particularly concerned that the development of multiple funding streams, real or hypothecated, would reduce the flexibility of institutions, be complex to manage, and would increase both transaction costs and risk. We believe that a significant increase in the risk associated with specific funding streams would require institutions to respond by reducing their fixed costs – essentially by reducing still further the number of staff on permanent contracts. Also, identifying funding more closely with specific activities might, arguably, cut across the current principle of funding that, although allocations are calculated in respect of UoA submissions, institutions have discretion over how they choose to spend the block grant provided. There is no obligation on institutions to follow the HEFCE research funding model in their own resource allocation processes, though most choose to do so to some extent. We were also anxious about whether such an approach would reduce the dynamism of the sector: the purpose of selective funding was not merely to support existing excellence but also to sustain a system that was dynamic, in which excellence could emerge both in areas related to existing activity and in totally new ones.

58. We consider that an alternative approach would be for the RAE to evolve further so that it provides more encouragement to researchers wishing to engage in applicable research. Such an approach has worked well in improving the general quality and quantity of UK research and could be effective in encouraging more applicable research.

59. Therefore, although the potential benefits of a direct capability building funding stream were recognised, on balance we felt that, as currently envisaged, there was a compelling case for ‘fourth leg’ funding only in a few emerging disciplines of strategic importance, such as nursing, primary care and art & design. In most cases other emerging or interdisciplinary areas can be appropriately funded by intelligent decisions about the allocation of current funding streams at the local level.

The basis of selectivity

60. We concluded that the basis of selectivity should continue to be quality, but that the characteristics of excellence of different disciplines should be recognised to a greater extent. We provisionally identified five characteristics of excellence:

- production of knowledge at the leading edge
- value to users
- commercial exploitation
- diversity of funding sources
• sustainability.

61. These parameters have in common the concept of impact, either on the discipline itself or on others. Recognition on the world stage might be an indicator of excellence in some disciplines, such as particle physics, but not necessarily or exclusively so in others, such as medicine, where the concern might also be for excellent research to meet national needs. We noted concern that in some disciplines (such as architecture) world class practitioners may not currently be attracted into the academic profession because it is perceived that RAE panels use rather narrow and out-dated definitions of excellence.

62. We consider the reasons for greater recognition of differences in the characteristics of excellence in the section beginning at paragraph 94 below.

Selectivity versus concentration

63. A finding of the HEPU study is that, at a gross level, the consistent application of selective funding policies at subject level has brought about an increase in the concentration of research funding, and this has been associated with a significant increase in research performance.

64. Further analysis of concentration was undertaken by exploring whether there was evidence of co-location of leading departments. Part of the rationale for an active policy of concentration is to bring together related disciplines in centres of excellence because of the assumed added value arising from synergies (see the section on centres of excellence beginning a paragraph 73 below).

65. Figure 6 shows the number of papers produced from institutions at the Super-UoA level, that is, output by institutions in clinical sciences, pre-clinical sciences, biological sciences, environmental sciences, mathematics, physical sciences, engineering, social sciences, business, language and culture, humanities, and visual and performing arts. The frequency distribution is described in terms of the number of papers in each of 25 equally sizes “bins” that together make up the full range in the number of papers produced. Taking into account the effect of very low output from specialist institutions in their non-core Super-UoAs, this pattern appears to approximate to a normal distribution.
66. When this analysis is repeated at the whole institution level (Figure 7) it is clear that the distribution is skewed: there are more institutions with high output levels than might be expected. This argues that high output areas are co-located within certain institutions, the skew resulting from the additive effect of high output areas in a relatively small number of institutions.

67. The frequency distribution of papers across institutions for different disciplines is shown in Figure 8. There is a tendency towards evenness rather than a normal distribution, and we believe this is evidence of active institutional management – reducing the number of medium-sized units in favour of lower or higher activity ones.
Number of papers published in a disciplinary area by each institution

This may be compared with the distribution of category A staff, in Figure 9, where the dispersed pattern seems to hold for the natural sciences, although not so for engineering or social sciences which have a positive skew.

Figure 8: Frequency distribution of papers, for all institutions, by discipline

Figure 9: Frequency distribution of RAE category A staff between institutions for different disciplines
68. We are persuaded that, in the natural sciences at least, there is a strong association between the overall performance of a discipline against international benchmarks and the concentration of research activity. The data appear to show that large departments tend to be clustered within the same institutions, producing large institutions, whilst small institutions tend to have a range of smaller departments across all areas (rather than some large and some small departments). However, we acknowledge that the ability of institutions to grow departments is strongly linked to student demand, and the review should not regard the opportunity to develop research effort within institutions as unconstrained.

