RSC | Advancing the Chemical Sciences

Study of the Costs of Chemistry Departments in UK Universities

Summary Report
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INTRODUCTION

1 This is a summary report of a study commissioned by the **Royal Society of Chemistry (RSC)** from **Nigel Brown Associates** of the gross income and costs of a sample of eight chemistry departments in UK universities.

2 The study sought information on the gross income and full economic costs of chemistry departments in the eight universities for different activities. Gross income was that used by the universities as a basis of resource allocation before any deduction for central services. Information on costs of chemistry departments was derived from universities' own data from the application of the Transparent Approach to Costing (TRAC) method. TRAC was developed by JM Consulting Ltd for the Joint Costing and Pricing Steering Group (JCPSG) of UK Higher Education Institutions to provide a more robust estimate of the full economic costs (FEC) of research projects and provide universities with a more general management tool.

3 This report presents the main findings from the study and seeks to draw some general lessons about the financial position of UK chemistry departments and how current developments in the public funding of teaching and research may impact on that financial position.

BACKGROUND

4 The **RSC** has been increasingly concerned about the future of chemistry as a discipline in UK universities as an increased number of universities in recent years have decided to close their chemistry departments. These closures reflect the general financial pressures on universities and the particular pressures on chemistry departments from the decline in demand for undergraduate chemistry programmes from a high in the mid-nineties and the increasing concentration of research funding towards those departments receiving the highest ratings in the Research Assessment Exercise (RAE).

5 This process of closure has accelerated since the outcome of the last RAE and the decision by HEFCE to concentrate further its funding for research in England by restricting it to departments that were rated 4 or better in the 2001 RAE and to reduce substantially the level of funding for those that were rated 4. Both the Scottish Executive and the Welsh Assembly Government are seeking to preserve their national research base through encouraging collaboration. Nevertheless, closures of chemistry departments have taken place here as well.

Table 1
Changes in Student Numbers 1994–95 to 2002–03

Subject	1994–95	2000–01	% Change from 1994–95 to 2000–01	2002–03	% Change from 1994–95 to 2002–03
Chemistry	23,522	19,660	-16.4	19,015	-19.2
Physics	14,041	12,905	-8.1	12,830	-8.6
All Physical Sciences	72,511	69,285	-4.5	71,040	-2.0
All Students	1,567,313	1,990,625	+27.0	2,296,625	+46.5

Source Higher Education Statistics Agency: Students in Higher Education Institutions 1994–5, 2000–01 and 2002–03

6 The basis for these concerns can be seen in **Tables 1** and **2** below which show respectively the decline in student numbers in chemistry and other physical sciences since the mid-1990s and the relative performance of chemistry and physics departments in the 1996 and 2001 RAEs.

7 **Table 1** demonstrates well the decline in popularity of physical sciences in general within the substantial overall increase in student numbers since 1994–95 and the particularly sharp fall in total numbers of chemistry students even when compared with physics. There is an indication from admissions in 2004–05 that the decline in demand for chemistry, at least at undergraduate level, may have been halted.

Table 2
Distribution of RAE Grades: Chemistry and Physics Departments 1996 and 2001

	Number of institutions receiving rating			
	1996 RAE		2001 RAE	
RAE Grade	Chemistry	Physics	Chemistry	Physics
5*	2	2	6	5
5	9	11	13	22
4	13	26	15	16
3a	11	7	9	7
3b	10	3	2	0
1 or 2	16	6	0	0
Total number of departments assessed	61	57	45	50

8 These data show that even by the time of the 1996 RAE, physics had a considerably shorter 'tail' than chemistry with only 32% of departments scoring lower than 4 while 61% of chemistry departments scored below 4. By 2001 only one physics department in seven entered for assessment was rated less than 4 compared with one in four chemistry departments. Between 1996 and 2001 the reduction in the number of chemistry departments entered for the RAE was more than twice the reduction in the number of physics departments entered. These results may reflect the high entry costs of some kinds of physics research compared to some areas of chemistry research leading to greater pressure earlier for increased concentration of physics research funding and in the number of departments.

9 There have also been increasing concerns in recent years that the funding of chemistry teaching in English universities by HEFCE was failing to reflect the increasing costs of providing that teaching. Although chemistry is one of the laboratory based subjects which until 2003–04 received a weighting of two in the HEFCE funding formula for teaching, this was perceived by chemistry departments to be inadequate to reflect the very strong emphasis on laboratory experience in undergraduate chemistry teaching compared with other laboratory based subjects.

10 The difficulty arises, however, not so much from the HEFCE formula, which groups disciplines together on the bass of similar expenditure characteristics, but from the way in which many institutions use the HEFCE formula to distribute teaching income to individual departments as a basis for resource allocation. In practice institutions moderate the impact of a pure income driven approach to resource allocation through cross-subsidies to those areas that are seen to be inherently more expensive. However, where an institution comes under general financial pressure subjects in receipt of subsidy are inherently vulnerable.

