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How the PBRF has shifted research funding

Introduction

The government introduced the Performance-Based Research Fund (PBRF) to link the funding for research in tertiary education to research performance and to separate it from funding for enrolments by domestic students at the bachelors level and higher. The purpose of the PBRF is to create incentives that are expected to lead to an improvement in the quality of the research conducted in tertiary education organisations.[1]

This note looks at the extent to which the PBRF has or has not resulted in shifts of funding between sub-sectors and, within the university sub-sector, between universities. It first considers the extent of funding shifts by comparing the shares of total research funding allocated in 2007. It then analyses the effects of the weightings that apply to different subject areas in the PBRF.

The data underpinning the analysis is drawn from the report on the 2006 PBRF Quality Evaluation (Tertiary Education Commission, 2007). The analysis updates and extends an earlier analysis based on the 2003 Quality Evaluation report, published in Ministry of Education (2004).

Note: In this analysis, data relating to the colleges of education has been included in the universities data. In some cases, this means that the results used in this analysis will differ from those reported elsewhere – notably by the Tertiary Education Commission in its report on the 2006 Quality Evaluation (Tertiary Education Commission, 2007). Refer to the technical note *Interpreting PBRF data* for further information.

The PBRF

The PBRF allocates research funding to tertiary education organisations through three measures of research performance – a research quality evaluation, the number of research degrees completions (RDCs) and the amount of external research income (ERI) generated.[2]

Subject area weightings apply to two of the three dimensions of the PBRF – the quality component and the RDCs. These weightings are intended to reflect the cost of research in that discipline and to weight the funding to take account of costs.

The basis of the weightings reflects the differences in the funding levels for teaching that applied at the time of the development of the PBRF. For these two dimensions, subject areas are divided into three groups. Subjects like law, social sciences, humanities, languages, business and mathematics have a weighting of 1. Sciences, computer science, music, visual arts and design have a weighting of 2. Engineering, technology, agriculture, architecture, medicine, dentistry, pharmacy veterinary science and surveying are weighted at 2.5.[3]

How has the PBRF shifted funding between sub-sectors?

The key measure of the performance of a provider in the PBRF is the amount of the contestable PBRF funding won divided by the number of full-time equivalent (FTE) PBRF-eligible staff. That is the most important measure since it gives an indication of the performance of the provider, normalised for the size of the provider, across all of the dimensions of the fund, taking account of all of the weightings and loadings built into the fund.

The universities have focused on research throughout their history and hence have dominated performance on all of the measures that are part of

[1] Fuller accounts of the origin and purpose of the PBRF can be found in Boston (2006), Ministry of Education (2004) and Tertiary Education Commission (2004).

[2] The scoring process is detailed in Tertiary Education Commission (2004) pp 19 to 20 and pp 37 to 38.

[3] Tertiary Education Commission (2007) has a table of the weightings (Table 8.2, p 71). There are also weightings for completions of research degrees by Māori and Pasifika students.

the PBRF funding model. The eight universities filled the first eight positions in the average quality score in the 2006 Quality Evaluation. Universities have substantial postgraduate programmes and hence dominate RDCs. Between 2003 and 2005, only 2.2 percent of the RDCs at participating tertiary education organisations were from outside the universities. Likewise, of the ERI won by the participating organisations in 2004, only 1.1 percent was earned outside the universities. Therefore, the universities have dominated the PBRF funding allocations.

Under the previous research funding system – the research top-ups – institutes of technology and polytechnics (ITPs), wānanga and private training establishments (PTEs) earned an increasing share of research funding through their enrolment of degree students.

Table 1 provides a summary performance of participating providers by sub-sector[4] on that measure, plus a ranking of the universities.

Of the 10 ITPs participating in the 2006 PBRF Quality Evaluation, the highest on that measure was Unitec New Zealand, which earned $6,461 per FTE. The highest of the PTEs that participated was Anamata – at $13,547 the highest-ranked organisation outside the universities. The higher of the two participating wānanga was Te Wānanga o Aotearoa ($3,942).

