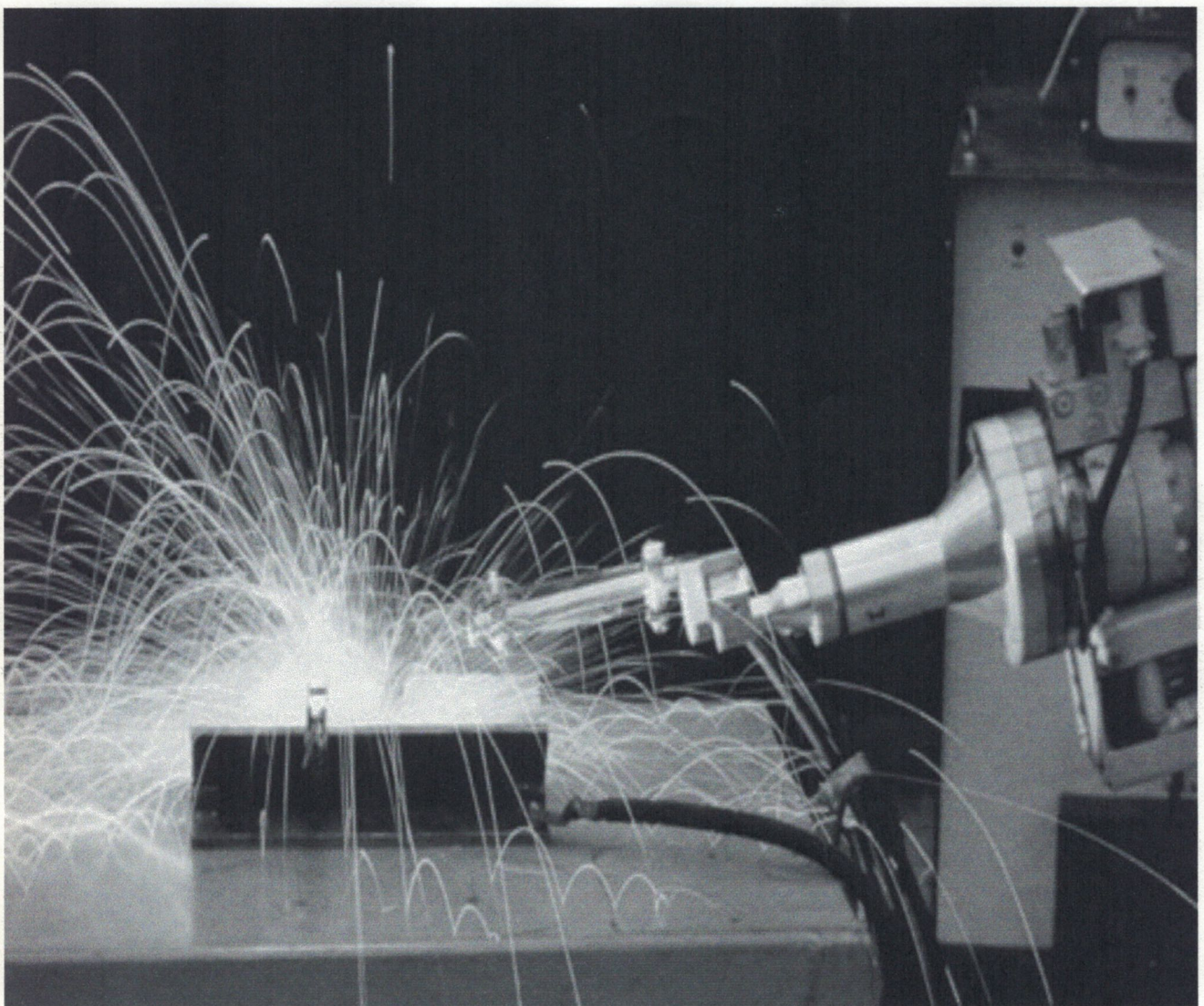


# BETTER SCIENCE AT LESS COST

Reforming the way in which the UK pays for  
academic research

Tim Ambler



Adam Smith  
INSTITUTE

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**Adam Smith**  
I N S T I T U T E

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# The question of value

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Research councils emerged from the First World War, when Britain discovered that most of its technology was imported from Germany. Even in 1915, Britain was paying Krupp's for the fuses in shells aimed at the Germans.<sup>1</sup>

Research councils are still with us, and have grown in number and in funding. This paper examines how the UK research councils of today channel funds to researchers.

