

CHAPTER 13

STEM PATHWAYS: MATHEMATICAL SCIENCES

WHAT ARE MATHEMATICAL SCIENCES?

The main purpose of studying and working in Mathematical Sciences is to understand and apply knowledge of symbolic language and logic, mathematical theories and their deductive systems, techniques and modelling. It also involves developing an understanding of random processes and the ability to apply mathematical methods and modelling techniques to practical problems. Mathematical Sciences is comprised of Mathematics, Statistics and Mathematical Sciences, n.e.c. (not elsewhere classified) (ABS, 2001).

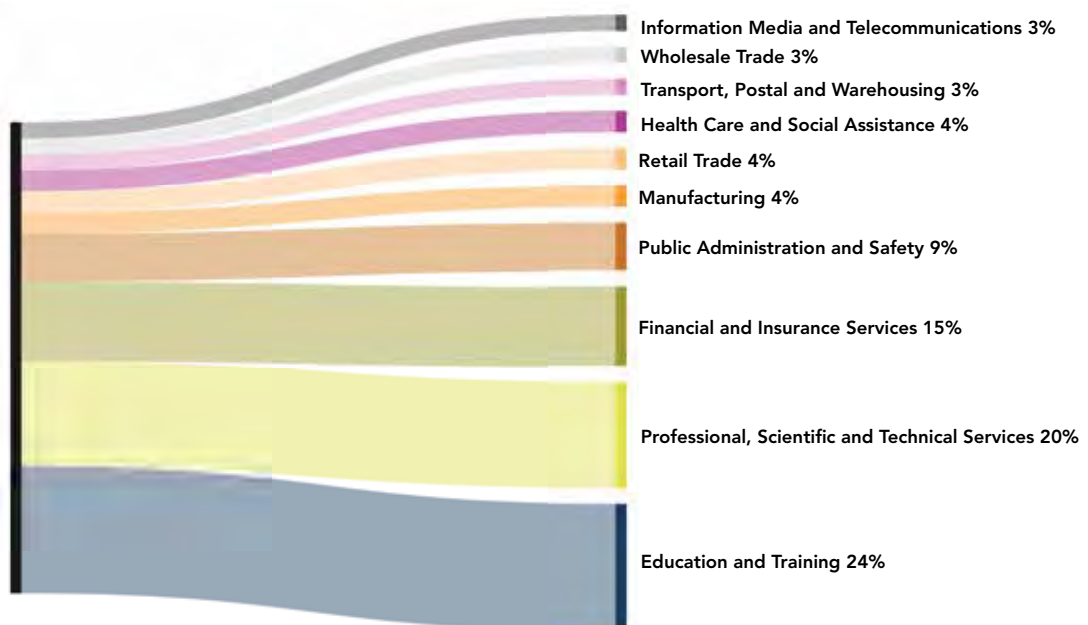
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STEM PATHWAYS: MATHEMATICAL SCIENCES

KEY FACTS

- 1** In 2011, there were 25 688 Mathematical Sciences graduates, and the majority were male (61 per cent).
- 2** Half of male and 44 per cent of female graduates were aged 45 and over.
- 3** Sixty eight per cent of all graduates were employed in the private sector—varying from 75 per cent of bachelors to 34 per cent of doctorates.
- 4** Approximately 44 per cent of all Mathematical Sciences graduates worked in two industries—Education (24 per cent) and Professional, Scientific and Technical Services (20 per cent) divisions.
- 5** The majority of graduates worked as Professionals (60 per cent) and 15 per cent as Managers.
- 6** At a more detailed level, graduates worked in a wide variety of occupations—the top four were: Software and Applications Programmers; Secondary School Teachers; University Lecturers and Tutors; and Actuaries, Mathematicians and Statisticians.
- 7** Forty one per cent of graduates with doctorates earned over \$104 000 per year, almost double that of bachelors (23 per cent).

Top ten industry sectors of employment for Mathematical Sciences graduates



HOW MANY MATHEMATICAL SCIENCES GRADUATES ARE THERE IN AUSTRALIA?

In 2011, there were 25 667 Mathematical Sciences graduates (bachelor and above) in Australia. The top sub-field of study was Mathematics, with 80 per cent of graduates. Eleven per cent of graduates held a doctorate degree, compared to 8 per cent of STEM graduates and 3 per cent of Non-STEM graduates.