Table 1: PBRF funding per full-time equivalent staff member 2007 by sub-sector and by university

	$/FTE
Universities (including colleges of education)	$35,450
University of Auckland (UA)	*$42,619*
University of Otago (UO)	*$40,089*
Lincoln University (LU)	*$35,473*
University of Canterbury (UC)	*$32,041*
Massey University (MU)	*$31,070*
University of Waikato (UW)	*$29,456*
Victoria University of Wellington (VUW)	*$25,968*
Auckland University of Technology (AUT)	*$13,959*
Participating ITPs	$ 3,873
Participating wānanga	$ 3,768
Participating PTEs	$ 3,491

Source: Tertiary Education Commission

Table 2 below considers the impact of the PBRF on the distribution of funding by looking at the percentage of the contestable PBRF funding won by each of the sub-sectors in 2004 and 2007 and compares that with the percentage of research top-up funding earned in 2003 and with the percentage estimated to have been earned in 2007 had the old research top-ups system continued.

Table 2: Percentage of contestable PBRF funding by sub-sector and university in 2004 and 2007 compared with actual research top-up funding in 2003[5] and estimated research top-up funding for 2007

	2007 PBRF	2007 RTUs	2004 PBRF	2003 RTUs
Universities (incl colleges)	97.6%	91.4%	98.7%	94.1%
UA	*30.3%*	*25.7%*	*28.8%*	*25.8%*
UO	*21.1%*	*16.6%*	*22.5%*	*16.1%*
MU	*15.0%*	*14.0%*	*14.1%*	*15.4%*
UC	*10.2%*	*11.1%*	*11.9%*	*12.4%*
VUW	*9.0%*	*11.2%*	*8.7%*	*9.4%*
UW	*6.4%*	*5.7%*	*7.4%*	*7.4%*
LU	*3.3%*	*2.4%*	*3.4%*	*2.9%*
AUT	*2.3%*	*4.6%*	*1.7%*	*3.8%*
ITPs[6]	2.1%	7.4%	1.1%	5.0%
Wananga	0.2%	0.7%	0.1%	0.4%
PTEs	0.2%	0.5%	0.1%	0.4%
	100%	100%	100%	100%

Note: College of education allocations have been incorporated into the allocations for the universities into which they were merged.
Source: Ministry of Education and Tertiary Education Commission

Had the old research top-up system continued, the polytechnics are likely to have made inroads into the universities' dominance of the research funding pool data. As a result of the introduction of the PBRF, the universities have been able to increase their share of the pool from 94 percent in 2003 to more than 97 percent in 2007. The PBRF pool is larger than the research funding pool would have been under the old top-ups system.[7] Yet the ITPs collectively earned in 2007 $9.1 million less[8] under the PBRF than they would have under the research top-ups system, a cut of 65 percent. This represents a reduction of about 1 percent of total ITP revenue. Likewise, the PBRF has reduced wānanga Vote Education research revenue by about 70 percent[9] – about 0.6 percent of total wānanga revenue. Effectively, there has been a transfer of funding to the universities.

[4] Note, however, that not all of the ITPs, wānanga or PTEs participate in the PBRF. Therefore, there will be some PBRF-eligible staff in non-participating providers in those sub-sectors. To that extent, it is likely that the performance of those sub-sectors is inflated in Table 1.

[5] In comparing these percentages, it is important to note that the injection of new funding by the government in successive budgets since 2002 means that the size of the total funding for research has grown substantially – by 2007, the difference was about $41 million a year.

[6] Note that the ITPs' apparent increase between 2004 and 2007 reflected the fact that only two ITPs participated in the PBRF Quality Evaluation in 2003, compared with 10 in the 2006 evaluation.

[7] $230.7 million in 2007, compared with a projected $189.6 million in 2007 by way of research top-ups. The estimate of the 2007 research top-ups figure is to be found in Tertiary Education Commission (2007) and is calculated on the amount that would have been available had research top-up rates been amended in line with tuition funding rates and had the government made no additional funding injections into the PBRF.

[8] $4.85 million compared with $14.05 million.

[9] From $1.3 million to $0.4 million.