METHODOLOGY

11 The objective of the study was to identify for a sample of eight chemistry departments "the five numbers" which the Funding Councils have required institutions to provide for the whole institution in applying TRAC. The five numbers are the full economic costs of:

- Publicly funded teaching;
- Non-publicly funded teaching (e.g. non-EU overseas students and other non-publicly funded teaching such as Continuing Professional Development);
- Publicly funded research – grants and contracts from Research Councils, UK government and Health authorities, and the EU, and research funded out of the Funding Council QR grant;
- Non-publicly funded research (e.g. charities, UK industry and commerce and overseas other than EU);
- Other activities (e.g. consultancy and other forms of knowledge transfer).

12 This study sought to set these figures against the gross income associated with these five categories to provide an estimate of how each contributed to the overall surplus or deficit of the chemistry department. However, it should be noted that this is not yet a TRAC requirement.

13 The study also sought to put the income and cost data in the context of the balance of different activities within individual departments and of the relationships between chemistry and other departments within the University.

14 A sample of eight was selected because it was the minimum number that would allow a proper mix in terms of different levels of research strength as measured by RAE ratings and geographical distribution across the UK.

15 The data on income and costs were collected through interviews with staff from planning, finance and chemistry departments in the sample universities through a questionnaire/aide memoire. This was developed in discussion with JM Consulting Ltd to seek consistency with the TRAC approach and refined through piloting with three departments.

16 The information collected related in the main to the year 2002–03 – the last year for which complete data were available. It covered:

- cost drivers – student full time equivalent (FTE) load, staff FTE and salaries, the extent of collaboration within and outside the University, space and its characteristics, and policies on capitalisation and depreciation;
- the methods used by the University to collect information about the allocation of staff time to different activities, the actual data collected and the robustness of the data;
- estimates of departmental gross income to be set against gross costs including publicly funded and non-publicly funded teaching and research and other activities;
- resource allocation models and budget allocation methods (currently used and prospective);
- costing data from the University's own TRAC cost allocation model.

17 The criteria used to select the sample departments, in addition to willingness to participate. were:

- the selected departments should include at least two departments graded 5*, two graded 5, two graded 4 and if possible a department graded 3a or 3b in the 2001 RAE;
- the selected departments should exclude any which were to be closed or where closure was known to be a serious option;
- there should be at least one department from a Welsh university and one from a Scottish university and the remaining departments should be located as far as possible in different English regions;
- the selected departments should have had at least 150 full-time undergraduate students in 2002–03.

CHARACTERISTICS OF THE SAMPLE

18 **Table 3** below sets out the principal characteristics of the eight chemistry departments in the sample, including the 2001 RAE score, home and EU undergraduate student load, overseas undergraduate student load, academic staff funded from university funds and dedicated space. These between them represent the principal cost drivers for departments.

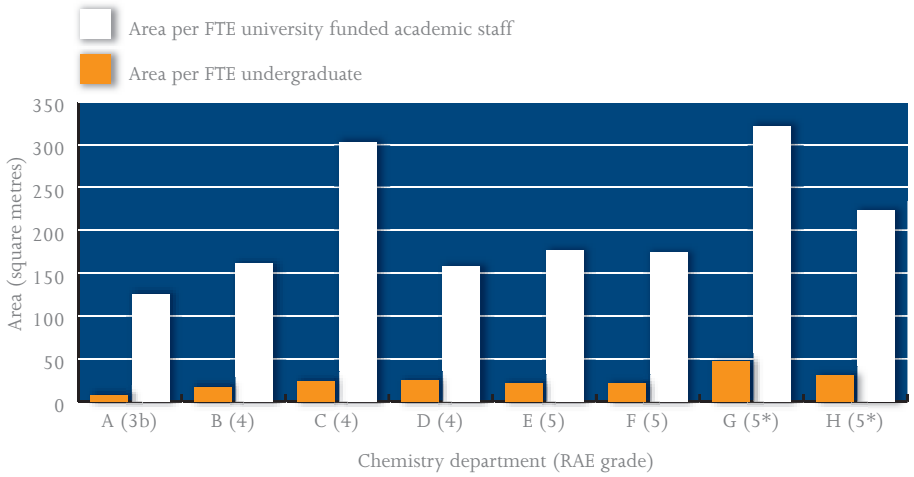
19 These data show that the sample departments fall into two groups in respect of undergraduate student load – 5 with under 300 FTE and three with over 350. Only the two 5* departments had significant numbers of overseas undergraduate students. They too had the largest amount of dedicated space reflecting in part the high level of research activity.

20 **Figure 1** compares the area per FTE undergraduate and per FTE university funded member of academic staff for the eight chemistry departments. There is no evident relationship between area and undergraduate numbers, although five are in the range 20–30 sq metres per FTE. With the exception of two of the departments, there appears on the other hand to be a relationship between dedicated space per FTE of university funded academic staff and 2001 RAE score. The two exceptions both have a substantial proportion of their accommodation in buildings constructed early in the 20th century and not purpose built to meet the modern requirements of chemistry teaching or research.

