Review of research cost relativities based on the Transparent Approach to Costing (TRAC) methodology

Report by J M Consulting to the UK higher education funding bodies

October 2011

Executive Summary

1. This is the Executive Summary of the final report of a study carried out by J M Consulting between 2007 and 2011 which designed and implemented a costing method (called TRAC–RCR) for calculating research cost relativities (RCR) using Transparent Approach to Costing (TRAC) data. The aim was to produce research cost relativities that could be used by the higher education funding bodies for England, Northern Ireland, Scotland and Wales to inform the subject cost weights that they use in their research funding methods.

2. The funding bodies have not yet made any decision about whether they will use this data. If they do decide to do so, there are a number of different approaches that could be taken, as described below.

The methodology

3. After an investigative study by J M Consulting in 2007, TRAC-RCR was developed and tested by 17 pilot institutions using academic year 2007/08 data. The methodology was slightly simplified and then rolled out to 46 institutions that produced data for 2008/09 and 2009/10. In the second year, significant differences from average data, and from the previous year's data, were investigated, which should have added to the robustness. Significant outliers are excluded from all data reported here.

4. An advisory group provided valuable input to the study. This included representatives from the four funding bodies and Universities UK, as well as a Finance Director and Pro-Vice-Chancellor for Research. Membership is given in Annex 1.

5. The research cost data and staff and student numbers in this study are those produced from annual TRAC. All definitions are those from TRAC. The methodology mirrors as closely as possible that used in TRAC (T) (which produces a cost per student for each subject), but there are differences in the two methods, arising from the different characteristics of Research from Teaching.

6. The 46 institutions participating in the study covered the UK and included 37 in England; 6 in Scotland; 2 in Wales; and 1 from Northern Ireland. Whilst the sample was biased towards research-intensive institutions (to ensure sufficient data was provided for each subject) it also included less-research institutions and specialist institutions. Participating institutions cover just over 80% of research activity (costs) in the sector. (Despite this, in two subjects the sample size was not sufficient to provide useable data.)

7. The RCRs produced by this study were considered by participating institutions to be more relevant than those that could be calculated from HESA data (which includes Teaching and Other activity, and excludes the costs of central services and estates).

8. The costing method in this study did not seek to replicate or interpret how research funding works – it merely sought to develop research cost relativities that reflect the cost profiles of research activity.

9. The study was originally designed to last two years, but it could be repeated in subsequent years if required. It only requires an institution a few days a year to produce the data. Alternatively, there is sufficient information contained in the

Technical Report to allow the methods to be dusted off and implemented for a second round of data collection in a few years' time, if considered appropriate. **There will continue to be variability in the year on year data, particularly in the next couple of years with the changing economic climate, and many institutions would be keen to have the most up-to-date and robust data used in the funding models.**

How the research cost relativities are calculated and shown

10. Research cost relativities are calculated for each subject, each of which is categorised into a HESA academic cost centre. **If they are to be used to inform funding allocations, the funding bodies would need to map these onto the subject typology that they will be using in their funding models.**

11. Each subject is then classified into one of five subject groups (see paragraph 19). Research cost relativities are then produced for each subject group. The classification of subjects to the subject groups was carried out merely for this study, to assist in understanding the results: it does not attempt to pre-determine the classification that would be made for research funding methods.

12. Most of the RCRs are based on a comparison of research costs divided by full-time equivalent staff:

    - research costs are those from annual TRAC. They therefore include all direct costs and indirect expenditure (indirect costs, estates, TRAC adjustments). All research costs are included, irrespective of how they are funded;
    - full-time equivalent (FTE) staff are those from annual TRAC. They are calculated from the direct time spent on Research by academic staff as established in annual TRAC. Research assistant FTEs are not included.

13. The focus in this study was to derive the relative costs of each subject, and definitions were designed to achieve this. **However, this means that the cost relativities calculated under this study use completely different definitions for FTEs than those used by the funding bodies in their funding methods.**

14. Each cost/FTE was compared to the cost/FTE calculated for the humanities/social science subject group (v) which was effectively assigned a research cost relativity of 1.00

15. Figures for every subject and subject group are shown separately for three types of research activity: Institution/Own Funded (I/O) research (research without an external sponsor); Postgraduate Research Student (PGR) research (costs associated with the training and supervision of PGRs); and Research Grants and Contracts (RG&C) research (research projects with external sponsors). TRAC definitions are used.

16. Unlike I/O and RG&C, RCRs for PGRs are calculated as research costs divided by full-time PGR student numbers (not academic staff). These are not weighted (as those in TRAC are).

17. Costs associated with all research activity were included, irrespective of how it was funded. The logic here was that (a) the focus of the study was on activities and costs, not how it was funded; (b) it would be anyway too difficult to analyse-costs at this level. Therefore, the costs and FTEs include those funded by the Research Councils, charities and European Commission, as well as industry and overseas governments. All I/O Research activity was included – this might be funded through funding body grant, institutional income or other income.

Costs covered by capital grants and other non-recurrent income from the funding bodies were also included. All PGR student costs and activity were included, including those for overseas students.

18. The research costs of all departments in all participating institutions were included, irrespective of any quality considerations – for example whether the department submitted in the 2008 Research Assessment Exercise and how it was rated. Data from the pilot year showed that it was very difficult to set a quality factor against an institution's activity in a HESA cost centre and, even when this was attempted, there was no obvious correlation of quality to cost shown in the RCRs.

Key findings

19. The cost relativities for 2009/10 derived from the 46 participating institutions are shown in Tables 7 and 8 in Annex 3. They are shown here by subject group:

Average cost relativity for sector, by subject group	I/O	PGR (including all stipends)	RG&C (excluding stipends)	I/O and RG&C	Total research
	(a)	(b)	(c)	(d)	(e)
i medicine & dentistry	2.29	2.30	3.41	4.28	3.71
ii laboratory-based science	1.86	2.06	2.53	2.96	2.92
iii intermediate cost	1.25	1.39	1.34	1.48	1.45
iv business & management	1.23	1.51	0.99	1.19	1.14
v humanities & social sciences	1.00	1.00	1.00	1.00	1.00

20. The cost relativities for all research activity (column (e)) **show very different cost relativities from the cost weights currently used in the funding bodies' research funding models** (or that could be calculated from HESA), with the exception of intermediate cost subjects (iii).

21. The cost relativities for the individual subjects assigned to each subject group (for the purposes of this study) vary widely. **If used to inform a funding model, the allocation of subjects to subject groups would need to be reviewed, as well as the number of subject groups.**

22. Medicine & dentistry (i) shows the highest cost relativity for all types of research. It is followed by laboratory-based science subjects (ii). Intermediate cost subjects (iii) and business & management (iv) show cost levels that are much closer to those of humanities &social science subjects (v).

23. The research cost relativities for RG&C activity (column (c)) in medicine & dentistry (i) and laboratory-based science subjects (ii) are significantly higher than those for I/O activity (column (a)). Externally funded work in the physical sciences generally requires more resources (Research Assistants, consumables, equipment and estates) than work without an external sponsor.

24. RG&C activity in medicine & dentistry (i) and laboratory-based science (ii) accounts for 83% and 70% of costs: in humanities & social sciences (v) it is much lower at 38%. This is reversed with I/O activity which in medicine & dentistry and laboratory-based science accounts for around 10% of costs, whereas in humanities & social sciences it is over 40%.

25. Research Assistant FTEs have not been used in the cost/FTE calculation that lies behind the research cost relativities shown here. **Some of the funding bodies may like to consider the inclusion of Research Assistant FTEs, possibly weighted. This could be appropriate if the staff numbers used as a volume indicator in the funding models include any Research Assistants. This would have the impact of flattening the relativities, potentially to a significant extent.**

26. PGR cost relativities (column (b)) were considered by participating institutions to be the least robust of all the figures. **Funding bodies may not therefore wish to use separate cost relativities for PGR funding.**

27. The total RCRs (column (e)) reflect volumes of activity. As RG&C make up nearly 70% of total research costs, **the cost relativities for RG&C have a significant impact on total cost relativities.**

28. However, the total cost relativities (columns (d) and (e)) are almost always higher than the cost relativities of each activity. The reason for this is given in detail at the end of section 4 of the technical report. **This has meant that a comparatively small volume of I/O activity in group (v) pulls the total research cost relativity higher.**

Use of the data

29. There are several ways in which the relativities could be calculated from the data available in this study. It would be appropriate to study these carefully to help inform how the relativities might be used.

