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Funding Research in Scotland's Universities: The Use and Abuse of RAE Results

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Summary

The Scottish Higher Education Funding Council distributes a sum in excess of £130 million to support research in Scotland's universities. This paper focuses on how much of this fixed pot each of the different subject areas receives on the basis of their respective research quality. The policy importance of this distribution across subject areas is manifest. Subjects which receive a very small share will diminish in activity in Scotland. Some may even disappear altogether. We analyse two different methods of allocation. The first is the method used by SHEFC where the benchmark for comparing research quality is inward looking and involves direct cross subject comparisons and averaging. The second method uses an international benchmark and no cross subject comparisons. We show that the funding implications of these two benchmarks are very different. We propose the use of the international benchmark together with some input on the national importance of each subject as a better basis for the subject area allocations.

1. Introduction

Since the creation of the Scottish Parliament in 1999 there has been increased interest in how this new autonomy for the people of Scotland would affect the major decisions affecting the lives of Scotland's people, firms and institutions (including its universities). People from many different walks of Scottish life (and with many different political allegiances) had argued that public sector priorities within Scotland had reflected the opinions and desires of voters far removed from the people of Scotland. Even where Scotland had previously had its own quangos such as the Scottish Higher Education Funding Council (SHEFC), reporting to Scottish ministers such as the Secretary of State for Scotland or the Scottish Education minister, these were politicians owing their positions to UK-wide voting patterns.

With this new autonomy it was felt that decision-making could be brought closer to the people of Scotland, bringing with it the very real possibility that the different constituent parts of the United Kingdom would, through their public expenditure decisions (both in terms of the total funds available to each sector, and how the funds within each sector would be allocated to the different institutions), signal significantly different strategic priorities.

One of the apparent winners of the 2002-03 distribution of funds decided on by the Scottish Executive has been education, with an increase in total funding from £696m to £724m (a 4% increase in nominal terms). Though welcome, this increase in spending is still less than the 8% increase for 2001-02 (and the 8.2% increase for health for 2002-03). But this 'largesse' is not without strings – in particular, the ultimate holder of the purse-strings, Chancellor Gordon Brown, has made it clear that the significant increases in public sector expenditure planned for the period up to 2006 are to fund improved public services and not improved public sector pay, and that a failure to deliver the required increases in service quality will jeopardise the promised funds[1].

The importance now being attached by quangos to the views of their political paymasters, including the Scottish Executive (i.e. the Scottish 'Cabinet'), is amply illustrated by SHEFC's main grant letter for 2002-03 to the Higher Education institutions (Circular Letter HE/15/02). In the 'Overview and Strategic Priorities' section it sets out the main influences affecting its

[1] Chancellor Gordon Brown's evidence to the Treasury Select Committee, Friday 19th July, 2002.

decisions on resource allocation; the first bulleted point reads *'Scottish Executive policies and priorities for higher education in 2002-03"*. The effects of the 'invisible hand' of the Scottish Executive are clearly visible throughout this document, for example a desire to increase total student places by 400, and the action to reduce social exclusion by increasing the Widening Access Premium by 30%.

However, the main Scottish Executive message to be taken from the SHEFC main grant letter is that public funding is now to depend more than ever on performance, with the words "quality", "improvement" and "excellence" appearing on nearly every page. Backing this up the document provides numerous examples of sizable sums of money earmarked for specific initiatives to improve delivery of teaching or research in various areas (e.g. an extra £10m to reinforce the development of quality research in light of the improvements made in the recent Research Assessment Exercise (RAE)).

To ensure the additional funds now being provided by the government to education do reflect the improvements in quality that the political paymasters are looking for, SHEFC (and other quangos) need to measure and report on the returns to both the existing funds, and the additional funds being made available. Rewarding the quality of research being undertaken at Scottish universities is seen as an instrument for encouraging even greater effort. The fundamental input in this reward process are the RAE results for 2001.The importance of this decision to Scottish universities cannot be over-stated – in 2002-03 more than £130m of funds was directly allocated on the basis of the results of RAE 2001.