Shifts of funding between the universities

While the universities as a group gained a larger share of the funding from the PBRF contestable pool than they would have from the research top-ups, only five universities increased their shares – Lincoln, Otago, Auckland, Waikato and Massey, in order of the scale of increase. If one were to discount for the effects of the government's additional funding for the PBRF – and compare what would have happened had the PBRF been implemented without extra funding injections – then Lincoln would have increased its research funding from this source by 35 percent or nearly $7,600 per FTE, representing nearly 2 percent of annual revenue. Otago's increase at 26 percent would also represent about 2 percent of its total revenue. The Auckland, Waikato and Massey increases in this source of revenue would have been 18 percent, 12 percent and 7 percent respectively.

AUT, a newer university building a research capability from its polytechnic base, predictably lost share. Discounting for the effects of the extra funding injections, AUT would have lost half of its funding from this source - $4.4 million or 2.1 percent of total revenue. Victoria University of Wellington and the University of Canterbury both lost share. In Victoria's case, in the absence of the funding injections, the reduction would have been 20 percent of this source of revenue or 1.6 percent of total revenue. This reduction reflects the strengths of that institution in social sciences and related fields that are funded at the lowest rate under the PBRF. In Canterbury's case, the loss of share was more than balanced by the effects of the additional funding injections; the $1.7 million reduction was offset by the extra $4 million Canterbury won of the additional funding.

Table 3: PBRF 2007 funding allocations per FTE

	QE points per FTE	QE allocation per FTE	RDC allocation per FTE	ERI allocation per FTE	Total allocation per FTE	PBRF Rank
UA	3.85	$22,842	$11,753	$8,024	$42,619	1
UO	4.01	$25,575	$7,867	$6,647	$40,089	2
MU	3.06	$18,080	$8,952	$4,038	$31,070	5
UC	3.52	$19,872	$9,504	$2,665	$32,041	4
VUW	3.42	$16,948	$6,353	$2,667	$25,968	7
UW	3.73	$17,564	$8,098	$3,795	$29,456	6
LU	2.96	$20,145	$5,493	$9,835	$35,473	3
AUT	1.86	$9,948	$2,731	$1,280	$13,959	8

Note: College of education results have been incorporated into the results for the universities into which they were merged.

The shifts of funding between the universities may appear reasonably significant given the fact that there is relatively little difference in the research quality scores between most of the universities – the four universities with the highest average quality score had scores in the 2006 Quality Evaluation in a very narrow band, from 3.52 to 4.01, while the seventh-ranked university on that measure had a 2006 Quality Evaluation average score of around 74 percent of the highest ranked. If it were possible to quantify the uncertainties on these scores, there would be little significant difference in performance across this measure between the seven top universities.

Data on RDCs between 2003 and 2005 shows greater variation between the universities than the research quality scores. Auckland earned most completion points per FTE[10] at 0.73, 20 percent above the second-ranked university on this measure (Canterbury) and 25 percent above the third (Massey). This performance is reflected in the funding allocations, with Auckland winning $11,750 per FTE respectively, compared with $9,500 by Canterbury. On a per-FTE basis, Auckland earned more than twice as much as Lincoln (ranked seventh) and 49 percent above Otago the fifth-ranked university on this PBRF dimension.

There is even more significant variation in the funding allocated on the basis of ERI. Lincoln is the clear leader on this dimension, winning nearly $10,000 per FTE, about 23 percent above Auckland, the second ranked university, more than twice the earnings of Massey (ranked fourth) and more than three times the allocation per FTE of Victoria and Canterbury (ranked sixth and seventh).

The effects of weightings assigned to fields of research

The three universities with the largest increases in their share of research funding on this analysis all have a substantial proportion of their research activities in higher-funded fields.[11] The situation is most evident in the university that made the greatest advance in funding with the introduction of the PBRF – Lincoln University. Much of Lincoln's current and

[10] The term 'completion point' is the number of doctoral and other research completions recorded over the period relevant for the 2007 funding allocations and weighted to reflect the PBRF funding formula. There are two points of difference between the numbers quoted here and the calculations used by the Tertiary Education Commission in allocating RDC funding. The first is that the ethnic weightings are omitted. The second is that for simplicity's sake, the non-doctoral research degree completions have all been treated as 1.0 EFTS – in practice, some may be weighted at between 0.75 EFTS and 0.99 EFTS. Neither omission is considered significant for the purposes of this analysis. The data source is Tertiary Education Commission (2007).

