

# Using metrics to allocate research funds<sup>1</sup>

**Tom Sastry and Bahram Bekhradnia**

1. In the Budget statement and accompanying document ‘Science and innovation investment framework: next steps’<sup>2</sup>, the Government announced its intention not to conduct further Research Assessment Exercises (RAE) after 2007-08 (and it also raised the prospect of abandoning the 2007-08 RAE, though there is no serious prospect of that). Currently, the RAE provides HEFCE with the information it needs for the selective allocation of research funds to universities as part of their block grant (QR). It also provides a check on the quality of research output, feedback to university managers and an internationally recognised benchmark of the quality of research at subject level. In future, the Government intends that the basis for QR allocation should be performance against ‘metrics’, with a presumption that these will be based on Research Council and other external income. It has said nothing about the RAE’s other functions.
2. The stated reasons for abandoning the RAE are that it fails to capture the value of interdisciplinary research, and that it fails to reward excellent user-focussed research. It needs to be noted that although in this respect ‘Next Steps’ repeats some widely stated views about the RAE, there is no evidence that it has these effects. Indeed, for a number of the criticisms levelled against the RAE – not only in ‘Next Steps’ – the evidence suggests that the RAE has not had the effect that has been claimed.
3. Also stated in ‘Next Steps’ as a reason for moving to metrics is that the RAE is expensive, and that at institutional level there is a 98 per cent correlation between QR allocations and the grants received from Research Councils. As will be clear from the discussion below, the RAE costs only a fraction of the Research Council grant allocation processes; and Table 3 below shows huge variations between the income universities receive from QR and what they would receive from an allocation system based on grant income from Research Councils and others.
4. Whatever the basis for competition, universities will do whatever they feel will maximize their funding – there will be behavioural consequences. That has been the case with the RAE, and it will be the case with metrics. It is essential that when making

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<sup>1</sup> The full version of this report, including full references and analyses, is on the HEPI website.

<sup>2</sup> Called ‘Next Steps’ in this report.

its proposals for the introduction of metrics the Government identifies the likely effects, and says what steps it is taking to mitigate these.

### **Impacts of a metrics based allocation**

5. The key feature of funding based on metrics is that it provides an incentive to pursue research grants in preference to other research and scholarly activities.

6. This has the advantage that it is likely to encourage a greater concentration of research resources upon the highest quality and most relevant research, with potentially beneficial effects. Research undertaken by Evidence Ltd shows that UK research is highly polarised between a minority of work with very high impact and a long tail which has little or no measurable impact<sup>3</sup>. A system which increases pressure on institutions to focus on research of high quality and high salience to others might mean that fewer outputs are produced, and that those which are produced have higher average impact.

7. There are, though, a number of potential disadvantages, among them that:

- There will be additional demand for grant funding which will in turn push up the transaction costs associated with that funding. Bearing in mind that over 70 per cent of Research Council grant applications are unsuccessful, the effect will be to increase the costs of research funding, possibly by a very large amount.
- Small changes in the weightings of different funding sources can profoundly impact a funding distribution based on metrics. Moreover, the amounts that universities earn from grants also fluctuate greatly relative to other universities, making metrics an inherently unstable basis for allocating core university grant.
- Academic researchers may become more hesitant about researching unfashionable fields, or where the conclusions may be unwelcome to funders.
- There will be no scrutiny of the quality of outputs, only of the success in obtaining new grants and contracts.

8. Other effects might be anticipated. By increasing the profitability of research funded by others, the reforms would, in many institutions, turn research into a standalone activity. It would make little sense to entangle a high-risk high-return activity (which is what research would become) with a low-risk, low-return one (teaching). We should expect an accelerating separation of research and teaching, with research increasingly concentrated in administratively separate institutes.

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<sup>3</sup> How Good is the Research Base? (Evidence Ltd, forthcoming as a HEPI report).