The RAE exercise consists of panels attaching a qualitative measure of research quality to each subject area submitted by each University. SHEFC uses these results to compare each subject area in each university with its peers, and links research funds to that comparison. There are a number of crucial choices to be made in the process of mapping qualitative RAE results into quantitative allocations of research funds. In this paper, we focus mainly on one such crucial choice – which is the process of identifying the relevant peer group. We show how the choice of peer group can seriously affect the results obtained, and hence the research funding allocations for individual departments, institutions and subject areas across institutions. SHEFC has decided that the relevant peers (i.e. the relevant benchmark) for any subject area is the totality of all <u>other</u> subject areas <u>within</u> Scotland. Our objective in this analysis is to focus attention on the allocation of research funds to each subject area in

Scotland. The extent of this research funding determines in large part the health, growth and survival prospects of that particular subject area. Subject areas which receive very little funding are obviously in danger of extinction. By sharp contrast to the much debated subject of how each of Scotland's universities do in the competition for research funds, the analysis of research funding for each subject area in Scotland is a relatively unexplored field. From the national perspective, subject area allocations are a rather more important area than inter-university allocations. The nation might well be able to afford a smaller set of universities. But can it afford the potential demise of subjects, not as a result of national priority but due to the idiosyncrasies of SHEFC research funding allocations?

We will argue that a narrowly-defined benchmark and inward looking will generate results that cannot be relied upon to reward true research excellence. 'International' comparisons will be invaluable in the attempt to evaluate the research quality of Scottish universities in the international / global context. The availability of consistent data across the rest of the UK provides an ideal opportunity to conduct this form of analysis.

The structure of the rest of this paper is as follows. Section 2 will set out the methodology we adopted to operationalise the SHEFC funding principles, and section 3 will discuss the results that flow from that methodology. Section 4 will discuss alternative benchmarks, discuss the results obtained from those benchmarks and use the findings to highlight the shortcomings of the initial internal benchmarks. Section 5 concludes with a discussion of the main findings of this paper, and the lessons to be learnt.

2. SHEFC Methodology

The starting point for looking at the method that SHEFC has adopted is the set of RAE results for 2001. The organisation responsible for the RAE[2] defined 69 broad subject areas such as 'Economics and Econometrics', 'History', 'Chemistry' and 'Pure Mathematics'. Universities throughout the UK submitted the research output of some (or all) of their staff for evaluation by panels set up for each of these subject areas[3]. Each University's submission to a panel was given a ranking on a seven-band qualitative hierarchical scale: 1, 2, 3b, 3a, 4, 5 and 5*. A ranking of 1 indicates a very poor quality of research for that submission, while a ranking of

[2] The RAE Exercise is jointly owned by the Higher education Funding Councils of the four Home Countries.
[3] Of these 69 subject areas there were submissions by one or more Scottish universities in 65 of them.

5* indicates a submission whose quality is of a global standard. Each submission had two dimensions to it: (1) the University it came from, and (2) the subject area it belonged to. Thus the raw data for constructing the research funding model consists of a qualitative ranking for every subject area in each of the UK's universities together with the numbers of staff entered in the submission[4].

When using this ordinal data to allocate its funds SHEFC assigns a numerical score to each qualitative band. In the past SHEFC used a scoring system whereby each band was given a score 55% higher than the band below it, resulting in the scores presented in the second column in Table 1[5]. However, SHEFC is now using the scores shown in the third column in Table 1; the most significant changes are the lack of funding for 3a-or-below-rated departments in pre-1992 institutions, and the minimal premium for 5* rated departments over 5 rated departments.

Table 1 : SHEFC's Scoring System for RAE results

RAE Rating	SHEFC's former scores	SHEFC's 2002-03 scores
1	0.42	0
2	0.65	0
3b	1	0
3a	1.55	0 / 1 *
4	2.40	1.55
5	3.72	2.80
5*	5.77	3.20

* SHEFC decided that submissions ranked 3a from 'post-92' universities would be given a weight of 1 as an incentive to further develop the research contributions of those staff.

The construction of such scores as shown in Table 1 is the first stage of the mapping process.

