Phelan's Bibliometric Analysis of the Impact of Australian Educational Research

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Abstract

Phelan (2000) has produced a complex bibliometric analysis of the international contribution of Australian educational research based upon publications and citations reported in the journals indexed by the Institute for Scientific Information – the Standard & Poors of the academic world. This paper examines Phelan's analysis, showing its strengths and weaknesses, as well as examining his proposal for the establishment of an Australian database along the lines of the ISI's index.

Bibliometric analysis is an imprecise art, as Phelan (2000) acknowledges. It is frequently dependent on databases that are constructed on principles that do not serve the bibliometrician's purposes; which do not combine easily with other databases or which vary in time period or coverage. In his study of the productivity and impact of Australian educational research Phelan acknowledges these limitations but also suggests that there is sufficient strength in the data he uses to produce a reliable estimate of Australia's international research reputation.

His publication and citation data is drawn from the list of journals indexed by the Institute for Scientific Information, a US-based organisation that lists publications and paper citations for 'leading journals' in most scientific fields. From the overall database only those publications and citations with Australian authors from 1981–97 were selected through the Research and Evaluation Policy project. This produced information on 300 000 papers written by some 800 000 authors, published in some 2693 journals. When classified by field the rather surprising conclusion was that of the thirteen major fields of publication[1] only earth sciences (which includes marine sciences and geology) had a higher percentage of world publications than education. In Phelan's words,

> the contribution of education to the world literature is surprisingly strong compared to other fields of research. Among this set of major

> fields, education is the second largest contributor in terms of publication. That share has also grown in recent years at a faster rate than it has for other fields. (Phelan 2000, p. 608)

If that is the case in comparison to other fields of research in Australia it is also the case that Australia seems to be fighting above its weight in the international educational literature. Taking the 35 most prolific countries for comparison, Phelan concludes:

> Producing about 3.5 per cent of international publications in the area of education, Australia was the fourth largest producer in this field for the period from 1987 through June 1998. This is a very strong performance for a relatively small country. Only the United States (66.8 per cent), the United Kingdom (10.00 per cent) and Canada (5.6 per cent) produced more educational research than Australia and all three of these countries are considerably larger both in terms of population and in terms of the size of their economies. (Phelan 2000, p. 595)

Notably, Australia, on these statistics, also outperformed all European countries as well as Japan. But before we take this assessment as the basis for self-congratulation it would be well to look a little more closely at the data on which these judgements are made.

Phelan fortunately provides a table listing the journals included in the ISI list. Not all of them are easily identified from the title abbreviations but of the 169 listed it is possible to readily identify 143. Of these 94 (66 per cent) were published in the USA, 33 (23 per cent) in the United Kingdom, 8 (5 per cent) in Europe, 3 (2 per cent) in Russia, 2 (1 per cent) in Canada and 1 (.6 per cent) in Australia, New Zealand and China respectively. Even if Europe is disaggregated into the three contributing countries it becomes apparent that journals from only nine countries are represented here despite the fact that judgements are being made about the educational productivity of some thirty five.

Moreover the criteria of inclusion in the ISI list are unclear. This may partly be the result of difficulties in defining the field of education. A strict definition (journals related to primary, secondary and tertiary education across curricular, pedagogical and assessment fields as well as policy and management, for instance) would clearly exclude a considerable number of journals with educational interests. A very loose definition might however also include journals with marginal relationship to 'mainstream' education. The ISI list for instance includes journals on medical and legal education, academic psychiatry and academic medicine. A quantitative solution to this issue of relative importance is possible in terms of circulation numbers but this might exclude some very important and influential specialist journals as well as producing a significant

bias towards journals produced in countries with large populations.[2] It is also that case that educational research is often published in 'non-education' journals.

It is also clear that educational researchers publish most of their research in 'local' journals. For instance 75 per cent of Australian publications are in non-ISI-listed journals. Phelan is aware of this problem, particularly in terms of a bias towards English-language journals in the ISI index. He uses India as an example.

> Thus, for example, while India produces only just over one third of one per cent of articles appearing in these (ISI) sources, India has many journals in which local authors publish that are not indexed by ISI. (Phelan 2000, p. 593)

In such circumstances it would be a reasonable question to ask whether the percentage of journals published in particular countries equates with the representation of those countries in the 'international' literature. Rather unsurprisingly, with 66 per cent of the journals on the ISI list published in the USA 66.8 per cent of the publications cited are from the USA. The UK publishes 23 per cent of the listed journals but achieves only some 10 per cent of publications; Russia 1 per cent of journals and 0.4 per cent of publications: Canada 0.6 percent of journals and 5.6 per cent of publications and Australia 0.6 per cent of journals but 3.5 per cent of publications. On these figures it would seem that the US gets about what could be expected; Russia significantly less than might be expected; the UK rather less than half of what might be expected and Canada and Australia significantly more than might be expected. On the other hand it might simply be that Canadian and Australian researchers are more prone to publish in other countries' (especially American and British) journals.

