

Revealing the hidden costs of research

How should universities account for the money they receive from governments? The answer is not as simple as it may at first appear. There are valuable lessons that other countries can learn from the US experience.

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How effectively are science budgets deployed? Exactly how are funds spent in the laboratory? The pressure for enhanced transparency of science spending is increasing. In the United States, for example, there has been a long-running and occasionally fractious debate about what is reasonable to count as the 'indirect costs' of research. And one of the conditions of extra money allocated by the UK government last year for science and engineering was that the research sector would improve the transparency of how the money is used. How should this be achieved?

A key factor in financial transparency is the accounting of indirect costs, a source of much debate and friction. In particular, attribution of indirect costs requires individual recipients of funding to make a notional apportionment of their time between research, teaching and administration — activities which, in a happily managed university, are seamlessly interwoven. How these issues are addressed in the United States is relevant elsewhere, because the US system for identifying the indirect costs of research within a large and diverse higher-education sector has evolved over the past half-century. We hope that what follows will be useful, even provocative, to US researchers as well as to those in other countries who are, or soon will be, wrestling with similar questions.

Indirect costs

The US system is based on the principle that the federal government reimburses universities the full costs associated with any research that is carried out for it. This system has its origins in the aftermath of the Second World War, when the principle on which defence contracts were based was transferred into civil research.

The costs of a research project are split into the direct costs — which can be directly attributable to that project — and the indirect costs, such as administration, building operation and maintenance, and library support, which are not easily attributable to individual projects. Clearly, for universities to operate sustainably they must receive payment for these indirect costs. Although easy to state in the abstract, this principle is not at all straightforward to put into practice.

The first issue is to identify the indirect costs. Despite specific guidelines, this requires negotiation, during which feelings can run high. Universities must each submit a proposal based on historical costs to one of

Table 1 Negotiated indirect-cost rates for selected US universities

Public		Private	
Institution	Rate	Institution	Rate
Univ. California, Berkeley	49.9	Brown Univ.	60
Univ. California, Los Angeles	49	CALTECH	57.45
Univ. Maryland	48	Univ. Chicago	53
Univ. Michigan	52.5	Cornell Univ.	61.09
SUNY, Stony Brook	47.5	Harvard Univ.	64
Univ. North Carolina	44.6	Johns Hopkins Univ.	64.5
Ohio State Univ.	46	MIT	59
Pennsylvania State Univ.	41.65	Univ. Pennsylvania	59
Rutgers Univ.	57	Princeton Univ.	59
Univ. Washington	48.5	Stanford Univ.	56
Univ. Wisconsin, Madison	44	Yale Univ.	65

Source: Council on Government Relations, data for 1996-97; CALTECH, California Institute of Technology; SUNY, State University of New York; MIT, Massachusetts Institute of Technology.

two federal 'cognizant agencies' (the Department of Health and Human Services, and the Office of Naval Research in the Department of Defense) saying how much they think they will need to cover the indirect costs of their research portfolio for the next few years. A set of strict rules is published by the Office of Management and Budget (see, for example, <http://www.whitehouse.gov/WH/EOP/OMB/html/circulars/a021/a021.html>).

Allowable indirect costs include provision of library facilities, supply of utilities to laboratories, and support to researchers from grant applications. Not allowable are advertising and public relations costs, contributions and donations, entertainment, fines and penalties, lobbying costs and the costs of defending fraud proceedings. 'Pregrant' institutional costs of starting new projects, or of closing down old ones, are also not allowable, although they can be significant.

The relevant federal agency examines a university's proposals in detail to see what proportion of costs has been allocated to research. A process of negotiation follows, resulting in an average 'indirect-cost rate' for the university. This is the ratio, for the sponsored research effort across the university as a whole, of the allowable indirect costs to the modified total direct costs. (The latter costs are all attributable to individual projects, excluding the costs of large capital expenditure and subcontracts above certain thresholds.) These modified costs are used to avoid obvious distortions from large items of capital expenditure.

Current UK practice is to calculate indirect costs only on the basis of salary direct costs. This provides an incentive for the inclusion of salary items in grants as this may be the only way a project can recover any of

its indirect costs. The US system avoids this type of problem.