69. Although the response to the 'Call for Evidence' showed significant support for the policy of selectivity, there was resistance to any move to concentrate research funding deliberately in a limited number of institutions.

70. Concerns about concentration articulated by respondents to the Call for Evidence included the suggestion that it would undermine competition, lead to ossification, and produce a greater number of teaching-only departments. Many respondents stressed that relatively small sums were sufficient to galvanise research. The stated advantages of spreading funding widely included:

- supporting diversity in the research base
- ensuring that teaching is informed by research
- enabling the needs of local and regional users to be met more flexibly
- providing better value for money.

71. To see if there was any empirical evidence to support the active concentration of research, we reviewed the outcome of the Oxburgh Review of Earth Sciences, which is often held to have been a significant example of deliberate concentration in research activity. Analysis of both the change in RAE ratings and bibliometric impact, compared with other disciplines, clearly demonstrates that this deliberate concentration has not had a greater beneficial effect than the 'natural' concentration occurring through the operation of a policy of selectivity.

72. Given that concentration is occurring naturally, and that selectivity of funding has broad support outside the sector as well as within, we agree with respondents to the Call for Evidence – that there should not be a deliberate policy of further concentrating research funding in certain institutions.

**Centres of excellence and critical mass**

73. As mentioned above, it is often held that co-location of cognate 'centres of excellence' in one institution produces extra added value through synergy. This remains unproven, and it is unclear whether the supposed synergy might come from the general intellectual atmosphere or from direct interaction between disciplines. There may be greater coherence in research programmes if research teams are physically co-located and this may enable more effective use of facilities. However, alternative strategies, distinguished by distributed activity, may also be effective in delivering synergies and/or critical mass.
74. It is clear from Professor Ewan Page’s work in 1999 for the HEFCE that size and mass are not essential for high quality research. He produced abundant evidence that work of the highest quality can be performed in small groups in a wide range of fields. However, he did find that the highest quality research occurs in institutions where a high proportion of staff are research active, and that such a research climate is likely to attract the greatest level of external sponsorship. Large universities submitted 90-100 per cent of their academic staff in the 1996 RAE. It was unclear though from this work whether there was a threshold effect, that is, some minimum number or proportion below which it was hard to sustain a vital research effort.

75. It may be that a larger group of researchers adds to overall vitality, through peer stimulus, the opportunity to exchange and develop ideas, and to be spurred by visible achievement. Second, the per capita marginal costs of research (administration, clerical support, etc) are reduced when a larger group contributes to infrastructure. This factor is significantly accentuated by the high cost of major equipment and facilities in the experimental sciences. Third, larger groups make possible the simultaneous and parallel development of research themes, leading to an overall acceleration. Fourth, group size contributes to diversity of thought and of sub-discipline, increasing the likelihood of cross-fertilisation and fruitful development. Fifth, larger groups of research students provide a more supportive atmosphere for research training. However, analysis of the significance of these factors is complicated by ambiguity about what is being referred to when the term critical mass is used: does it mean total research staff, total academic staff, or research active staff (in RAE terms); does it relate to physical proximity or can it be virtual?

76. Findings from the case studies undertaken by HEPU indicate that any critical mass effects are strongly discipline-dependent. One interviewee suggested it is difficult to achieve international excellence in chemistry with a staff number fewer than 20, whereas in plant sciences it was suggested that as few as five leading researchers might constitute sufficient critical mass. Table 2 below suggests that the RAE panels took such a view.

**Table 2: relationship between unit size and average grade in some physical sciences subjects in the 1996 RAE**

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<th>Unit size</th>
<th>Chemistry</th>
<th>Physics</th>
<th>Earth Sciences</th>
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<tr>
<td>Top quartile</td>
<td>4.58</td>
<td>4.86</td>
<td>4.57</td>
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<tr>
<td>Second quartile</td>
<td>3.87</td>
<td>4.04</td>
<td>4.25</td>
</tr>
<tr>
<td>Third quartile</td>
<td>3.07</td>
<td>3.79</td>
<td>2.67</td>
</tr>
<tr>
<td>Fourth quartile</td>
<td>1.40</td>
<td>2.54</td>
<td>2.83</td>
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77. Interviewees also articulated the view that in the social sciences critical mass is important, as many complex social issues are more likely to be addressed successfully by groups (if not teams) of co-located researchers. In the arts, it was held that it was much less clear that the term ‘critical mass’ had relevance, but a number of interviewees saw value in working in departments alongside other recognised scholars.
To explore the significance of critical mass at a gross level, we asked HEPU to look at the relationship between the level of output and bibliometric impact at the Super-UoA level across all academic disciplines. In Figure 10, ranked impact in the UK (those ranked first have the highest impact) is clearly correlated with output. Overall, at this gross level, mass appears to be a significant determinant of achievement. This also applies in the USA as shown in Figure 11.
Figure 10 Relationship between ranked bibliometric impact (at the Super-UoA level) against total output