This data also raises the important issue of how educational debates in one country are related to those in others. It is not possible to tell from Phelan's data if my surmise is correct, but if it is then it indicates that Canadian and Australian researchers are possibly more connected to educational research and policy agendas in other countries (especially the United Kingdom and the United States) than researchers in those countries are to other national debates. Extending this to the Indian example used by Phelan the question arises as to how the significant number of publications and journals that are produced in India are related to the 'international' literature. Or, more bluntly, in what ways are the journals on the ISI list actually in their content and orientation 'international'? Or, even more importantly, in what sense other than the rather limited example given above of Canadian and Australian researchers is there a truly 'international' educational research literature?

There is also the important question of the impact of publication. Does anyone read the papers published? One way of attempting to address this issue is to look at the citation rates of articles and journals. Phelan reports an 'impact' score for individual journals which is 'the average number of citations per publication for that journal over the years it has been indexed by ISI' (Phelan 2000, p. 588). This would presumably mean that an impact score of 1.00 indicates that there would have been, on average, one citation per publication. For the years 1981–97 fifty-one of these journals had an impact score of less than one. Two had an impact score of zero! It would seem difficult to argue that these journals were publishing significant research in education, but they remain on the ISI list.

Turning to national comparisons in citation rates as an index of the impact of educational research Phelan provides data (table 3.4, p. 600) that show significant fluctuations over time. For instance, for the period 1987–98 Denmark tops the list with an average citation rate of 4.27. But this is almost wholly achieved during the period 1987–91 with an average of 10.19 citations per publication (1st place) while for the period 1993–97 the rate fell to a relatively low 1.03 (11th place). Sweden likewise had an overall score of 2.93 due largely to a high score (7.38, 2nd place) in the early period falling to a low score (0.73, 22nd place) in the later period. The United States rates third on the list for the overall period 1987–98 (2.71) but again most of this is due to a higher rate (4.12, 5th place) in the early period, while for the later period the rate was 2.17 (3rd place). Australia is listed tenth on this table for the overall period (2.12) with an early score of 3.39 (8th place) and a later score of 1.08 (7th place).

Phelan's conclusion here is interesting:

> Looking at the data over time, however, it is clear that Denmark and Sweden were strongest on this measure in the period from 1987 to 1991. Their best research, on average, was produced in the 1980's and the quality of their research by this measure appears to have declined in more recent years. (Phelan 2000, p. 599)

The leap here from 'rate of citation' to 'quality of research' does not seem justified. One is reminded of the huge citation rates that followed the initial publication of claims to have achieved 'cold fusion' and the eventual disconfirmation of the original research.

Phelan's comment on Australia is that 'the ability to attain a relatively large number of citations per article produced appears to be Australia's weakest area in the data examined here' (Phelan 2000, p. 599).

Turning to internal, Australian, rather than international comparisons Phelan examines the performance of 38 Australian universities on a variety of measures: share of publications, historical share of citations, share of citations to recent publications, recent publication impact, publications per staff member and citations to recent work per staff member. Combining data for these measures Phelan constructs a productivity index. His conclusions are wholly based on the ISI data and are limited to the 25 percent of Australian educational research published in those journals. However, his claim is that publication in ISI journals represents both international recognition and an index of quality.

His conclusions are clear:

> The data [show] that a relatively small number of universities are located near the top on a large range of productivity measures presented here. The University of Queensland and Curtin University of Technology perform particularly strongly on most of the measures examined here. Deakin University, the University of Sydney, and the University of New South Wales, all of which are also very strong on a number of measures presented here, closely follow them. Other universities that clearly make a major contribution to internationally recognised educational research are the University of Western Australia, La Trobe University, Queensland University of Technology, the University of Western Sydney, and Monash University. (Phelan 2000, p. 614)

He also passes comment on the apparent rise and fall of particular universities.

> The most current of the measures presented here suggest that three universities, Deakin University, the Queensland University of Technology, and the University of Western Sydney have emerged particularly strongly in recent years to become leaders in the area of educational research. The University of Sydney still performs well on many measures, but its performance appears to be diminishing over time. The performances of the University of New England, the University of Adelaide, Macquarie University, and the Australian National University have also weakened substantially in this field over the years. (Phelan 2000, p. 614)

However he also argues that there is a clear separation between research-producing institutions and the rest.