Over one quarter of graduates (6913, 27 per cent) were either not in the labour force or were unemployed (24 and 3 per cent, respectively).

The majority of graduates were males (61 per cent). The gender difference was higher amongst Mathematical Sciences doctorate holders (80 per cent male).

HOW OLD IS THE MATHEMATICAL SCIENCES GRADUATE WORKFORCE?

Mathematical Sciences graduates in the workforce were comparatively older than the Non-STEM graduates (Figure 13.1). This difference was most pronounced for males compared to females.

Twenty two per cent of the female Mathematical Sciences qualified workforce was aged 34 or under. In comparison, 39 per cent of females were in the same age group for the Non-STEM qualified workforce.

In comparison, 24 per cent of the male Mathematical Sciences qualified workforce was aged 34 or under, compared to 33 per cent for Non-STEM.

WHERE DO MATHEMATICAL SCIENCES GRADUATES WORK?

The private sector employed 68 per cent of all Mathematical Sciences graduates; however the proportion varied depending on level of qualification as follows:

- ▶ Bachelor level: 75 per cent
- ▶ Postgraduate level: 52 per cent
 - Masters: 66 per cent
 - Doctorate: 34 per cent

Figure 13.1: Age distribution of employed Mathematical Sciences graduates at bachelor level and above, by field and gender

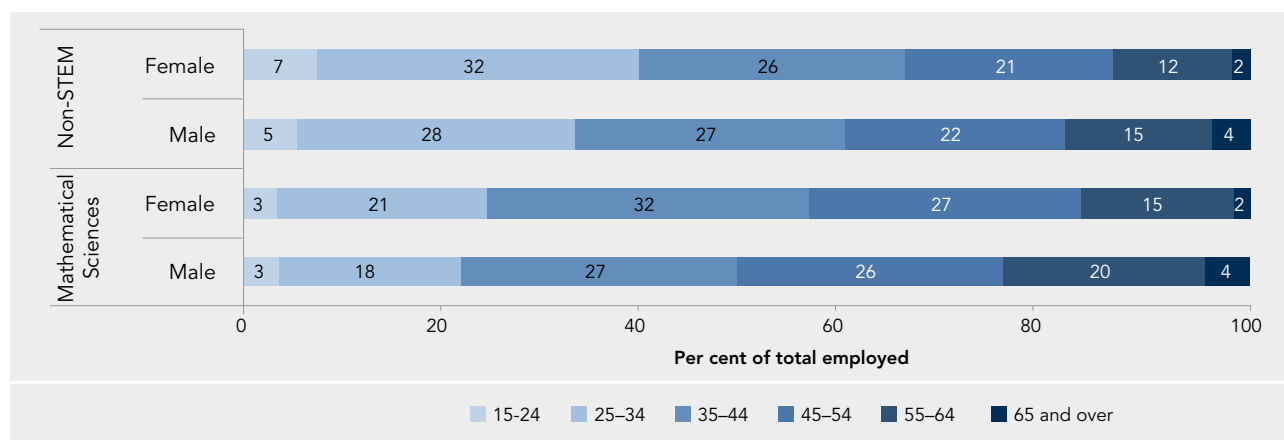


Figure 13.2: Top ten industry divisions of employment for Mathematical Sciences graduates with qualifications at bachelor level and above, by gender