It is a good moment to explore this. Sir Gareth Roberts is about to report to the university funding bodies on the assessment of academic research; while the government says it aims to more than double the 1997/8 "science" budget, to £3bn pa by 2005/6.<sup>2</sup> Among the other questions which this paper seeks to disentangle are:

- how much of that spending goes on research that will help the UK economy,
- how much goes into valid but failed attempts at new advances,
- how much is research that few would regard as true science,
- how much is research of no potential value to any third party, and
- how much is consumed by bureaucracy.

The question of how much in total the UK government should take from taxpayers to spend on academic research, is one which concerns this paper only peripherally. Professor Terence Kealey makes powerful arguments against using public funds on research, but that is not the argument here.<sup>3</sup> Our focus is on how the given budget is spent – since, whatever the size of the budget, the public has a right to expect value for money. Nobody wants to see money frittered away on unproductive research. Nor should it be dissipated in bureaucratic allocation systems (in this context, alarm bells should ring when the Higher Education Funding Council of England, which hands out annual grants to about 200 higher-education and further-education bodies, increased its own running costs by 60% to £16m between 1998/9 and 2001/2).<sup>4</sup>

Obviously research, by its nature, brings no performance guarantees, and the risk needs to be assessed against the potential. Unfortunately, the official criteria for public funding of research are unclear, which leads to the possibility, or likelihood, that even seemingly-successful research may not be justifying its public cost.

The line between necessary and excessive bureaucracy will never be exact. But the mere fact that we have two separate grant-giving systems – the research councils and the higher-education funding councils – each handing out £1bn p.a. of public money implies that if one is a good system, the other must be wasteful. And this "dual funding" is in addition to government funding of their own laboratories and commissioned research aimed at specific goals (£0.29bn for England). So how could the UK improve the returns that it seeks from public funding of academic research?

After briefly summarizing the historical background, the present dual funding is described, first the research councils and then the higher education funding councils. The conclusion is that this complex mechanism is out of date: the old-style university research system upon which it is predicated is now found only within a small elite. After returning to the basic

issues of research funding, the paper proposes a means to rebalance supply and demand and outlines an alternative allocation system which should provide better taxpayer value.

## **The growth of research councils**

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### **Research councils and the war effort**

The first predecessor of research councils was the Department of Scientific and Industrial Research (DSIR) which was set up in 1916 to harness the scientific contribution to the First World War. Accordingly, the primary focus was industrial, and the chemical industries in particular. Initially, support for training researchers was limited, with 24 studentships and 12 post-graduate researchers being funded in 1917.

The Medical Research Council (MRC) followed next in 1920 in substantially its present form – i.e. it was funded by government but had autonomy in deciding how the money should be used. This was followed by the Agricultural Research Council (ARC) in 1931. Although the ARC no longer exists as such, some of its functions continue in DEFRA and its non-departmental public bodies.

While most people accepted that science and research were good things, the role of research councils was only clear in wartime, as a scientific contribution to the war effort. If universities conducted pure and long-term research and if businesses conducted profit-related R&D, what was the purpose of additional government funded bodies?

### **Research councils and planning**

In the late 1930s, J D Bernal argued that science could and should be planned and its budgeting rationally determined accordingly.<sup>5</sup> Although much of Bernal's view of the interaction between science and society would seem commonplace today – though it was hotly debated at the time – our belief in the capacity of the state to plan and manage the economy, or science within it, crumbled with the Berlin Wall.

Yet a belief in state planning was very much alive in the Wilson government of the 1960s. The 1963 Robbins Report provided the blueprint that operates today. It proposed a huge increase in tertiary education, in the number of universities and in academic research, with two objectives: economic growth and higher cultural standards. (How higher cultural standards can be assessed, still less attributed to academic research spending, is unclear. And in any case, culture is perhaps more properly a matter for the arts councils.)