UK

Figure 11 Relationship between ranked bibliometric impact (at the Super-UoA level) against total output

USA
79. We considered the policy implications of this finding. Correlations do not necessarily imply causation: it could be that large departments tend to be better, or it could be that good departments tend to grow. Also, these critical mass effects based on bibliometric impact had no logically necessary link with any effects that might affect interactions with users. Critical mass effects could well be discipline-dependent and the analysis above did not take this into account.

80. Therefore comparable analyses were carried out at subject levels (Figure 12). This clearly shows that size is significantly correlated with quality in most science-based subjects, but even in these subjects it is clearly not the only factor determining performance.

81. Critical mass effects are usually thought of as involving a threshold, but the analysis showed no evidence of this. Rather there was generally a positive relationship between size and impact (except in the arts and humanities, and mathematics).

82. However, data for those institutions whose performance in a given discipline was above world average impact (the bottom set of graphs in Figure 12) did not show such a strong relationship between size and performance. This is evidence that in many subject areas there are small departments performing at the very highest levels.
Figure 12: The upper set of graphs show 'size' (number of sources, at the Super-UoA level) on the X-axis plotted against impact (against the world average) on the Y axis. The lower set show the same information, with the same X axis scaling, but only for those institutions performing at above the world average ie the Y axis begins at 1).
Characteristics of excellence and support of centres of excellence

83. One of the key issues for the group was to explore definitions of excellence and the characteristics of a 'centre of excellence'.

84. It might be simplest to define excellence or a centre of excellence in UK terms as a unit graded at 5 or 5* in more than one RAE. However, this is a slightly narrow definition. The HEPU case studies made it clear that excellence is hard to define and it is often reinterpreted in synonyms. Centres of excellence were considered to be more readily definable, but generally this was couched in terms of exemplars. The characteristics of specific institutions, departments, or research groups were usually cited (they tend to be seen in concrete terms rather than in a network or virtual sense):

- entities to which scholars and researchers would be attracted on an international basis
- a critical mass of researchers and activity
- a stimulating research culture, a 'buzz'
- client satisfaction; repeat business; being seen by industry as the think tank
- high esteem from peer group, seen as setting a benchmark
- at the cutting edge in identifying and undertaking work which pushes back the disciplinary boundaries, rather than just filling the gaps in knowledge.

85. At the Lisbon summit in March 2000, EU research ministers discussed the development of European centres of excellence and defined them as entities with:

- a critical mass of high level scientists and researchers
- a well-identified structure (mostly based on existing structures)
- capability to integrate connected fields and to associate complementary skills
- capability to maintain a high rate of exchange of qualified human resources
- a dynamic role in the surrounding innovation system (adding value to knowledge)
- high levels of international visibility and scientific and/or industrial connectivity
- a reasonable stability of funding and operating conditions over time (the basis for investing in people and building partnerships)
- sources of finance which are not dependent over time on public funding.

86. Excellence in research within an institution is felt by some to be a less useful concept than the idea of excellence overall, including teaching and other work such as industrial and contract work. Arguably, it is not necessary, after four RAEs, to provide specific support for centres of excellence, since the system has already identified and funded them, and as they are well able to attract funds in any case. This may be less
true in the arts and humanities.

87. The work from HEPU appears to indicate that entities that would be recognised by peers as centres of excellence are indeed characterised by engagement with a wide variety of activities and high levels of performance across this range of activities. Thus a centre of excellence, as opposed to an area of excellence, is indicated by both the range and level of activity. These additional activities may include substantial collaborative work with industry, collaboration with other researchers, significant levels of research training, etc. Such an approach is consistent with the view stated earlier in this report on the characteristics of excellence (which included self-sustainability and diversity of funding sources).