The second stage of the process is to use the scores to assign for every subject area a numerical index that measures the absolute quality of research for that subject area within the Scottish universities, *ignoring all the data from the rest of the UK*. In effect every member of

[4] The raw data we utilised in the analysis presented in this paper is available from the authors on request.
[5] It is not entirely clear where this value of 55% came from, or why the SHEFC figure should differ from the HEFC figure of 50%.

staff[6] submitted to the RAE panel would be given a score equal to their department's weighting in column three of Table 1. The index of absolute research quality for a given subject area is then simply the average of these scores. Suppose a subject area, say Knitting, had submissions from two Universities, say Glasburgh and Edingow. Suppose further that Glasburgh submitted ten members of staff to the Knitting RAE 2001 Panel and obtained an RAE band of 5, whilst Edingow submitted five members of staff to the Knitting RAE 2001 Panel and obtained an RAE band of 5*, then the index of absolute quality score for Knitting would be an average based on a total of 15 researchers, 10 of whom get a score of 2.80 (the score value of the 5 band) and 5 of whom get a score of 3.20 (the score value of the 5* band). Hence:

Absolute Quality Index of Knitting = Average Quality of Knitting Scores

= [(10 x 2.80) + (5 x 3.20)] /15 = (28 + 16)/15 = 44/15 = 2.93

The third stage of the process consists of defining an absolute index of research quality for Scotland taken as a whole. This consists of constructing a weighted average of the absolute indices for each of the 65 subject areas represented by submissions from Scottish universities (constructed at stage 2) with the total number of researchers submitted by Scottish Universities taken together acting as the weights. For example, suppose there are two subject areas only, say Plumbing and Carpentry. Suppose further that Plumbing had twenty members of staff submitted from the whole of Scotland and it had an Absolute Quality Index of 2.90, whereas the corresponding numbers for Carpentry were thirty members of staff and an Absolute Quality Index of 3.00, then the index of the absolute quality of research in Scotland would be defined as:

Absolute Quality Index for Scotland = [(20 x 2.90) + (30 x 3.00)] = 148/50 = 2.96

The fourth stage of the process consists of defining a *relative* index of research quality for each subject area in Scotland. This index of relative quality for any subject area is simply the ratio of the absolute index for that subject to the absolute index for the whole of Scotland.

[6] SHEFC used not only numbers of staff submitted to the RAE panels (main volume indicators) but also numbers of research assistants, research students and research income (minor volume indicators). Here we use the main volume indicators data only.

Pursuing the two subject example discussed in stage 3, then the relative quality index for Plumbing and Carpentry would be respectively given by:

Relative Quality Index for Plumbing in Scotland = 2.9/2.96= 0.98
and *Relative Quality Index for Carpentry in Scotland = 3.0/2.96= 1.01*

Table 1 in the Appendix summarises these calculations for all 65 subject areas represented in Scotland. In effect, the table summarises the absolute and relative quality of each subject area as generated by the SHEFC methodology. From this table we see that the best ranked subject areas were 'Mineral and mining engineering' and 'Middle Eastern and African Studies', both of which generated Absolute Quality Index scores of 3.20 and Relative Quality Index scores of 1.58; at the other end of the spectrum 'Nursing' generated scores of just 0.21 and 0.10. One implication of these is that, other things being equal, each researcher in Scotland in Mineral and mining engineering will receive 15.8 times as much research support funding as each researcher in Scotland in Nursing. Is this where our national priorities lie? Does it really make sense to directly compare Mineral and mining engineering and Nursing when their RAE panels may well have been operating in different ways?

In the fifth stage, these Relative Quality Indices play a major role in the allocation of funds to each subject area. Each subject area accumulates 'points' that determines their share of the £130m distributed by SHEFC. These points are calculated by multiplying the Relative Quality Index above by the total number of submitted staff for Scotland as a whole and a Cost Base weight (which reflects the costs of doing research within that subject area, and can take the values 1.0, 1.2 or 1.6[7]). The SHEFC payout to each subject area is then proportional to their points. The final results (i.e. the funds each subject area obtains) are presented as 'Method 1' in Table 2 in the Appendix[8]. Note that the total payout of £130 million is fixed independently of the RAE results. In effect SHEFC forces all subject areas and all Universities to play a zero sum game.

[7] Table 1 in the Appendix also shows the Cost Base weight for each of the subject areas; in general many of the physical sciences are given a Cost Base weight of 1.6 whilst many of the arts and humanities are given a Cost Base weight of 1.0; many of the social sciences are given a Cost Base weight of 1.2.
[8] The distribution of funds amongst the departments submitting to that RAE subject area panel is in proportion to their contribution to the 'points' accumulated by that subject area.