The Social Science Research Council (SSRC, now the Economics and Social Science Research Council, ESRC) was created in 1965. The extent to which this was “long overdue” as Rose and Rose claim<sup>6</sup>, or a waste of taxpayer money, is still far from clear. Was it structured and funded to achieve measurable goals, as an instrument of cultural or social engineering, or just, in a spirit of political correctness or fairness, keeping up with the scientific Joneses?

The research councils and research institutions were reconstructed under two ministries:

- The Ministry of Technology took charge of the National Research Development Corporation (NRDC), the Industrial Reorganization Commission (IRC) and the Atomic Energy Authority (AEA).
- The Department of Education and Science channelled research money to universities via the University Grants Committee (now the Higher Education Funding Councils) and five research councils: the Agricultural Research Council, the Medical Research Council, the Social Science Research Council, the Science Research Council (SRC) and the Natural Environment Research Council (NERC, covering geology, hydrology, ecology and oceanography).

Three councils had research institutes (ARC, MRC and SRC) and all interacted with university research council units and groups. The bureaucracies thus achieved a degree of independence from government (the old DSIR) and came of age. Nearly 40 years on, their structure has little changed, as the table below shows.

**Table 1: Research councils and their 2000/1 costs**

Research Council	Staffing	Gross Cost £m	Net Cost £m
Biotechnology and Biology	3,283	231	212
Central Laboratory	1,683	98.1	3.2
Economics and Social	97	78.4	72.2
Engineering and Physical Sciences	287	432.7	413.1
Medical	3,800	382.9	321.1
Natural Environment	2,602	234.8	224.3
Particle Physics and Astronomy	279	208	203
Arts & Humanities			70 <sup>7</sup>
<b>Total</b>	<b>12,031</b>	<b>1665.9</b>	<b>1,518.9</b>

Table 1 shows the direct costs and manning levels of research councils, excluding part-time volunteers.<sup>8</sup> It includes the research institutes (which largely accounts for the high levels of staff) but excludes the massive time involvement of academics submitting formal proposals, peer reviewing them and contributing to the administrative burden in other ways. According to the HEFCE<sup>9</sup> only about one-third of this gross cost came through to English higher education institutions (or academics in those institutions) so, allowing for the other HEFCs, about half the costs of research councils are consumed by their own institutes, non-research initiatives and internally.

This £1.5bn cost understates government spending on science which, it is claimed, will reach £3bn by 2005/6. Table 2 is taken from the science budget and shows about £2.5bn for 2003/4 but this excludes the non-science academic reach funding, HEFC funding (£1bn), government laboratories and research commissioned for policy goals (£0.35bn). Thus the total for 2003/4 must exceed £4bn.

**Table 2: The Science Budget 2003-04 (£ million)**

	<b>Baseline 2003-04</b>
MRC (1)	414.8
BBSRC	267.3
NERC (1)	256.2
EPSRC:	463.6
<i>of which Cross-Council core programmes</i>	37.0
PPARC	248.780
ESRC	93.584
CLRC (1)	91.299
RC Pension Scheme	29.740
Royal Society	29.245
Royal Academy of Engineering	5.270
SRIF/University research capital	250.000
Diamond	3.561
Large Facilities & RC Institutes unallocated	5.000
Higher Education Innovation Fund	50.000
CMI	14.000
OST managed funds	24.364
<b>TOTAL</b>	<b>2246.384</b>

### **Current organisation**

The Arts and Humanities Research Council was set up in January 2003, on advice from Lord Dearing and on grounds similar to the SSRC, namely that it was “unfair” that the sciences should have research councils when the arts did not.

The research councils, under the mantle of the Office for Science and Technology, are now part of the Department of Trade and Industry (DTI). The logic, apart from territorial competition by ministers and civil servants, was twofold: in practice the Department of Education and Science had given little attention to the research councils; and the purpose of the councils was to direct research toward growing the UK economy and, maybe, improving the quality of life.