## Cost

9. The highest realistic estimate of the cost of the RAE is about £100 million over 7 years, and the real cost is likely to be lower, as this figure includes expenditure that universities would incur independent of the RAE. This amounts to less than 1 per cent of the £10.5 billion allocated through QR in the 7 years after 2001. The total administrative cost of the funds provided by Research Councils is at least 10 per cent. Therefore, assuming similar levels of overhead for other grant funders, the total transaction cost of the £2.8 billion<sup>4</sup> given each year in research grant and contract funding is at least £280 million – or £2 billion over the 7 years to 2007-08. The basis for these estimates is explained in the full report.

10. If QR funding is linked to research grant income, the effective value of grant funding will increase and universities will make more applications. Indeed, as the block grant that universities receive from HEFCE will otherwise reduce, universities – and their staff – will be obliged to win research grants and contracts in order to maintain their core funding. There will be huge pressure to increase the number of grants and contracts won. This will have costs at both ends.

11. Even now, the success rate for grant applications is just 29 per cent – huge amounts of effort are wasted on unsuccessful grant applications. In future universities will spend even more effort on making additional grant applications; and grant funders will spend more money on processing them. And if Research Councils penalise unsuccessful applications, then the bureaucratic cost on institutions will increase, as they seek to screen applications, possibly with parallel peer review processes. An increased proportion of the funding available for university research will be swallowed by the cost of grant applications.

12. Applications are only a part of the story. By effectively increasing the value of research grants, linking QR to metrics would make it possible for funders to pay an economic rate for a larger amount of research, and it is reasonable to expect the volume of funded research to increase. This will have a direct impact upon the costs of administering awards once they have been made (both institutions and the funding agency face costs). Even if the Research Councils are prevented by the Government from increasing the volume of research they fund, it is unlikely that other funders would

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<sup>4</sup> Figure for 2004-05 (HESA data).

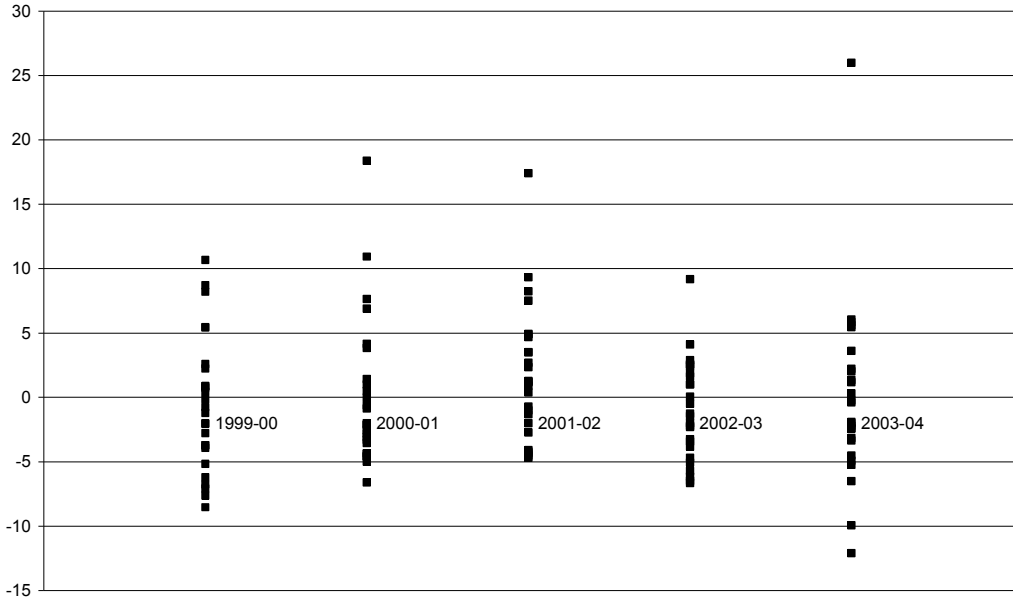
show similar restraint. Given the Government’s concern with the sustainability of the research base, this will be extremely unfortunate.

13. Once these factors are considered the costs of linking QR to grant income can look quite alarming. On the basis of entirely plausible assumptions set out in the full report, linking QR to research grant income could cost over £700 million over seven years even once the savings from scrapping the RAE are taken into account.