30. There is a considerable amount of change taking place in the allocation of research funding, in which research cost relativities play only a small part. Final decisions on these have not been made, and will be different in the four countries. Any implementation arising from this study would be part of a package of measures in the research funding models, probably linked to the implementation of the Research Excellence Framework. It is therefore unlikely that the research cost weights in the funding bodies' research funding methods will be revised in the near future.

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1 Terms of reference

1.1 This study was designed to produce cost weights for research from Transparent Approach to Costing (TRAC) data that could be used to inform the funding bodies' research funding methods. Subject cost weights are currently used to inform the funding bodies' research grant allocations.[1] The Higher Education Funding Council for England (HEFCE) has made a commitment to review weights periodically and this study investigated the feasibility of calculating them using a TRAC-based approach.

1.2 The study was initiated by HEFCE, initially as a pilot study in 2009, with the aim of understanding to what extent TRAC-based subject cost relativities differed from the current ones, which are based on Higher Education Statistics Agency (HESA) expenditure data; and to inform their consideration of whether the current cost weights should be updated. Institutions and funding bodies from all four countries participated in the study in the first full year of data collection following the pilot year.

1.3 The design of the costing method used in this study was based on four studies:

- TRAC[2], which provides the data on costs allocated to Research used in this model. These costs are reported as part of an annual accountability exercise that has now been carried out for nearly ten years;
- TRAC (T) methods, which produce data to inform cost weights for teaching in England, Scotland and Northern Ireland. These compare a cost per student full-time equivalent (FTE) across each HESA academic cost centre;
- preparatory work on a method for costing research carried out by J M Consulting in 2007/08;
- work by 17 pilot institutions in 2009 (academic year 2007/08 data) which calculated illustrative weights and was used to develop the methodology.

1.4 In this report, the following terminology is used:

- 'cost relativities' are the comparative cost levels of different subjects. These are expressed by way of a comparison with the cost level for subject group (v) which is set at 1.0[3]
- 'subject' is a HESA academic cost centre;

[1] See, for example, HEFCE 2010/24 Guide to Funding: How HEFCE allocates its funds.

[2] http://www.hefce.ac.uk/finance/fundinghe/trac/tdg/FSSGJuly2009.pdf is a policy overview describing TRAC and its use.

[3] HEFCE uses the term 'cost weights' in its research funding method. Cost weights of 1.6, 1.3 and 1.0 for subject groups A, B and C are used by HEFCE, HEFCW and DELNI. SFC uses cost weights of 1.6 (high), 1.2 (medium) and 1.0 (low).

- ‘subject group’ is a number of subjects grouped together.

1.5 This study produces a set of research costs per academic staff member, and per postgraduate research student (PGR), for each HESA academic cost centre.[4] This data has been produced for two years, for a sample of institutions across the UK higher education sector, which helps to show year on year variations.

1.6 A considerable amount of change is taking place in the allocation of research funding, in which research cost relativities play only a small part. Final decisions on some of these changes have not yet been made (and will anyway be different in the four countries). These changes include:

- the replacement of the Research Assessment Exercise (RAE) by the Research Excellence Framework (REF);
- changes in the number and configuration of the Units of Assessment (UoAs) previously used in the RAE;
- changes in the HESA staff record (e.g. the way some clinical and academic staff are defined and included);
- changes in the research funding models (e.g. the exclusion of minor volume factors such as Research Assistant FTEs).

1.7 Therefore any implementation arising from this study would be part of a package of measures in the research funding models – possibly following the first REF. As results from the REF will not be known until 2014, it is very unlikely that the cost weights will be revised in the near future. They would not be likely to inform funding allocations before 2015/16. It is the funding bodies’ usual practice to consult the sector before introducing significant changes to funding methods.

1.8 Currently the funding bodies each use a single set of cost relativities covering all research activities (i.e. they do not disaggregate further by type of activity and/or research sponsor). Whether this continues to be the case will be a decision for each funding body. To help inform these decisions, the study was designed to show the cost relativities separately for each of:

- research funded by external research sponsors (research grants and contracts, RG&C);
- institution/own-funded Research (I/O research);
- PGR activity.

2 Background

2.1 A consultation in 2005 by HEFCE found support from institutions for a proposal to base the subject cost weights used in the funding method for research on data from TRAC, rather than from HESA. This followed the introduction of TRAC (T) (cost relativities for Teaching) across England, Northern Ireland and

[4] Definitions are provided in the section “Methodology”, below.

Scotland, with the aim both of informing funding bodies' funding methods for teaching, and of providing useful information for institutional managers.

2.2 J M Consulting produced a technical report in May 2007 which discussed the use of a TRAC costing method to provide cost relativities for research (unpublished).

2.3 An outline design for a suitable costing system was provided, however the report identified some challenges which would need to be considered in a detailed design stage:

- in research, unlike in teaching, there is no common unit of 'output' activity (which in teaching, is the student who has achieved their learning objective);
- the funding council methodologies in their allocation of research funds draw heavily upon measures of 'input' activity (academic staff and researchers) which are not based on either annual data nor on TRAC data;
- Units of Assessment are used to describe different subject areas in research. These are different from the HESA academic cost centres used (to a large extent) in the funding of Teaching, and in TRAC (T);
- there is complexity of research funding where funding council funding might be used to help cover the full economic cost of some publicly-funded (PF) contracts (e.g. funded by the Research Councils (RCs), other government departments (OGDs), and European Commission (EC)), but also used to provide funding for PGR activity, and also to make the major contribution to I/O activity which by definition does not have an external sponsor.

2.4 To assist in addressing these challenges of scope, application and definitions, testing and development work was carried out in a pilot year in 2009. This involved 17 institutions in England and Scotland that produced a range of data based on 2007/08 figures.

2.5 The final costing methodology was developed from this pilot exercise: this involves a simpler set of methods and data reporting than that undertaken in the pilot year. 46 institutions then recorded data for the financial year 2008/09, reporting in February 2010; and for 2009/10, reporting in February 2011. These included the pilot institutions and additional institutions from England, Scotland, Wales and Northern Ireland. A list of participating institutions is at Annex 1.

2.6 Institutions returned data using the same definitions and format for both years. The proforma used for the institutional returns for 2009/10 is given in Annex 4.

2.7 Workshops were held in both 2010 and 2011 at which participating institutions reviewed and discussed the data, to provide a better understanding of issues and findings.

2.8 An advisory group comprising colleagues from the funding bodies, institutions and Universities UK (UUK) provided advice to the consultants. Its membership is at Annex 1.

2.9 An interim report, based on 2008/09 data, was produced in November 2010, and circulated for comment to all participating institutions as well as to the

advisory group. This final report has significantly the same format and content as the interim report.

3 Methodology

3.1 The main principles incorporated into the design of the cost approach are described first in section A below.

3.2 Section B briefly summarises the methodology actually used by institutions. Annex 4 is a copy of the input form completed by institutions.

3.3 A summary of the output benchmarking tables is given in section C. Annexes 2 and 3 are copies of the results from the two years. These consist of a set of tables and a set of figures, for each year.

A. Approach to costing

3.4 The costing method was designed around the following principles:

TRAC

3.5 The costs and FTEs were based on the annual TRAC data on Research (submitted by all institutions at the end of January each year). In light of their subsequent work for this study, institutions could make changes to annual TRAC returns only to correct errors, in which case they would have to resubmit their annual TRAC return and (possibly) the TRAC (T) return. In practice, no problems arose in this area.

3.6 A minimal burden was placed on institutions. The study required no additional analysis or collection of data within their institution that were not readily available. The only challenge was in ensuring that the costs of research, and staff doing that research, were recorded against the same HESA academic cost centre.

Research sponsor types

3.7 Similar research carried out for different types of external sponsor was assumed to show similar cost relativities. Therefore, all externally sponsored activity (research grants and contracts, or RG&C) was reported as one total.