88. Earlier in this report a generally strong correlation was reported across institutions between industrial funding and public sector research grant income. We consider this offers evidence of a general alignment between fundamental and applied research. A further analysis by HEPU confirmed this view, that there is a greater concentration of commercial funding as public funding increases. Figure 13 shows that industrial funding per category A staff member (RAE 1996 return) increases as total research funding increases. This relationship is highly significant and the slope accounts for 40 per cent of the variance.

Figure 13: commercial funding per category A staff member (RAE 1996 return) versus total research funding

89. Also, earlier in this report a generally positive relationship was demonstrated between size and research impact in some disciplines, which we considered to be indicative of critical mass effects. A similar analysis was also undertaken to explore the relationship between commercial funding and research impact. This measured the extent to which applicable and fundamental research are correlated. As is shown in Figure 14 the relationship between industrial funding (horizontal axis) and bibliometric impact (vertical axis) shows a great deal of scatter (as one would expect when looking at complex organisations in a rather gross and simplistic fashion), but there are a number of areas where commercial funding is clearly correlated with
bibliometric impact, arguing that many units are able to effectively integrate the publication of information for the public good with meeting the needs of users.
90. We believe that these data indicate that research quality in academic terms is not in conflict with applied research. However, the measurement processes and threshold standards cannot be considered a valid basis for identifying centres of excellence.

91. This view of general, but not tightly defined, co-variance of the parameters of excellence is further supported when correlations between other measures are explored. Figure 15 shows, unsurprisingly, that there is a significant level of correlation between specific research funding and the output of doctoral students. However, there is significant variance within the relationship, with two or three-fold differences in PhD output for institutions with the same level of research funding.

Figure 15: Relationship between the level of research funding and the output of doctoral students

92. The correlation shown in Figure 15 between research funding and PhD studentship numbers is consistent with the findings noted earlier, that selectivity and the pursuit of excellence have brought about a significant increase in the concentration of postdoctoral research assistants and those undertaking research training. The production of trained manpower is a key function of a productive and effective research base but, unfortunately, it is not currently possible to link this to employment data.

93. Continuing further with this analysis of co-variance, we explored the relationship between project funding and bibliometric impact. An analysis of Medical Research Council (MRC)
funding is shown in Figure 16 to illustrate the general, and expected, finding that grant funding is correlated to overall output in terms of publications.

Figure 16: Relationship between the level of institutional MRC research funding and publication output in the biomedical sciences

Differentiation in the characteristics of excellence

94. We believe that the question of whether there should be fewer UoAs – which we do not intend to recommend – can be separated from the question of differentiating between the assessment criteria of broad subject groupings - which we do recommend.

95. Panel criteria declared for the 2001 RAE are already quite diverse compared with previous exercises. As trust in the RAE has grown, so the panels have felt greater confidence in identifying the distinctive characteristics of excellence in their discipline. We believe that there is value in developing this diversity further, and that this could be achieved without undermining confidence in the consistency of judgements. We therefore support more diversity in the criteria, but believe it essential that criteria within broad areas (such as a Super-UoA) should be consistent and closely related. We do not believe that there is a case for general and significant increase in the diversity of criteria within cognate areas.

96. We wish to make clear that one of our major recommendations is a move to greater recognition of excellent applicable research, thereby encouraging this activity over time. This does not necessarily require fundamental changes in the assessment and funding basis, but can be achieved through further moves in the direction already travelled for the 2001 RAE.
97. We are also inclined to the view that there might be grounds for considering the creation of a number of thematic units of assessment, to recognise better the characteristics of excellence in interdisciplinary areas such as environment and development. (We are grateful to the quality assurance sub-group for their thorough exploration of possible thematic areas of assessment, so they are not all recorded here.) This would have a number of benefits, not just by providing an assessment framework in which there was the greatest level of confidence, but also by signalling the commitment of the HEFCE, along with other funders, to encourage researchers to engage in interdisciplinary research where they wish to.

98. There may be more benefits than just enhancing the assessment of interdisciplinary research. Earlier in this report it was noted that most institutions’ resource allocation models reflect the HEFCE research funding model, so rewarding successful groups. However, this level of transparency may constrain the ability of institutional managers to invest as strategically as they might like in order to build up new areas, especially where they cut across a number of disciplinary boundaries. Establishing thematic units of assessment in some areas would target funding to these interdisciplinary research areas through standard resource allocation mechanisms.