Table 3
Principal Characteristics of the Eight Chemistry Departments in the Sample: 2002–03

Chemistry department	RAE score 2001	HOME & EU undergraduate student load (FTE)	Overseas undergraduate student load (FTE)	University funded academic staff (FTE)	Dedicated space (sq. metres)
A	3b	287	1	18	2,262
B	4	222.6	12.6	24	3,870
C	4	435.9	5.5	35	10,600
D	4	223.3	1.9	35	5,522
E	5	231.1	10	28.3	5,005
F	5	386.9	7.2	48	8,351
G	5*	241.3	39.6	35.3	11,350
H	5*	379	21	51.7	11,545

Figure 1
Dedicated space per FTE undergraduate and per FTE university funded member of academic staff 2002–03



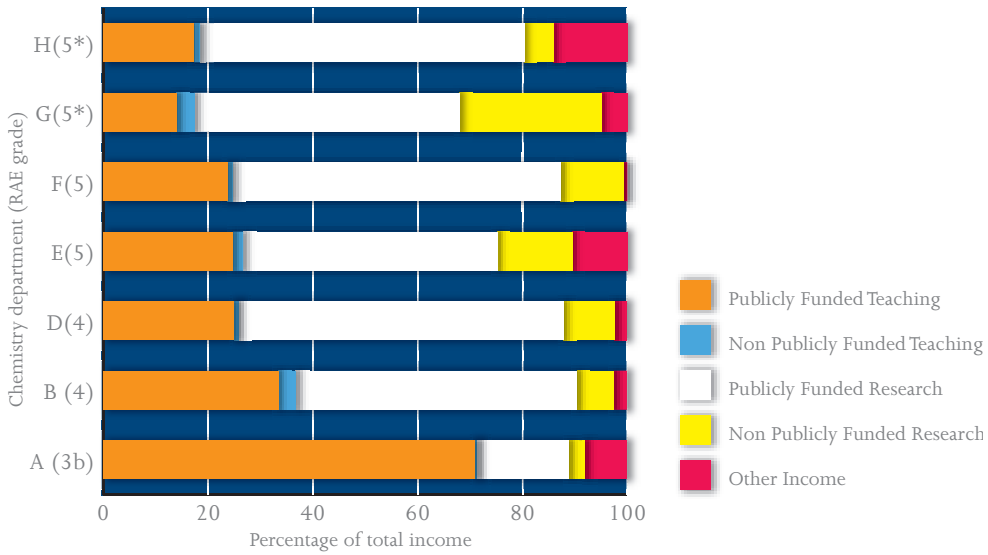
DEPARTMENTAL INCOME

21 Figures for Gross Departmental income were collected on Publicly and Non-publicly Funded Teaching, Publicly and Non-publicly Funded research and Other activities. Publicly funded teaching income includes Funding Council teaching grant (other than for postgraduate research students) and tuition fees. Non-publicly funded teaching income is primarily undergraduate overseas student fee income. Publicly funded research includes Funding Council QR grant, grants from UK Research Councils, research contracts from UK government sources (including the NHS) and EU government and other sources. Non-publicly funded research income includes that from UK research charities, UK Industry, other overseas sources and other sources. 'Other' includes income from all other sources.

22 **Figure 2** below shows for each of the departments in the sample the proportion of total gross income by activity type in 2002–03.

23 The figure shows the predominance of income from public sources, which in most of the departments was over 80% of total income. This is also the case for research income separately, with the

Figure 2
Distribution of income by activity 2002–03



majority of research grant and contract income coming from Research Councils. The figure also shows up the expected inverse relationship between the proportion of income from teaching and RAE score with the exception of Department C. The figure also shows the very low proportion of income from non-publicly funded teaching.

24 Total departmental income ranged from just over £2 million to nearly £13 million in 2002–03.

25 The publicly funded teaching income (Funding Council grants plus student fees, excluding grants and fees for postgraduate research students) per FTE student in 2002–03 was somewhat more variable than might be expected from funding models based on standard units of resource. **Figure 3** below shows the observed variation. The two highest figures are chemistry departments in a London university and a Scottish university both of which receive a higher average unit of resource across all subjects than the average for English institutions. Excluding these two departments gives an average unit of funding for the other six departments of £5,600 around what would be expected from the HEFCE funding formula in 2002–03.

