Academic Productivity and the Changing Research Funding Models in Australia: What is the True Picture?

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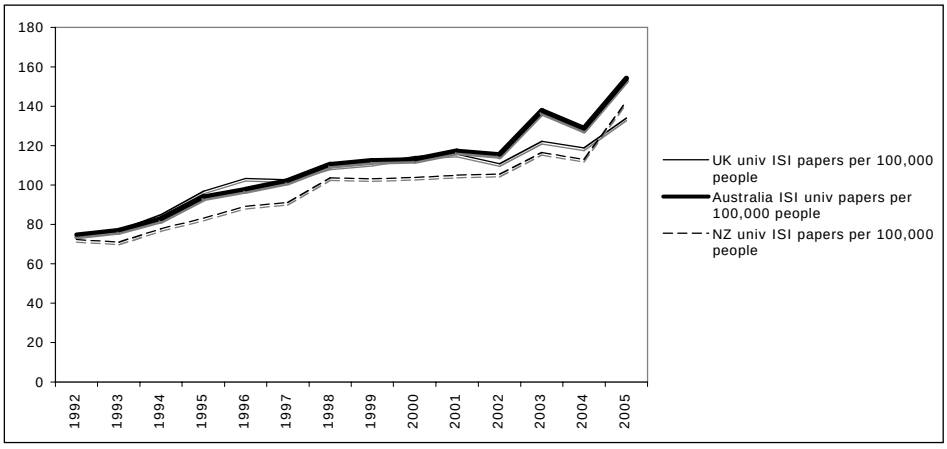
EXTENDED ABSTRACT

It has become usual practice for the Australian Federal Government to shape the country's research priorities to better reflect and care for the needs of the economy, society and the physical environment where they exist. The funding mechanisms for university research and research training have also changed with the latest system being introduced since 2001. A new model, namely the Research Quality Framework (RQF) is being currently discussed, shaped along the lines of the British Research Assessment Exercise and the New Zealand's Performance Based Research Fund. These are also times when the performance of Australian universities is being attacked with open calls for them to prove that they are worth the taxpayers' money.

The paper analyses the productivity of the Australian academic sector between 1992 and 2005 in comparison with New Zealand and the UK (see Figure 1) and then uses the case study of the Institute for Sustainability and Technology Policy (ISTP). Murdoch University to demonstrate the changes in research quality. Its main argument is that the constantly improving performance of the Australian universities is not being acknowledged and instead, a false public image of lack of productivity is being created. Data on research publications is used to show that Australia outperforms the UK and New Zealand whose systems are being used as the model for the proposed changes in Australia. The gap has in fact widened since their reforms were introduced. Further data is provided on different citation systems, research funding and PhD completions in ISTP to demonstrate productivity gains during the period under question.

Serious questions can be asked as to the sustainability of the proposed changes. A country with a long-term vision for the future should use universities as a social pillar, which can guarantee brighter prospects for its future generations. For Australia to have a strong and world-class university research sector, adequate resources should be provided to match its current achievements and facilitate the transition to any new funding model. Also, such a new model should allow for diversity and flexibility to properly reflect the complexity of the academic world.

Figure 1. Research productivity of academics in Australia, New Zealand and UK (represented by ISI papers per 1000,000 population), 1992-2005



1. INTRODUCTION

The academic environment in Australia is being constantly shaped by changing research priorities and most importantly changing funding models. However, the current debate surrounding the new Research Quality Framework (or the RQF buzzword) is the first time in Australia's history when universities are being publicly attacked for not delivering expected research outcomes and not being productive. The latest RQF paper produced by the Department of Education, Science and Training (DEST) claims that "it is difficult to assure stakeholders that public funds for research are being invested in the highest quality endeavours. Without this assurance, the argument for further public investment in research is not as persuasive as it should be" (DEST, 2005, p. 7). The paper (which is one of a series of RQF publications) asserts that if we have "a consistent approach to measure research quality and impact across the breadth of the Australian research landscape" (DEST, 2005, p. 7), it would be easier to convince the taxpayers that investing in Australian research capabilities is worth their dollar.