Negotiated indirect-cost rates vary across the United States from less than 40 to more than 70 per cent (see Table 1 for a selection of rates, and Table 2 for an example of the breakdown of indirect costs in one institution). There are good reasons for this variation among institutions. First, research is more expensive in some subjects than in others. Second, there are marked regional differences. Energy costs at different times of year can vary dramatically between, say, Phoenix, Arizona, and Chicago, for example. Third, and perhaps most important, there are different incentives to private and public universities to negotiate on their rates — public universities have an income stream from state governments, which can in some cases be used to cover some kinds of indirect costs; private universities do not.

The first two columns in Fig. 1 show the average differences between the indirect-cost rates proposed by US universities and the rates finally agreed, and also how these rates differ between private and public universities.

The indirect-cost rate agreed between the university and the cognizant agency is applied to every federal government grant and contract for research at that university (at least in theory — see below), and is the starting point for the university in negotiating a rate for indirect costs with other project funders. The same rate is used for all faculties across the university (although in some cases a separate rate is calculated for, say, the medical school or off-campus laboratories).

Teaching or research?

Why is it not possible to specify exactly the indirect costs of research in each university

simply by referring to the rule book? A primary difficulty is that, much as funders and administrators would like to tease them apart, teaching and research are intertwined. For example, an undergraduate or postgraduate helpfully engaged in a project is both a teaching cost and a research benefit. How is the principal investigator's time spent in this case divided between teaching and research? How is these apprentices' use of the library to be divided between their being taught or their conducting research? To ask these questions is to see that they are ultimately silly. Nevertheless, rough and common-sense answers are ineluctable parts of any estimate of indirect-cost rates. Even in the United States, with its strict set of rules, the process is still ultimately a subjective matter, and resolving the debate about the proportion of a particular laboratory's time that should be allocated to research is a non-trivial, even protean, task.

A similar calculation is carried out to identify the indirect costs associated with teaching, which can be directly relevant for certain externally funded courses. Typically, this rate is significantly higher than the rate for research, owing to the range of student services offered which are in most cases 100 per cent attributable to instruction, and because a high proportion of library services are attributed to instruction (perhaps not adequately reflecting the relative costs of supporting the research side of a library).

US universities have to devote time and money to keeping track of the relative proportions of time spent on research and teaching by individual faculty members, together with a multitude of other items which can affect the attribution of indirect costs to externally sponsored research. No figures are available for these administrative costs, which are not easy to estimate. We guess that they account for about one or two (possibly more) of the 50–60 percentage points in the agreed indirect-cost rates in Table 1.

The offsetting benefit is that this encourages a full understanding of the costs associated with different elements of the work

being done, both by the central administration and by the faculty. And, perhaps more important from the point of view of funders, it ensures that the same indirect cost is not accounted for twice — once for research and once for teaching. But all this has its own substantial costs, not only in administrative procedures but also, sadly often, in friction between faculty, university administration and government.

There are useful lessons from the virtues and the vices of the US system to be learned by the United Kingdom. Transparency encourages clear thought about the costs and benefits of particular indirect-cost items (in particular, it usually shows that — contrary to some scientists' suspicions — their colleagues in the humanities are not being subsidized by the indirect costs on science grants).

But all this costs time, money and emotion between researchers and administrators. Well handled, the clarity and accountability of the US procedures have benefits for both the university and the funders. At the same time, care is needed not to overdo the accounting and reporting requirements on universities. After all, the ultimate purpose of the exercise is to deliver quality research and teaching.

Indirect costs are real costs

For the holder of a hard-won research grant (often funded below the level requested), there can be a natural, if unreflective, tendency to see indirect costs as money wasted. In the United States, this is stereotypically the line taken by both researchers and funders. If only this money was not being 'siphoned off' by the administrators, the argument runs, there would be even more to fund research. This common misapprehension was one of the reasons why the term 'indirect costs' was replaced by 'facilities and administration costs' in the early 1990s. It is doubtful whether changing the name has changed the argument.