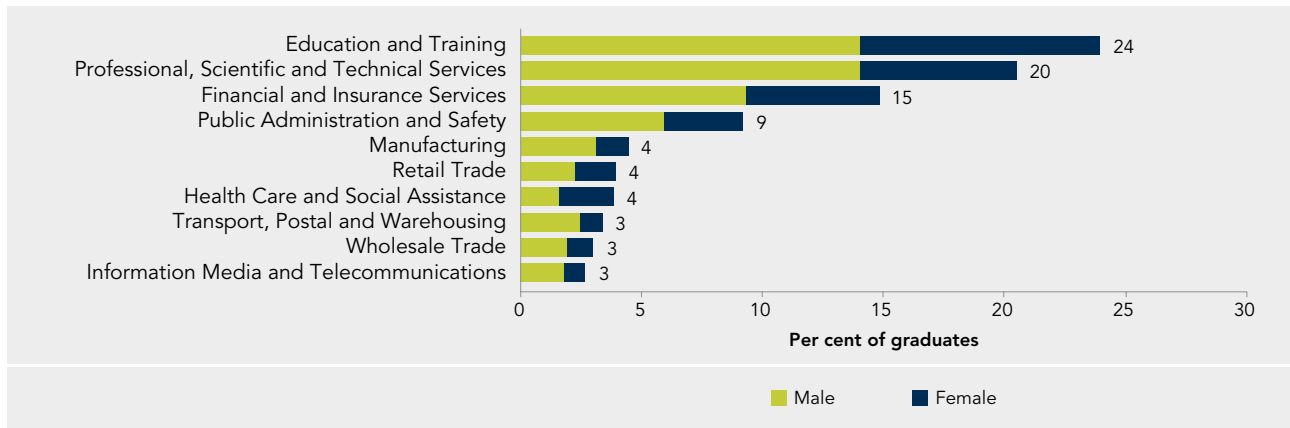
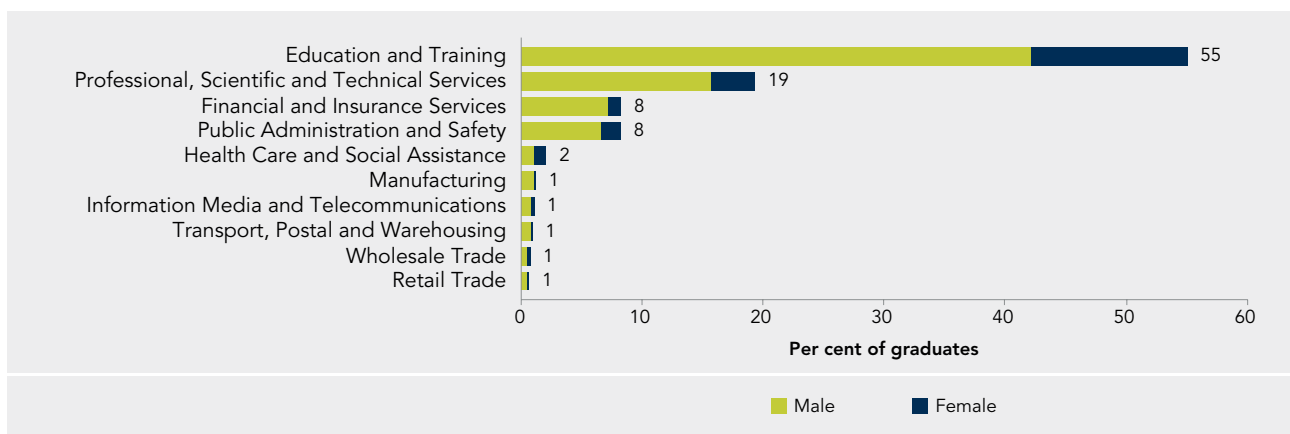


Figure 13.3: Top ten industry divisions of employment for Mathematical Sciences doctoral graduates, by gender



INDUSTRY SECTORS OF EMPLOYMENT

Industries are classified in four levels (ABS, 2006a):

- ▶ Divisions (the broadest level)
- ▶ Subdivisions
- ▶ Groups
- ▶ Classes (the finest level)

See Appendix B for a detailed list.

The top three industry divisions that employed Mathematical Sciences graduates were Education and Training, Professional, Scientific and Technical Services, and Financial Services (24, 20 and 15 per cent, respectively)

(Figure 13.2). There were more males compared to females employed in all industries of employment except Healthcare and Social Assistance.

For individuals with a doctorate degree in Mathematical Sciences, the top employment industries were Education and Training and Professional, Scientific and Technical Services (55 and 19 per cent, respectively) (Figure 13.3).

Among the top destinations of employment at the industry class level, Higher Education employed 11 per cent of all graduates and 50 per cent of doctorate degree holders (Figure 13.4 and Figure 13.5). For all graduates, the second highest industry class for employment was Computer System Design and Related Services (9 per cent). However, for doctorate holders the second most popular industry was Scientific Research Services (7 per cent).