*Instability*

14. A system which pegs QR funding to external grant income will be inherently unstable. If QR had been allocated pro rata to research grants and contracts in each of the years from 1998-99 to 2003-04 the fluctuations in grant levels would be quite dramatic as Figure 1 shows. In 2003-04, for example, Nottingham would have lost 12 per cent of its share, while Warwick would have increased its share by 26 per cent.

Figure 1: Year-on year changes in share of QR if QR allocated in direct proportion to research grants and contracts in a single year (STEM subjects only; top 25 recipients of QR in 2006-07 only)



Source: HESA finance record<sup>5</sup>

15. This analysis assumes that no weightings would be applied to different types of research grant income in the QR formula. Table 2 below illustrates the effects of attaching different weightings to different sources of income. Considerable volatility attaches to all, but each model affects different institutions very differently.

<sup>5</sup> Published in successive annual HESA volumes entitled ‘Resources of Higher Education Institutions’ also known as ‘blue books’.

16. The combined effects of changes in performance from one period to the next, and changes in the weightings, produce some huge income variations, depending on the weightings. Southampton for example increases its share by 54 per cent in one scenario and much less in all the others; Sussex gains 68 per cent in one instance but only 6 per cent if the unweighted allocation is retained.

17. It will be almost impossible to calculate which institutions might benefit from particular weightings in future: that will depend upon variations in relative performance in different competitions. It is entirely likely that a university which lobbies for one set of weightings in one period will be as concerned to see a different one introduced later. It is hard to see how a stable system could be devised on the basis of a compromise between the interests of different institutions.

Table 2: Percentage change in share of QR (unweighted 1998-2001 data vs. weighted 2001-04 data: STEM subjects only - for selected research intensive universities)<sup>6</sup>

	Weightings applied to 2001-2004 data				
	Un-weighted	Research Councils only	5:3:2 <sup>7</sup> model	5:4:1 model	4:4:2 model
Bath	-3.4	29.0	3.6	1.8	-2.3
Bristol	0.6	15.7	6.0	9.8	5.5
Cambridge	7.9	28.3	15.5	21.2	15.1
Durham	9.5	36.1	12.2	4.0	4.1
UEA	12.3	54.0	22.1	21.3	15.2
Imperial	-1.5	-12.6	-3.0	-0.3	0.0
Kings	-9.3	-41.3	-15.3	-11.4	-8.5
Leicester	-6.4	21.0	1.8	5.0	-0.9
Manchester (total)	2.5	37.6	12.2	14.7	8.0
Newcastle	-1.2	-22.9	-7.5	-9.6	-5.2
Nottingham	0.3	17.1	2.8	-0.5	-1.4
QMW	3.7	1.8	7.4	16.4	12.1
Reading	-3.4	32.2	2.4	-3.7	-6.1
Sheffield	-1.4	16.4	1.7	-0.9	-2.3
Soton	8.3	53.7	18.2	15.8	10.0
Surrey	-1.8	11.2	-4.8	-18.3	-13.4
Sussex	5.7	67.9	22.2	25.0	13.9
UCL	-6.1	-12.3	-1.7	10.9	5.3
Warwick	0.5	14.2	0.7	-6.1	-4.7
York	1.2	11.7	2.8	0.6	0.1

<sup>6</sup> Source: HESA finance record, as footnote 3.

<sup>7</sup> The ratios refer to the values placed respectively on income from research councils, charities and other external income.

### *Effects upon the nature of the research carried out*

18. Even if the new arrangements lead to improved research performance on some measures, the price of this might be in terms of the effect on intellectual freedom. Under any peer review system there is a danger that researchers will adapt their research to the preferences (imagined or real) of reviewers.

19. With metrics, however, there is an additional and much more serious danger: that research which is irrelevant – or hostile – to the interests of major research funders will become impossible to undertake as institutions seek to protect their relationships with funders. This is the downside of one of the undoubted benefits of the proposals: their potential to focus the UK's research capacity upon work which is likely to generate applications of public interest and thereby make a measurable contribution to the economy and society, at least in the short-term.

