

WOMEN ENGINEERING ACADEMICS IN AUSTRALIA: TRENDS IN EMPLOYMENT

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ABSTRACT: Women currently form a very small but growing minority of engineering academics in Australia. In a 1993 paper [1], the authors demonstrated that the employment profile for women academics in engineering was similar to that of women in other disciplines: women are concentrated in the lower academic levels and in untenured positions.

In this paper, statistics for male and female engineering academics in Australia from 1989 to 1994 are analysed and the trends for both sexes are presented. Despite increases in the number of women academics in engineering, they are still heavily concentrated in the lower levels. In 1994, for every age cohort, women occupied lower levels than men in the same age range.

Statistics are presented showing the distribution of engineering academics across universities by gender. These show that there is a range in the percentage of women academics in engineering. In only one university are more than 10% of engineering academics holding tenurable positions female. Thirteen universities have no women in tenurable positions: of these, eight have no women engineering academics at all, tenured or untenured.

INTRODUCTION

In this paper the trends in employment for women engineering academics over a five year period are analysed. It is shown that in general women are concentrated in lower academic levels and in untenured positions. The reasons for this were discussed in some detail in an earlier paper [1] and are not repeated here.

The data presented in this paper was obtained from the Department of Employment, Education and Training (DEET) in Canberra. The classification of academic staff includes both research and teaching staff. The statistics are for the discipline 'engineering/processing'. Data in this form is available only from 1989.

TRENDS IN EMPLOYMENT OF AUSTRALIAN ENGINEERING ACADEMICS

In 1994 there were, in total, 2099 engineering academics in 32 universities in Australia. Of these only 125 or 6% were female. Although still very small, the numbers had increased

considerably from 1989 when there were only 52 women engineering academics representing 3% of the total.

Figure 1 shows how the total number of female and male engineering academics has changed over the period 1989 to 1994. Note the change in scale by a factor of ten between graphs for female and male. There has been a 24% increase in the number of engineering academics overall, but the percentage increase for females has been much greater at 140%. For both men and women there has been a slight slowing in the growth rate. For women the growth rate was 21% per annum for the first three years but fell to 17% per annum for the last two years. For men the corresponding figures are 5% per annum and 3.5% per annum.

Figure 1 also shows the distribution between tenurable and other forms of appointment. Females were much less likely to hold a tenurable position than males. In 1994 only 44% of females compared with 69% of males held tenurable position. Over the period shown the percentage of all engineering staff holding tenurable positions dropped from 73% to 68%, although the percentage of females holding tenurable positions increased slightly from 42% to 44%.

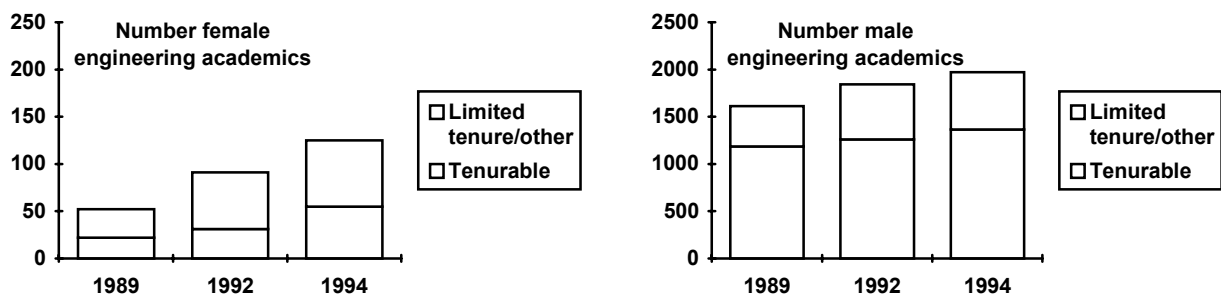


Figure 1 Trends in numbers of female and male engineering academic staff in Australia.