The aim of this conference paper is to put to the test the assumptions behind the current Australian Government position in relation to publicly-funded research. In order to do this, it uses macro analysis of academic productivity in Australia (particularly in comparison with New Zealand and the UK) and a case study of the Institute for Sustainability and Technology Policy for changes in research quality. The main argument is that the constantly improving performance of Australian universities is not being acknowledged and instead, a false picture of wastefulness of taxpayer money is being created.

2. THE PRODUCTIVITY EVIDENCE

The RQF papers claim that there is concern that refereed publications as currently used in the university funding formula[1] "do not sufficiently encourage a focus on research quality" (DEST, 2005, p. 7). The main argument for change in the research funding in Australia is influenced by the schemes introduced recently in the UK, the National Research Assessment Exercise (Harnad et al., 2003) and New Zealand, the Performance Based Research Fund (Goldfinch, 2003).

It is interesting to see how Australia has performed, particularly in comparison with these two countries in terms of research output. Since the advent of computerisation in the 1970s, bibliometric methods for analysing and describing research output have been accepted internationally and the journal lists, bibliometric indicators and rankings produced by the Institute for Scientific Information (ISI) have received a wide support (Smith and Marinova, 2005; Dale and Goldfinch, 2005). The ISI covers around 10-12% of all refereed journals (e.g. 8,700 in 2004) with additions and deletions from its list(s) made as often as fortnightly (ISI, 2004). The ISI works on the belief that a core "small number of journals accounts for the bulk of significant scientific results" (Garfield, 1996, p.13).

Table 1 shows that in the last three years, namely since 2003 Australia has outperformed both the UK and New Zealand by the number of ISI papers on a per capita basis. The estimated figure for 2005 is 182 papers per 100,000 population compared with 176 for New Zealand and 172 for the UK. For Australia, the increase since 1992 has been dramatic, namely by 72% (or around 5.5% per annum). The respective figures are 64% (or around 5% per annum) for New Zealand and 44% (or around 4% per annum) for the UK. Moreover, during the 1992-2005 period out of the three countries only Australia has consistently improved its absolute share in total ISI refereed papers (see Figure 2) to reach around 2.5%. Have universities contributed to these changes and where do Australian universities, in particular, stand?

Table 2 presents data on the ISI papers generated by the university sector in all three countries. The productivity of Australian universities (measured as number of ISI refereed papers per 100,000 population) has been consistently higher than that of New Zealand for the entire 1992-2005 period. It also has been higher than that of the UK since 2001. The gap between the Australian and British/New Zealander academic productivity increased significantly in the last three years (which broadly coincides with the introduction of their respective new university funding models). Figure 3 also clearly shows that the university sector has been pushed in all three countries to become the main contributor to the pool of ISI

[1] Research funding in Australia is currently based on performance-driven formulas which include outside research income, high degree research student completions and load, and number of refereed publications (books, book chapters, refereed journal publications and full-paper refereed published conference proceedings). The latter component is valued only at 10% in the Research Training Scheme.

refereed papers. In the case of Australia, the share of universities has reached as high as 85% in 2005.

Against this outstanding performance of Australian university researchers, it is misleading for the Federal Government to imply that there are problems as to how the taxpayers' money is used in supporting research. There is clear indication that research productivity of the Australian universities has been increasing consistently. This however has not been matched by any means with appropriate increases in their research funding.

The ISI evidence of productivity shows that Australian academics have been producing world-class research that is widely accepted by the top refereed journals in an environment which generally undervalued the importance of publications and did not directly encourage publishing in ISI journals. It is therefore completely wrong to create an image of underperforming for the Australian university sector. The right question to ask is whether Australian academics are being rewarded for their increased productivity.