> All of the institutions mentioned so far, however, even the declining ones, considerably outperform a fairly large group of universities at the bottom of the distribution … that have not produced much in the way of educational research over a long period of time. (Phelan 2000, p. 614)

One of the most telling charts however is the one that relates research productivity as measured by publication rates to research expenditures. Here Phelan's conclusion is that

> The University of Queensland, Queensland University of Technology, Curtin University, the University of Sydney and Monash University, La Trobe University and Deakin University … produce more research than would be predicted by their levels of expenditure on research. The University of Melbourne, Griffith University, Macquarie University and the University of Wollongong, all universities with reasonably large expenditures on educational research, produce fewer articles than would be expected from the amount of money invested. (Phelan 2000, p. 649)

If citation rates are taken as a measure of attention paid to research these comparisons become even more striking. To take but two extreme examples. Melbourne University accounts for 10.77 per cent of the total expenditure on educational research but achieves 4.7 per cent of publications and 0.33 per cent of citations. Deakin University, with 2.31 per cent of educational research expenditure, achieves 4.6 per cent of publications and 3.89 per cent of citations for the period 1992–97 (Phelan 2000, pp. 649–51).

It is perhaps worth noting here that the ARC research quantum, which ranks universities by overall research performance, significantly diverges from the ranking provided by Phelan's data! For instance, if universities are ranked by 2001 research operating grants as an index of research quantum and their ranking compared with Phelan's composite index of productivity in educational research (Table 1 – overleaf) some fairly startling disparities become apparent. For instance of the 18 universities where educational research ranked higher than the university's overall ranking 6 were 6–10 ranks higher and 3 were 11–15 ranks higher. Of those 19 universities where educational research ranked lower than the overall university ranking 4 were 6–10 ranks lower, 1 was 11 ranks lower and 3 were more than 16 ranks lower! This suggests what most of us have believed for some time: that the crude and cheap Australian way of ranking universities by overall performance provides a highly inaccurate estimation of the productivity of particular fields of research and that a system similar to that employed in England where like fields of research are compared with like would produce significantly different results.

University	Overall rank	Education	Difference
Sydney	1	4	-3
Monash	2	10	-8
Queensland	3	1	+2
ANU	4	23	-19
Melbourne	5	13	-8
QUT	6	8	-2
UWS	7	9	-2
UNSW	8	5	+3
Griffith	9	20	-11
La Trobe	10	7	+3
RMIT	11	33	-22
UniSA	12	28	-16
Deakin	13	3	+10
Curtin	14	2	+12
UTS	15	16	-1
Newcastle	16	11	+5
Edith Cowan	17	22	-5
Adelaide	18	12	+6
VUT	19	25	-6
Charles Sturt	20	30	-10
UWA	21	6	+15
Macquarie	22	14	+8
Tasmania	23	21	+2
James Cook	24	17	+7
Wollongong	25	26	-1
Flinders	26	18	+8
UNE	27	19	+8
CQU	28	27	+1
USQ	29	24	+5
Murdoch	30	15	+15
ACU	31	34	-3
Swinburne	32	36	-4
Canberra	33	31	+2
Southern Cross	34	37	-3
Ballarat	35	38	-3
NTU	36	31	+5

Table 1: University and education rankings compared

Phelan provides interesting data in a number of other areas including the contributions of individual authors and individual publications and rates of collaboration. But perhaps the most significant recommendation he makes is that an index such as that produced by ISI for 'international' publications should be devised for Australian educational research as a whole, including the 75 per cent that is currently not part of the ISI database. It would seem useful for AARE to pursue this possibility.

Overall the Phelan study, despite the limitations of the ISI data noted above, provides a useful (and the only available) estimate of the international impact of Australian educational research and the comparative contributions of various institutions. Two particular issues emerge from the study. Firstly, the inappropriateness of the ARC research quantum ranking by institution rather than by field of study is clearly shown. Secondly, the need for an Australian-based index comparable to that of the ISI but inclusive of all Australian educational research would be a significant contribution to a proper assessment of the health and impact of Australian educational research.

Notes

[1] These were education, mathematical sciences, physical sciences, chemical sciences, earth sciences, biological sciences, information science, engineering, agricultural sciences, medical sciences, economics, political sciences and behavioural sciences.

[2] It can be argued of course that if a country produces a large number of high circulation journals it will inevitably constitute a larger proportion of total world literature in the field. Whether or not this by itself ensures that such a contribution to the total world literature is indeed *international* in its focus, scope or interest is another judgement entirely.

References

Phelan, T. J., D. S. Anderson and P. Bourke (2000) Educational research in Australia: a bibliometric analysis, in DETYA, *The Impact of Educational Research,* Higher Education Division, Department of Education, Training and Youth Affairs, Canberra.