3.8 Research activity carried out for all external sponsors was included, irrespective of whether supporting the costs for a particular sponsor group is an eligible use of research funding received from the funding bodies.

3.9 It was considered likely that I/O research would show different cost relativities from externally sponsored research. Therefore I/O research was reported separately from RG&C.

3.10 The method recognised the complexities and problems of getting good quality information on PGR activity. So the costs of this activity were also reported separately.

3.11 In addition, the costs of PGR scholarships, stipends, and maintenance that are covered by external RG&C were reported separately. These were then reported under the PGR research sponsor type, rather than RG&C. See paragraph 3.20

Subject classifications

3.12 Costs were collected, and cost relativities calculated, for subject areas defined in terms of HESA academic cost centres, not UoAs, nor any new subject divisions that might be considered for the REF. This required institutions to allocate their costs and FTEs from their own departments and schools to HESA academic cost centres. (It is of note that none of the research funding methods currently uses HESA academic cost centre information, so the cost relativities derived from this study would need to be mapped onto the subject groups used for funding.)

3.13 In the first year, institutions were asked to split medicine and dentistry (CC01 and CC02 HESA academic cost centres) into clinical and non-clinical disciplines, to reflect the then emerging thinking on how REF UoAs might be configured. However, as no clear definitions were available, and data is not held this way in institutions, no institution was able to split the cost and FTE data in this way. Costs were therefore not reported separately for clinical and non-clinical research.

3.14 To assist with comparisons and understanding of the data, subjects were assigned to one of five subject groups:

i. medicine and dentistry (each covering both clinical and non-clinical);

ii. laboratory-based science subjects;

iii. intermediate cost subjects;

iv. business and management subjects;

v. humanities and social sciences subjects.

3.15 The assignment of subjects to subject groups broadly (but not exactly) correlates to the classifications used by HEFCE in their research funding model.

3.16 This classification was only done to assist in reviewing the data. It is important to note that it does not in any way pre-determine decisions that the funding bodies might take regarding the number of groups and the classification of subjects to them.

Calculation of cost relativities

3.17 Research activity in each HESA academic cost centre was expressed in terms of a cost per staff FTE or cost per student FTE. These were then compared to the average data for the sector for subject group (v). That is, each sector cost/FTE figure for every subject and subject group was divided by the average cost/FTE for group (v) to arrive at the cost differential or relativity from (v). Subject group (v) therefore is reported with a cost relativity of 1.0

3.18 All costs were included, even if some of them are not funded wholly or in part by the funding bodies' research funding. Treatment of costs in the following areas was specifically considered during the pilot year:

- building costs which might be partly funded through capital funding, not recurrent research funding;
- research libraries, some of which receive non-formula funding from HEFCE;
- equipment costs, some of which might be 100% funded by some research sponsors (i.e. no funding council funding is used);
- PGR stipends (scholarships, maintenance payments) which again might be 100% funded by some research sponsors.

3.19 The first three items were included where they were reported under TRAC because (a) they do not have a material impact on the cost relativities; (b) they are difficult to establish (and this was burdensome to institutions) which leads to a loss in robustness; and (c) the focus of the study is on costing activities, not how they are funded.

3.20 The last item, PGR stipends, is considered material, and could be more easily identified. They were recorded separately from RG&C, and were excluded from any figures reported on RG&C costs. They were included in PGR costs.

Staff and student FTEs

3.21 The calculated activity figure (cost/FTE) was deemed to reflect the real relationship between costs and staff/student numbers – it was not an artificial or contrived relationship. This meant that the numerator (costs) and denominator (staff or student FTEs) of the activity figure relate to the same research activity, in the same year. This was ensured through the use of TRAC staff numbers (direct time allocated to Research) in the denominator of the cost/FTE calculation. The Research time of all academic staff was included, not only those staff selected for submission to the RAE (which, broadly, related to 2007 activity, and covered their contracted time including on Teaching and Other activities, not just their time on Research activity).

3.22 Similarly all PGR students were included in the denominator, not only funding council-fundable PGRs (only the latter are included in the research funding calculations). These PGR numbers were not weighted (as they are in the calculation of the indirect cost rates in TRAC).

3.23 The direct research time of academic staff provided the staff FTE denominator. Research Assistant (RA) numbers are not now used in the HEFCE funding method (except where they are eligible to be returned in the RAE and, in future, the REF, on the same basis as academic staff because they meet the strictly defined eligibility criteria set out in RAE/REF guidance). They are, however, used in the funding methods used in Scotland, Wales and Northern Ireland, and therefore data on RA FTEs was collected during this exercise so that they could be added into the denominator if wished.

Quality factors

3.24 Cost relativities were established from data from all departments in the participating institutions. All departments' costs were equally weighted, i.e. they were not excluded or weighted more or less heavily due to any quality assessment (whether on the basis of RAE results, or another method – see next paragraph).

3.25 Although quality factors are used in funding bodies' research funding models, they were not taken into account here. Data from the pilot year showed that (a) it was very difficult to set a 'quality' factor against each HEI's HESA academic cost centres due to challenges in timing, departments' mapping to UoAs and to HESA academic cost centres, staff classification, and so on; (b) even when a first attempt at this was done in the pilot year (using 'departments with the higher amount of quality-related research 'QR funding' as a proxy), there was no obvious correlation in the cost relativities.

3.26 It is also for institutions to decide where and how they spend their funding council research funding, and it was considered inappropriate to try to build this into a costing model.

Participating institutions

3.27 The cost relativity for each HESA academic cost centre was informed by data derived from a sample of institutions in the sector selected by HEFCE and the other funding bodies. This was not a random sample: it was designed to include institutions who received the majority of funding body recurrent research funding; plus a number of specialist institutions and institutions receiving smaller research funding allocations; and to cover the four countries. The sample was constructed to provide useable data if only the institutions in England were included; but also has a strong representation from Scotland (six institutions) and Northern Ireland, and includes two institutions in Wales. Patterns of research activity and cost profiles were not considered to be likely to differ by country.

3.28 The size of the sample was set at a level that recognised that some institutions do not have robust time allocation at the department level.

3.29 The methods do not form part of the formal TRAC guidance and were designed to be implemented by a sample of institutions in the sector for a two year period only (after the pilot year). However, they could be used in subsequent years, and this is discussed below.

Research funding

3.30 This study, and the calculation of the cost relativities by subject group, does not prejudge any decision by the funding bodies on how many subject groups there will be, what the cost relativities will be, or how subjects will be allocated to them.

3.31 The study sought to develop cost relativities for research that reflect the actual costs of different types of research activity in institutions rather than how research funding is allocated by funders, or used in institutions.

B. The method

3.32 The work required from each participating institution included the following:

1	Total Research costs in each department are taken from annual TRAC, separately for each of: ○ I/O research ○ PGRs ○ all RG&C. Annual TRAC costs (and TRAC (T) costs) are adjusted and resubmitted if the work done in this exercise shows that they were incorrect. However, they are not adjusted if there is no error. Methods and assumptions (for example for allocating the time clinical academics spent on Other (clinical services) between teaching and research) remain the same in all three costing models.
2	The costs of scholarships, stipends and fee remissions are excluded from RG&C, and are reported under the PGR research sponsor category. Only identifiable costs are excluded (some stipends may form part of wages and cannot easily be identified separately from salary costs of research staff). Any scholarships, stipends and fee remissions posted to the PGR research sponsor category remain in that category. (Pilot data showed that some institutions post all of these costs to the PGR research sponsor category; others split their allocations between PGRs and RG&C.)
3	All other costs are included. Therefore infrastructure costs, the cost adjustments, and costs of research libraries are left in. No analysis of the type of cost in each cost centre or research sponsor type is done as part of this exercise.
4	Academic departments' costs are mapped onto cost centres in a way that reflects research activity, not teaching or total activity. These costs provide the top-line, or numerator, of the cost/FTE figure. The key here is to ensure the costs of research and the staff FTEs working on that research (see (7) below) are allocated to the same cost centre. Taught student numbers and RAE submissions are not very relevant. If it is easiest, a simple mapping of a department to one or more cost centres can be done that reflects the department's name (which may not reflect the subject categorisation of all types of research undertaken in that department).
5	The FTEs that reflect the direct time of academic staff working on the Research in each academic department are identified. FTEs are defined in exactly the same way as in the TRAC Research indirect cost rate calculation. The FTEs exclude Research Assistants. However, the number of RA FTEs is recorded because SFC, HEFCW and DELNI (and to a much lesser extent, HEFCE – see paragraph 3.23) do use RA numbers to drive part of their funding allocations, and need to be able to understand the potential impact of these staff on the calculations. RAE-submitted staff numbers are not relevant to or recorded as part of this exercise as they are not a robust indication of the staff numbers now driving costs in each subject area. This is notwithstanding any current policies of the funding bodies to allocate funds on the basis of RAE-submitted staff numbers.