99. One implication of a move to greater recognition of the differences between disciplines could be increasing reliance on existing published performance indicators in some disciplines (such as citation analysis). Used appropriately, such an approach could enhance the process and reduce the burden of the assessment. However, it is clear that simple relationships do not exist between RAE scores and these indicators, so they are unable to replace the RAE. For instance, Figure 17 shows the relationship for chemistry between ratings in the 1996 RAE and bibliometric impact. Although the correlation is better in this discipline than in any other, it only accounts for part of the variance in grades, and could not be used alone.

Figure 17: Relationship for chemistry between 1996 RAE ratings and bibliometric impact
Selectivity and collaboration

100. Work undertaken by the sub-group looking at teaching, research and other activities has detailed the highly collaborative nature of the UK research base. As noted above, we consider collaboration to be an important indicator of excellence, as:

- collaboration involves investment and the implied costs to others are a reflection of the expected level of benefit
- interviewees in the HEPU study suggested that centres of excellence are those attracting international visitors
- industrial collaboration should reflect the perceived ability to deliver a competitive advantage

101. Responses to the Call for Evidence evidenced a widespread perception that the RAE and its associated funding model do not reward collaboration, although the responses did not often define what sort of collaboration was not recognised.

102. While Research Councils fund research networks directly, the HEFCE currently funds institutions, and assumes that where networks will enhance performance then institutions and individuals will develop them.

103. We suspect that the value of collaborative networks in research is not always appreciated by peer review processes. Since collaborative research is an effective way for researchers in institutions with a poorly developed research base to contribute to world class research activity, we are keen to encourage the process, but not to the extent of specifically funding such networks. We believe that if a funding scheme were developed to support research networks directly it would create problems and distortions that outweighed the benefits, for example, in terms of managing institutions and creating artificial partnerships that fail to add value. Only half of the respondents to the Call for Evidence who thought there was a problem in the recognition of collaboration argued that the funding approach should be changed to support it more effectively.

104. However, given the importance of supporting research networks and collaboration, we suggest that this issue should be considered further by the HEFCE.
Should the same approach to selectivity be applied to research training as to other research outputs?

105. Our major concern is that the production of high quality people who have received high quality research training should be seen as one of the key characteristics of excellence, and that assessment and funding approaches should recognise this.

106. Perhaps special consideration needs to be given to provide funding to support high quality research training. Highly trained people make a vital contribution to the economy; in particular it may be argued that they are at least as effective as published research outputs in transferring knowledge.

107. It is often remarked that the former polytechnics had much good practice to offer in regard to career development, but equally we note the arguments for an even greater concentration of research training, into fewer institutions or groups of institutions and, possibly, fewer programmes. The Call for Evidence offered considerable support for the concentration of research training. However, although a number of respondents proposed such a move, there were significant differences about how this could best be achieved. The major schools of thought included:

- facilitating groups of institutions to establish collaborative graduate schools
- greater selectivity to support the development of regional and national centres
- assessing research training, either within or outside the RAE, and providing additional financial support to excellent departments.

108. HEFCE funding for research training and research activity are closely linked, with PhD students featuring as a minor volume measure in the research funding model. Following the transfer of funding from the teaching to the research funding model, a sum is available in respect of all postgraduate research (PGR) students in departments rated 3b or above.

109. A more selective approach could be implemented quite easily under the current arrangements, by distributing selectively that PGR funding which is not currently quality-related. However, we are concerned that postgraduate students in lower rated departments are already less well supported than those in other departments, and selectively allocating this funding would reduce further the resources available to support them.

110. We note the large number of postgraduate researchers in the UK, relative to the number of academic career opportunities available. We consider that this requires a fundamental change in the accepted purpose of postgraduate training, and its explicit recognition as a preparation for a number of different types of career rather than simply as a
preparation for an academic career. If PGR activity were seen as preparation for a career outside academia, collaborative PGR provision could provide a basis for students to be receive high quality training whilst still distributed widely throughout the research base, and therefore able to engage with potential employers. Collaborative arrangements could lower or raise the barriers to entry for PGR provision by institutions, depending on how they were implemented.

While we are broadly in favour of the concentration of research training, we believe it must be achieved in a manner that does not undermine the ability of institutions to engage in research. We are also aware that experience in the USA suggests there are dangers in over-concentration of research training. We note that the sub-group on teaching, research and other activities considered the pros and cons of developing collaborative models of PGR provision, to improve the student research training experience.

111. We note the view of the nature and purpose sub group that one possible approach to reducing the incentive to recruit postgraduate research students, while still providing support for research in a broad range of institutions and thereby encouraging dynamism, would be to remove PGR students from the volume measure in the HEFCE research funding model.