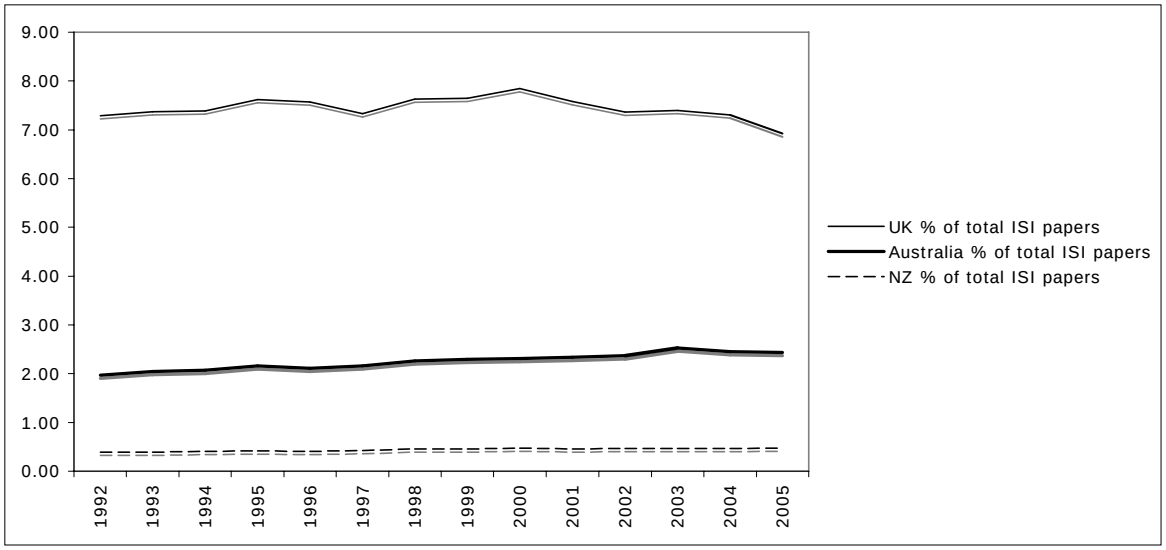
Table 1. ISI refereed paper publications by Australia, New Zealand and UK, 1992-2005

	United Kingdom		New Zealand		Australia	
Year	ISI papers	ISI papers per 100,000 people	ISI papers	ISI papers per 100,000 people	ISI papers	ISI papers per 100,000 people
1992	68,921	119	3,692	107	18,612	106
1993	69,961	121	3,708	107	19,427	110
1994	74,140	127	4,109	117	20,770	116
1995	81,526	140	4,414	124	23,112	128
1996	85,378	146	4,612	127	23,838	130
1997	84,062	143	4,828	131	24,819	134
1998	89,253	151	5,397	145	26,477	141
1999	90,097	152	5,358	142	27,053	143
2000	91,436	154	5,505	144	26,882	140
2001	91,067	152	5,524	143	28,087	145
2002	85,928	143	5,418	139	27,631	141
2003	95,344	159	5,962	151	32,589	165
2004	90,677	150	5,732	144	30,425	153
2005*	103,848	172	7,108	176	36,587	182

Notes: * The 2005 figure is extrapolated based on data until September 2005 (inclusive).

Source: Data extracted from ISI Web of Science, 30 September 2005.

Figure 2. Percentages of total ISI papers for Australia, New Zealand and UK, 1992-2005



Source: Data extracted from ISI Web of Science, 30 September 2005.