20. In addition, with metrics-based funding the contribution of each individual to an institution's income can be calculated. This is bound to have an impact upon the kind of research which is carried out, with pressure to focus upon the next grant or contract, and to make more expensive bids in order to attract more funding.

### *Effects upon non-research activities*

21. The current system is said, with some plausibility, to promote an excessive focus upon research at the expense of other activities (particularly teaching). However, this is a structural problem that arises from the highly selective allocation of research funding, and is unlikely to be improved if the basis for selectivity changes from the RAE to metrics. So long as research funding is selectively allocated, and teaching funding is not, then this is likely to remain an issue.

22. As noted in paragraph 8 above, the proposed changes will make it increasingly tempting to limit research opportunities to high performers and to separate research from teaching departments entirely. This would have negative effects upon teaching in subjects where research income is necessary to make teaching departments viable (in particular the physical sciences where student demand is weak and demand from research funders much stronger). The proposals would, therefore, increase the temptation to convert science departments into non-teaching research institutes. They would also strengthen the hand of departments which were successful in winning research income in demanding resources from the centre, reducing the ability of universities to support less research-strong departments.

### *Effects upon recruitment practices*

23. One of the concerns about the RAE is that it might influence universities to hesitate before recruiting young staff without a research track record. The RAE guidance to panels and institutions has at least been able explicitly to recognise this danger and mitigate it. In a situation where QR income depends on the value of research grants won, this danger will be even more present, and it will be extremely important to the health of our research to put in place measures to avoid this. However, it is difficult to see what such measures might be.

### **Do metrics and the RAE produce the same results?**

24. 'Next Steps' reports a correlation of 98 per cent between Research Council income and HEFCE recurrent research funding in each of the years 2000-01 to 2004-05, describing the correlation between an HEI's QR and Research Council income streams at the institutional level as 'very strong'. It uses this correlation to argue that the costs and distortions associated with the RAE are unjustified, implying that an allocation that reflects Research Council income would have similar outcomes to one based on the RAE. This is not the case.

25. The HE sector varies greatly in scale. Measured by total income the largest institutions are more than a hundred times larger than the smallest. Measures like the FTE of staff or students show an even greater size range. Measures which do not allow for this difference in scale will almost always be highly correlated.

26. A weak correlation would indeed indicate that it would be difficult or impossible for measures like Research Council income to replicate QR allocations, but the reverse does not hold. Table 3 compares a metrics-based funding system with the provisional QR allocations received in 2006-07 by the 20 English institutions receiving the most QR.

Table 3: What Difference Does It Make? The impact of allocating QR in proportion to research grant income in science, engineering, medicine and technology

Institution name	2006-07 HEFCE QR funds (£s)	Percentage change in QR received if allocation based on income from research grants and contracts				
		Research Councils only (1:0:0 model)	Unweighted (1:1:1 model)	5:3:2 model	5:4:1 model	4:4:2 model
Imperial College	73,783,610	-26	-2	-8	-7	-4
University College London	70,817,913	-9	-7	-2	10	4
University of Cambridge	65,911,681	37	8	19	25	17
University of Oxford	61,144,801	18	13	18	27	22
University of Manchester	54,843,226	3	-11	-8	-10	-11
King's College London	37,743,690	-35	-1	-8	-5	-1
University of Southampton	34,276,573	29	-11	-2	-5	-10
University of Leeds	32,162,879	-13	-13	-13	-14	-13
University of Sheffield	28,991,796	30	2	7	4	1
University of Bristol	28,953,034	-1	-9	-7	-6	-8
University of Birmingham	27,139,191	3	-5	-2	0	-3
University of Nottingham	25,576,598	7	-11	-9	-15	-15
University of Newcastle	25,424,237	-35	-17	-22	-24	-20
University of Liverpool	23,640,597	-4	1	-2	-5	-3
University of Warwick	15,503,532	21	30	20	3	13
University of York	14,396,780	-5	-23	-18	-17	-20
University of Surrey	14,362,808	-35	-27	-35	-48	-40
QMUL	13,896,728	-24	20	15	26	27
University of Leicester	12,701,952	30	3	11	15	9
University of Reading	12,660,468	-5	-32	-28	-32	-34

Source: HEFCE and HESA finance record<sup>8</sup>

27. There is nothing absolute or 'right' about the present distribution. But coincidence of outcomes between a QR distribution based on metrics and the present RAE-based distribution does not provide grounds for making the change proposed by the Government. There is no such coincidence.