112. There is clearly a balance to be struck between measures which improve the experience of individual students, and measures which promote the ability of institutions to develop as seems most effective given their particular circumstances.

**Desired outcome of selectivity**

113. The group's terms of reference include a series of separate questions on the desired outcome of selectivity:

   a. Can and should the 'right' balance of established disciplines and centres of excellence and support of emerging subjects and new centres be defined?
   b. Does the current approach to selectivity deliver the right balance between disciplines?
   c. Does the current approach to selectivity deliver the right balance between institutions?
   d. Does the current approach to selectivity deliver the right balance between support of established and emerging excellence?
   e. Does the current approach to selectivity deliver the right balance between 'blue skies' research and research relevant to the needs of users?
114. We believe we have addressed these questions in depth. We noted, for example, that an increase in selectivity would run the risk of reducing the number of genuinely research-led institutions to a level which would be inconsistent with the general health of the UK research base. We also considered the need to support both established and emerging excellence and whether selectivity should differ between disciplines. In addition, we noted that high quality applicable research is – as it should be – already rewarded through the RAE process, so that while this should be further encouraged, no further separate mechanisms seem necessary or desirable.
Conclusions

Supporting world class research

115. We note the finding by HEPU of an increase in UK research performance over the period when HEFCE operated an explicit policy of selectivity. At the same time, because of the aggregation of highly rated departments in a relatively small number of higher education institutions (HEIs), research funding overall has also become increasingly concentrated. Peak performance in the UK has outstripped the rising world average and this is one of the strongest effects of concentrating funding. Average performance has also improved but at a rate similar to that of the world generally.

116. However, we believe that a further major increase in selectivity would reduce the number of research-led institutions to an unacceptable level, inconsistent with the general health of the UK research base. Such an approach would compromise both the economic and social contribution of HEIs. Supporting existing excellence in only a small number of institutions could also undermine the dynamism introduced since 1986, potentially leading to complacency and ossification. While responses to the Call for Evidence showed significant support for selectivity on a subject-by-subject basis, there was considerable resistance to the deliberate concentration of research funding in a limited number of institutions.

117. Although we greatly welcome the strong evidence for improved performance over the last 15 years, we recognise only too well that there is no room for complacency. There is a clear need for further improvement in particular areas: interaction with industry in the broadest sense being one of the most important.

118. We believe that the assessment process should recognise differences in the characteristics of excellence of disciplines to a greater extent. However, there is a concern about whether this should extend to different approaches to selectivity in different disciplines, as this may undermine the principle of block grant funding. Identifying funding more closely with specific activities may, arguably, cut across the current principle of funding that, although allocations are calculated in respect of UoA submissions, institutions have discretion over how they choose to spend the block grant provided.

119. We believe that excessive attention devoted either to peak or to average performance could undermine effectiveness overall. This does not necessarily imply different funding and assessment mechanisms, but means that the roles and requirements of good research and the best research should be considered separately.
120. There is clear evidence of a link between the quality of research output and concentration/critical mass in some experimental science subjects. However, size of department might not be an appropriate proxy for critical mass: in many disciplines, mass is distributed and not defined by physical proximity. Data shows that large departments tend to be gathered together on the same campuses, that is, large institutions tend to have large departments while small institutions tend to have a balance of smaller departments in all areas, rather than some large and some small departments. However, the ability of institutions to grow or shrink activity is to an extent dependent upon student demand, which drives the underlying size of the department, and so it should not considered that this as an issue entirely within the discretion of institutions.

121. We are unconvinced by the argument that critical mass should be used as a criterion in funding decisions. In considering the evidence for a link between bibliometric impact and size, there was no evidence of causation. Even if a causality were established, there was no evidence that the critical mass effect that related to bibliometric measures was also relevant to other activities such as interaction with users of research. Finally we noted that the evidence of a correlation between size and impact did not indicate that there was a 'critical mass' threshold as was conventionally conceived, rather that a linear relationship existed.

122. We believe the evidence shows that the current funding system has developed and strengthened centres of excellence. Those institutions which were already strong have improved and increased the proportion of research activity and output which they undertake, along with the quality (as measured by bibliometric impact) of that output. We felt this was the most compelling reason against the development of a separate funding stream based on centres of excellence, since this would replace a system that was accepted and effective with one whose disadvantages and effectiveness could not be judged beforehand. We consider that centres of excellence should be allowed to emerge rather than being identified and promoted by funding bodies, and should always be subject to competitive pressures.