Since the DTI has no responsibility for the quality of our lives except through building economic prosperity, the cultural rationale has now worn somewhat thin. In any case, the location of these councils within the DTI reinforces the view that they are primarily there to grow the UK economy and accordingly should be judged on their contribution to GDP.

# The role of the research councils

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We have already dismissed the idea that research councils should plan, in any detailed sense, what science should be conducted to achieve what outcomes. In any case, today's research councils do not attempt to do that.

The opposite extreme is total academic freedom: universities and academics should be given resources to use as they see fit and without any trammels or expectations. Quite apart from the waste such largesse would create, Rose and Rose point out that academic freedom has always been a myth. The great majority of researchers work on other people's projects, and even the favoured few who can choose new areas are still limited by the budgets they can acquire.

Research councils operate between those extremes by inviting researchers to bid for funding and then making allocation decisions according to implicit and explicit criteria. This leads to three questions: how explicit are the criteria, are they the right criteria and how well does the ranking of proposals according to those criteria actually work?

## Questions over the funding criteria

The short answers seem to be that the criteria are not explicit, we cannot therefore know if they are the right ones; and the decision process is wasteful and probably ineffective if only because it is hard to be effective without knowing the goals.

The ESRC, for example, organizes its thinking around "Thematic Priorities".<sup>10</sup> They are very widely drawn. One, for example, has the objective "To understand people's lifetime experiences". They all, arguably, represent fashionable interests as distinct from ways to test how research might actually benefit UK taxpayers.

Having set up these priorities, the ESRC then proceeds to ignore them for grant giving: "The Council's Research Grants scheme responds to the best and most exciting research ideas emerging from all social science disciplines. Although this responsive mode of funding is independent of the Thematic Priorities it plays a vital role in supplementing the proactive work undertaken in the themes, and shaping future Thematic Priorities." So the criteria for responsive grants (17% of ESRC spending) are "best" and "most exciting".

It may seem unfair to pick on the ESRC, which is far from handling the major part of research council expenditure. On the other hand it is the part directly responsible for the business school sector and thus if any research council were to have a positive effect on GDP, it should be this one. A careful reading of the ESRC plan fails to reveal any research strategy that could help any British business. And if no business benefits, then nor does GDP. To take an example, marketing is a practical discipline which generates profits, cash flow and, ultimately, GDP. In the last 10 years, London Business School has not had a single British PhD student in that area, still less one funded by the ESRC.



## **Unfocussed bureaucracies**

Turning to the Medical Research Council, the House of Commons Select Committee was less than complimentary in saying "The MRC has a distinguished history and can claim credit for the high status of UK biomedical research. We commend it for valuable work it undertakes to maintain that reputation. Nevertheless, there is significant disquiet about the policies and performance of the MRC from individual researchers and organisations. We realise that we were unlikely to receive submissions from people with no grievances but we have concluded that those who have submitted evidence have legitimate concerns. We have found evidence of poor financial management and poor planning, with too many funds committed over long periods leading to large numbers of top quality grant proposals being turned down. The MRC has introduced misguided strategies for its research support that have discriminated against young researchers and some disciplines. It is has been guilty of inconsistent and inadequate communication which have hampered our ability to assess the MRC's performance and misled its research community. Combined, these have harmed the reputation of the organisation and caused great resentment among and inconvenience to the research community it is meant to be supporting."<sup>11</sup>

(By way of personal illustration, I was involved in an application for MRC support from a fund that they had designated for speculative work. The paperwork was lengthy to prepare and the process took so many months that we had, successfully, completed the project before the MRC decision was handed down. We were denied on the grounds that our project was speculative and unlikely to succeed.)

But it would be misleading to suggest that research councils should be judged by the grants they allocate. The great majority of their staff are in their own research institutes.

The Biotechnology and Biology Sciences Research Council (BBSRC) provides an example. 2,076 people are employed in their eight research institutes with a further 1,214 employed in other posts (740 funded by BBSRC).<sup>12</sup> £210m was general Treasury grant in aid and £24m was from other sources. Of this, £142m went to universities (grants £114m and students £28m) and £88m went to their research institutes (grants £14m, core funding £55m, capital £15m and central laboratory for research councils £4m). Administration accounted for £14.3m (staff £5.5m, other costs £8.8m) excluding depreciation and various adjustments. There was an operating deficit of £14m for the 2001/2 year. Thus grants represented about half the total cost. Grant applications are peer reviewed in a similar way to journal articles, apart from the work not having been completed at that stage, and between one third and 40% are successful.