Figure 13.4: Top ten industry classes of employment for Mathematical Sciences graduates with qualifications at bachelor level and above, by gender

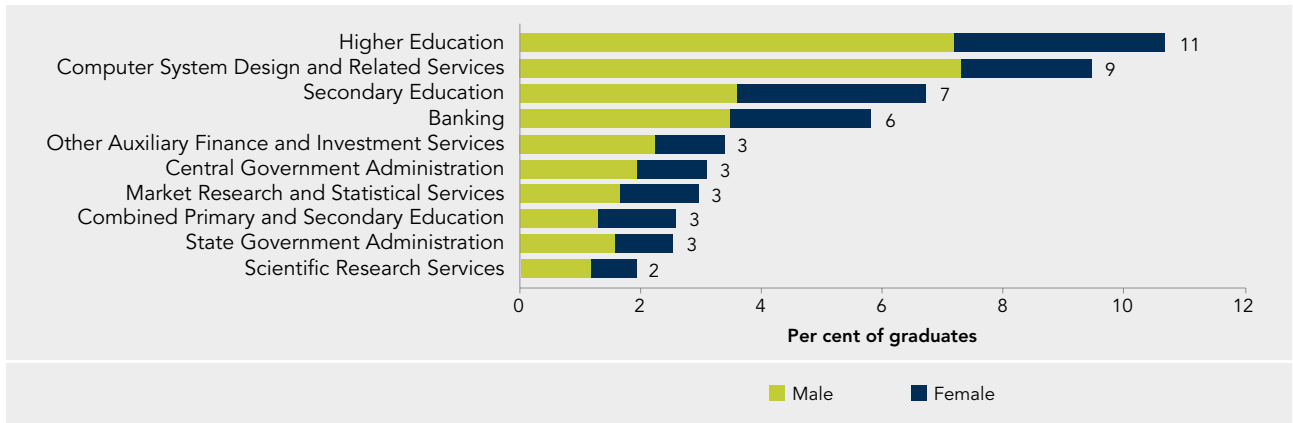


Figure 13.5: Top ten industry classes of employment for Mathematical Sciences doctoral graduates, by gender

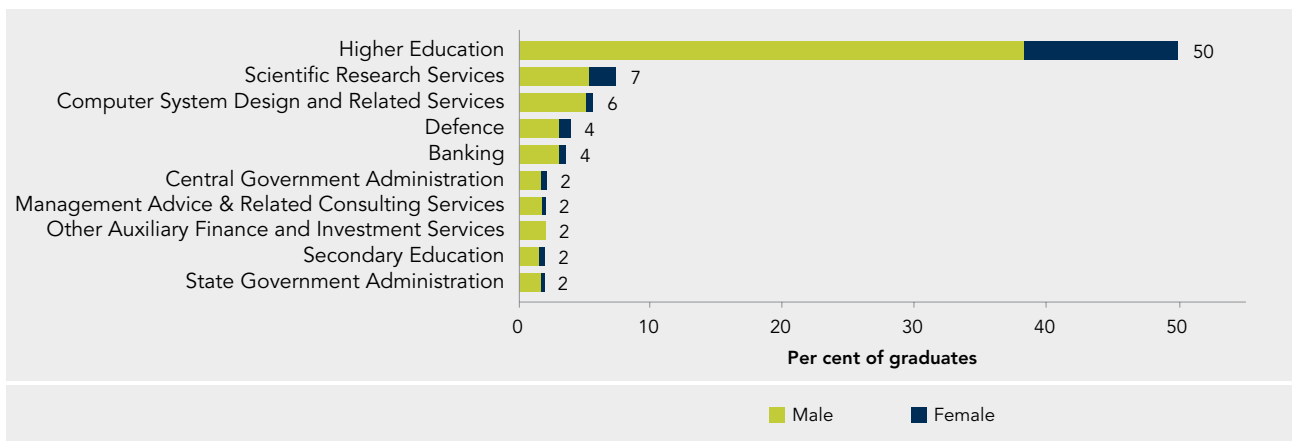


Figure 13.6: Top ten unit group level occupations for Mathematical Sciences graduates with qualifications at bachelor level and above, by gender