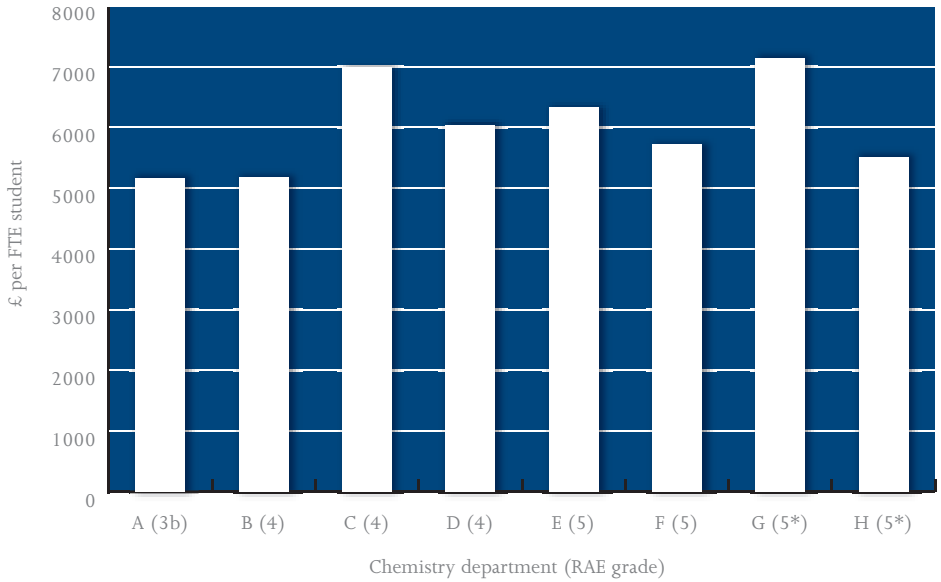


Figure 3
Publicly Funded Teaching Income per FTE student 2002–03

THE ALLOCATION OF ACADEMIC STAFF TIME

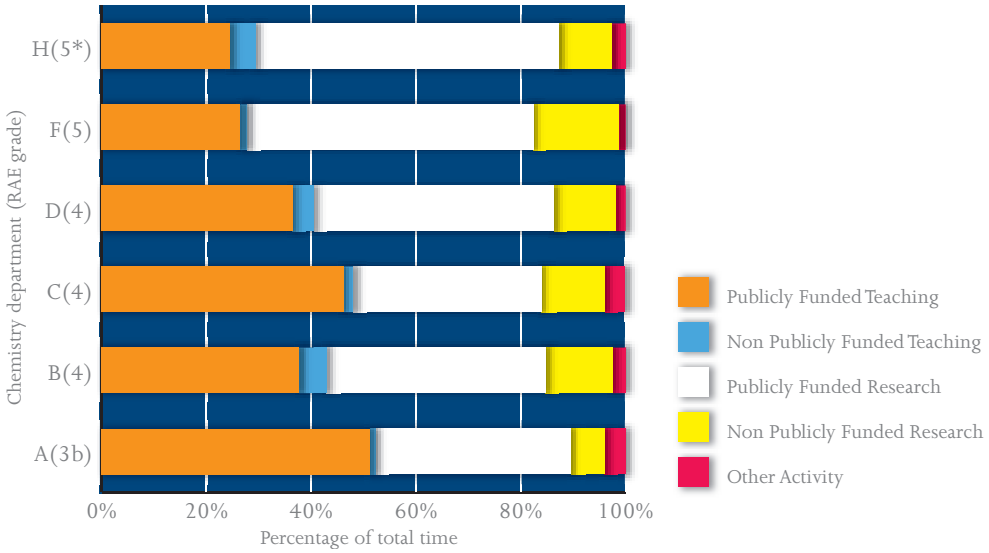
26 At the heart of the TRAC method for the allocation of costs between different activities is the allocation of academic staff time between the five main activities. Data on the allocation of academic staff time have been collected by universities in a range of ways but in all cases staff, either within a selected sample or all staff in departments, have been asked to record the percentage division of their time between these activities and support activities within a fixed period. However, this survey of staff activities was never intended to be robust at the level of individual departments: it was intended to underpin the allocation of costs to the different activities for the whole institution in the first instance in order to report whole institutional cost figures to the Funding Councils, for the first time in 2002–03. Institutions are seeking to improve the overall robustness of the time allocation data to underpin the development of full economic costing of individual research projects although there is still no requirement that data be robust at the level of individual departments.

27 Nevertheless, in six of the universities in the sample the level of returns of allocation of academic staff time obtained from chemistry departments was judged, on the basis of the proportion of staff making returns, to be sufficiently robust to rely on the data as a basis for allocating costs between the five different kinds of activity. The heads of chemistry in the universities concerned confirmed this judgement. In the case of the other two institutions the data from 2002–03 were not robust enough for this purpose, although both institutions are seeking to develop a more robust approach within full economic costing of research projects.

28 **Figure 4** shows the observed division of academic staff time between the five activities for the six chemistry departments with robust time allocation data.

29 While this shows a similar pattern to the sources of income by activity type (**Figure 2**), the proportion of time allocated to publicly funded research and to publicly funded teaching generally exceeds the proportion of total income from those activities.

Figure 4
Allocation of academic staff time by activity for selected chemistry departments in the sample: 2002–03



OVERALL FINANCIAL POSITION

30 All of the chemistry departments in the sample were operating with budget deficits in 2002–03 based on current resource allocation models. These do not yet allocate costs on a full economic costing basis, although some of the universities in the sample are contemplating moving to a full economic cost basis for their resource allocation models. These deficits were recognised by the universities and usually covered by transparent subsidies from across the university.

