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Australia's research quality framework and gender equity

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This article presents quantitative evidence that shows that the introduction of a research assessment scheme similar to the proposed Research Quality Framework (RQF) is likely to exacerbate gender inequity in the Australian university sector. It contributes new measures of gender differences in the publications records of Australian academics. It also identifies the significant impact that measured research performance already has on the promotion chances of Australian academics. Both pieces of evidence indicate that an RQF-style scheme would increase the importance of measured research success in determining career chances and, in doing so, would further reduce gender equity in the university sector.

[Key words: research assessments, universities, gender equity, Australia]

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INTRODUCTION

The contexts of this paper are (a) the current poor representation of women in the upper ranks of Australian academia; and (b) the current agenda of the Australian federal government to introduce new methods to measure the research performance of Australian universities and academics, and to base the allocation of research resources on these measures. Until the recent change in Australia's federal government, in December 2007, the proposal was to introduce a Research Quality Framework (RQF). The new government is likely to implement a modified version of this scheme.

The paper presents quantitative evidence that shows that the introduction of an RQF-style scheme is likely to exacerbate gender inequity in the Australian university sector. It contributes new measures of gender differences in the publications records of Australian academics. It also identifies the significant impact that measured research performance already has on the promotion chances of Australian academics. Both "pieces" of evidence indicate that an RQF-style scheme would increase the importance of measured research success in determining career chances and, in doing so, would reduce the promotion chances of many women.

THE POSITION OF WOMEN IN AUSTRALIAN UNIVERSITIES

Although general and academic women have advanced into more senior positions within Australian universities over the last decade, they are still well in the minority. More significantly, there appears to be a slowing rate of progress as university expansion ceases and fewer new jobs are created. Table 1 shows a steadily improving proportion of academic women in higher ranks up to 2002 and then little change from that point onwards. For example, between 1999 and 2002, women's share of Level B (lecturing) positions increased from 32.6 to 47.0 per cent, but remained virtually unchanged between 2002 and 2004.

Table 1. Female Academics' Share of Total Employment in Australian Universities by Level, 1988–2004

Position	1988	1990	1996	2002	2004
Level D (Associate Professor and Above)	7.0	9.1	13.0	19.4	20.2
Level C (Senior Lecturer)	14.1	16.2	24.3	34.2	34.6
Level B (Lecturer)	32.6	37.6	41.6	47.0	47.1
Level A (Senior Tutor)	45.9	51.2	51.6	54.6	53.7

Source: Department of Education, Science and Technology (DEST) Higher Education statistics

Despite the increase in the number of women in senior positions over the last decade, female vice-chancellors (VCs) were still in the minority (30%) in 2004 and there were no female VCs within the Group of Eight universities (commonly identified as Australia's leading universities). Most female VCs are in the "newer" universities. In 2002, women accounted for only 29 per cent of the senior executives in Australian universities (Carrington & Pratt, 2003).

THE RESEARCH QUALITY FRAMEWORK (RQF) AND INTERNATIONAL COMPARATORS

Although the exact format of the actual approach to measuring research performance in Australian universities has not yet been determined, indications are that it will be based on the RQF model that was close to finalisation before the change of government. As such, it will represent a substantial change from the current metrics[1] used to measure research performance in Australian universities and be more similar to the United Kingdom's Research Assessment Exercise (RAE).

The RQF and the RAE both feature the use of expert-review based assessment. Under the schemes researchers are required to produce four research outputs over a six-year assessment period; and funding allocations are based on the number of eligible ("research active") staff and their combined assessment scores.

The early evidence on women's experiences under the RAE is not positive. A large report on gender and research activity in the 2001 RAE compiled by the Association of University Teachers (AUT, 2004) identified that a substantially higher proportion of men than women were counted as research active in the 2001 RAE. Specifically, male academics in 2002–03 were 1.9 times more likely than females to be counted as research active. The report warned:

> The significance of the RAE extends beyond its impact on recurrent funding outcomes. The results of the RAE are used as a benchmark for research quality by other funders of research in the UK. . . . The RAE has become increasingly used as a yardstick for making decisions about the careers of academic staff, with success in the RAE taken as a proxy for quality. . . . Failure to perform well in the RAE may in turn have a negative impact on an academic's career opportunities, not least their promotion prospects. (AUT, 2004: 6)

[1] These measures currently include the number of postgraduate students and completions, competitive research grants and other government- and industry-funded grants and the funding awarded, and the number of publications.