3. Results from using an internal benchmark

The allocation of funds that this method generates is broadly in line with what one might expect, with the top eight 'winners' being the physical and medical sciences.

1. Biological Sciences £14,946k
2. Hospital-based Clinical Subjects £7,256k
3. Computer Science £6,801k
4. Physics £6,784k
5. Veterinary Science £6,184k
6. Clinical Laboratory Sciences £5,166k
7. Electrical and Electronic Engineering £5,019k
8. Chemistry £4,597k

The total funding of these eight subject areas is just short of £57m, nearly 44% of the total funds allocated. In part this reflects the higher Cost Base weights factored into the SHEFC method. It also reflects the number of researchers submitted. However, subsequent analysis in this paper will question whether the choice of benchmark is also a significant factor.

However, there were sizable research funds made available to the arts, humanities and social sciences, with Business and Management Studies, English Language and Literature, History, Law and Psychology each securing funding of more than £3m. By contrast, Nursing, and some language and area studies generated funding of only £200k or even less. Should we be indifferent to the potential demise of research in these subjects in Scotland?

4. Alternative benchmarks

As indicated above, however, the choice of benchmark is of crucial importance in determining the quality of research in each subject area. By constructing and using the Absolute Quality Index for Scotland as the benchmark to derive the relative quality index for each subject area, the SHEFC method compares each subject area within Scotland with every other within Scotland. For this to yield accurate measures of relative research excellence (between the subject areas), and hence a justified allocation of research funds, requires that the criteria used by the different RAE subject area panels to judge standards of research

within their field are consistent with each other. If the Plumbing RAE Panel was to award higher rankings than the Carpentry RAE Panel for the same quality of research excellence then the Plumbing RAE panel will generate a higher research funding allocation for the all Plumbing departments in Scotland.

For this reason each RAE panel (being as it is composed largely of academics from within the departments submitting to it) has a financial incentive to be more generous with its rankings than other RAE panels, and the natural consequence of this is the much noted grade inflation witnessed in RAE 2001. If everyone plays the same 'game' the same way then there is likely to be compression of the rankings into the higher reaches of the scale, but no implied transfer of research funds from one subject area to another – since the total payout is fixed at £130 million. However, this is a strong assumption to make. Table 1 in the Appendix, showing the Relative Quality Indices, reveals huge variations in performance. Although the Panels do have generic norms to apply in allocating a quality score, it is hard to believe that these can be evenly applied across such different disciplines as Nursing, Celtic Studies and Biological Sciences.

What is required is some 'external' subject-specific benchmark (a guarantee of quality) against which to measure the research submissions being evaluated. For the UK as a whole it is not clear what this alternative benchmark could be. However, for Scotland, and SHEFC in particular, the results for the rest of the UK can be used to reduce the bias that may be present in the Scottish RAE results as a result of the financial incentives encouraging grade inflation. In particular, rather than taking the absolute (and potentially inflated) measures of research quality, it is possible to measure research quality of a subject area within Scotland relative to that found for the same subject area in England. This eschews the need for any cross subject comparisons – which as we have argued earlier are open to serious ambiguity. We explore such an alternative below.

We proceed by completely ignoring stage 3 of the SHEFC method which defines an absolute index of quality for the whole of Scotland, Instead we define the Relative Quality Index for each subject area in Scotland as simply the ratio of the Absolute Quality Index for that subject area in Scotland to the Absolute Quality Index for that subject area in a well defined regional alternative, say for example England. Thus if the Absolute Quality Index for a subject area in Scotland and England are 2.7 and 3.0 respectively, then the Relative Index of

Quality for that subject area in Scotland is 0.9 (i.e. 2.7 divided by 3.0). The rest of the methodology proceeds as before.

Three versions of these results are presented in the results in Table 2 in the Appendix, differing only in the extent of the regional comparison group used – Method 2a uses England, Method 2b uses the UK as a whole (including Scotland) while Method 2c uses the UK excluding Scotland. The similarity of these three comparison groups ensures that the three sets of results do not differ significantly, and in the discussion below we make use of the Method 2a results.