(Note change of scale by factor of ten between graphs)

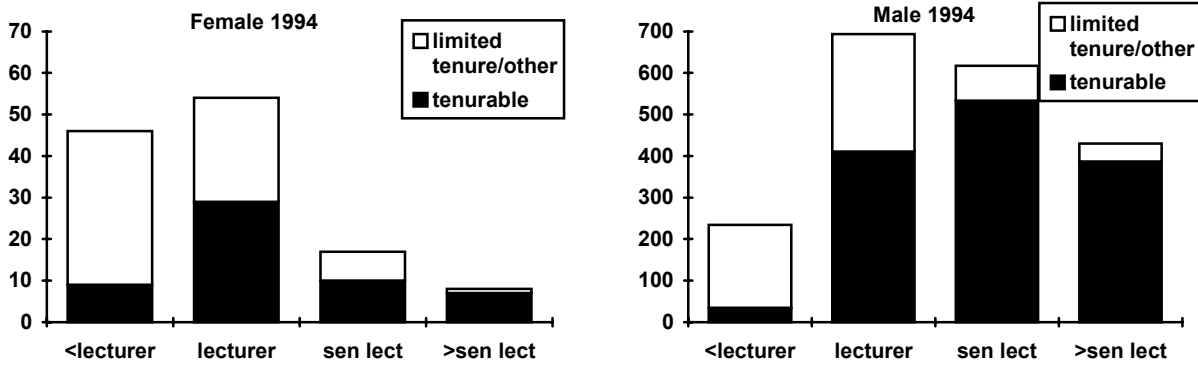


Figure 2. Number of female and male engineering academic staff in Australian universities by level of appointment and tenure. (Note change in scale by factor of ten between graphs for male and female)

LEVEL OF APPOINTMENT OF ENGINEERING ACADEMICS

Figure 2 shows the level of appointment of female and male engineering academics in engineering. Overall the women are concentrated in lower levels and in untenured positions. The most common level of appointment for females was limited tenure/below lecturer while for males it was tenurable senior lecturer. The differences in level of appointment are partially but not entirely explained by the lower average age of the females.

AGE DISTRIBUTION OF ENGINEERING ACADEMICS

Figure 3 shows the age distributions for each sex in 1994, along with the age distribution for 1989 shifted by five years. For example, in 1989 there were 10 females aged 25-29. They appear on the graph at their age-group in 1994, 30-34. In 1994 there were 30 females aged 30-34. Thus there has been a net intake of 20 females in the late twenties to early thirties age group. The two graphs show both the difference in age distributions between males and female and the differences in age of entry.

The female engineering academics are on average younger than the males, although perhaps not as young as might be expected. In 1994 58% of female engineering academics were thirty-five or older, and 38% were over 40 years old. For males, 81% were thirty five or over, 67% were forty or over. More than half of male engineering academics in 1994 were forty-five or over.

The graphs show that over the period 1989 to 1994 there has been a very different pattern in age of recruitment for males and females. The net intake is shown in the graphs as the difference between the light bars and the dark ones. There has been relatively little net intake of males aged 29 and under, (where age is measured at 1994 not at date of entry). The bulk has come at 30-34 (at 1994) with a tailing off up to age 54. For females there was a substantial proportion of the intake aged 29 and under and the split over the 30s and early 40s is almost uniform. As the number of women engineering students has been increasing over the last two decades, there are substantially more women engineering graduates in the lower age ranges than the higher ones. This relatively large intake in the early 40s is therefore surprising.

Although no conclusions about the reasons for the differences can be drawn without much more detailed research which tracks the careers of individual academics, the results are consistent with the 'career web' model for female careers which was described by Swarbrick [2]. The patterns are consistent with male academics beginning academic careers, directly or shortly after completing doctorates and being continuously employed thereafter, and with females moving out during their thirties, perhaps due to child bearing and returning later on. The pattern could also be explained if a relatively high proportion of women became academics only after a substantial period in other employment.