31 It is scarcely surprising, therefore, that all the departments in the sample showed overall deficits using the TRAC approach to costing which allocates out to budget centres all central costs and adjustments. **Figure 5** below shows the income, TRAC derived costs and overall deficits for each of the eight departments in the sample.

32 The most significant factors contributing to the observed costs of chemistry departments are the high level of dedicated space per FTE member of the permanent academic staff and the high proportion of laboratory work which undergraduates are required to undertake compared to some other disciplines, and the amount of supervision by academic staff that this entails. In most of the universities

in the sample the space costs derived using the TRAC method did not reflect the higher than average operating costs of much of the dedicated space in chemistry departments, arising in particular from the ventilation requirements promulgated by the Health and Safety Executive. Only one or two of the universities in the sample had sought to distinguish between different types of space on the basis of its cost in use. Such differentiation in types of space for costing purposes will serve to increase further the costs of chemistry relative to those of some other disciplines within universities.

33 Although all the deficits are in the range £500,000 to £3.6m they represent from just over 10% of total income to over 50% of total income.

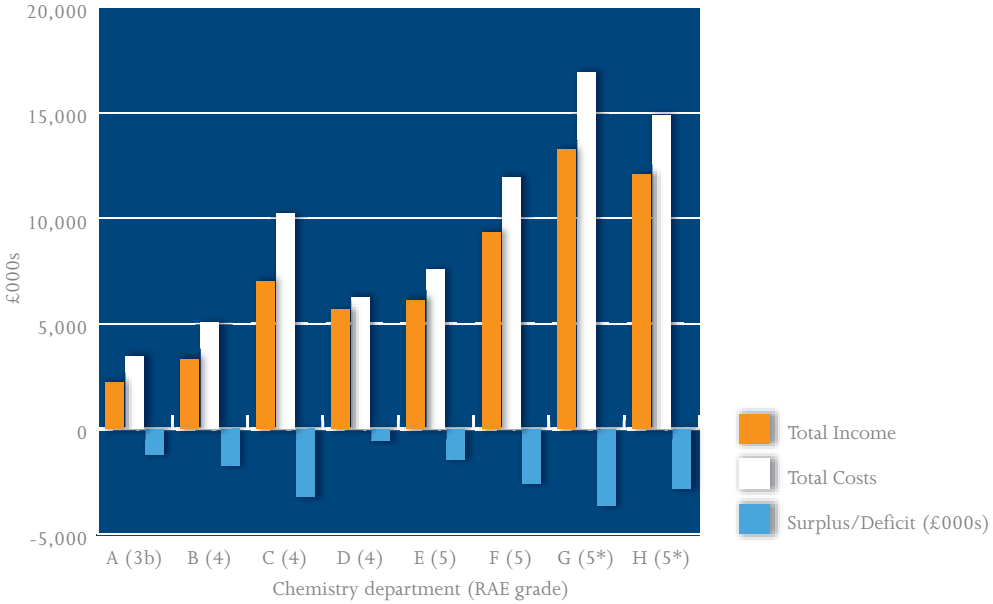


Figure 5
Overall Financial Position of sample Chemistry Departments – Income and TRAC Costs 2002–03

CONTRIBUTION TO THE DEFICITS FROM DIFFERENT ACTIVITIES

34 While non-publicly funded teaching (mainly overseas students) and other activities both contribute to the overall deficits observed in most of the chemistry departments in the sample, income from these two activities accounts for less than 10% of total income for most of the departments in the sample and at most represents only 15% of total departmental income. The three key areas for considering the source of the overall deficits are, therefore, publicly funded teaching, publicly funded research and non-publicly funded research.

35 **Figure 6** shows the relative contributions of publicly funded teaching and publicly and non-publicly funded research to the overall deficit for the six departments in the sample where it was possible to allocate costs between different activities.

36 This figure demonstrates that for all of the institutions all three activities made a significant contribution to the overall deficit in 2002–03. However for four of the six institutions non-publicly funded research made the largest contribution to the overall deficit.

37 As expected those departments with the lowest publicly funded teaching income per FTE student had the highest proportional deficit for publicly funded teaching, but the relationship is almost certainly more complex than this.

38 **Table 4** shows for example the derived student to staff ratios (SSR) for publicly funded teaching based on the academic staff time allocated to publicly funded teaching for each of the six departments.