The results are quite striking in terms of who wins and who loses when we utilise this 'external' subject-specific benchmark of research quality. The final two columns in Table 2 in the Appendix present simple comparisons of Methods 1 and 2a to indicate the effects of this choice of benchmark. They indicate the extent to which subject areas lose research funding as a result of the use of the SHEFC 'internal' benchmark rather than the alternative 'external' benchmark that we propose. Thus, Nursing would generate research funding of £202k under the external benchmark system, but under the SHEFC internal benchmark system generates only £87k, a loss of 57%.

Those subject areas towards the top of the table lose significantly from using SHEFC internal benchmarks, while those subject areas towards the bottom of the table gain significantly from using SHEFC internal benchmarks. Is there any pattern that emerges in terms of the winners or losers? Significantly, of the top eight winners listed at the start of Section 3, seven benefit from the use of SHEFC's internal benchmarks (Computer Science is the only loser). The gains in percentage terms vary from 4% to 28%, whilst in money terms they vary from £172k to £1,361k.

It is not our contention that large quantities of money are being given to subject areas with poor research records – far from it[9]. However, one can legitimately ask whether their research records justify such a large share of the research funding cake (a 44% share for these eight subject areas).

[9] Five of the eight subject areas have Absolute Quality Indices between 2.64 and 2.80, and Relative Quality Indices between 1.31 and 1.39, and only Chemistry out of the eight subject areas has a Relative Quality Index less than 1.

In particular, there are instances where some subject areas have research ratings that appear stellar compared to their Scottish peers in other subject areas, but are not a match for the stars of English academia in their own subject areas. Biological Science accounts for 11.5% of the Scottish research funding under Method 1, buts its six submissions (one 5*, four 5s and a 4) are put in the shade by the five submissions from Cambridge (two 5*s, three 5s, with 64% of the staff appearing in the 5* departments)[10].

In other instances the results are not as impressive as might at first appear. In Hospital-based Clinical Subjects the Scottish record of one 5*, two 5s and a 4 would appear somewhat (but not that much) better than the English record, but the four Scottish submissions were *much* more 'brutal' in terms of excluding those staff who could endanger the RAE rating. In Veterinary Science every submission throughout the UK (including the two Scottish ones) was ranked as a 5. This high consistency in one subject area is unmatched by any other subject area in Scotland. However, this is much less striking when seen from a UK-wide perspective.

Thus, the research records of the winners under the SHEFC method need to be viewed in a more objective light, and it can be argued that the physical and medical sciences benefit from being a large fish in a small pond rather than a small fish in a large pond. If academic pride were all that was at stake as a result of this process then it would be of little concern to those outwith the academic community. However, the distribution of more than £130m of public money depends on this exercise. Crucially, the future development of each subject area also depends on these allocations. As Table 2 in the Appendix shows, the inter-subject allocation is very sensitive to the benchmark decision. As a result this benchmark decision should be viewed as of crucial importance to SHEFC, the Scottish Executive and Scottish society at large.

However, this alternative benchmark is not without its own risks. In particular, were a subject area within Scotland of a low research quality, but that low research quality extended to the submissions in that subject area within England, then the external benchmark would award those Scottish submissions with funding that they might not deserve. It is quite possibly the

[10] Furthermore, the two Cambridge submissions achieving a 5* ranking submitted all of their eligible staff, something that could not be claimed by Scotland's only 5* ranked submission in Biological Sciences.

case that every system for allocating research (or other) funds on the basis of quality measures is vulnerable to some bias (whether measurement or comparison). However, if the comparison benchmark group is big enough (as would be the case for Scotland), then it is unlikely that the subject specific external benchmark is seriously distortive.

One alternative is to remove the quality aspect altogether from the subject area funding allocation decision. This can be done by introducing a National Priority Index which feeds future developmental needs into the decision. Thus the 'brownie points' on which the subject area allocations depend could be the product of the national priority index of that subject, staff numbers and the cost base. We have no basis for assigning National Priority Indices. But in Table 2 in the Appendix we present calculations assuming all subject areas have equal priority (method 3)[11]. There is of course no reason why the National Priority Index should not be combined with a Relative Quality Index (however constructed) to determine the Subject Area brownie points – and consequent research funding allocation[12].