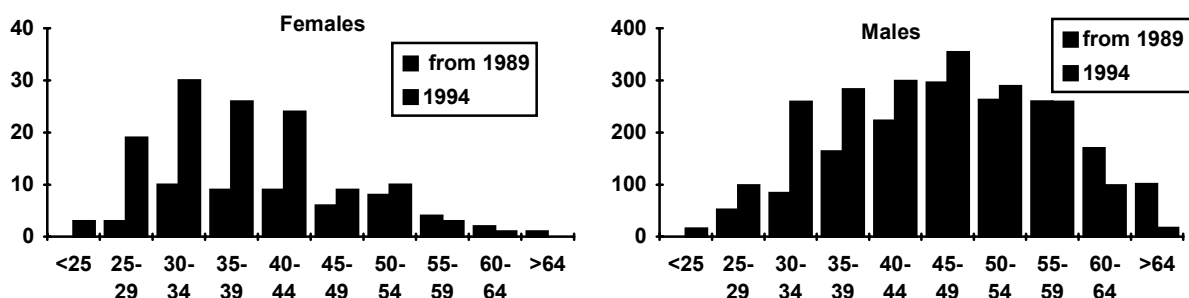


Figure 3. Age distribution of female and male engineering academics in Australia

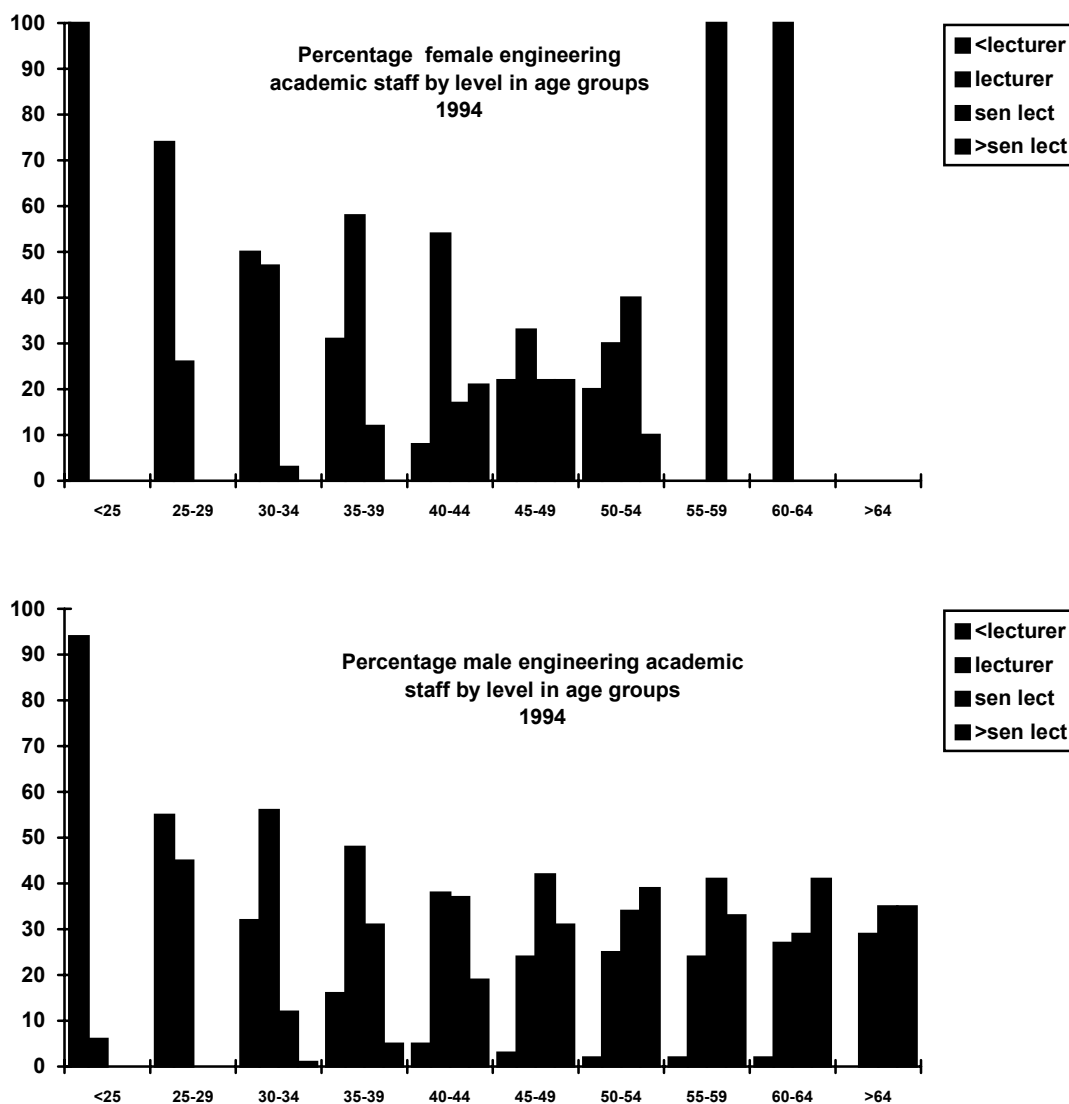


Figure 4 Percentage of female and male engineering staff by level in age groups 1994

LEVEL OF APPOINTMENT IN DIFFERENT AGE GROUPS

Figures 2 and 3 show that women are employed at lower levels than men and they are on average younger. The lower average age is not alone sufficient to explain the difference in employment levels. This is demonstrated in Figure 4 where for each age group the percentage at each level of appointment is graphed. Males are at higher levels than females in all age groups. For example in the 30-34 age group for females 50% were 'below lecturers', 47% were lecturers and 3% were senior lecturers. For males in the same age range 32% were 'below lecturers', 55% were lecturers, 12% were senior lecturers and 1% were 'above senior lecturers'.

DISTRIBUTION ACROSS UNIVERSITIES

Figure 5 shows for 1994 the total number of engineering academics in each Australian university and the percentage

of these who are female. The universities are graphed in decreasing order of number of engineering academics. The university with the largest number is University of New South Wales with 237, while the smallest is Flinders with only 6.

Because of the very small numbers of female academics involved, no conclusions can be drawn about the variations between universities. There also seems little consistency for individual universities over the years for which statistics are available.