Allport, in the National Tertiary Education Union's response to an issues paper on the RQF, also drew on New Zealand experiences with a similar scheme to highlight potential risks for female academics, noting that: "Given the emphasis on research track records, early career researchers and staff who have had breaks in their careers for family or other reasons have faired poorly in the assessment exercises" (2005: 15).

The ATN response to the issues paper raised similar concerns based on the British experience. It noted that "the British RAE has resulted in ECRs [Early Career Researchers] and some MCRs [Mid Career Researchers] feeling their work is undervalued as it cannot be compared (or submitted) with that of older colleagues" (ATN, 2005: 17).

Allport (2005) also warned that the British experience shows that entire disciplines were threatened as a result of the introduction of the RAE and many departments were closed due to the overall poor rankings received. Borowsky added to this by raising concerns about the impact of the RQF on Australian Arts and Humanities faculties, where many women are employed. She concluded that, "Given the problematic nature of metrics particularly in the humanities and social sciences, they should be used with caution" (2005: 5).

THE CURRENT STUDY

The current study aims to contribute to the debate on the possible impacts of an RQF-style scheme on gender equity in Australian universities by providing data on the importance of publications to the promotion chances of female academics in Australia. The remaining parts of this paper report the results of an analysis of staff record and publications data collected from Curtin University academics for the period 1997–2004. They explore how the incidence of promotion varied between men and women across the study period, and how this incidence was affected by the employment and publication characteristics of the academics.

The analysis represents a substantial addition to the set of existing studies of gender-based differences in career outcomes in the Australian university sector. Previous studies on this issue (see, for example, Austen 2004) have typically relied on annual, cross-sectional data collections. They have been able to map the trends in the proportion of women attaining, for example, academic grades C, D and E (as was shown in Table 1). However, their reliance on cross-sectional, rather than longitudinal, data has meant that they have not been able to readily identify patterns of promotion. The current study also features the important innovation of linking together the staff and publication records of individual academics.

Data

The data exploited in this analysis was initially collected to meet Curtin University's obligations under the *Higher Education Funding Act* of 1998. As is the case in all Australian universities, Curtin must report to the federal Department of Employment, Science and Training (DEST) each year on the characteristics of its academic and general staff. For each staff member and for each year, data on age, gender, organisational unit, appointment level, fractional appointment characteristic and contract length are collected for this reporting exercise.

The unique aspects of the current study derive, first, from the fact that it makes use of an un-published version of the DEST data collected by Curtin. Specifically, it utilises the annual data sets that contain staff identification numbers, and uses these numbers to link together the staff records in the data sets spanning 1990 to 2004. Staff identification numbers are also used to "link in" assembled data on publications for academic staff over the period 1997–2004. This provides a matched data file containing staff record and publications data for academic employees (other than sessional tutors and lecturers) over the 1997–2004 period. In total, matched publications and staff records data are achieved for 1,541 academics. The data set, which comprises observations on each academic for each year they were employed at Curtin between 1997 and 2004, spans 6,996 observations.[2]

Curtin University of Technology

Curtin University is the focus for this investigation simply because, as my home university, it was an obvious candidate for the data collection exercise. That is, it is not featured in this study because of any particular concerns about its promotion practices or levels of gender equity. Indeed, if anything, Curtin has a better record than other Australian universities in achieving gender equity. It received an Equal Opportunity for Women in the Workplace Agency (EOWA) "Employer of Choice for Women (EOCFW)" award in 2005 and 2006 (EOWA Media Release, 21 February 2006). As such it has been recognised as having relatively high numbers of women at senior levels, succession plans for women in management, development plans for high achievers, paid maternity leave and high maternity leave retention rates and the ability to work part time at all levels.

Curtin University is generally categorised as a mid-ranking university in terms of its research and teaching achievements. It is separate from the Group-of-Eight universities that record the highest outcomes on current research performance metrics. It does not contain either a school of medicine or a school of law. It features a relatively large profile of international students and offshore programs. In sum, the importance attached to publication in determining promotion *may* be lower than in some other Australian universities.