5. Conclusions

This paper has examined the allocation of research funding implications of the benchmark system that SHEFC has adopted for distributing its £130m of research funding in 2002-03. The sums involved are huge, with three subject areas gaining more than £1m (and three other subject areas losing more than £1m) as a result of the use of the SHEFC internal benchmark method rather than an external benchmark. These sums are more than enough to significantly affect the nature of academic research within Scotland, and hence pose serious questions for SHEFC in its mission to promote quality research within Scottish academia. Our suggestion to use international subject-specific benchmarks produces different winners and losers. The main virtues of our proposed method is that it does not encourage grade inflation, and it does not ignore within subject comparative data.

[11] One major caveat exists for these results. These results, like all of the others, have been generated on the basis of the actual submissions made under the actual system used in RAE 2001. Excluding RAE 2001 results from the analysis would involve all members of staff to be 'submitted', and hence the staff numbers data would increase dramatically, and hence the relative allocations would be subject to change, particularly to the extent that the non-submitted staff are not representative of Scottish academia as a whole.

[12] Once the subject area allocations have been determined, the allocation to each Department in that subject area can be based on relative quality of the Department compared to other Departments in the same subject area in Scotland. The final payout to each University is then just the sum of the payouts to each Department in that university. Since inter-University payouts are not our primary focus in this paper, we do not explore this area further.

Though this paper has focused on the specific example of the SHEFC research funding allocation for 2002-03, the lessons to be learned have a much wider applicability. In particular, when examining standards within a 'small' country (whether those standards be in the public or the private sector) measures of quality (in terms of internationally-acceptable standards) are less accurate if the benchmark chosen depends on the performance of qualitatively unlike internal peers. International standards that compare like with like provide a much more objective benchmark and should be used where possible.

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The data utilised in this analysis was provided in electronic form as part of the SHEFC circular letter above.

Appendix

Table 1

Subject area	Staff	Cost base	Absolute Quality Index	Relative Quality Index
Nursing	40.88	1.20	0.21	0.10
Metallurgy and Materials	18.70	1.60	0.21	0.11
Environmental Sciences	56.50	1.60	0.65	0.32
Music	39.73	1.00	0.68	0.34
Library and Information Management	49.70	1.20	0.69	0.34
Italian	13.00	1.00	0.95	0.47
Built Environment	87.20	1.20	1.03	0.51
Other Studies and Professions Allied to Medici	135.25	1.20	1.07	0.53
Archaeology	34.45	1.20	1.08	0.53
Economics and Econometrics	103.75	1.20	1.12	0.55
General Engineering	128.33	1.60	1.12	0.56
Business and Management Studies	308.90	1.00	1.15	0.57
European Studies	39.00	1.00	1.21	0.60
Chemical Engineering	29.33	1.60	1.23	0.61
Food Science and Technology	24.50	1.60	1.30	0.64
Russian, Slavonic and East European Languages	13.00	1.00	1.31	0.65
Art and Design	212.36	1.20	1.32	0.65
Drama, Dance and Performing Arts	23.60	1.00	1.33	0.66
Clinical Dentistry	42.42	1.20	1.37	0.68
Social Policy and Administration	48.86	1.00	1.45	0.72
Education	162.50	1.00	1.46	0.72
Pharmacology	18.50	1.60	1.55	0.77
Sports-related Subjects	47.24	1.20	1.56	0.77
Communication, Cultural and Media Studies	27.80	1.00	1.62	0.80
Tow n and Country Planning	70.60	1.00	1.79	0.89
German, Dutch and Scandinavian Languages	29.83	1.00	1.81	0.90
Community-based Clinical Subjects	129.85	1.20	1.81	0.90
Iberian and Latin American Languages	26.00	1.00	1.82	0.90
Celtic Studies	14.38	1.00	1.90	0.94
Chemistry	177.30	1.60	1.90	0.94
Politics and International Studies	99.66	1.00	1.94	0.96
Civil Engineering	100.41	1.60	1.94	0.96
Philosophy	68.76	1.00	1.96	0.97
Sociology	75.23	1.00	1.96	0.97
Asian Studies	10.00	1.00	1.96	0.97
Mechanical, Aeronautical and Manufacturing Eng	108.98	1.60	2.01	0.99
Geography	94.57	1.20	2.02	1.00
Statistics and Operational Research	59.35	1.20	2.04	1.01
Classics, Ancient History, Byzantine and Moder	28.00	1.00	2.04	1.01
Physiology	42.75	1.60	2.05	1.01
Agriculture	68.50	1.60	2.07	1.03
Computer Science	233.43	1.60	2.14	1.06
Psychology	165.37	1.20	2.17	1.08
History of Art, Architecture and Design	46.02	1.00	2.20	1.09
Physics	216.41	1.60	2.30	1.14