	Academic staff FTEs (their direct Research time) – excluding RAs – then provide the bottom-line, or denominator, of the cost/staff FTE.
6	The PGR student FTEs supported in each department are identified. These are the same as those in the TRAC Research indirect cost rate calculation. They therefore include overseas students.
7	Academic staff research FTEs and PGR FTEs in each academic department are mapped onto one or more HESA academic cost centres. The staff and students are mapped onto the HESA academic cost centre containing their costs (i.e. direct research costs, RAs working on their projects, scholarship/stipends (unless they were posted to RG&C), salaries, associated academic department, central service department, and estates costs, as well as the cost adjustments).

3.33 Institutions completed a spreadsheet input form – see Annex 4. The following calculations were made automatically as data was entered:

- a research cost per academic Research FTE (for each of I/O and RG&C) for each of the 34 HESA academic cost centres;
- a research cost per PGR FTE (using costs in the PGR research sponsor type) for each HESA academic cost centre;

3.34 Additional calculations were made as part of the benchmarking analysis:

- a baseline cost relativity of 1.0 from subjects mapped (for the purposes of this study) onto subject group (v);
- cost relativities from this baseline, separately for each HESA academic cost centre;
- comparative cost relativities for subject groups (i) to (v) based on a pre-determined classification of HESA academic cost centres into subject groups.

3.35 The classification of each subject to a subject group is shown in the tables and figures in Annexes 2 and 3 (see for example Table 1). Whilst loosely based on the classifications HEFCE currently uses in its research funding model, it is important to note that:

- some subjects are allocated to more than one subject group in the HEFCE research funding model (e.g. maths) – that was not done in the costing exercise;
- neither the HEFCE research funding model nor this costing exercise split clinical medicine or dentistry (CC01 and CC02) into clinical and non-clinical research;
- a separate subject group ‘business and management’ was split out from humanities and social sciences for the purposes of the costing model because it was felt the costs may show different relativities from other humanities and social sciences subjects, the volumes may be large, and there might be no strong rationale for reflecting the higher costs in the funding bodies’ funding models (such as, for example, the higher salaries of staff engaged in predominantly non-research activities, such as teaching on MBA programmes);
- none of this pre-determines any decision on the classification of subjects in future research funding models.

3.36 Two years of data were collected. The data was not compared with that from the pilot year (2007/08) as methods and definitions had changed significantly.

3.37 46 institutions participated in both 2008/09 and 2009/10. These included the 17 pilot institutions. They are listed in Annex 1 and were from the following countries:

37 England
6 Scotland
2 Wales
1 Northern Ireland

3.38 The pilot institutions had access to technical support (from Melanie Burdett at J M Consulting). Data was produced by institutions by the end of February in each year 2010 and 2011, and benchmark tables and graphs were then produced by HEFCE. Workshops were held in May 2010 and 2011 to discuss findings.

C. Benchmark tables

3.39 Participating institutions received a copy of data for their institution, benchmarked against sector figures. Annexes 2 and 3 show figures for the sector as a whole (only the plots/scatter graphs show data at institutional level, anonymised). The reports and graphs were produced on the same basis for both years.

3.40 All reports showed mean (average), median, and upper and lower quartiles. Outliers were excluded in both sets of data. Where the number of institutions returning data to one cost centre was too small (risking their identification), data for that cost centre was not shown in the sector figures.

3.41 Twelve tables were produced, in a set of six pairs of tables. Each pair showed firstly the results for each HESA academic cost centre, and then the results for the five subject areas:

i. medicine and dentistry
ii. laboratory-based science subjects
iii. intermediate cost subjects
iv. business and management subjects
v. humanities and social sciences subjects.

3.42 The tables, replicated in full in Annex 2 (2008/09 data) and Annex 3 (2009/10 data), were as follows:

Tables 1 and 2: Costs per TRAC: total costs of research

Tables 1b and 2b: PGR costs per TRAC: PGR costs

Tables 3 and 4: FTEs per TRAC: academic FTEs direct time on Research)

Tables 5 and 6: Research cost per FTE (for each of I/O, PGR and RG&C)

Tables 7 and 8: Cost relativities (with the sector results for group (v) set as the baseline 1.0

Tables 9 and 10: Research Assistants per TRAC (FTEs). These were not included in the tables or calculations reported in Tables 1 to 8.

3.43 Graphs were also produced. These were titled 'figures' and are replicated in full in Annex 2 (2008/09 data) and Annex 3 (2009/10 data). The graphs were as follows:

Figure 1: Volumes of activity: research costs for each subject group, by sponsor type (data from Table 2a)

Figure 2: Research cost per staff FTE: for each subject group, by sponsor type (data from Table 6)

Figure 3: Total research cost relativities: for each cost centre, by subject group (data from Table 7)

Figure 4: Research cost relativities: by sponsor type, grouped by subject group (data from Table 8)

Plots: Total research cost per FTE and academic staff FTEs for each cost centre. These scatter graphs show individual institutional data (institutions are not identifiable).

4 Key findings

4.1 These findings were developed from a review of the data and discussions at the workshops and advisory group meetings. In general they refer to 2009/10 data, but also refer to 2008/09 data where differences are of interest. The thrust of most of the key findings however applies to both years, and almost all findings were mentioned in the interim report produced in November 2010 (2008/09 data only).

The methodology and quality of the data

a. The methodology

4.2 Overall, the methodology proved to be fit for purpose. It uses data from TRAC, which is a suite of costing methods relied upon as a key accountability measure by funders. A considerable amount of work is done by institutions in producing the annual TRAC data (from which these research costs are drawn), and by funders in overseeing its quality.

4.3 The cost weights currently used by some of the funding bodies were originally informed by HESA data. (Other funding bodies used different mechanisms.)

4.4 TRAC is a better reflection of the relative costs of research than HESA data as it is more focussed. The following are the key differences between cost relativities based on TRAC data and those based on HESA data:

Research costing method	based on TRAC data	based on HESA data
Costs	All relevant research costs making up the full economic cost. Includes central departments, estates, and the two TRAC cost adjustments.	Academic department expenditure only, so excludes that in central departments, and estates. Not including the TRAC cost adjustments (infrastructure and the Return for Financing and Investment, RFI). Includes all department costs, covering teaching and other activities as well as those of research. Direct costs of research grants and contracts are reported separately and may not be included in the relativity calculations.
FTEs	Direct time of academic staff that they spend on research. In most institutions this matches with the year in which the costs are incurred. No teaching time is included. The analysis of work is based on the amount of time staff were in post during the year.	Numbers of academic staff from HESA (all staff for whom the institution is liable to pay Class 1 National Insurance contributions and/or who have a contract of employment with the institution) – which would include staff who do not do any research. Includes all activity of academic staff including teaching and other activity. It is possible to select only staff whose main source of salary is general institutional funds. All staff who meet the criteria for inclusion at any time during the year are recorded – although start and finish dates can be used.
		Alternatively, numbers of staff entered into the RAE – which is based on a survey at a census point for the most recent RAE, possibly several years earlier.

b. Allocation to cost centres

4.5 Of course the costing work did involve some challenges for institutions, and the relativities will only be as good as the TRAC data and allocations behind them. In particular, TRAC data at the level of department is not robust in all institutions. (This lack of robustness at department level is of course also a feature in TRAC (T) and HESA data).