## **Comfort versus value**

A detailed assessment of how research councils use their funds and their explicit or implicit criteria is beyond the scope of this paper. What is clear is that value for the taxpayer does not feature in the process. Instead, it is a comfortable regime in which committees and "peers" drawn from the academic establishment judge research proposals according to their own conventions, perhaps casting an eye to political correctness. But the very nature of the best research, or learning, is that it challenges and changes established knowledge: every major advance, from Copernicus to Einstein, has been achieved in the teeth of resistance by the academic (and often political) establishment.

Top scientists are, of course, aware of this problem and strain to allow for it. Nevertheless, an organisation that has been bureaucratised as long as the MRC, or the other research councils and their institutes, is bound to drift progressively into supporting established relationships at the expense of the best research.

## Questions of quality in higher education research

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The Higher Education Funding Councils (HEFCs) for England, Scotland Wales and Northern Ireland took over from the University Grants Committee as the channels of teaching and research funding to higher and, more recently, further education institutions. Further education colleges do not receive significant research funding, so this paper is concerned with the 130 or so universities and stand-alone degree giving colleges.

**Table 3: 2001 Research Assessment Exercise (RAE) grading<sup>13</sup>**

RAE grade	Number of departments	Research quality weighting 2003/4
1	18	0
2	140	0
3b	278	0
3a	499	0
4	663	1
5	716	2.793
5*	283	3.357
<b>Total</b>	<b>2597</b>	

Funding in this relatively new system is driven by a four-yearly research assessment of departments within the institutions. In 2001, an average of about 20 departments in the 130 or so universities were graded, as shown by Table 3. The idea is to focus research money on the best and most intensive research departments. This is achieved by estimating the volume measure (based on staffing and other factors) and then multiplying it by a quality rating (the last column in Table 3) to give the actual funding.

The idea of weighting grants to the most productive units makes sense but it has a number of problems. For example:

- The Research Assessment Exercise is immensely cumbersome and costly.
- The money goes to the universities who may, or may not, direct it onwards to the units that earned the ratings or who will be productive in future.
- The assessment of quality is largely based on publications, with “international” (mostly American) journals scoring highest. This says little about the relevance or potential contribution of the research, only that the authors have competitive publishing skills.

- The RAE measures outputs, in the shape of published articles, without regard for inputs. (By contrast, the research councils fund inputs, or at least responsive grants, without regard for outputs.)

The HEFCE 2003/4 mainstream awards, which exclude some postgraduate supervision and other minor grants, are shown by Table 4.

**Table 4: 2003/4 HEFCE Research “Mainstream” grants<sup>14</sup>**

<b>Research quality weighting</b>	<b>Number of departments</b>	<b>2003/4 Grant £m</b>
5*	817	459
5	571	338
4	474	100
3a and 3b	26	0
<b>Total</b>	<b>1888</b>	<b>898</b>

A curiosity here is the apparent inflation in the number of supposedly 5\* research departments since the 2001 assessment exercise, from 283 to 817. But the fundamental question in all this is the validity of the “quality” part of the award system.

For example, do journal publications (one of the key quality criteria) really reflect the relevance and value to the taxpayer of research contributions? Even in marketing, which as we have seen, should directly impact business cash-flow and therefore GDP, the senior US academic Scott Armstrong estimates that only between 1% and 3% of journal articles are in any sense useful.<sup>15</sup> This matches Richard Smith’s UK claim that less than 1% of medical journal publications as being useful.<sup>16</sup>

As Holub et al. have found for economics, inflation in the numbers of researchers and the number of articles they produce – precisely to acquire “quality” rankings or to achieve tenure criteria – means that the proportion of useful articles is declining over time.<sup>17</sup> The number of articles published by a department is not a good index of its quality. Grade inflation by the HEFCs could only make things worse.