Figure 6
Contribution to Total Deficit from Publicly Funded Teaching and Publicly and Non-publicly Funded Research 2002–03

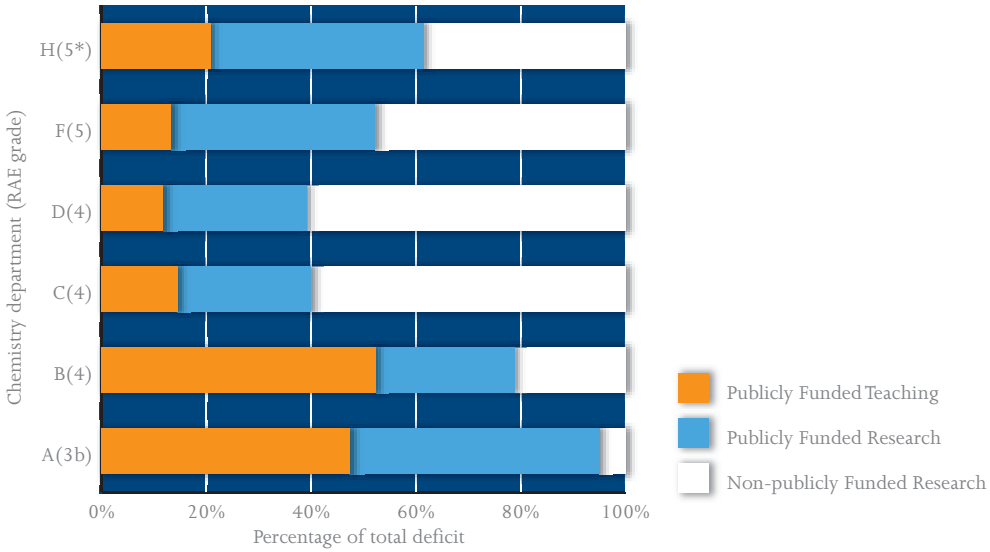


Table 4
Student to Staff Ratios for Publicly Funded Teaching for Six Chemistry Departments: 2002–03

Chemistry department (RAE grade)	Student (FTE) (a)	Academic staff (FTE) (b)	Proportion of staff time allocated to publicly funded teaching (c)	Academic staff FTE for publicly funded teaching (b) x (c)	Student staff ratio (a) / (b) x (c)
A (3b)	230.0	24.0	0.377	9.1	25.2:1
B (4)	439.0	35.0	0.463	16.2	27.9:1
C (4)	302.0	18.0	0.513	9.2	32.7:1
D (4)	229.3	29.0	0.365	10.6	21.7:1
F (5)	386.9	48.0	0.265	12.7	30.5:1
H (5*)	379.0	51.7	0.246	12.7	29.8:1

39 There is no observed correlation between SSR for publicly funded teaching and the size of the deficit on publicly funded teaching as a proportion of income.

40 It is noteworthy that most institutions in the 2002–03 TRAC exercise broke even (income within + or - 10% of costs) for publicly funded teaching as a whole. By contrast all the chemistry departments in this sample were in deficit for publicly funded teaching with only one having a deficit of less than 10% of income.

41 It is difficult to draw a precise conclusion from these data about the level of additional funding that would be required to bring most chemistry departments into surplus on publicly funded teaching. This is particularly the case with the 2002–03 TRAC derived costs data where there were significant differences in the way in which each institution applied TRAC.

42 However, under the current funding regime a significant uplift in HEFCE grant would be required, given the fixed undergraduate fee, to bring most of these departments into balance on publicly funded

teaching. The introduction of variable fees of up to £3,000 from 2006–07 would be expected to help, but not all the additional funding generated will be available to meet existing high costs.

43 The contribution of publicly funded research to the overall deficits is somewhat greater than that of publicly funded teaching, but this primarily reflects the higher level of income from publicly funded research. This is illustrated by **Figure 7** which shows the deficits for publicly funded teaching, and publicly and non-publicly funded research as a percentage of the associated income for each of the six departments where it proved possible to allocate costs to the different activities. This also shows that for most departments the largest percentage deficits by far are on non-publicly funded research.