Descriptive Statistics on Publications and Promotions at Curtin

The following tables report summary information on the incidence of promotion, publications and levels for the male and female academics included in this study. The measure of publication utilised is the average annual number of publications of the academic in each year of employment between 1998 and 2004. This is a very basic measure that counts all journal articles, books, chapters, creative works, and so on. It contains no adjustments for the number of authors or for "quality". However, to be included in Curtin University's publications database, claims of publications must be well documented (e.g. evidence of reviewing provided). Participation in the measurement scheme is voluntary; however, the university allocates funds to individuals based on their Research Performance Index (RPI) score. Thus, there is a strong incentive for individuals to supply their publication information to the university. In the database, individuals who do not have publications records are assumed to have not published.

The measure of promotion used in the creation of these tables is, simply, whether the academic was promoted at least once over the study period. The levels referred to are Level A (equivalent to a senior tutor) through to Level E (full professor).

[2] Excluded are academics for whom only one year's observations are available.

Table 2. Publications, Curtin Academic Staff, 1998–2004: Median Annual Number of Publications by Gender and Level (number of observations in brackets)

	Level A	Level B	Level C	Level D	Level E	TOTAL
Female	0.00(157)	0.33(309)	1.00(87)	1.75(20)	2.83(17)	0.29 (590)
Male	0.00(154)	0.40(344)	1.00(220)	1.71(119)	4.14(105)	0.75 (942)

Note: The total includes academic staff above Level E.

Table 3. Publications, Curtin Academic Staff, 1998–2004: Median Annual Number of Publications by Gender and Division[a] (number of observations in brackets)

	Humanities	Curtin Business School	Engineering	Health	Resources and Environment	Aboriginal Studies	Admin
Female	0.33(143)	0.67(85)	1.33(37)	0.33(217)	0.00(31)	0.00(34)	0.00(44)
Male	0.43(176)	0.83(195)	1.50(225)	1.00(168)	1.00(117)	0.00(25)	0.07(44)

Note: a) Division at year of entry or 1997

Table 4. Publications, Curtin Academic Staff, 1998–2004: Median Annual Number of Publications by Gender and Promotion Record (number of observations in brackets)

	Not Promoted Between 1998 & 2004	Promoted Between 1998 & 2004
Female	0(432)	1(159)
Male	0.5(684)	1.71(266)

The figures in these tables convey some preliminary information on gender differences in publications and the links between publications and promotion chances. The median number of publications by female academics each year is shown to be less than the level recorded by men. Across all levels, women typically recorded 0.29 publications each year, whilst men recorded 0.75.

These differences can be partly ascribed to the different levels of appointment of male and female academics at the university. Women were heavily represented among the group of Level A academics and, as could be expected, the annual publication count of these academics was substantially lower than among higher level academics (where men have a higher representation).

The gender-based differences in publications can also be partly ascribed to the different fields that women and men work in at the university. As is shown in Table 3, women's representation is low in divisions of the university that record relatively high publication numbers.

Table 4 gives some preliminary information on the relationship between promotion success and publication. The data shows a correlation between publication numbers and promotion for both men and women at the university. However, the fact that roughly equal proportions of men and women were promoted during the study period (26.9% of women and 28.0% of men) should alert the reader to the likely influence of other factors in determining promotion success. These factors are explored in the multivariate analysis of promotion probabilities, outlined in the following sections.

A Fixed Effect Probit Model of Promotion

This part of the paper reports on the results of an exploration of the longitudinal dimensions of the database. This analysis was conducted with the aim of examining in detail the importance of publication records in the determination of promotion.

A fixed effect probit model was used in this analysis. The fixed effect models were originally developed to facilitate the analysis of panel data sets, and probit models are used in circumstances, such as those of this study, where the dependent variable is dichotomous (in this study it identifies whether or not a staff member was promoted in a particular year).

The modelling procedure focuses interest on the factors affecting the probability that an individual records a promotion in a particular year (see Greene, 1997, for a full account of the procedure). The approach works with the concept of an index function. The likelihood that an individual *i* will record a promotion in time *t* is seen to depend, first, on the influence of the various measured personal and job characteristics in that time period, denoted by $\beta' x_{it}$ [this is the index function]; and, second, on the influence of certain unmeasured factors, represented by ε. The combined influence of the measured factors and unmeasured factors is represented by:

$$y_{it}^* = \beta' x_{it} + \varepsilon_{it} \qquad (1)$$

As a fixed effect model, the focus is on group differences in the intercept terms of the regression. The slopes and variances are assumed to be constant across the groups of observations, which are defined by dummy variables. In our particular model groups were defined to identify publication record (a count of publications each year); gender; part-time employment (that is, an episode of part-time employment during the individual's career at Curtin); division; academic level either in 1997 or in the year of entry (for those who joined Curtin after 1997); and age either in 1997 or in the year of entry (for those who joined Curtin after 1997).