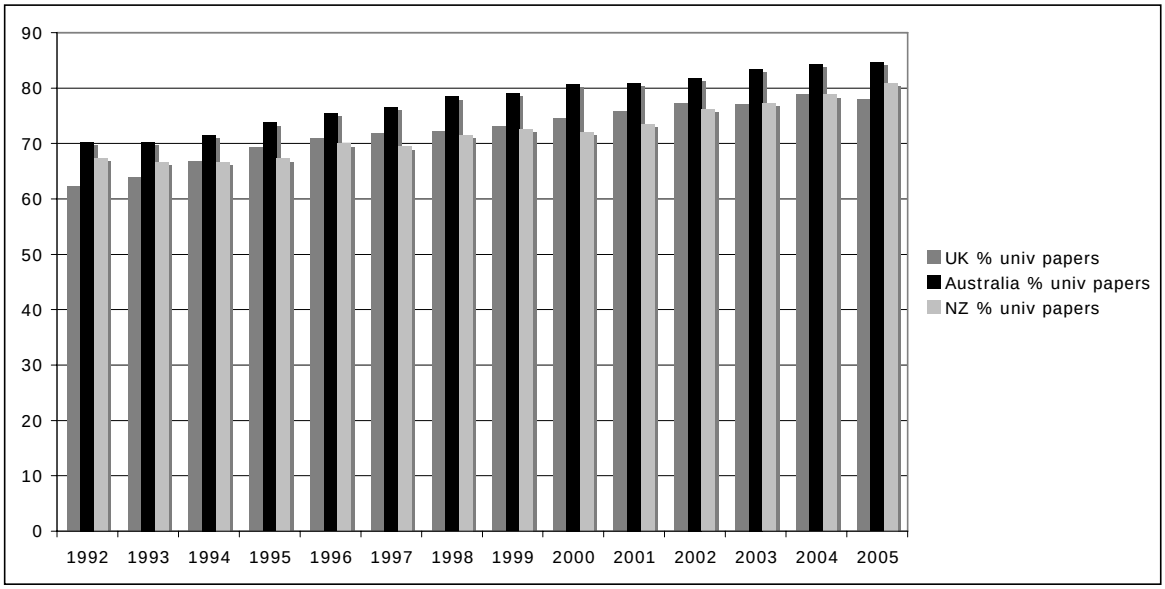
Table 2. ISI refereed paper publications by university sector in Australia, New Zealand and UK, 1992-2005

	United Kingdom		New Zealand		Australia	
Year	ISI univ papers	ISI univpapers per 100,000 people	ISI univ papers	ISI papers per 100,000 people	ISI univ papers	ISI papers per 100,000 people
1992	42,890	74	2,485	72	13,074	75
1993	44,689	77	2,470	71	13,642	77
1994	49,515	85	2,740	78	14,860	83
1995	56,563	97	2,968	83	17,050	94
1996	60,553	103	3,227	89	17,979	98
1997	60,417	103	3,354	91	19,009	102
1998	64,479	109	3,863	104	20,767	111
1999	65,841	111	3,895	103	21,378	113
2000	68,182	115	3,964	104	21,696	113
2001	69,058	116	4,060	105	22,730	117
2002	66,371	111	4,125	106	22,606	116
2003	73,461	122	4,605	117	27,196	138
2004	71,593	119	4,516	113	25,650	129
2005*	81,005	134	5,752	143	30,963	154

Note: * The 2005 figure is extrapolated based on data until September 2005 (inclusive).

Source: Data extracted from ISI Web of Science, 30 September 2005.

Figure 3. Percentage shares of university papers in total national ISI refereed papers for Australia, New Zealand and UK, 1992-2005



Source: Data extracted from ISI Web of Science, 30 September 2005.

3. THE CITATION GAME

Citation rates are a major component in the British Research Assessment Exercise as well as in the Performance Based Research Fund in New Zealand. Although they have not been part of the current and past university funding models in Australia, they are likely to be given a heavy weighting in the proposed RQF. In the anticipation of this development, there has been a resurgence of interest in studies that rank and compare university

departments. Three recent examples are the following:

- the ranking of all Australasian political science units based on ISI publication and citations rates (Dale and Goldfinch, 2004);
- the study by Hix (2004) ranking international political science departments based on their publication rates in a selected group of "political science" journals which themselves are ranked according to the citations per article each journal has attracted; and
- the ranking of economics departments and individual academics in Australia and New Zealand (Macri and Sinha, 2005) where the authors also incorporate journal weights (based again on citation rates) to measure quality.