4.6 Institutions had problems, as expected, where they had to allocate the costs of some departments to more than one cost centre. This was the area where

institutions had to do most work, and proved the most challenging (as in TRAC (T) and HESA methods). However, it was mainly only a problem for institutions that had fewer numbers of departments. Although quite a number of institutions were planning to consolidate into fewer departments, this did not yet impact on the 2008/09 or 2009/10 data used in this study.

4.7 The departments that were most named as giving difficulties in the allocation to cost centres were medicine and biochemistry; and the rationale for allocations to the general and specific engineering subject areas seemed to vary widely (as in HESA reporting). Even so, overall, most participating institutions did not consider that this had a significantly adverse impact on the robustness of the sector data.

4.8 As previously mentioned, it was not possible to split CC01 and CC02 ('clinical medicine' and 'clinical dentistry') into clinical and non-clinical activity. Some of the latter is recorded under biosciences.

4.9 Some institutions considered the results for a group of subjects to be more robust than those produced for each cost centre. However, this was influenced by the extent that they could map their departments' figures directly onto one cost centre. The robustness of the figures for each subject group is anyway affected by the figures for the individual subjects allocated to it.

c. Allocation to research sponsor types

4.10 Despite the work undertaken in the annual TRAC cost method to allocate costs and time (FTEs) to each research sponsor type, institutions felt that the 'total research' cost relativities produced in this study, covering all research sponsor types, were more robust than the individual relativities calculated for each research sponsor type.

4.11 The I/O TRAC data is changing. More FTEs (and therefore more direct costs, at least) are being re-allocated from research to teaching, or from research to scholarship (and thence to teaching or research), as a result of the changes in TRAC time allocation methods that were introduced in 2010.

4.12 As a result I/O seems to be becoming a (slightly) smaller part of the total research activity. Costs in I/O fell by nearly 2% (to £1,282M) in the year to 2009/10, while RG&C costs increased by 2% (to £5,171M). The changes in cost levels varied widely across the different subject groups:

Change in costs 2008/09 to 2009/10 (% of 2008/09) (from Tables 1a and 2a)	I/O	RG&C
i medicine & dentistry	-5%	4%
ii laboratory-based science	-1%	2%
iii intermediate cost	-7%	4%
iv business & management	-4%	-7%
v humanities & social sciences	-2%	-1%
Totals, all cost centres	-2%	2%

(These figures need to be considered with caution as both years' data excluded outliers, but these outliers did not relate to the same HEIs or subjects in the two

years. Nevertheless, the movement in the data would appear to be a logical result of the TRAC time allocation changes and increases in RG&C volumes.)

4.13 This affects the total cost relativity (I/O and RG&C combined). In medicine & dentistry (i) and intermediate cost subjects (iii), in particular, I/O costs have decreased more significantly than in the baseline subject group (v), while RG&C costs have grown slightly more. This places more emphasis on RG&C costs in the aggregated research cost relativity. See paragraph 4.65 for a discussion on the impact of this. The full impact of the changes in time allocation have not been felt in the data so far, so this trend is likely to continue.

d. Allocation to PGR research sponsor type

4.14 As expected, the information produced for the PGR research sponsor type was not considered to be as robust as other data, because of the flexibility in the TRAC methods that institutions can use to allocate their various types of costs.

4.15 Significant increases in PGR costs were experienced in 2009/10 from 2008/09, due to the implementation of changes in TRAC which required better costing of PGR activity:

Change in costs 2008/09 to 2009/10 (% of 2008/09) (from Tables 1a and 2a)	PGR
i medicine & dentistry	10%
ii laboratory-based science	15%
iii intermediate cost	14%
iv business & management	18%
v humanities & social sciences	17%
Totals, all cost centres	15%

4.16 This means that the costs of PGR activity are now close to those of I/O activity (£1,160k in PGR compared with £1,282k in I/O).

4.17 The impact of moving the stipends/scholarships/maintenance costs from RG&C to PGRs was studied. These are shown in Tables 1b and 2b. This was not material for the RG&C figures.

4.18 However, if the PGR cost relativities alone were to be used, the treatment of stipends etc. should be carefully considered. They are material in the PGR figures and this varies significantly by subject group (2–4% of PGR costs in groups (iii), (iv) and (v), but over 7% in groups (i) and (ii)). The approach adopted in this study was to include these stipends in the PGR figures. This increased the PGR cost/FTE for groups (i) and (ii), but did not affect the cost/FTE in the baseline group (v) as significantly.

4.19 This comparatively greater increase in the cost/FTE for groups (i) and (ii) over group (v) meant that the PGR cost relativities for groups (i) and (ii), as reported in this study, are higher than they would have been if stipends had been excluded. We note that funding from the funding bodies (whether designated as QR or PGRs) can be used by institutions to fund these types of cost.

e. Outliers

4.20 The tables and figures exclude outliers. It was decided to exclude the costs and FTEs of an institution in a subject (and therefore in the relevant subject group and totals) where their cost/FTE was more, or less, than three standard deviations from the initial mean for that subject. Outliers for the 'Total' row were identified and removed independently. The data shows recalculated means, with outliers excluded. There was no particular consistency in the outliers i.e. no one institution nor type of institution appeared significantly more frequently than others. However, the outliers were all higher than the initial mean – and therefore the reported costs, FTEs, and cost/FTE figures have all been reduced with the exclusion of the outliers. Not all subjects had outliers.

4.21 Data for both years exclude outliers on the same basis (the actual data points, and the subjects where they originally sat, are of course different). The 2008/09 data benchmarked in 2010 have been restated.

f. Changes from 2008/09 to 2009/10

4.22 To assist with robustness, and a better understanding of outliers and changes, institutions were asked to review some figures they submitted in 2009/10. Any cost/FTE that either differed by more than 20% from the 2008/09 figure for that institution, or was less than 5% or more than ten times the average of all cost centres, was highlighted on the data collection template. Participating institutions reviewed this data. If the institution then considered their data to be entered correctly, then a narrative explanation was provided. (Many figures were still correct – one institution showing a cost/FTE in a cost centre that was ten times that of other institutions explained this as being solely due to a European project which was managed and undertaken by staff designated as RAs. With very little academic FTE, the cost/FTE was very high.)

4.23 There were many reasons for the changes reported, which can be summarised as follows:

i) Improvements in TRAC methodology, including:

- The switch of I/O time to teaching (or scholarship)
- Moving to a different time allocation system, or including more detail on the time allocation survey (e.g. time by research sponsor type)
- Better recording of the costs of PGR activity
- Changes to cost drivers (e.g. to ensure PGRs are allocated appropriate costs; but also moving space from classroom to lab in a particular subject, for example)
- Changes arising from a review of last year's benchmarking data.

ii) Real changes in cost, or changes in the type of activity (e.g. a new research centre)

iii) Small FTE numbers – these can often be difficult to cost as robustly as subject

areas with larger volumes. However the impact on the average sector cost/FTE in the subject is small

iv) Collateral impact of changes in the institution. Reorganisations, combining departments, or changing staff contracts (e.g. to Teaching-only), mean changes to the TRAC systems and impact on the data

v) Unavoidable variations arising from the methodology used, e.g.:

- Allocation of costs and FTEs from departments to cost centres (as discussed above)
- Time allocation surveys that take three years to complete, or where there is a time lag; or where the sample size is not robust at the level of an individual department or subject
- The choice of cost drivers – even the choice between using an FTE driver weighted for salaries, and one that is unweighted, will impact on figures

vi) Occasional errors

4.24 These are all to be expected, even if it is only the first two that positively add to the robustness of the data year on year.

g. Weighting

4.25 The analysis in the benchmarking reports treats all figures as equal (i.e. there is no weighting for type of institution or department). Both a median and a mean average have been shown in the benchmarking reports. The mean average reported is a weighted mean. The mean gives a greater influence to larger institutions (so a large department reporting to one cost centre will have a larger impact on the cost/FTE and therefore the average cost relativities than a smaller department from another institution reporting to the same cost centre). Remember that outliers (the extreme largest figures) have all been excluded.

h. Research Assistants

4.26 In the cost/FTE calculation RAs were excluded from the denominator (FTE). Their costs were included in the numerator. If their FTEs had been included the research cost relativities would have been significantly reduced. This can be seen from looking at data from RAs (Table 10) in conjunction with academic FTEs (Table 4) and costs (Table 2).