In 1994 there were only six universities where more than 10% of the engineering academics were female. There were eight universities with no female engineering academics, but seven of these were universities with less than thirty engineering academics in total. In 1994 Curtin University had no women engineering academics out of a total of seventy, but in 1989 and 1992 had three and five respectively.

Only five universities had ten or more women engineering academics, these were the four with the largest number of engineering staff and University of Technology, Sydney.

Figure 6 shows the figures for tenurable staff only. There was only one university with more than 10% female tenured academics, but this represented only two women out of a

total engineering staff of seven. Five universities had between 5% and 10%. Thirteen universities had no tenurable female engineering academics, this included the University of Queensland which is the university with the third largest number of engineering academics. Monash University, the second largest had only one female out of a total of 124 tenurable staff.

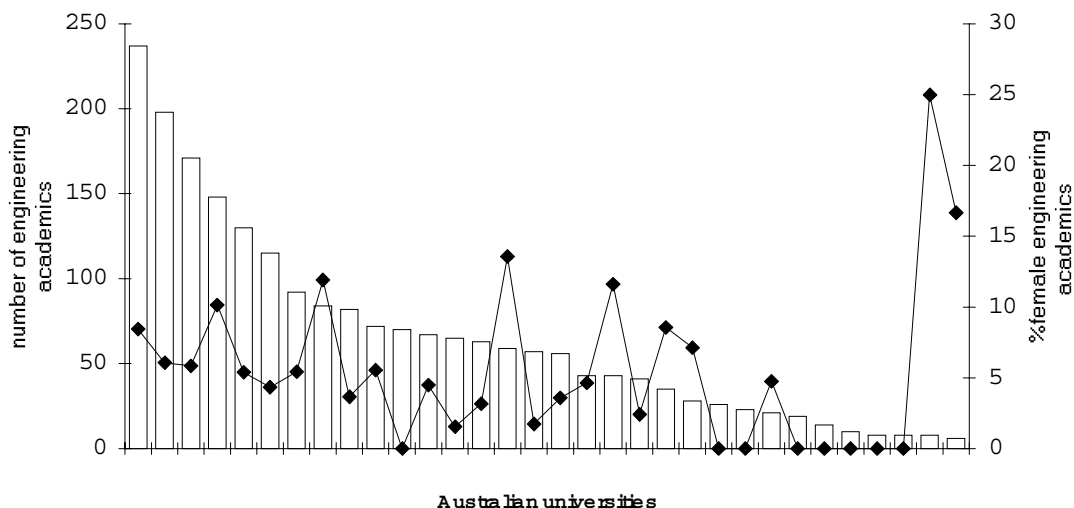


Figure 5. Total number of engineering academics and percentage of engineering academics who are female for Australian universities for 1994 (In decreasing order of number of engineering academics)