Measures

This choice of independent variables was motivated by the results of prior research on the factors affecting career outcomes for academics. Part-time work has been shown previously to limit individuals' ability to prove themselves to be "ideal workers" in the sector (Drago, Crouter, Wardell & Willits, 2001; Williams, 1999). As mentioned earlier in the paper, the individual's academic division has previously been identified as having an effect on the opportunities for and encouragement given to publication. Divisional status may also influence promotion opportunities, due to variations in student enrolments and the effects this can have on the resources available to fund promotions (Austen, 2004). Academic level is an important control factor in the analysis, as promotion chances typically fall substantially the further an academic progresses along his or her career path (that is, it appears to be "easier" to achieve a promotion from Level A to Level B than from Level D to E) (Austen, 2004). A variable measuring the individual's age was incorporated in the model to help capture the individual's level of labour market experience, which is also commonly linked to employment opportunities.

Limitations

The outcomes of the modelling exercise are affected by the absence of reliable measures of some important variables, such as education. Having a PhD is critical to achieving promotion in the university sector. However, education level has only recently been added to the DEST data collections. The education records of staff that joined the university before this change was made are very limited and it is especially difficult to ascertain when a qualification was achieved. If the data collections continue into the future this particular problem could be remedied in future studies.

The study is also limited by a lack of information on the family circumstances of staff members (such as the presence of children or other family members requiring care). However, once again, the potential exists to improve on this study in the future by making use of the large data collections of university HR departments. These typically provide data on the types and amounts of leave that staff members take (e.g. parental and sick leave) and, as such, would provide useful information on the types of family and health circumstances affecting promotion chances.

A further reason to treat the results presented below with some caution relates to their derivation from a model that does not include any lagged effects. That is, the probability of promotion in a particular year is related in the model to the publication, demographic and employment characteristics of the individual in the same year. Ideally, the relationship between promotion chances in a particular year and an individual's promotion record in preceding years would also be measured. This type of analysis is planned for future studies.

Results

The following set of tables report the estimated coefficients, t statistics and other significance measures derived from the application of the fixed effect probit model to the data on Curtin academic staff for the 1998–2004 period. The data in the first table relates to a model that was based on the entire data set and included a dummy variable to identify gender. The data in the second table relates to separate analyses of female and male sub-samples.

In each table the statistically significant relationships (at the 10% level) are highlighted. It should also be noted that whilst the coefficients reported here provide information about the direction and relative magnitude of each relationship, it is necessary to calculate marginal effects to see the extent to which changes in the value of each explanatory factor affect the probability that a promotion is recorded.

Table 5. Conditional Maximum Likelihood Estimates of Promotion: Curtin Academic Staff, 1998–2004

Variable	Coefficient	b/Se	P[|Z|>z	Mean
Publication number	0.0290	5.392	0.0000	2.08
Male	-0.0238	-0.453	0.6508	0.64
Had worked part time	-0.0236	-0.326	0.7445	0.30
Entry level position was fractional	-0.0031	-0.035	0.9717	0.17
Had worked in a Non-academic role	-0.1459	-1.601	0.1093	0.08
Age at entry or in 1997	-0.0061	-2.028	0.0425	44.18
Was Level A at entry or in 1997	0.3851	4.111	0.0000	0.21
Was Level B at entry or in 1997	0.0893	1.128	0.2594	0.44
Was Level C at entry or in 1997	0.1223	1.501	0.1335	0.19
Division: Curtin Business School	-0.0972	-1.369	0.1710	0.19
Division: Engineering	0.0052	0.071	0.9432	0.16
Division: Health	-0.2382	-3.463	0.0005	0.25
Division: Resources and Environment	-0.1856	-2.026	0.0428	0.09
Division: Aboriginal Studies	-0.0456	-0.35	0.7265	0.03
Division: Administration	-0.2943	-2.35	0.0188	0.05
Constant	-1.2558	-6.709	0.0000	

Notes: Estimated using Limdep (Greene, 2002); no. of obs: 6,996; Log likelihood function:-1832.063

Table 6. Conditional Maximum Likelihood Estimates of Promotion: Curtin Academic Staff 1998–2004, by Gender