No one would challenge the idea that the HEFCs’ attempts to target funds to the most productive researchers are serious and well intentioned. It is no easy task. At the same time, the criteria are quite some way from what would provide the taxpayer with value for money.

## **Getting back to taxpayer value**

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### **The bedrock of performance?**

Tony Blair asserted that “the science base is the absolute bedrock of our economic performance.”<sup>18</sup> But is that true? And even if it is, how should government assess how much

science research should be funded generally by the taxpayer, how much should be commissioned to specific ends, and how much should be funded by charities, business and other private sources?

It is important to be sure that we are debating this issue on economic and taxpayer value grounds. The Blair comment is powerfully supported by a combined research councils' paper that claims that "all seven Research Councils help to develop the UK economy".<sup>19</sup> They provide fine examples of UK scientific advances that translated into UK benefits; and it is certainly true that scientific education has raised managerial skills. But at the same time, their publication makes no macro case for the amount of funding nor does it justify the basis of allocating funds.

Suggesting that "UK businesses are 20-30 percent less productive than their main overseas competitors. £5 million of Research Council money is being spent on research to find out why, and to help management improve productivity",<sup>20</sup> gives credence to the Kealey view that government interference itself is responsible for the UK's performance deficit. If all this public funding of research beyond the levels of our competitors is so productive, why is the UK so far behind?

Perhaps the most interesting aspect of this apologia for public science budgets is the extent that the research councils are moving away from funding scientific research and more into campaigning and telling businesses how they should run themselves. Realpolitik as these may be, one can question whether the taxpayer should be paying for them out of funds intended for research.

Nor is the quality of this work always clear. The business performance measurements proposed for aerospace firms by LINK (a research council sponsored venture), for example, are splendidly, but sadly, out of date, if not plain wrong. In assessing competitiveness, for example, they take no account of competitors or customers, only internal financial and accounting measures.<sup>21</sup> But since this body stems from the DTI, this is hardly surprising. When the DTI measures "competitiveness" it is not how strong we are versus foreign competition but how open, i.e. weak, the UK is to competitors.<sup>22</sup> One of the five indicators is "diversity of employment opportunities"; none of the five measures ratings by customers or against competitors. Yet any businessperson knows that competitiveness is defined by winning customers against competition.

### **Who should pay for research?**

Kealey contrasts two models of public financing of science: that of Francis Bacon and of Adam Smith.<sup>23</sup> The "Bacon" model is essentially the one accepted by Tony Blair and Research Councils UK. Funding science from the public purse will, in some ill-defined way, fuel progress and thereby prosperity. The "Smith" view is that if scientific research needs funding, the market will take care of it. Kealey's analysis is that Smith was right and that economic performance (or, by inference, "productivity" in research council language) is inversely correlated with public financing of science. What works is not an altruistic support for research, but private interest driving the science it needs.

The two stages of creating new science and then converting that to profits (or GDP) work in very different ways. Scientific advances are published to the world and are available to all. Their technological development, however, is private and commercial. Logically, the

optimal position for the taxpayer in any one country is not to fund research that can be exploited by competitors abroad, but to have its own businesses take advantage of scientific advances funded by the taxpayers of other countries.

The ideal public/private balance of funding cannot be known but is likely to fall, as things usually do, between the two extremes. The long lead times, ten or even twenty years, for basic research and the uncertainty of its results do indeed mean that the taxpayer should finance some research. How much, remains a matter for debate.

### **Producers triumph over customers**

But the scientists' clamour for more research money is clearly self-interested and seems to be proportional to the number of resource-hungry scientists rather than any measure of public good. As Kealey points out, the more that public funds train more researchers, the more the pressure for public funding of research escalates. In business school language, the system is producer-driven as distinct from being driven by the needs of the consumer, i.e. the taxpayer.

An example of this process at work is also provided by the pre-1997 election discussion document for the Labour Party.<sup>24</sup> This argued for bringing "science push" and "demand pull" coherently together at every stage of research, development, production and marketing, not only within the UK but across Europe. Defence R&D should be switched to civil R&D. Gender imbalance should be reduced. To improve access by small and medium sized businesses, local networks should be established. The public should be educated about science and scientists should be educated about society. And so on.