Such failure to recognize that indirect costs are real costs has underlain congressional pressure to reduce indirect-cost rates

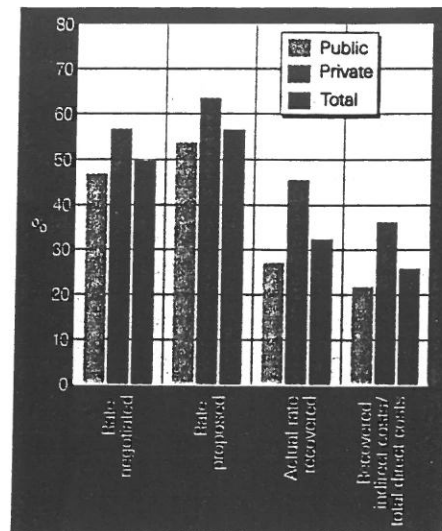


Figure 1 Average indirect-cost rates for US universities (Source: Council on Government Relations).

over the past decade or so. There have been significant changes since the high-profile case in which Stanford University was criticized for allegedly including illegitimate items in the overheads covered by federal funds. There has been a tightening of what is included in the Office of Management and Budget rules: the amount that can be claimed for administration in the indirect-cost rate has been capped at 26 per cent; and more stringent accounting requirements on universities have been introduced.

Of course it is important to have pressure on universities to operate as efficiently as possible so that indirect costs are at the necessary minimum. But indirect costs are very real costs for universities. The US system exposes the inherent tensions: funders and researchers have a short-term interest (for different reasons) in driving down the fraction of their grant spent on indirect costs, leaving a larger fraction for the more visible direct costs. And this view often attracts political support. On the other hand, administrators seek to maximize indirect costs. This enables them to provide the vital infrastructure for research, and also brings in money to allow the university flexibility in starting new projects and winding down old ones.

This tension among researchers, administrators and funders is healthy if moderated by proper understanding of the issues. In the United Kingdom, where there is less history of debate of these questions, some funders are emphasizing direct costs, and university administrators are making the case for indirect costs, but the researchers are comparatively silent.

Cost sharing

Although the principle underlying the funding of US research remains full-cost reimbursement, it is not at all clear that this is

Table 2 Components of indirect-cost rate for Princeton University

Type of cost	Proportion of modified total direct costs (per cent)
Administration (total)	26.0
General administration and services	7.1
Departmental administration	15.7
Sponsored projects	1.8
Other administration	1.4
Facilities (total)	33.0
Depreciation of buildings	4.7
Depreciation of equipment	2.9
Library	4.0
Interest	2.2
Plant operations and maintenance	19.2
Overall indirect-cost rate	59.0

Source: Princeton University.

being delivered in practice. There often seems to be an implicit belief by some funders, in both federal and private sectors, that universities have a responsibility to cover some research costs from 'their own' funds.

Universities use the federal rate as a starting point for negotiation with non-federal funders (such as industry or charities) but often agree to carry out the work for less (the risk, of course, is to lose the work to someone else). And even federally funded projects do not always bring with them the full amount for indirect costs.

When it comes to the funding of individual projects, there is a strong temptation for funding agencies to argue down the proportion of money directed to indirect costs, so allowing more projects to be funded. At least superficially, this makes good sense from the perspective of the funding agency and the faculty researcher. But, in the long run, the underfunding of infrastructure will eat into the capabilities of the research enterprise.

The difference between what US universities should theoretically receive (if everyone reimbursed indirect costs at the full negotiated rate) and what they actually receive is demonstrated by columns 2 and 3 in Fig. 1. Across all universities, the figure suggests that, on average, indirect costs are recovered (from all funding sources) at the rate of 32 per cent, roughly two-thirds the average negotiated rate (for federally funded work) of 50 per cent. Again, the rate at which indirect costs are recovered varies between private and public universities, and it is notable that private universities recover a greater proportion of theoretical indirect costs than public ones.

It is not for us to decide whether US universities should be expected to make a contribution to the costs of externally commissioned research. But at present they clearly are doing so. And these costs have to come from somewhere. Such questions cry out for discussion of what fraction, if any, of the full costs of sponsored research should be the university's — rather than the external funder's — responsibility. The US Office of Science and Technology Policy is reviewing this issue. A report is scheduled to appear soon, and its conclusions deserve to attract wide interest.