	Female Academics				Male Academics			
Variable	Coefficient	b/Se	P[|Z|>z	Mean	Coefficient	b/Se	P[|Z|>z	Mean
Publication number	0.0420	3.758	0.0002	1.38	0.0262	4.197	0.0000	2.48
Had worked part time	0.0646	0.639	0.5229	0.46	-0.1510	-1.38	0.1675	0.21
Entry level position was fractional	-0.1465	-1.258	0.2082	0.26	0.1746	1.309	0.1905	0.12
Had worked in a Non-academic role	-0.0913	-0.723	0.4695	0.11	-0.1827	-1.332	0.1828	0.06
Age at entry or in 1997	-0.0029	-0.575	0.5651	42.83	-0.0081	-2.14	0.0324	44.94
Was Level A at entry or in 1997	0.6533	3.044	0.0023	0.30	0.2778	2.434	0.0149	0.16
Was Level B at entry or in 1997	0.2684	1.314	0.1888	0.51	0.0520	0.583	0.56	0.39
Was Level C at entry or in 1997	0.3775	1.742	0.0814	0.12	0.0617	0.682	0.4956	0.23
Division: Curtin Business School	-0.1644	-1.296	0.1948	0.15	-0.0934	-1.07	0.2845	0.21
Division: Engineering	0.0401	0.248	0.8045	0.06	-0.0313	-0.365	0.715	0.22
Division: Health	-0.1203	-1.23	0.2185	0.39	-0.3801	-3.735	0.0002	0.17
Division: Resources and Environment	-0.0618	-0.325	0.7449	0.04	-0.2454	-2.294	0.0218	0.12
Division: Aboriginal Studies	-0.1671	-0.878	0.38	0.05	0.0731	0.402	0.688	0.02
Division: Administration	-0.0298	-0.182	0.8558	0.07	-0.6975	-3.169	0.0015	0.04
Constant	-1.6835	-4.886	0		-1.0879	-4.844	0	

Notes: Estimated using Limdep (Greene, 2002); (a) female: obs: 2,526; Log likelihood function:-660.4; (b) male: obs: 4,470; Log likelihood function: 1161.3

DISCUSSION

The results from this data analysis indicate a very strong link between publications and promotion chances. For women, increasing the number of publications from 0 to 4 each year increases, on average, the promotion probability by 37.1 per cent. For men, this change is 22.4 per cent. Other results from this analysis are, firstly, that promotion chances are substantially higher for Level A staff. This may indicate that the largest barrier to women's career advancement currently does not relate to the ability to move from, say, Level A to B. Rather, promotion barriers affect, primarily, the movement from B to C, or D to E. In the Curtin sample used in this study, women's chances of promotion were not evidently affected by their divisional location. In contrast, men's promotion chances were lower, ceteris paribus, if they were based in the Health, Resources and Environment, or Administrative divisions (the 'default' division was Humanities). Men's promotion chances also fell as their age of entry increased. This was not a significant source of difference in the sub-sample of women.

These results suggest that programs to improve gender equity in Australian universities should pay particular attention to barriers to research and publication encountered by women, and that resources should be directed towards improving publication opportunities for women. The results also indicate that the implementation of an RQF-style scheme is likely to reduce the chances of gender equity in the sector. The figures generated in the study show that women's publication counts are currently substantially below men's, and that this negatively affects women's promotion chances. A further concentration of research funding towards established researchers can only be expected to diminish women's career chances.

A further potential implication of the results of this study is that programs designed to promote gender equity could achieve greater results if they are targeted at the movement of women from Level B to Level C and higher positions.

These findings are limited. However, there is significant potential to extend this study to explore other dimensions of the promotion experience of women and the various factors that affect promotion chances. The inclusion of data from other universities will enable better evaluation of the effects of women's discipline areas and the general university characteristics on their promotion chances. The integration of human resource type data (on leave periods and types) will facilitate studies of labour market absence on publication opportunities and promotion chances. Inclusion of information on PhD completion will enable analysis of the importance of this factor in determining promotion outcomes.

In summary, the preliminary evidence on the role of publications in determining the promotion chances of academic women in Australia indicates that moves to implement an RQF-style scheme should be of great concern to those interested in fostering gender equity in our universities. The large data sets that are collected by the universities provide a resource that can be used to track the experiences of male and female academics throughout their careers. It is important that researchers and practitioners concerned with equity make use of this resource to benchmark women's current position and experiences in the sector, and to monitor the effects of new programs.

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