Encouraging applicable research

123. A policy of selectivity must ensure the ability to engage effectively and efficiently with industry. We believe there is no case for supporting research of poor quality simply because it is 'relevant'. However, we recognise that data obtained from the OECD, by the sub-group looking at the nature and purpose of HEFCE research funding, shows that, outside the pharmaceutical industry, the level of in house R&D funded by business in the UK is low compared with other countries. There is therefore, a need for a greater level of support for applicable research in the UK within HEIs, compared for example with the USA, where many more major, and some smaller, companies are actively engaged in corporate research, as opposed to development.
124. We welcome the statement of neutrality in the guidelines for the 2001 RAE that research will not be discriminated against on the basis of nature or purpose, and believe that this will encourage significantly more applicable research. However, there is a further step that the HEFCE could take in encouraging applicable research – to frame the assessment and funding process so that it rewarded work explicitly because it was applicable. We are disinclined to suggest this form of affirmative action in support of applicable research, as we feel there is no case for supporting research of poor quality simply because it is relevant. Instead, we recommend that the changes for the 2001 RAE should be built on, and the community reassured that applicable research will be appropriately assessed.

125. We do not believe that there should be a separate funding stream for applicable research, as opposed to HEROBC, which supports knowledge transfer. However, we recommend that definitions of the characteristics of excellence should encourage applicable research.

Recognising research networks and collaboration

126. We feel that the direct funding of research networks could result in a number of unintended effects, as institutions seek to maximise their income by ‘games-playing’. A further issue of concern was that cross-institutional research groups would ‘institutionalise’ themselves, evolving a layer of bureaucracy (and associated cost). However, we enjoin the HEFCE to consider this issue further, in view of the importance of ensuring support to researchers who have found that their activities are enhanced through developing research networks.

127. We recognised the need to reflect disciplinary differences: some areas require expensive specialist facilities while many disciplines, predominantly but not exclusively in the social sciences and arts and humanities, arguably do not, and therefore do not require a physical ‘centre’.

128. In relation to the increasingly interdisciplinary and collaborative nature of research, we considered whether it would be appropriate to move to a system with fewer, more broadly-based, units of assessment. We are not inclined to propose such a change, as we doubt that the purported benefits would materialise.
Development of research people and production of PhDs

129. We believe that the production of appropriately trained people should be seen as a key characteristic of excellence, and that assessment and funding approaches should recognise this.

130. Although responses to the Call for Evidence indicated little support for the deliberate concentration of research funding, there was widespread support for the concentration of research training. If such a policy were adopted it would require a funding mechanism to drive and support this change.

131. We noted that a proportion of current PGR funding is not allocated by reference to quality, but could be so, and this would marginally increase selectivity in the resourcing of research training. However, a more substantial change would occur if the research assessment process were to produce a separate rating or sub-rating for research training. In this case, a different basis of selectivity could be applied to research training from that for research activity. However, we are conscious that postgraduate students in less highly rated departments are already less well-resourced than others, and we note that the USA experience suggests that over-concentration of research training can be as problematic as over-dispersion. We also recognise that the HEFCE is only a minority funder of research training, and therefore any changes in HEFCE policy will need to be co-ordinated with the activities of the Research Councils if such an approach is to be effective.

Widening research

132. We acknowledge that in an environment with limited funding those units which are improving, but not yet operating at the peak of excellence, might feel their contribution is not appropriately rewarded. In particular, we noted the following views in response to the Call for Evidence:

- selectivity does not adequately reward emerging areas of excellence
- selectivity reflects historical levels of funding rather than potential future performance
- the (perceived) drift towards greater selectivity should be halted
- selectivity leads to concentration even if this is not a specific aim of the policy.

133. The HEFCE approach to funding aspires to equality of treatment not equality of funding. The overall aim is to balance support to nurture and develop emerging excellence with support for proven excellence. We recognise that this is the basis on which the Funding Councils provide some QR funding at the 3b-level (and CollR funding at the 2-rated level), but
then increase funding geometrically as the quality of research increases.

134. It is important, though, that the characteristics of emerging and/or interdisciplinary research be properly recognised. We believe that, where appropriate, thematic units of assessment or sub-panels should be established.

135. We feel that some of the dissatisfaction of the post-1992 institutions in response to the outcomes of the funding model is due to the fact that QR is the only significant source of money from the Funding Councils for which they can compete. A re-balancing of incentives for the sector as a whole might require the development of greater incentives for teaching quality or for other elements of institutional missions. Such an approach might, for example, recognise the fact that delivering teaching to traditionally under-represented groups and less well prepared students and otherwise supporting them is often more expensive than dealing with well prepared entrants.