Accounting and Finance	84.00	1.00	2.34	1.16
Earth Sciences	77.67	1.60	2.40	1.19
French	63.86	1.00	2.48	1.23
Anthropology	29.00	1.00	2.50	1.24
Social Work	44.43	1.00	2.51	1.24
History	187.66	1.00	2.53	1.25
Law	168.50	1.00	2.59	1.28
Applied Mathematics	104.33	1.20	2.61	1.29
Clinical Laboratory Sciences	143.40	1.60	2.64	1.31
Electrical and Electronic Engineering	138.90	1.60	2.65	1.31
English Language and Literature	154.50	1.00	2.69	1.33
Hospital-based Clinical Subjects	256.41	1.20	2.77	1.37
Biological Sciences	393.65	1.60	2.78	1.38
Veterinary Science	161.84	1.60	2.80	1.39
Pharmacy	42.40	1.60	2.80	1.39
Linguistics	22.00	1.20	2.80	1.39
Theology, Divinity and Religious Studies	76.83	1.00	2.80	1.39
Pure Mathematics	52.33	1.20	2.85	1.41
Mineral and Mining Engineering	24.20	1.60	3.20	1.58
Middle Eastern and African Studies	7.00	1.00	3.20	1.58

The Absolute Quality index for Scotland as a whole is 2.02.

Table 2

SUBJECT	Method 1	Method 2a	Method 2b	Method 2c	Method 3	1 minus 2a	1 minus 2a (% of 2a)
Nursing	86,993	201,821	222,802	210,432	857,640	-114,828	-57
Communication, Cultural and Media Studies	383,793	676,461	617,100	627,864	486,024	-292,668	-43
Drama, Dance and Performing Arts	266,950	469,257	459,012	460,616	412,596	-202,307	-43
Environmental Sciences	497,396	829,353	910,969	858,406	1,580,453	-331,957	-40
Other Studies and Professions Allied to Medici	1,487,071	2,425,147	2,262,823	2,191,481	2,837,472	-938,076	-39
Social Work	952,268	1,484,675	1,380,793	1,517,316	776,765	-532,407	-36
Education	2,029,201	2,950,526	2,999,003	2,999,260	2,840,969	-921,325	-31
History of Art, Architecture and Design	863,203	1,223,728	1,141,085	1,211,025	804,562	-360,526	-29
Sports-related Subjects	753,586	1,053,572	1,057,341	1,059,485	991,070	-299,986	-28
Art and Design	2,867,085	3,934,305	3,920,409	3,869,405	4,455,198	-1,067,220	-27
Built Environment	916,499	1,252,497	1,304,030	1,235,992	1,829,409	-335,999	-27
Library and Information Management	348,996	462,162	536,434	487,290	1,042,679	-113,166	-24
Town and Country Planning	1,080,592	1,388,824	1,294,677	1,292,992	1,234,292	-308,232	-22
Business and Management Studies	3,026,637	3,886,820	4,104,356	3,952,492	5,400,463	-860,182	-22
Agriculture	1,937,184	2,435,063	2,444,635	2,531,172	1,916,124	-497,879	-20
Social Policy and Administration	603,690	754,462	796,249	791,310	854,214	-150,772	-20
Geography	1,956,154	2,323,044	2,324,073	2,346,544	1,984,028	-366,890	-16
Music	231,342	265,909	272,384	258,004	694,595	-34,566	-13
Celtic Studies	232,741	263,156	200,013	189,785	251,404	-30,415	-12
Computer Science	6,801,433	7,642,199	7,488,400	7,605,452	6,529,647	-840,766	-11
Linguistics	630,445	695,393	703,206	741,747	461,548	-64,948	-9
Sociology	1,254,953	1,374,061	1,341,005	1,336,746	1,315,237	-119,108	-9
European Studies	400,851	431,513	423,634	410,961	681,832	-30,662	-7
Physiology	1,194,194	1,283,730	1,268,801	1,270,403	1,195,829	-89,535	-7
Community-based Clinical Subjects	2,411,681	2,577,847	2,608,041	2,578,380	2,724,183	-166,166	-6
Psychology	3,678,061	3,921,297	3,821,594	3,846,836	3,469,373	-243,236	-6
General Engineering	1,965,861	2,085,768	2,228,196	2,104,080	3,589,725	-119,907	-6
Food Science and Technology	433,601	458,472	533,731	499,331	685,329	-24,871	-5
Politics and International Studies	1,649,335	1,728,468	1,725,923	1,715,707	1,742,344	-79,133	-5
Statistics and Operational Research	1,239,704	1,271,075	1,266,052	1,257,880	1,245,131	-31,371	-2
Earth Sciences	2,541,238	2,593,753	2,488,534	2,523,418	2,172,633	-52,515	-2
Economics and Econometrics	1,185,794	1,194,185	1,264,618	1,189,183	2,176,619	-8,392	-1
Theology, Divinity and Religious Studies	1,834,737	1,836,462	1,724,209	1,809,322	1,343,210	-1,725	0
Electrical and Electronic Engineering	5,019,267	4,846,955	4,669,344	4,797,820	3,885,396	172,312	4
Metallurgy and Materials	54,584	52,436	54,806	52,501	523,088	2,148	4
History	4,044,312	3,818,846	3,783,720	3,828,505	3,280,838	225,467	6
Pharmacy	1,620,052	1,512,246	1,472,225	1,505,040	1,186,039	107,806	7
Chemistry	4,596,719	4,276,324	4,501,194	4,404,261	4,959,544	320,395	7