Putting aside the immense bureaucratic apparatus needed to implement such a vision, the bottom line was that researchers should be given far more money and more secure careers. So the producer side triumphs again: the demand side of the equation is not developed.

But another shortcoming in the "science push" side has been overlooked: academics are (increasingly) recruited and promoted on the basis of their publications ("publish or perish") and less, if at all, on the effectiveness of their teaching or scholarship. Curious as it may seem, there is no requirement for a tertiary level teacher to know anything about the subject s/he teaches, even though teaching is most of what most academics are expected to do.

The present academic assessment system is based on one that may have suited the old elite universities very well, but as tertiary education has expanded, academics have been obliged to undertake more teaching. The HEFCs try to focus funds on the few, but all academics have to push for resources in order to gain status (even though their research may be of little interest to themselves, still less anyone else). Academics generously review papers, and especially conference papers, in order to maximise their attendance at conferences and their career prospects. Only a tiny minority produce research that is of value to business and taxpayers.

The pressures of teaching, and writing articles and research proposals, take time from scholarship, i.e. learning from the best research by others. The solution would require a massive reversal of university conventions, namely that the focus on "research" should be replaced by the assessment of teaching content and scholarship.

## Better science for less public money

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Taxpayer value would be enhanced by a clearer allocation of roles:

- Government should fund science in two ways: general funding and grant-giving via universities and demand-led commissioning of research directed to practical goals.
- The technology stage (converting science to profits) should be left to business, and business should be left to do what it does best without government interference, although tax incentives (as now) for R&D should remain an option.
- Both limbs of dual funding should be replaced by a transparent mechanism in which university departments are funded and are accountable to HEFCs for the way those funds are used by academic research teams.
- The criteria for research funding should be clearly defined. They will include the potential impact of the research on GDP, the likely time-scale, and risk – ie taxpayer value. In other words, the justification should be switched from science push to demand pull.
- At the same time, a small number of high-talent individuals should receive “play money”. The evidence for serendipity, in the work of exceptional researchers, is provided by history. Since these people tend to be unconventional and resistant to bureaucracy, there is little point in subjecting them to complex application processes. Since they do not know what they might find, it is easier to identify who they are and give them arbitrary amounts.
- Full-time researchers apart, academics should be primarily assessed on teaching and scholarship. In much the same way that other professionals, such as doctors, are now expected to update themselves on a regular basis, academics should have an occasional “MOT” on their knowledge of their subjects.
- Research Councils should be abolished and their institutes transferred initially to higher education institutions, bidding for funds as above.
- The bureaucracies and committees should be abolished and HEFCs reduced to streamlined channels for transferring Treasury funds to research teams.
- Private and charitable funding would be unchanged.

It is difficult to quantify the effect of these radical proposals on the £4bn 2003/4 government budget for academic research quantified above, but the order of magnitude seems likely to be a reduction of £0.5bn through the reduction of bureaucracy<sup>25</sup> and committees and a further £0.5bn<sup>26</sup> from reducing research that the UK taxpayer does not need to fund. That £1bn total saving can be used to improve teaching standards in schools and universities, or returned to citizens and businesses in the form of lower taxes.

# Improving the calibre

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Few academics wish to divert their energies from teaching and research to the processes of seeking funding through submitting projects for approval. They would prefer to join successful research teams and know that the money will continue to arrive so long as the team continues to produce valuable results. Philip Stott is not alone in lambasting the cumbersome RAE system, wedded as it is to published articles.<sup>27</sup> A far simpler system of league tables for research teams based on genuine output would not be difficult to devise.

Given the shortage of teachers, and especially science teachers, at the secondary and tertiary levels of education, it would be a further benefit that unfunded researchers should return to teaching, and that the research council bureaucrats, many of whom are well qualified, should take up jobs in teaching or industry. After all, the UK suffers from a national skills shortage.