[11] For instance, the University of Otago generated 18 percent of its 2003 research top-up funding from categories other than the lowest-funded categories, compared with 28 percent for all universities. The corresponding figure for Lincoln was 17 percent and Auckland 24 percent.

historical research excellence is in areas related to land-based industries. Yet these fields have attracted relatively fewer enrolments and hence generated relatively lower research top-up funding. Much of Lincoln's PBRF funding would have come from applied sciences such as agriculture and environmental sciences, fields with higher PBRF discipline weightings. On the other hand, Lincoln's research top-up funding would have been boosted by relatively stronger enrolments in fields, such as business and tourism, that generate lower funding. By contrast, Victoria University of Wellington, which lost both share and funding, has a traditional research strength in the social sciences – which draw PBRF funding at lower rates. While Victoria's research top-up funding would also have reflected its social sciences strength, its degree enrolments in fields such as science and architecture would have bolstered its research top-up funding.

In addition, it is clear from the 2003 and 2006 Quality Evaluation results that, with a few exceptions, the highest-performing subject areas tended to be those fields with higher funding weightings. In the 2006 Quality Evaluation, four of the five highest-performing subject areas were fields that draw funding at higher weightings. Of the 12 PBRF Quality Evaluation panels, the three panels with the highest average quality scores in the 2006 Quality Evaluation were all covering subject areas that attract higher-weighted funding.[12] The 2003 Quality Evaluation showed similar results.

These observations raise questions as to the effects of subject area weightings on the PBRF funding allocations: to what extent has the PBRF shifted the source of research funding from lower cost/lower funded fields of study to higher, and what effect has that had on the allocations made to the universities?

Table 4 shows the 2004 PBRF quality and RDC funding generated broken down by cost/funding category and compares that with research top-up funding in 2003. The table shows that, compared with the research top-up system, an increased share of research funding has been earned by activities in higher funded categories under the PBRF.

The implication is that the introduction of the PBRF meant a shift in the fields that produce research income for the universities.

Table 4: Percentage of contestable PBRF funding by funding category in 2004 compared with research top-up funding in 2003

		Percentage of research funding	
	Funding category	2003 RTUs	2004 PBRF funding
Lower Cost	A, I	28.8%	23.5%
Higher Cost	B, C, G, H	71.2%	76.5%

Because the ERI earned by researchers in higher-cost disciplines is likely to be higher than that earned by those working in lower-cost disciplines,[13] the shift observed in Table 4 from lower categories to higher categories is likely to have understated the actual movement.

The 2007 PBRF university Quality Evaluation and RDC allocation data has been recalculated with the differential weightings between fields of study removed from the formula.[14] The results are presented in Tables 5, 6 and 7 below.

Table 5: PBRF Quality Evaluation funding by university in 2007 – weighted and unweighted

	Actual allocation ($000)	Unweighted allocation ($000)	Difference due to the weightings ($000)	% age difference
UA	$37,443	$36,455	$988	2.7%
UO	$30,944	$28,039	$2,905	10.4%
MU	$20,123	$19,656	$466	2.4%
UC	$14,469	$14,969	-$501	-3.3%
VUW	$13,493	$15,712	-$2,220	-14.1%
UW	$8,841	$10,836	-$1,995	-18.4%
LU	$4,324	$3,667	$657	17.9%
AUT	$3,797	$4,098	-$301	-7.3%

Note: College of education results have been incorporated into the results for the universities into which they were merged.

[12] Conversely, some of the poorest-performing subject areas in the Quality Evaluation were in areas funded at the lowest rate.

[13] It should be noted that much of the Vote Research, Science and Technology contestable research funding is directed towards higher-cost fields of study such as science, technology and health.