136. We considered whether there was a case for a separate funding stream to support emerging excellence and emerging disciplines, so as to ensure a system in which the development of new research areas was facilitated. In particular, it was acknowledged that these new areas might not always arise from within established centres of excellence, and the manner and timing of their development was not easy to foresee. We agreed that the funding approach should be sufficiently flexible to respond to these developments. However, although we feel there is a case for targeted support in some emerging disciplines of strategic importance (such as nursing and art and design), we believe that most emerging or interdisciplinary areas can be appropriately funded by intelligent decisions about the allocation of current funding streams at the local level.
### Annex A

#### Membership of the sub-group

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>Professor Sir Martin Harris</td>
<td>Chair, Vice-Chancellor, University of Manchester</td>
</tr>
<tr>
<td>Professor Sir Alec Broers</td>
<td>Vice-Chancellor, University of Cambridge</td>
</tr>
<tr>
<td>Mr Peter Agar</td>
<td>Deputy Director, Confederation of British Industry</td>
</tr>
<tr>
<td>Professor Dorma Urwin</td>
<td>Principal, University College, Worcester</td>
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<tr>
<td>Professor Sir Brian Follet</td>
<td>Vice-Chancellor, University of Warwick</td>
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<tr>
<td>Professor Janet Finch</td>
<td>Vice-Chancellor, Keele University</td>
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<tr>
<td>Dolores Byrne</td>
<td>Director of Air Systems, Defence Evaluation and Research Agency</td>
</tr>
<tr>
<td>Professor Norman Taylor</td>
<td>Formally Director of the Standing Conference of Principals</td>
</tr>
<tr>
<td>Mr Bahram Bekhradnia</td>
<td>Director of Policy, HEFCE</td>
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<tr>
<td>Dr David Pilsbury</td>
<td>Head of Research Policy, HEFCE</td>
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Annex B
Terms of reference

To consider the role of selective funding, and the appropriate degree of selectivity required to support existing and developing excellence.

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

What has been the effect of the selective allocation of funding by HEFCE and its predecessors?

- What are the different bases on which selectivity has been applied in the UK?

- What has selectivity meant for the research base as a whole and for individual institutions?

- How has the operation and outcome of selectivity differed from the concentration of research funding?

- How have institutions managed selectivity, in particular to what extent has collaboration enabled the management of selectivity?

What is the desired outcome of selectivity and is the current approach delivering it?

- Can, and should, the ‘right’ balance between support of established disciplines and centres of excellence and support of emerging subjects and new centres be defined?

- Does the current approach to selectivity deliver the right balance between disciplines?

- Does the current approach to selectivity deliver the right balance between institutions?

- Does the current approach to selectivity deliver the right balance between support of established and emerging excellence?

- Does the current approach to selectivity deliver the right balance between ‘blue skies’ research and research relevant to the needs of users?
How does our selective approach to funding compare with that in other countries?

- How is selectivity determined in other countries?
- Is the UK more or less selective than comparator countries?
- Is selectivity linked to the relative performance of the research base?

What is the most appropriate basis for selectivity to meet the future needs of the research base and the stakeholders in it?

- How should we be selective: should it continue to be on the basis of quality and if so, quality judged by whom?
- Should we adopt a different approach to selectivity for different types of research?
- How does selectivity fit with the policies of other funders and other policies of the Funding Council?

How selective should the HEFCE be to meet the future needs of the research base and stakeholders?

- What criteria should determine the threshold for HEFCE funding?
- How should funding vary with performance?
- Should selectivity differ by discipline or by type of institution?
- Should all institutions be able to compete equally for HEFCE QR funding?

What is critical mass?

- What infrastructure is needed to support critical mass?
- Must critical mass be in a single place, or can it be distributed?
What is the role of national research facilities in the generation or maintenance of critical mass?

How can selectivity facilitate the development of centres of excellence?

What constitutes a centre of excellence?

Does a policy of selectivity enhance the development of centres of excellence?

What is the most appropriate balance between support of established centres of excellence and disciplines and emerging centres of excellence and disciplines?

Can excellence be defined only in terms of research activity or must it also include research training and/or work with industry and the community?

How can selectivity best support excellence in research training as distinct from excellence in research activity?
Annex C: Selectivity scenarios