Pharmacology	391,299	357,077	366,739	353,371	517,493	34,221	10
Iberian and Latin American Languages	402,983	366,760	381,584	370,754	454,555	36,223	10
Mechanical, Aeronautical and Manufacturing Eng	2,982,931	2,714,328	2,777,211	2,733,585	3,048,455	268,603	10
Biological Sciences	14,946,040	13,584,676	13,605,270	14,081,360	11,011,419	1,361,365	10
English Language and Literature	3,549,709	3,223,678	3,170,978	3,212,157	2,701,105	326,031	10
Civil Engineering	2,664,352	2,417,603	2,417,689	2,315,372	2,808,730	246,749	10
Applied Mathematics	2,786,586	2,508,118	2,462,987	2,490,662	2,188,787	278,468	11
Archaeology	379,930	338,847	356,118	342,109	722,742	41,083	12
Chemical Engineering	493,459	438,478	466,560	443,857	820,437	54,982	13
Hospital-based Clinical Subjects	7,256,136	6,444,474	6,464,153	6,570,128	5,379,343	811,662	13
Middle Eastern and African Studies	191,044	169,107	165,965	168,736	122,380	21,937	13
Clinical Laboratory Sciences	5,166,098	4,562,492	4,492,750	4,536,387	4,011,273	603,606	13
French	1,353,153	1,194,634	1,221,761	1,229,652	1,116,457	158,519	13
German, Dutch and Scandinavian Languages	460,650	404,150	425,156	412,666	521,514	56,500	14
Clinical Dentistry	596,630	519,074	580,308	556,739	889,949	77,556	15
Philosophy	1,146,672	988,723	1,046,224	1,015,047	1,202,123	157,949	16
Italian	105,756	89,778	98,118	90,437	227,277	15,978	18
Pure Mathematics	1,528,255	1,296,392	1,309,501	1,329,441	1,097,855	231,863	18
Asian Studies	167,163	139,494	140,779	138,046	174,829	27,670	20
Anthropology	617,907	512,247	534,432	534,404	507,004	105,660	21
Classics, Ancient History, Byzantine and Moder	487,418	403,687	425,254	418,578	489,521	83,731	21
Russian, Slavonic and East European Languages	145,415	120,184	129,946	118,937	227,277	25,231	21
Physics	6,784,246	5,604,988	5,646,431	5,550,836	6,053,553	1,179,258	21
Mineral and Mining Engineering	1,056,745	864,221	807,810	855,249	676,937	192,525	22
Accounting and Finance	1,678,670	1,360,066	1,415,022	1,342,480	1,468,562	318,604	23
Law	3,728,766	3,000,650	3,031,684	3,021,245	2,945,866	728,116	24
Veterinary Science	6,183,706	4,824,276	4,774,196	4,774,196	4,527,088	1,359,431	28

NB : The subject areas are sorted according to the results in the final column.