[14] The calculations were made by allocating the funding won by the eight universities on these two PBRF dimensions according to a formula the same as that used in the PBRF but with all subject areas weighted as 1. The Māori and Pasifika weightings in the RDC dimension were also ignored. All masters research projects were weighted as 1.0 EFTS for the sake of simplicity. The data is drawn from Tertiary Education Commission (2007).

Table 6: PBRF research degree completions funding by university in 2007 – weighted and unweighted

	Actual allocation ($000)	Unweighted allocation ($000)	Difference due to the weightings ($000)	%age difference
UA	$19,265	$18,741	$525	2.8%
UO	$9,536	$8,836	$700	7.9%
MU	$9,964	$10,193	-$229	-2.2%
UC	$7,012	$7,103	-$91	-1.3%
VUW	$5,058	$6,017	-$959	-15.9%
UW	$4,076	$4,148	-$72	-1.7%
LU	$1,179	$1,110	$69	6.2%
AUT	$1,043	$985	$57	5.8%

Note: College of education results have been incorporated into the results for the universities into which they were merged.

Lincoln University and the University of Otago benefited most from the subject weightings, while Victoria University of Wellington and the University of Waikato lost most funding.

Table 7: Differences in PBRF funding by university due to subject weightings in 2007

	Difference due to the weightings ($000)	% age difference
UA	$1,512	2.2%
UO	$3,605	7.4%
MU	$237	0.7%
UC	-$592	-2.5%
VUW	-$3,179	-15.4%
UW	-$2,067	-13.9%
LU	$726	9.5%
AUT	-$243	-4.6%

Note: College of education results have been incorporated into the results for the universities into which they were merged.

The subject weightings make a difference to the rankings also. Table 8 shows that if the weightings were dropped in the 2007 allocations, Lincoln would drop from third to fifth, while Waikato would move from sixth to third, with Massey dropping from fifth to sixth.

Table 8: PBRF 2007 funding allocation per FTE by university – weighted and unweighted

	Actual allocation/FTE	Rank weighted	Unweighted allocation/FTE	Rank unweighted
UA	$42,619	1	$41,697	1
UO	$40,089	2	$37,115	2
LU	$35,473	3	$32,090	5
UC	$32,041	4	$32,843	4
MU	$31,070	5	$30,857	6
UW	$29,456	6	$33,563	3
VUW	$25,968	7	$29,961	7
AUT	$13,959	8	$14,596	8

Note: College of education results have been incorporated into the results for the universities into which they were merged.

A similar analysis of the 2003 Quality Evaluation results and the 2004 funding allocations reveals a similar pattern – Lincoln University, the University of Otago and the University of Auckland would all have been worse off[15] if the PBRF were implemented with the disciplinary weightings removed – as would be expected given the extent of their activity in areas funded at higher rates. As in 2007, the two universities that would have gained substantially in 2004 if the weightings were removed were Victoria University of Wellington (14 percent) and the University of Waikato (11 percent).

Conclusion

The principal effect of the PBRF has been to shift research funding to the universities and away from the ITPs. Between the universities, the effects are more complicated. If we exclude AUT, a newer university that is building its research capability, there is little difference between the universities on the PBRF's research quality assessment. Discounting for the effects of subject-based weightings, there are five universities whose research quality allocations are clustered between $19,800 and $23,200 per FTE. The other two dimensions of the PBRF – RDC and ERI – produce greater variations of performance and thus are more important drivers of funding shifts.

Another significant influence on where money goes is the subject weightings. The PBRF subject weightings tend to shift funding towards those universities with substantial research activities in the sciences and the applied sciences – more sharply than the old research top-ups system. In large part, this is a consequence of the fact that in some universities these fields are the focus of considerable research activity but may not attract large numbers of enrolments. Conversely, some lower-funded fields that draw significant enrolments may have lower research performance.

References

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[15] Compared with the actual PBRF allocation. Lincoln University would have lost 12 percent of its 2004 PBRF allocation, the University of Otago 7 percent and the University of Auckland 2 percent.

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