Because of limitations in the ISI search engines, it is impossible to get any other aggregated citation rates than for individual academics. Hence, it is a very labour-intensive exercise to estimate what are the citation rates for all Australian academics, compared to their counterparts in the UK or New Zealand. Therefore we looked at the academic unit with which we are affiliated, namely the Institute for Sustainability and Technology Policy (ISTP) at Murdoch University in Western Australia. Since 1995, the ISTP has maintained the same size of 8 full-time equivalent academics. Table 3 shows its citation rates/academic staff for 1995-2005 using the ISI citation index.

Table 3. ISI citations for ISTP academics, 1995-2002

	ISI citations/ academic	ISI citations/ paper
1995	0.000	0.000
1996	0.250	0.667
1997	0.375	0.375
1998	1.375	11.000
1999	1.625	3.250
2000	1.750	2.800
2001	2.125	2.833
2002	1.875	3.750
2003	3.000	6.000
2004	2.250	3.600
2005*	6.000	6.000
1995-2000 average	0.725	3.058
1995-2002 average	1.172	3.084
1995-2005 average	1.919	3.747
2001-2005 average	3.050	4.437

Note: * The 2005 figure is extrapolated based on data for 2005 until September (inclusive). Data obtained from ISI Web of Science, 30 September 2005.

Despite some ups and downs in the ISI citations per ISTP academic and paper (triggered mainly because of the small size of the unit), the period averages show a distinctive trend towards increased citation rates. The latest 5-year annual average of citations/academic staff, namely 3.05 is more than 4 times higher than the first 5-year average (see Table 3). Similarly, the number of citations/paper for 2001-2005, namely 4.437, has increased one and a half times compared with the 1995-1999 period[2].

An alternative citation tool, which is fast gaining popularity, is scholar.google.com. Google "works with publishers of scholarly information to index peer-reviewed papers, theses, preprints, abstracts, and technical reports from all disciplines of research" (2005). Apart from being freely available, it also has speedier and more flexible assessment procedures for inclusion of on-line publications (visited by Google's crawler). Despite its wider coverage, it lacks the academic prestige of ISI. In the case of ISTP, we noticed that there was very little overlap between the ISI and Google publications. Table 4 presents similar data for ISTP as Table 3 but based on data from Google.

Table 4. Google citations for ISTP academics, 1995-2002

	Google citations/ academic	Google citations/ paper
1995	1.750	2.800
1996	1.125	0.692
1997	1.375	1.100
1998	1.250	1.667
1999	2.125	1.700
2000	2.250	3.000
2001	4.875	3.250
2002	7.500	3.158
2003	12.875	4.292
2004	8.875	5.917
2005*	5.000	4.286
1995-2000 average	1.525	1.592
1995-2002 average	2.781	2.171
1995-2005 average	4.558	2.964
2001-2005 average	8.237	4.400

Note: * The 2005 figure is extrapolated based on data until September 2005 (inclusive). Data obtained from Google Scholar, 30 September 2005.

[2] The ISTP 1995-2002 citation averages also compare favourably with the averages of the top political science units in Australia and New Zealand (see Dale and Goldfinch, 2005).

The same trends seem to be apparent in the Google citation rates, namely the citation rates have increased significantly during more recent years. Consequently, irrespectively of which citation tool is used to assess the quality of the academic output of ISTP, the changes that had been witnessed in the last decade are a clear signal about the increased quality of output by academics. Hence, again there appears to be no justification for concerns about the world-class quality of Australia's research. The question should be asked not how the system should be changed to punish academics for not performing but how to further encourage an extremely positive trend.