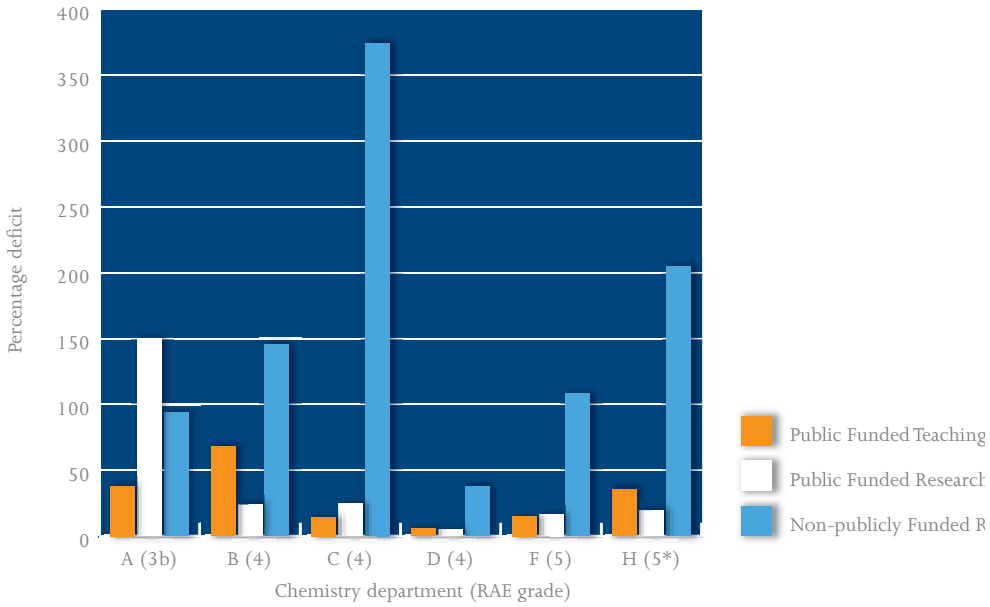


Figure 7
Percentage Deficits on Associated Income by Activity Type 2002–03

44 These data illustrate well the impact of the current system under which the public research grant funding bodies pay only a proportion of overheads. Higher RAE ratings give rise to higher levels of Funding Council grants that are able to support a higher proportion of the costs of outside contracts. Those departments with lower RAE ratings seek to raise their research grant and contract income from a lower base of Funding Council grant and end up with a higher proportionate loss. This effect is most acute for departments with an RAE score of less than 4 which no longer receive research funding from the Funding Councils other than in respect of postgraduate research students.

45 Overall the sector was in deficit on publicly funded research in 2002–03 and thus these chemistry departments were not significantly out of line.

46 It was this kind of evidence of the deficit on publicly funded research and earlier evidence of the impact of such deficits on investment in the research infrastructure that led the Government to agree that public funding bodies, including in particular the Research Councils should in future pay a higher proportion of the research overheads. This is to be implemented from 2005–06 through the full economic costing of research proposals to the Research Councils. The Government is making available increased funding from 2005–06 to the Research Councils to increase the proportion of project overheads that they can meet without reducing the volume of research that they support. Over time this percentage is expected to increase towards 100%.

47 The income for non-publicly funded research derives largely from research charities and industry. Traditionally charities do not pay towards overheads and this explains part of the deficit in this case. However, in 2002–03 income from UK research charities accounted at most for 6% of total research income for the departments in the sample.

48 The position on industrial support for research in chemistry departments is more material. Since 1995–96 the proportion of total research grant and contract income for chemistry departments in UK universities from UK industry has grown from under 15% to over 20% of the total (HESA Finance Record 1995/96 and 2002/03). This is despite significant downsizing of some major players in the chemical industry in the UK in particular the reduction in UK operations by ICI. The pharmaceutical industry, however, continues to be a major source of research income for university chemistry departments.

49 Thus chemistry departments have been competing for a smaller total of funds from large companies and have sought to sustain their industrial income by bidding for work or collaborating with smaller UK companies. Within such a competitive market and, until now, in the absence of good costing information and robust pricing policies, it seems likely that departments will have priced the work at a level well below full economic cost. Without more realistic pricing most of this non-publicly funded research will not be sustainable.

ANALYSIS AND CONCLUSIONS

50 This research has shown that using the TRAC approach to costing all eight of the chemistry departments in the sample were in deficit in 2002–03. This finding is consistent with the evidence of underlying deficits within the resource allocation models currently used by the universities that do not currently reflect the TRAC costing principles.

51 Analysing the data for the five activities – publicly and non-publicly funded teaching, publicly and non-publicly funded research and 'other' activities – was only possible for six of the chemistry departments in the sample for which the allocation of academic staff time was sufficiently robust to allocate time between activities at the level of individual departments. For these six the analysis shows that most of the departments had deficits in 2002–03 in all five activities.

52 Deficits for chemistry departments of the level identified in this study have been a major contributory factor in the decisions by individual universities to close their chemistry departments. They simply can no longer afford to cross-subsidise chemistry at the level that appears to be required.

53 Although chemistry is undoubtedly not unique in many of its characteristics, the following factors combine to contribute to its particular position:

- In 2002–03 around 80% of total income for this sample of chemistry departments was for publicly funded teaching and publicly funded research. Chemistry departments (and some others such as physics and humanities departments) are peculiarly sensitive to the extent that public funding formulae adequately reflect the full costs of delivery.
- Chemistry is an expensive subject to teach because of the amount of laboratory work that undergraduates undertake, even when compared to some other laboratory based disciplines. This requires the maintenance of properly ventilated laboratories (that may only be in use for thirty weeks of the year) and adult supervision of laboratory work by academic staff. Together these increase both the indirect and the direct costs of teaching relative to many other subjects. It is not clear that these high relative costs are fully reflected in the current formula for the funding of teaching used by HEFCE.