Totals – i.e. covering all I/O, RG&C and PGR activity	RAs (Table 10) divided by academic FTEs (Table 4)	without RA FTEs		with RA FTEs (at 1.00 per FTE): adding these FTEs to those in Table 4; costs are unchanged	
		cost/FTE (Table 6)	cost relativity (Table 8)	cost/FTE	cost relativity
ii laboratory-based science	3.13	£736k	**2.92**	£180k	**1.10**
v humanities & social sciences	0.56	£252k		£163k	

The RA/academic FTE ratio in medicine & dentistry (i) is 4.7, in intermediate cost subjects (iii) it is 1.2, and in business and management (iv) it is 0.5

In 2008/09 the laboratory science (ii) ratio was 2.82. The increase to the 3.13 ratio of 11% was the result of an increase in RAs of 8% and a reduction in academic staff FTEs of 3%.

4.27 Including RAs in the relativity calculations results in a reduction in the total cost relativity of group (ii) from 2.92 to 1.10. This is due to the higher ratio (3.13) of RAs to academics in laboratory-based science (ii) compared to humanities & social science (v) where it is 0.56. The cost/FTE of group (ii) drops much further. The cost relativity in science is correspondingly reduced. The impact would be even more marked in medicine & dentistry, where the ratio of RAs to academic FTEs is even higher at 4.7 – the relativity becomes 1.01

4.28 If RA numbers are included in the research funding model, but are weighted (e.g. by 0.1), they should be weighted in a similar way in the denominator of the cost relativity calculation.

4.29 The inclusion of only some RAs (e.g. research fellows) might be appropriate where they are included in the RAE/REF along with the academic staff and are therefore included in the volume figures used in the funding model.

4.30 We also note that if (weighted) RAs were included in the denominator, consistent with the volume measures used for funding, the academic staff FTEs should also be weighted. Academic FTEs should represent all academic time, not just their time recorded against I/O research and RG&C in TRAC.[5] Otherwise the academic FTE numbers would be understated in the relativity calculation. Restating academic FTEs would result in an increase in those figures, and would reduce the impact of including RAs

[5] The funding bodies use staff numbers in their funding models, not the (much smaller) FTEs recorded as time on research in TRAC. If the funding allocated on the basis of RA numbers is to be taken into account in the relativity calculation (the denominator), then both sets of staff number need to be defined in a way that reflects how they are applied in the funding model. If not, the RA numbers would have an inappropriately large impact when used with academic staff numbers (which in TRAC are weighted at, in effect, 0.4) – see below. RA numbers should therefore be weighted at 0.1 (if a 10% factor is applied in the funding model) and academic staff numbers should be multiplied by 2.5

Returns from annual TRAC show that academics in the most research-intensive institutions (peer group A) spend on average 40% of their time on research. The academic FTEs reported in this RCR study could therefore be increased by 1/0.4; i.e. multiplied by 2.5

4.31 Care should be taken with use of the research sponsor type data (I/O, RG&C) in the RA numbers reported in Tables 9 and 10. Institutions seem to have used widely different methods when choosing to allocate RAs to I/O or not. If RAs were to be included, it would be more robust to use total research costs/FTEs, not the costs/FTEs calculated separately for I/O and RG&C.

i. Size of the sample

4.32 It is valid to ask if the figures represent the sector. The institutions were not chosen in that way (see paragraph 3.27 above) but as they carry out just over 80% of Research activity (measured as total TRAC costs), they might be considered a good reflection of research activity in the sector.

4.33 In two cost centres – agriculture and forestry (CC13) and catering and hospitality management (CC26) – the sample size was not sufficient to provide useable data.

Cost/benefit of producing the data

4.34 Institutions contributing data receive a useful insight into developments in funding bodies' research funding models, and participation allows them to contribute to the reviews of these funding models. It should also help to improve robustness of other parts of their annual TRAC and TRAC (T) models, and provides useful benchmarking opportunities with their peers.

4.35 However, it does not provide institutions with useful information to manage their institutions, and therefore the burden of any continued data collection exercise (after this second year) should be considered very carefully. The lack of usefulness for institutions may cause surprise. By way of an example, an examination of outliers in one institution showed that their cost/FTE in the humanities was very low – in itself not a cause for concern or celebration, they are just spending less. Their science cost/FTE was at the sector average, but as a result of their low humanities costs/FTE, their science cost relativity was much higher than the sector average. There is nothing much in this that assists planning, management or decision-planning.

4.36 If this study were to be instituted as a sector-wide data collection exercise, teaching-intensive institutions might need considerable encouragement to produce data for a research-focussed exercise, when the information is of limited value to even a research institution.

4.37 The burden on institutions is however small: annual TRAC already produces the raw data, and TRAC (T) requires institutions across the sector (except Wales) to allocate teaching costs in departments to cost centres, so this research costing methodology sits well with the current costing methods institutions are using.

4.38 In the second year of data collection, institutions reported that they spent between a half day and four days on the recording, analysis and reporting of the data. Their RCR systems were by then well established, but any changes in organisational structure for example, needed to be incorporated, and the opportunity to benchmark with prior years and other institutions led to work in examining outliers.

4.39 The data produced by this costing method is based on TRAC, and institutions might find it counter-intuitive if it was not used in some way (and, for example, HESA data continued to be used instead).

4.40 We note that there is a logical argument for using cost weights that have been calculated in the same way (i.e. either HESA, or TRAC (T)/TRAC-RCR) in both the research and teaching funding models. In particular, if TRAC methods were used it would mean that any bias in an institutional figure in TRAC (T) might, at least to some extent, be counterbalanced in TRAC-RCR (as costs and FTEs can only be reported in one of these models, not both).

4.41 If there is a firm decision by the funding council(s) to use the data to inform funding, many TRAC managers who attended the benchmarking workshops would be very keen to continue to provide the data in subsequent years. The main reason for this arises from the time lag before the data might be used in a funding model (2014). It is very likely that the data will change, not only for the several reasons given in the box above (paragraph 4.23) but also because of the changing economic climate they are now experiencing. They would like the most up-to-date data to be used. As it is not a burden to produce, many are keen to continue to do so. If this was to happen, it would be necessary to ensure that all (or most) participated, and that no or minimal changes to the data proformas and tables were made. Benchmarking tables should be produced for the sector, but there should be no need for workshops or a national support facility.

The main cost relativities

4.42 Table 8 shows the cost relativities for research, based on this TRAC-based costing method.

4.43 Five relativities are shown for each of the five subject groups. The averages (from Table 8) are shown below:

Average cost relativity for sector	I/O	PGR (including all stipends)	RG&C (excluding stipends)	I/O and RG&C	Total research
	(a)	(b)	(c)	(d)	(e)
i medicine & dentistry	2.29	2.30	3.41	4.28	3.71
ii laboratory-based science	1.86	2.06	2.53	2.96	2.92
iii intermediate cost	1.25	1.39	1.34	1.48	1.45
iv business & management	1.23	1.51	0.99	1.19	1.14
v humanities & social sciences	1.00	1.00	1.00	1.00	1.00

4.44 This clearly shows the use of the average cost per FTE for group (v) as the baseline – the cost relativities for that group become ‘1.00’ (see the final row).