4. THE FULL PICTURE OF ACADEMIC RESEARCH PRODUCTIVITY

The full picture of academic productivity goes way beyond the ISI or Google refereed journals. A study by Smith (2003), for example, found significant shifts in the publication patterns of Australian geoscientists who have become part of centres with partial industry funding (e.g. Cooperative Research Centres). Confidentiality and embargo clauses restrict making research outcomes available in the scientific literature or the public domain. The Australian focus of industry-funded research also makes it less appropriate to US, British or even international journal titles. Against this background it is also interesting to be aware of how Australian academic units have responded to the other criteria for research funding from the government purse.

4.1. Research income and higher degree research student completions

The other two components of the current research funding model include outside research income and completions of Doctoral (e.g. PhD) and Masters (e.g. MPhil) students. The ISTP is used again to show the changes that have occurred for these two measures of academic performance. Table 5 shows outside research income per ISTP academic and Table 6 presents the trend in completion time for ISTP PhD students. There is almost a two-fold increase in the outside research income during the 1999-2004 period (see Table 5) while the completion time for PhD students has been drastically reduced by 12 months (or a quarter) between 2001 and 2004 (see Table 6).

The Institute for Sustainability and Technology Policy may not be the average academic unit (as it is consistently amongst the highest performing units at Murdoch) but it is still representative of the pressure that the Federal Government has put on Australian universities. It has no special funding but has performed at a high level of research output at the time when the Federal Government is questioning university output. Research productivity and outstanding performance in academia have not been adequately rewarded and the public, including the average taxpayer, should be given the true picture. Creating knowledge and capabilities for the future generations is the most important role universities play. They should be encouraged to provide the best nurturing environment instead of being forced to adopt fierce competition strategies for a highly restricted and limited research budget. Australian academics are proud of their achievements and their pride is well justified.

Table 5. Outside research income per academic at ISTP, 2001-2004

	$
1999	32,629
2000	41,939
2001	39,321
2002	39,573
2003	98,020
2004	81,416

Source: Data obtained from Murdoch University's Grants Office.

Table 6. Completion time (months) for PhD students at ISTP, 2001-2004

	months
2001	52
2002	46
2003	45
2004	40

Source: Data available at www.murdoch.edu.au.

4.2. Research activities not included in the funding model

The list and the range of professional activities researchers undertake are big. In addition to teaching, they include public seminars, academic refereeing, membership of professional and editorial bodies, administrative duties, community service, marketing and commercial activities, to mention a few (e.g. Smith and Marinova, 2005; CHASS, 2005). There are significant questions as to whether these functions would be improved by a new more competitive model.

5. CONCLUSION

A country with a long-term vision for the future should have a strategy that allows its development to be sustainable. Most states and nations now use

the language of sustainability to develop policy to ensure they have a long-term future. Universities are a social and institutional pillar, which can guarantee that future generations inherit the Earth with its natural and social resources in an equitable manner. Underfunding of research and research training is no different to the environmental damage and social destruction caused by solely economic and market driven imperatives. It is much easier to not let things slip than to try to fix them. In addition to rewarding the already outstanding performance of Australian universities, any change in the research funding environment should reflect these needs and allow for adequate resourcing of academic activities.

There cannot be a definitive answer as to what is the best way to measure research productivity and quality. Any funding model is by definition a simplification of the real world. By making a set of assumptions, certain aspects of reality are better represented in a model than others. Consequently, with a shift from one model to another, some are winners and some lose. Trying to find the "best fit" or "a more consistent and comprehensive approach to assessing the quality and impact of publicly funded research" (DEST, 2005, p. 7) is a statistical illusion when it comes to investing in a more sustainable future for Australia.

There are at least two necessary pre-conditions for Australia to have a healthy, strong and world-class university research sector. Firstly, adequate resources should be provided to match its current achievements, including financially facilitating the transition to any new funding model. Secondly, the funding model used[3] should allow for diversity and flexibility to properly reflect the complexity of academic world.

6. ACKNOWLEDGEMENT

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[3] Some very good recommendations are made by CHASS, 2005.