- Space per FTE member of academic staff is the indicator on which chemistry departments consistently show up as expensive compared to other laboratory based subjects. The difference here with physics may reflect the position in which a significant amount of physics research is conducted in national or international facilities not maintained by the University.
- In common with other disciplines heavily dependent on Research Council funding, chemistry departments have suffered from the failure of funding levels to reflect the full economic costs of research projects.
- The largest sources of non-publicly funded income in the chemistry departments in this sample (and from chemistry departments as a whole) were from research contracts with industrial companies and, to a lesser extent, with research charities. While research charities will not contribute to overhead costs, the substantial overall percentage deficits on non-publicly funded research indicate that departments are also setting prices for industrial sponsors well below the full economic cost. This reflects the absence until now of good cost data. In addition for chemistry there may be two separate factors depressing the prices charged to industrial sponsors: on the one hand the need to compete globally for research business from large multinational companies and on the other hand to develop relationships with smaller UK-based companies which may simply be unable to afford the full economic cost of the research they are seeking to sponsor or for which there are other less easily quantifiable benefits.

54 Since nearly all the chemistry departments in this study showed deficits in each of the five activities seeking to grow any one of those activities, unless that growth addresses the underlying financial imbalances, will make the financial position worse.

55 There are four developments on the horizon that are likely to improve the financial position of chemistry departments although not necessarily remove deficits altogether.

56 First the move to variable tuition fees for home full-time undergraduates in English universities from 2006–07 with the clear indication that most universities providing undergraduate chemistry courses will charge £3000 per annum. If all the additional income of £1800 per student over the current full-time fee were to be available this would increase the income of a department with 250 full-time undergraduates by £450,000 per annum by the end of year four. However, this increase in income will be offset either directly or indirectly by the costs to the universities of providing bursaries and scholarships for students from low-income families and those with the best A levels (or those who perform best at the end of the first year). Thus in 2006–07 the additional net income might be as little as £75,000 for a department with an intake of 60 with some risk to demand because of the increased indebtedness for students on graduation. This might reduce demand selectively for the four year M Chem.

57 Second, the current review by HEFCE of the teaching funding method in England could increase the level of funding for undergraduate chemistry teaching especially as HEFCE has indicated that it wishes to explore the use of TRAC cost data as a basis for the future allocation of teaching funds to institutions. However, there are a number of caveats about the possible impact of this review on funding for undergraduate chemistry teaching. The subject weightings that emerge will, as now, reflect the relative average costs of all the subjects in each academic subject group. Thus if HEFCE stays with its current four groups, it will only be if the relativities change substantially using the TRAC approach, rather than the current direct expenditure approach, will the weightings of individual subject groups change. Furthermore any change in the weightings will be damped because the total funding available will be unchanged. Finally it remains unclear how HEFCE will adapt its funding method to reflect the variable tuition fee regime. It is also worth noting that although the unit of teaching resource was substantially higher in Scotland in 2002–03, the Scottish institution in the sample was still in deficit on its publicly funded teaching.

58 Thirdly, the move to full economic costing of research projects funded by Research Councils and government departments should improve the financial position of publicly funded research in chemistry departments. With the provision of additional funding by the Government to meet a significantly higher proportion of project overheads than now - the current estimate is for grants to be based on 80% of overheads funded from 2006–07 with a move over time to funding 100%. Project income should increase by 10–15% without any increase in costs. Given the high reliance of chemistry departments on Research Council funding and the high proportion of deficits in the sample departments attributable to publicly funded research, the move to fund a higher proportion of overheads should help the overall financial position of chemistry departments provided they can sustain the current volume of research projects.

59 Furthermore, the move to full economic costing for Research Council projects will be augmented by increases in Funding Council research grants. However, as well illustrated in the application of a revised funding formula for HEFCE R grant for 2005–06 there can be no guarantee that this increase will be reflected in increased allocations to chemistry departments.

60 Fourthly, the improved systems being developed by universities under TRAC should provide an improved basis for pricing research projects funded by UK industry. This, together with the decision by the Funding Councils to use some of the additional funding for research made available by the Government to increase the funding available for projects sponsored by research charities through partnership funding, should help to reduce the deficits on non-publicly funded research.

61 Despite the potentially positive effects of these prospective changes in public funding, it seems clear that chemistry departments will need to continue to explore with their universities ways of generating additional teaching income on the current cost base in a sustainable fashion and identifying ways of reducing the cost base if they are to obtain long-term financial security. They will have to continue to review the cost consequences of their pedagogic approach, bearing in mind the **Royal Society of Chemistry**'s requirements for recognition. They will also need to explore increasing prices towards the full economic costs for research undertaken for industrial clients taking full account of the markets they are operating in.

62 Departments clearly also have to plan for the next RAE in 2008. With the continuing pressures for concentration of research funding, departments will wish to continue to improve their performance in the RAE and be under pressure from their universities to do so. However, as the analysis in this report shows even a 5* rating is not sufficient to avoid an overall deficit.

ACKNOWLEDGMENTS

I am most grateful to the staff in the chemistry, finance and planning departments in the eight universities which agreed to participate in this study. In particular I am grateful for their forbearance in answering my many supplementary questions.

I am also grateful to Melanie Burdett and Jim Port of JM Consulting Ltd for their willingness to assist me in developing the list of questions, developing my own understanding of the Transparent Approach to Costing (TRAC) method and offering a critique of the emerging results.

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