### Modified metrics-based allocation

28. If the intention of the Government was merely to liberate the sector from the burden of the RAE or to reduce the impact of funding processes upon behaviour, metrics are not the answer. They are likely to increase the pressures on academics and institutions and to produce a corresponding increase in the amount of compliant activity. This report has identified a number of issues that will arise if metrics are introduced as the basis for distributing QR, some of which could have a very serious impact on the science base.

<sup>8</sup> Published in successive annual HESA volumes entitled 'Resources of Higher Education Institutions', also known as 'blue books'.

29. The most promising means of mitigating the impact of metrics involves limiting the application of metrics to a small proportion of the funding allocated. If the link between metrics and QR income is made less direct, the negative impact upon the HE sector will become less severe and the useful life of the metrics will be extended. Any metrics used to allocate funding are bound to decay as measures of quality as those assessed develop tactics which deliver apparent improvement without enhancing real quality. Approaches such as those described here may slow that process by reducing (though not eliminating) the incentives to develop such tactics.

30. One way of reducing the instability caused by metrics would be for any funding formula to use several years', rather than one year's income<sup>9</sup>. As Table 2 shows, three years' data will not be sufficient to eliminate instability though a longer period might do so, providing the weightings employed did not change. However, the use of several years' data would do nothing to dampen compliant activity.

31. There are two other ways of dampening the effect of metrics, similar in concept but different in effect. One option would be to provide the great majority of QR (probably >95 per cent<sup>10</sup>) on the basis of the previous year's baseline with the remainder distributed to those who had improved their performance in the previous year. This 'improvement pot' might be distributed in relation to the extent to which an institution's share of weighted research grant income exceeded the previous year's. This would mean that each institution could budget on the basis that it could be sure of receiving at least 95 per cent of the previous year's allocation but that it would be quite normal for institutions to lose 5 per cent or to gain rather more, making the system potentially very dynamic. The amount of QR funding directly linked to external income would, however, be relatively small, perhaps reducing behavioural effects.

32. A simpler, more stable, system would be to peg the majority of QR to the previous year's baseline and to allocate the remainder in proportion to weighted research grant income regardless of whether any improvement had been achieved. This would involve a more direct trade-off between stability and dynamism.

33. Either approach would only work if there was a good baseline on which to build, such as will be established by the 2008 RAE. Subsequently, citations (or some other

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<sup>9</sup> It makes little difference whether a rolling average or a periodic recalculation is used: the latter is slightly gentler because it gives institutions whose numbers begin to decline early in the funding period time to adjust whereas under a rolling average their grant will be revised every year.

<sup>10</sup> The actual proportions would have to be fixed in the light of detailed modelling.

measure *not used in the funding formula itself*) could be used to check that, as metrics began to drive funding, funding continued to follow quality, thus guarding against the dangers associated with the loss of retrospective assessment.

34. Attractive though such arrangements might seem, they would have their disadvantages. Their strengths are a consequence of the fact that they do not offer the transparency promised by systems which provide for a more straightforward link between research grant income and QR. Perhaps the greatest reservation, though, is that they may not be sufficiently effective at dampening the more damaging effects of metrics. Institutions may take the view that in the longer term their grant will depend upon their ability to obtain external research income over an extended period. Obtaining grants and contracts would still be the only way of obtaining QR, and these approaches may not dampen compliant behaviours as much as might be hoped. Undoubtedly, though, some modification of a purely metrics-based funding system will be needed to offset some of the dangers discussed above.

### **Alternatives to funding-based metrics**

#### *Use of citations*

35. In an ideal world grant funding would form part of a basket of indicators rather than being the sole source. However, whilst it might strengthen the case for metrics if there were a basket of viable metrics it is not evident at present what such a basket might contain. Citations are sometimes suggested as a possible measure.