4.45 These are shown graphically in Figure 4 in Annexes 2 and 3.

4.46 These cost relativities are similar to those in 2008/09. (Those for individual subjects varied more widely, as discussed in paragraph 4.68 et seq.) Of the 20 figures shown in groups (i) to (iv) above, most changed very little and only two changed by more than 6%:

Laboratory-based science (ii) – the total of I/O and RG&C +7%

Business & management (iv) – RG&C -11%

4.47 Key points on the results are:

- the relativities are very different from the current cost weights used in the HEFCE research funding model – medicine & dentistry (i) and laboratory-based science (ii) show much higher cost relativities. The difference is not so marked in intermediate cost subjects (iii);
- medicine & dentistry (i) shows the highest cost relativity, irrespective of the research sponsor type. It is followed by laboratory-based science (ii). This order of relativity is understandable and is reflected in the cost weights currently used by the funding bodies. Intermediate cost subjects (iii) generally show higher cost relativities than in business & management (iv). Business & management (iv) is itself higher than humanities & social sciences (v);
- the cost relativity in medicine & dentistry (i) is nearly 50% higher for RG&C work (column (c) 3.41) than for I/O work (column (a) 2.29). It is also significantly higher in laboratory-based science (ii) (nearly 40% difference from 2.53 vs 1.86). This is understandable as externally funded work in the physical sciences would generally require more RA, consumables and equipment resources than work without an external sponsor. The position is different in the other subject groups. In intermediate cost subjects (iii) the two are nearly the same, while in business & management (iv) it is reversed – the I/O cost relativity is nearly 25% higher than the RG&C cost relativity;
- total business & management (iv) cost relativities are 14% higher than those in humanities & social sciences (v). If these subjects were reported as one, then the cost relativity in science is likely to flatten slightly (but only slightly as business & management (iv) has a much lower volume of activity than (v) – see paragraph 4.52;
- PGR activity slightly flattens the 'total research' relativities in medicine & dentistry (i) – i.e. if only I/O and RG&C activity were considered (column (d)) the relativity is 15% higher than if PGR activity was included (column (e)). This impact is small in comparison to the variations in the cost relativities between the individual research sponsor types. It is even smaller in the other subject areas. However, it is relevant to remember that the costs in the PGR area are broadly the same as those in I/O, and should not be ignored.

  As a result, and given the comments made about the robustness of the PGR figures (paragraph 4.14) it would be simpler and probably just as robust just to use the 'total research' relativities (column (e)) rather than try to apply any separate PGR cost weight in the funding model.

4.48 It is of interest that the cost relativities based on a number of research sponsor types (e.g. I/O and RG&C combined in column (d)) are almost always higher than any individual research sponsor type. See for example in laboratory-

based science (ii) where the I/O relativity is 1.86; the RG&C relativity is 2.53; yet the combined relativity is more than 15% higher at 2.96. This is even more marked in medicine & dentistry (i). It is due to the much lower volumes of I/O activity in the physical sciences compared to that in the humanities & social science subject group that forms the baseline figure. This is explained in detail in paragraph 4.65 below.

4.49 There are several ways in which the cost relativities could be calculated, in addition to the various ways shown in the tables in this report. For example, incorporating RA FTEs into the denominator (see paragraph 4.26 et seq.), or weighting the different types of Research activity.

4.50 The relativities shown in this table are of course a result of individual subject costs, and are therefore very sensitive to how subjects have been classified to subject groups. This is considered in paragraph 4.67 et seq. below.

Nature of the subject groups

4.51 The tables show that there are significant differences in the subject groups.

4.52 Table 2a shows that laboratory-based science subjects make up nearly half of research costs, with medicine & dentistry making up just over a quarter. Humanities & social sciences and business & management together make up a relatively smaller 16%:

The subject groups making up the total costs of research	Total research costs £'000	% of total research costs
i medicine & dentistry	£2,086,100	28%
ii laboratory-based science	£3,556,213	48%
iii intermediate cost	£526,997	7%
iv business & management	£243,174	3%
v humanities & social sciences	£963,338	13%
Total	£7,375,822[6]	

4.53 This is of interest as the cost relativities are, in this set of reports, based on those in group (v). So the cost/FTEs in that subject group are of critical importance, as well as those in the other, larger, subject groups.

4.54 Table 2a shows the different subject profiles in each research sponsor type. This shows that 32% of I/O costs are in humanities & social sciences (v), compared to only 7% of RG&C costs. The position is reversed in the medicine & dentistry and laboratory-based science subject groups (i) and (ii):

[6] Total costs derived from adding the subject group totals in Table 2a. This total is slightly different from the total in Table 1a as outliers were removed independently from all fields, including total costs.

% of activity in each research sponsor group, for each subject group	I/O	PGR (including all stipends)	RG&C (excluding stipends)
i medicine & dentistry	15%	16%	35%
ii laboratory-based science	35%	56%	50%
iii intermediate cost	11%	8%	6%
iv business & management	8%	4%	2%
v humanities & social sciences	32%	16%	7%
	100%	100%	100%

4.55 This is shown graphically in Figure 1 in Annexes 2 and 3 (I/O and RGC only).

4.56 Put another way, the table below shows the volume of activity in each subject group for each research sponsor type. There is a relatively higher amount of RG&C activity in laboratory-based science and medicine & dentistry (70% and 83%), compared to that in business & management and humanities & social science (38%). I/O activity is therefore small in laboratory-based science and medicine & dentistry, but larger than RG&C levels in business & management and humanities & social sciences:

% of activity in each research sponsor group, for each subject group	I/O	PGR (including all stipends)	RG&C (excluding stipends)	
i medicine & dentistry	9%	9%	83%	100%
ii laboratory-based science	12%	18%	70%	100%
iii intermediate cost	26%	19%	56%	100%
iv business & management	43%	18%	38%	100%
v humanities & social sciences	42%	20%	38%	100%
All subject groups[7]	17%	15%	68%	100%

4.57 This shows that the makeup of costs in medicine and the sciences is very different from that in the baseline humanities subject group.

Cost/FTE

4.58 The cost/FTEs for each subject are shown in Table 5 (calculated from the costs in Table 1a divided by the FTEs in Table 3). It is easiest to study the differences between individual subjects when these are shown as cost relativities, covered in paragraph 4.67 et seq.

[7] Derived from the total costs figure reported in the last set of boxes in Table 1a. It cannot be derived by adding the subject group totals for I/O, PGR and RG&C. See also footnote 6.

4.59 Cost/FTEs for each subject group are shown in Table 6 (again, derived from costs in Table 2a divided by the FTEs in Table 4). They are shown graphically in Figure 2, also part of Annexes 2 and 3 (I/O and RG&C only).

Cost/FTE (average)	I/O	PGR (including all stipends)	RG&C (excluding stipends)
i medicine & dentistry	£347,411	£26,529	£1,013,030
ii laboratory-based science	£282,390	£23,752	£ 753,137
iii intermediate cost	£189,250	£15,955	£ 397,346
iv business & management	£186,267	£17,374	£ 294,310
v humanities & social sciences	**£151,770**	£11,513	**£ 297,357**

FTE is direct research time of academic staff for I/O and RG&C.
FTE is PGR student FTEs for the PGR research sponsor type.

4.60 These show that the cost of I/O activity in the humanities & social sciences group (v) at £151,770/FTE are half those of RG&C at £297,357/FTE. They are even less (37%) in the laboratory-based science subject group (ii). This is logical – the costs in I/O in the humanities & social sciences might consist largely of the salary of one FTE, plus estates and indirect costs on their time.

4.61 In I/O carried out in the science subjects, additional costs are incurred. There will be some equipment, estates, technician and consumables costs. Costs are also incurred in I/O by some institutions' inclusion of relevant RA costs (those who are between research contracts for example). Practice on this varies, as shown in Tables 9 and 10.

4.62 In RG&C there are considerably more RAs (again, see Tables 9 and 10) and therefore pay costs are higher. The increased FTE numbers bring associated indirect costs and relevant estates costs.

Change from 2008/09

4.63 Paragraph 4.12 above described the change in costs from 2008/09. FTE levels have also changed – the combined effect of these can be seen in the movement in the cost/FTE:

Change in average cost/FTE 2008/09 to 2009/10 (% of 2008/09) (from Tables 5 and 6)	I/O	RG&C
i medicine & dentistry	-4%	7%
ii laboratory-based science	0%	8%
iii intermediate cost	-1%	8%
iv business & management	2%	-8%
v humanities & social sciences	-1%	4%

4.64 The I/O cost/FTE has decreased in all subject groups, but more significantly in medicine & dentistry (i) than in humanities & social sciences (v), leading to a

reduction in the I/O cost relativity in (i). In RG&C the increases in the cost/FTE in medicine & dentistry (i), laboratory-based science (ii), and intermediate cost (iii) subject groups are higher than the increase in the baseline humanities & social sciences (v) cost/FTE, therefore the cost relativities have increased. However, as none of the changes are significant, the changes in the cost relativities are not significant (see paragraph 4.46).