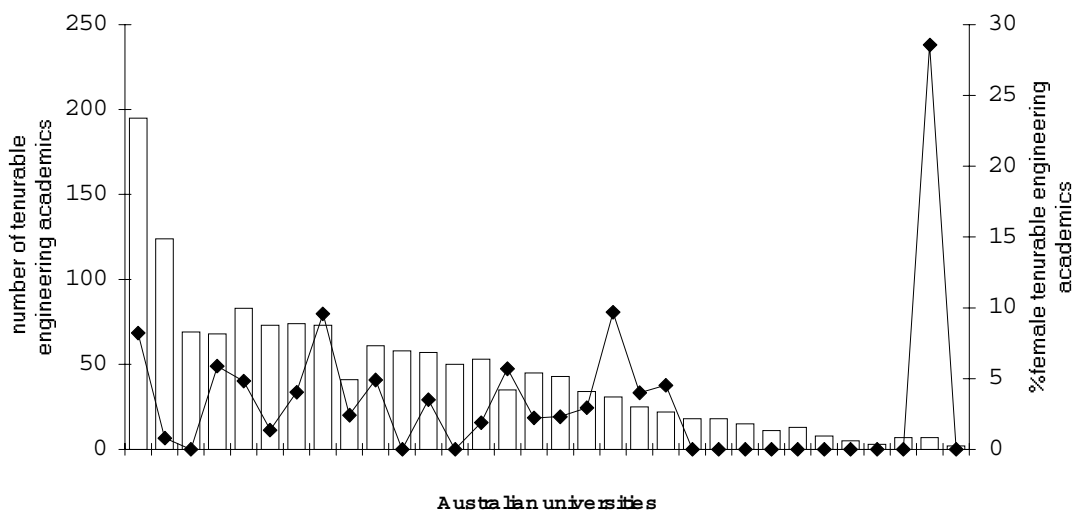


Figure 6. Number of engineering academics in tenurable positions and percentage of these who are female for Australian universities for 1994 (In decreasing order of total number of engineering academics).

COMPARISON WITH OTHER DISCIPLINES

It is interesting to compare the distribution by level of appointment in engineering with other study areas. This is

shown in figure 7. The entries at the extreme left of each graph are the overall distributions. These show the well known fact that female academics are concentrated at lower levels than males. The distribution for women in engineering

is remarkably similar to the distribution of women overall. For all study areas females are at lower levels of appointment than males. Women in engineering have higher average levels of appointment than women in science.