36. Annex E of the full report discusses some of the difficulties with using citations in funding formulae. In brief, whilst citations are a very useful indicator at high levels of aggregation – for example at subject level, to assess the relative quality of UK research – they are increasingly unreliable at lower levels of analysis, such as the individual researcher, research group or department. They are also easy to manipulate<sup>11</sup>; and they might skew research effort towards fashionable fields and penalise researchers for taking time to report negative results whilst rewarding ‘attention-seeking’ papers which may not be of the highest quality (see footnote 3). Moreover, they measure only academic quality, and are not influenced by utility, so they would not meet one of the Government’s main apparent objections to the RAE.

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<sup>11</sup> E.g., by soliciting citations from colleagues.

### *A scaled-down RAE*

37. If the RAE is regarded as excessively bureaucratic, the obvious solution might be not to link QR to the still more intensive grant funding system of the Research Councils, but rather to scale down the RAE so that it is more appropriate to its task.

38. In paragraphs 31-32 above, consideration is given to basing only a small proportion of QR each year on metrics. The same principle could, of course, be applied to the RAE. If only a proportion of the funding was driven by the RAE it would be possible to run a much less intense process.

39. At present the RAE has two features which would have to change if the costs and burdens associated with it are to be substantially reduced:

- It leaves it to universities to decide which researchers and which pieces of work to submit for assessment. That decision-making process within universities costs far more time, money and consternation than the assessments themselves.
- It is over-engineered. An exercise whose purpose is to summarise the performance of around 160 universities is conducted as if it was supposed to appraise 50,000 individual researchers and their work. The 2001 RAE considered 180,000 items of research.

40. The HE sector has, when consulted previously, placed higher priority on the robustness of the assessment than the avoidance of burdens and distortions. This may well be because it is familiar with – and tends to trust – systems based on individualised peer review. If so there may be difficulties in winning consent for a slimmed-down RAE although in principle it is perfectly feasible. If major changes are to be made, however, it would be appropriate to give the sector a choice between a slimmed down peer review process and a metrics-based allocation, as well as a continuation of the RAE on something like the present basis.

### *Reducing the role of the Research Councils*

41. As noted above, the Research Council system is undoubtedly and for good reason more expensive than the funding council system of funding research. Even assuming only relatively marginal increases in the costs associated with grant funding, linking QR to external research income costs far more than it saves. If the costs and burdens of the present arrangements are of concern, there is a much more effective option to hand: downscaling the Research Council system.

42. In theory, the Research Councils and the funding councils perform complementary roles, the former funding on the basis both of quality and strategic importance, the latter on the basis of quality alone. In practice, there is one clear exception to this division of labour: the Research Councils' response mode funding.

43. Response mode funding exists to enable researchers to bid for funds to undertake research on subjects of their own choosing. Funding depends solely on the quality of the research proposal. The funding councils, however, already have a much cheaper system for funding on the basis of quality alone: QR based upon the RAE. There is a very strong argument for transferring to the funding councils the proportion of Research Council funding currently deployed in response mode funding. The funding councils would allocate this to universities as part of their block grant, for universities to spend as they see fit, in accordance with their own judgements and priorities. There would be a significant cost saving to the sector: for every £100 million of funding transferred from the Research Councils to the funding councils, roughly £9 million would be saved in administrative costs.

### **Conclusion**

44. The move from the RAE to metrics as the basis for allocating QR funds represents a huge leap into the unknown. Whatever weaknesses the RAE is believed to have – and the majority of these have not been demonstrated as effects of the RAE – it is apparent that metrics represent an alternative that will cost more, could lead to behaviours at least as deleterious as the RAE, and could lead to considerable instability. It is incumbent upon the Government to identify the likely impact of its proposals, and to say how these will be mitigated.

45. It would be bad policy-making to decide to abandon the RAE without proper evidence about its impacts and in the absence of a proper review of the implications of the alternatives. Indeed it would be irresponsible, and would represent an intolerable risk with what has developed into a world class research base. But if that is decided, there are alternatives that might be preferable and would certainly avoid some of the negative effects of a metrics-based system.