Impact of cost/FTE on the aggregate cost differentials

4.65 In a year's data, the difference between the cost/FTE in I/O and RG&C is surprisingly important. It significantly affects the aggregate cost differentials for that year. This is because of the different proportions of I/O and RG&C activity in each subject group. The impact can be seen by studying the results in group (ii) – when compared to group (v).

	I/O	RG&C	Total cost (I/O plus RG&C but excluding PGRs)
Why is the total cost relativity higher than either of its component parts?			
(Table 8) group (ii)	1.86	2.53	2.96
Consider the volume of costs in each research sponsor type			
(Table 2a) £'000			
group (ii)	**£436,630**	£2,474,571	£2,911,201[8]
group (v)	**£396,931**	£ 353,348	£ 750,279
So I/O is relatively small part of the total costs of group (ii) – £436,630 of a total of £2,911,201 (15%) – but is significant part of group (v) costs – £396,931 out of £750,279 (53%).			
The cost/FTE in I/O of £151,770 in group (v) is very low compared to others			
(Table 6) group (ii)	£282,390/FTE	£753,137/FTE	£591,407/FTE
group (v)	**£151,770/FTE**	£297,357/FTE	**£199,988/FTE**
This low cost of course forms the baseline of the cost relativity calculation. Because I/O is such a significant part of total costs in group (v), it pulls down the total baseline cost/FTE in that group to £199,988/FTE – below the RG&C cost/FTE of £297,357/FTE.			
At the same time, the total cost/FTE in group (ii) – £591,407/FTE – has not been affected as much by I/O in that group – £282,390/FTE – because I/O is a relatively small proportion of the total activity. Therefore the differential in the total column – 2.96 (see first box) – is pulled higher than the differential in the RG&C column – 2.53			

4.66 This shows that despite a relatively small amount of I/O activity in group (v) (only 9% of the total costs of group (v) and (ii) research) – its low cost/FTE (£151,770) increases the total cost differential for group (ii) by 17% to 2.96 from the RG&C differential of 2.53

[8] The totals shown here are calculated as a sum of the I/O and RG&C figures on the left. They differ slightly from those shown in the benchmark tables as a result of the method used to exclude outliers. See footnote 6.

Allocation of costs to subject groups

4.67 Tables 1, 3, 5 and 7 show the subject group that has been associated with each subject. This classification was broadly based on current funding models. The data shows that this classification would need rethinking, as many of the subjects are clear outliers in their allocated group; and there is a considerable overlap between the ranges for the different subject groups.

4.68 The following table is a representation of Table 7, showing each subject's cost relativity (as compared with the average for group (v)) in descending order. Figures for 2008/09 are shown, along with the percentage change year on year.

HESA academic cost centre	Total research cost relativity for 2009/10 per Table 7 (in descending order)	Subject group used in the tables	Total research cost relativity for 2008/09	% change from 2008/09 to 2009/10
18 mineral, metallurgy and materials engineering	4.42	ii	4.11	7.5%
17 chemical engineering	4.09	ii	3.96	3.3%
10 biosciences	3.97	ii	3.98	(0.3%)
1 total clinical medicine	3.83	i	3.81	0.5%
11 chemistry	3.82	ii	3.49	9.5%
4 anatomy and physiology	3.67	ii	3.80	(3.4%)
8 pharmacy and pharmacology	**3.31**	**ii**	**2.71**	**22.1%**
16 general engineering	3.24	ii	3.53	(8.2%)
21 mechanical aeronautical and production engineering	3.04	ii	2.79	9.0%
12 physics	3.02	ii	3.04	(0.7%)
19 civil engineering	**2.84**	**ii**	**2.54**	**11.8%**
20 electrical electronic and computer engineering	**2.80**	**ii**	**2.54**	**10.2%**
3 veterinary science	**2.66**	**ii**	**3.00**	**(11.3%)**
14 earth marine & environmental sciences	**2.64**	**ii**	**2.28**	**15.8%**
25 IT systems sciences and computer software engineering	**1.98**	**ii**	**1.75**	**13.1%**
2 total clinical dentistry	**1.87**	**i**	**1.69**	**10.7%**
6 health and community studies	**1.77**	**ii**	**1.38**	**28.3%**
7 psychology and behavioural sciences	1.72	ii	1.57	9.6%

34 education	1.50	v	1.51	(0.7%)
5 nursing and paramedical studies	1.59	iii	1.48	7.4%
37 archaeology	1.52	iii	1.51	0.7%
28 geography	**1.52**	**iii**	**1.36**	**11.8%**
38 sports science and leisure studies	1.49	iii	1.38	8.0%
23 architecture built environment and planning	**1.33**	**iii**	**1.59**	**(16.4%)**
24 mathematics	1.15	ii	1.13	1.8%
27 business and management studies	1.14	iv	1.19	(4.2%)
29 social studies	1.06	v	1.07	(0.9%)
41 continuing education	**1.00**	**v**	**1.38**	**(27.5%)**
33 design and creative arts	0.98	iii	1.00	(2.0%)
31 humanities	0.88	v	0.86	2.3%
30 media studies	0.76	v	0.83	(8.4%)
35 modern languages	0.74	v	0.73	1.4%

Agriculture and forestry (13) and catering and hospitality management (26) are not shown

4.69 This shows that:

- cost relativities in three cost centres – health and community studies (6), pharmacy and pharmacology (8) and continuing education (41) – have increased or decreased by 20-30%;
- relativities in 8 cost centres have moved between 10-20%;
- relativities in the other 21 cost centres have moved less than 10%.

4.70 Figure 3 (the graphs in Annexes 2 and 3) shows this graphically.

4.71 The subject groups defined for and used in this study show the following ranges:

Total research cost relativity	Range of cost relativities for subjects classified to each group for this report	Average for the group
i medicine & dentistry	1.87 – 3.83 [two cost centres]	3.71
ii laboratory-based science	1.15 - 4.42	2.92
iii intermediate cost	0.98 – 1.59	1.45
iv business & management	[one cost centre only]	1.14
v humanities & social sciences	0.74 – 1.50	1.00

4.72 The scatter graphs in Annexes 2 and 3 show the cost/FTE for each subject, for each institution (excluding outliers). These plots help to show the spread of data in each subject.

Index of main abbreviations

DELNI	Department for Education and Learning in Northern Ireland
FTE	Full-time equivalent
HEFCE	Higher Education Funding Council for England
HEFCW	Higher Education Funding Council for Wales
HEI	Higher Education Institution
HESA	Higher Education Statistics Agency
I/O	Institution-own funded research
OGD	Other government department
PF	Publicly-funded
PGR	Postgraduate research students
RA	Research Assistant
RAE	Research Assessment Exercise
RC	Research council
TRAC-RCR	Transparent Approach to Costing – Research Cost Relativities
REF	Research Excellence Framework
RG&C	Research grants and contracts
SFC	Scottish Funding Council
TRAC	Transparent Approach to Costing
TRAC (T)	Transparent Approach to Costing – Teaching
UUK	Universities UK

Annex 1

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Institute of Education
King's College London
Lancaster University
Leeds Metropolitan University
London Business School
London School of Economics and Political Science
London School of Hygiene & Tropical Medicine
Loughborough University
Queen Mary, University of London
Queen's University Belfast

Royal Veterinary College
Swansea University
University College London
University of Aberdeen
University of Bath
University of Birmingham
University of Bristol
University of Cambridge
University of Dundee
University of Durham
University of East Anglia
University of Edinburgh
University of Exeter
University of Glasgow
University of Leeds
University of Leicester
University of Liverpool
University of Manchester
University of Newcastle upon Tyne
University of Nottingham
University of Oxford
University of Portsmouth
University of Reading
University of Salford
University of Sheffield
University of Southampton
University of Stirling
University of Sussex
University of Warwick
University of York

Annex 2 Review of research cost relativities 2008-09: summary

Tables 1 to 10; Figures 1 to 4; plots (scatter graphs)

Annex 3 Review of research cost relativities 2009-10: summary

Tables 1 to 10; Figures 1 to 4; plots (scatter graphs)

Annex 4 TRAC RCR proforma