It is not for this paper to say how the £1bn savings should be employed. There will be no shortage of claimants, including education. Raising the level of secondary education would be preferable over social-engineering the university entrance criteria. The most important consequence is not the £1bn saving, but the improvement in the calibre of research and teaching that should follow.

## References

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- <sup>1</sup> Hilary Rose and Steven Rose (1969), *Science and Society*, London: Allen Lane The Penguin Press. Most of the historical background of this paper is drawn from this excellent book which will not be continuously cited. The Krupp's example is on p.36.
- <sup>2</sup> Office of Science and Technology (2002), *Science Budget 2003-04 to 2005-06*.
- <sup>3</sup> Terence Kealey (1996), *The Economic Laws of Scientific Research*, Basingstoke, Hants: The MacMillan Press.
- <sup>4</sup> HEFCE Annual Report 2002. This no doubt coincided with additional responsibilities for further education but the incremental costs should not have been that high.
- <sup>5</sup> J D Bernal (1939), *The Social Function of Science*, London: Routledge & Kegan Paul
- <sup>6</sup> Rose and Rose, *ibid*, p.100.
- <sup>7</sup> New research council – see DTI press release 22/1/03.
- <sup>8</sup> Figures from *Public Bodies 2001*, HMSO.
- <sup>9</sup> HEFCE Annual Report 2002, p.10, £581m.
- <sup>10</sup> ESRC 2002-2003 Operating Plan
- <sup>11</sup> House of Commons, Science and Technology Committee, *The work of the Medical Research Council*, Third Report of Session 2002–03 HC 132.
- <sup>12</sup> BBSRC Annual report 2001/2.

- <sup>13</sup> HEFCE 2001 Research Assessment Exercise Results
- <sup>14</sup> HEFCE data for quality-related research (QR) and capability funding for 2003-04. Downloaded Excel sheet "data0304".
- <sup>15</sup> Scott Armstrong [armstrong@wharton.upenn.edu](mailto:armstrong@wharton.upenn.edu), "DISCUSSION - To What Extent is Scientific Research on Marketing Useful?" email: Wed, 5 Feb 2003 and Armstrong, J. S. (2003), "Discovery and Communication of Important Marketing Findings: Evidence and Proposals," *Journal of Business Research*, 56, 69-84, with commentaries by Rossiter and Lehmann, 85-90, and a response on pp. 91-92.
- <sup>16</sup> Smith, Richard (1991), "Where is the Wisdom: The Poverty of Medical Evidence," *British Medical Journal*, 303, 798-799.
- <sup>17</sup> Holub, H. W., Tappeiner, G. & Eberharter, V. (1991), "The Iron Law of Important Articles," *Southern Economic Journal*, 58, 317-328.
- <sup>18</sup> [http://www.ost.gov.uk/index\\_v4.htm](http://www.ost.gov.uk/index_v4.htm), 5-4-03.
- <sup>19</sup> Research Councils UK (2002) *Science Delivers*, p.7. This was before the addition of the Arts and Humanities Research Council.
- <sup>20</sup> Research Councils UK, *ibid*.
- <sup>21</sup> [http://www.ost.gov.uk/research/link\\_scheme.htm](http://www.ost.gov.uk/research/link_scheme.htm)
- <sup>22</sup> <http://www.dti.gov.uk/competitiveness/pdf/indicators2002.pdf>
- <sup>23</sup> Terence Kealey *ibid*.
- <sup>24</sup> The SET (Science, Engineering and Technology) Forum (1995), *Shaping the Future*.
- <sup>25</sup> The direct administrative costs of the Research Councils (projecting from the BBSRC and ESRC) is of the order of £150m and grants are about £1.14bn of the 2003/4 £2.28bn spending. This leaves about £1bn being spent on institutes and a wide variety of initiatives. Virtually all the administrative costs could be saved by using streamlined HEFC channels for grant giving and, of the other expenditure, 35% is a target figure for potential savings.
- <sup>26</sup> About 25% of grants funded by Research Councils and HEFCs.
- <sup>27</sup> Philip Stott "Under this asinine rule we'd never have heard of Darwin," *The Times*, 24 April 2003.