Complex as it is, the US system does not require universities to demonstrate that money allocated for research overheads was spent directly, and in proportion, on the departments and groups that brought the money in. Nor should it. Having agreed an appropriate indirect-cost rate, the government leaves the universities to spend these infrastructure funds as they see fit. The transparent accounting systems in US universities, designed to track expenditure, are useful both in faculty debate and during subsequent rounds of indirect-cost negotia-

Comparing US and UK costs

The first difficulty in any comparison between US and UK research council indirect-cost rates is that the US rates in Table 1 and Fig. 1 are based on modified total direct costs (MTDC), whereas UK rates are generally based on direct-cost salary items. Any comparison would need a rough estimate of what fraction of MTDC is represented by salaries. Using a very rough guess of around two-thirds would translate the average US rate of 50–60 per cent in Fig. 1 to a UK rate of 75–90 per cent.

A second difficulty is that UK research councils allow as direct costs items which in the United States tend to be accounted as indirect costs (secretarial help, certain office expenses, and so on). If a fraction, f , of the UK direct costs are of this kind, we must move these costs from the denominator to the numerator of the indirect-cost

tions. They also serve as evidence of good stewardship of public funds.

Conclusions

We believe that the openness of the US system has gone a long way to ensuring that all involved — researchers, administrators and funders — understand the issues. The system has benefited from it, in terms of efficiency and value for money, and in fostering a common understanding of aims and purposes. In the United Kingdom, because of the conditions attached to the new money awarded by the government, those involved have to get to grips with indirect costs.

Many universities in the United Kingdom have developed or are developing systems for greater accountability. The Committee of Vice-Chancellors and Principals commissioned a study last year to estimate the indirect costs of research in the UK system. The unpublished report leaves many of the key questions unanswered, not least because it does not distinguish between teaching and research — mainly because of lack of relevant information. Owing to this, and many other difficulties in the calculation, it is difficult to draw many useful conclusions from the study.

There are, of course, many differences — accounting, cultural and institutional —

rate to compare with US rates. This reduces the UK rate that is effectively equivalent to US rates to around $[(75 - 0)(1 - f) - 100f]$ per cent.

Third, the US indirect-cost rate includes components for buildings, generic and/or shared equipment and its depreciation, central computing facilities, and other things (see Table 2) that would fall in varying degrees into the higher education funding councils' (HEFC) research infrastructure costs in the United Kingdom, rather than being part of the research councils' indirect-cost rate. Under this 'dual support system', indirect costs in the United Kingdom are reimbursed by two different mechanisms: HEFC research infrastructure funds and research councils' indirect costs. If the numbers in Table 2 for Princeton University were taken as typical — admittedly an unreliable supposition

— we see them as falling roughly half to two-thirds in the research council indirect-cost category, and roughly half to one-third in the HEFC research infrastructure category (most, but not all, administration in the former; much of facilities in the latter).

Such a very rough guesstimate would suggest a UK indirect-cost rate in the neighbourhood of half to two-thirds of the 75–90 per cent of salary direct costs guessed above, which is to say very roughly in the range 37–60 per cent. To the extent that f is not zero, these figures will be somewhat smaller. For example, if f is around 0.05 (5 per cent of direct costs being for items that count as indirect costs in the US system), then our guesstimate of the UK equivalent for UK research council indirect-cost rates falls to roughly 33–54 per cent.

between the UK and US higher-education sectors, so any comparison between indirect-cost rates in the two countries can be misleading. Nevertheless, we outline in the box above how we think the average US indirect cost rate of 50–60 per cent in Fig. 1 would translate into an equivalent UK rate on research council grants, as calculated by current UK rules, very roughly in the range 37–60 per cent. The current UK research council rate of 46 per cent happens to lie around the geometric mid-point of this range. Of course, this estimate is very rough, so this agreement may be coincidental.

Fig. 1 also shows that the average ratio of indirect costs actually recovered by universities in the United States is around 25 per cent of the total direct costs of the projects. The challenge for the UK research community, in return for the new injection of government money, is to understand and agree the equivalent UK figure. Those in charge of managing research can then deliver the right money to the right people in a transparent fashion without introducing unnecessary bureaucracy. □

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