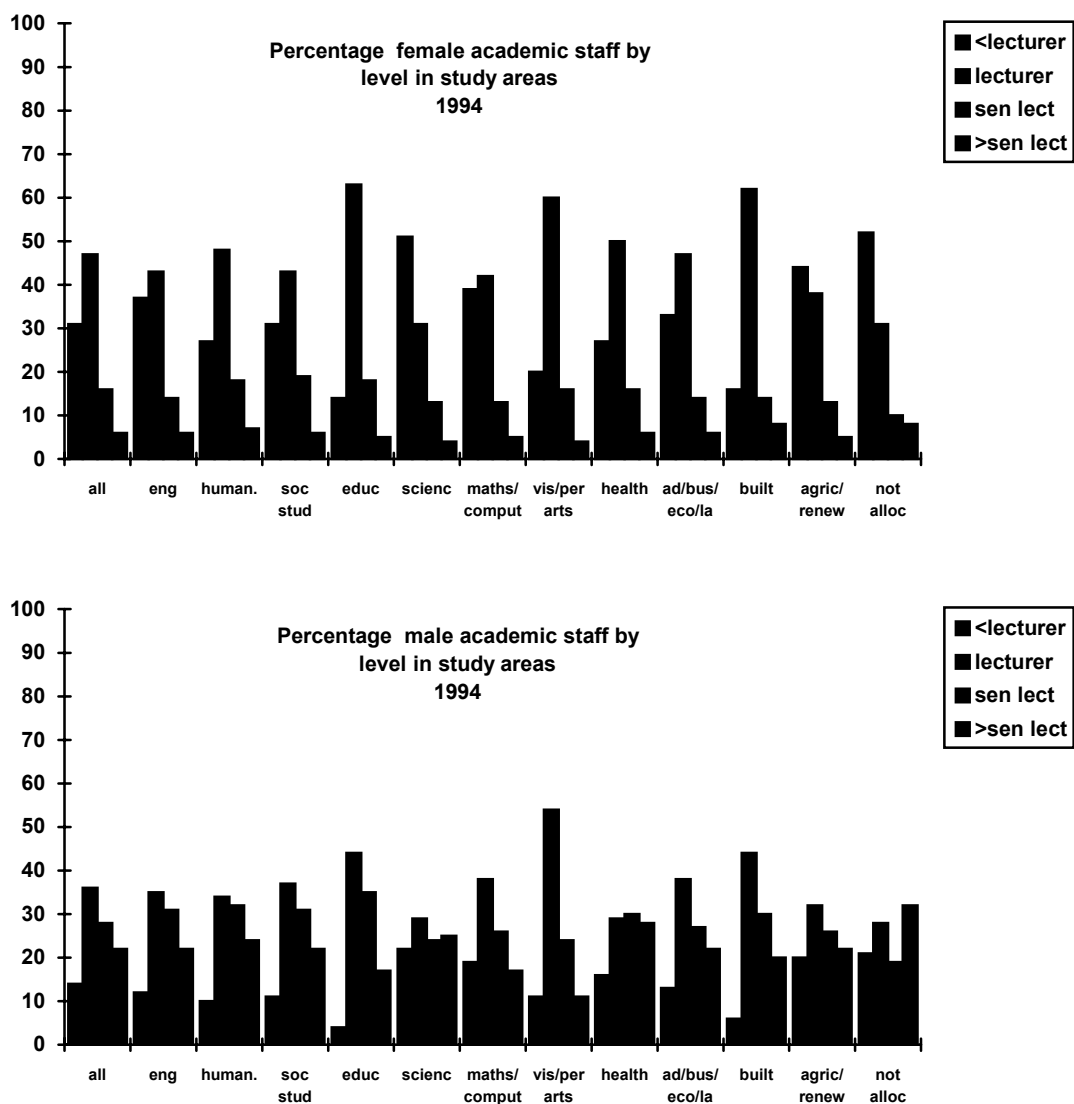


Figure 7. Distribution of female and male academic staff by level in different study areas

CONCLUSIONS

Although the number of women engineering academic staff in Australian universities increased rapidly over the five year period 1989 to 1994, they still form a very small proportion, 6%, of engineering academics. The women are concentrated in the lower levels and are much more likely to be untenured than men. The women are younger on average than the men, but this does not completely explain the difference in levels. In every age range from the youngest to the oldest the average level of appointment of females is lower than males.

Comparison of the age distribution of males and females in 1989 and 1994 suggests that females tend to enter at an older age than males.

The distribution of female staff across universities is in general quite even, although there are a number of exceptions. Some larger faculties have no or very few tenured women staff. For some universities the number of women has dropped over the period.

The distribution of female engineering across levels is very similar to that for female academics as a whole. Female engineering academics have a higher average level of appointment than female academics in the sciences.

No conclusions about the reasons for the differing levels of appointments of males and females within the same age range can be made from the statistics presented. This would require more detailed research in which individual female academics qualifications and experience was compared with that of their male colleagues.

REFERENCES

1. Armstrong J. and Bellis, C , Women Engineering Academics in Australia, *Proceedings of the 5th Annual AaeE Convention and Conference*, Auckland pp104-109 (1993).
2. Swarbrick A, Combination Careers: a Feminist Re-evaluation of career-breaks and women's careers. *Report of Engineering Education and Professional Practice*:

Developing Gender-Inclusive Models Conference, Leeds (1994).