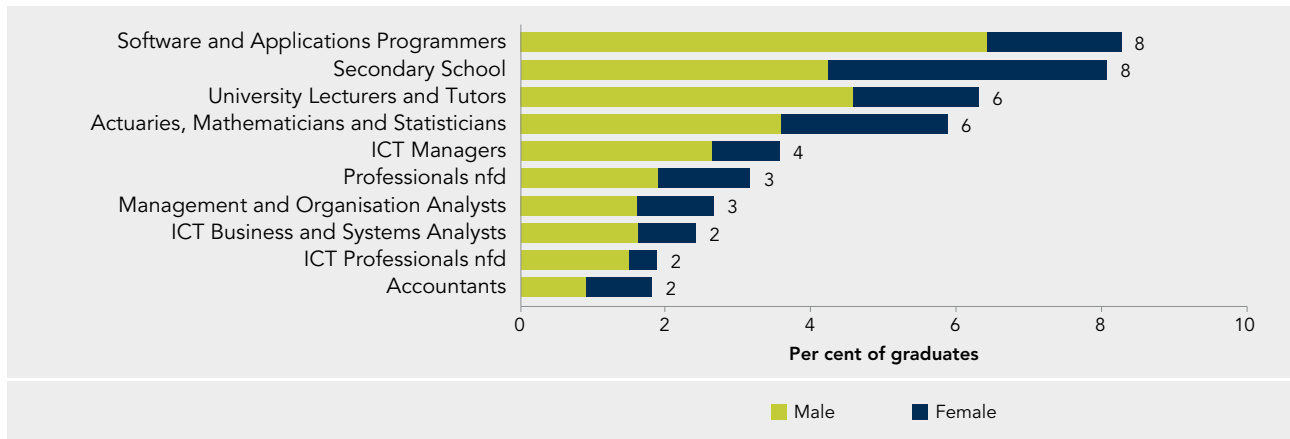
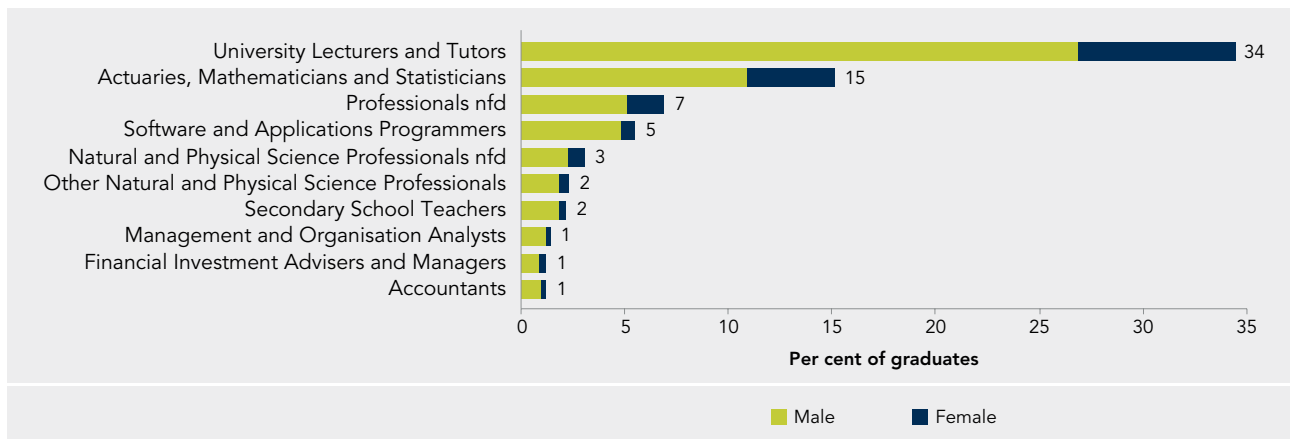


Figure 13.7: Top ten unit group level occupations for Mathematical Sciences doctorate graduates, by gender



WHAT ARE THE OCCUPATIONS OF MATHEMATICAL SCIENCES GRADUATES?

Occupations are classified in five levels (ABS, 2013):

- ▶ Major group (broadest level)
- ▶ Sub-major group
- ▶ Minor group
- ▶ Unit group
- ▶ Occupation (most detailed level)

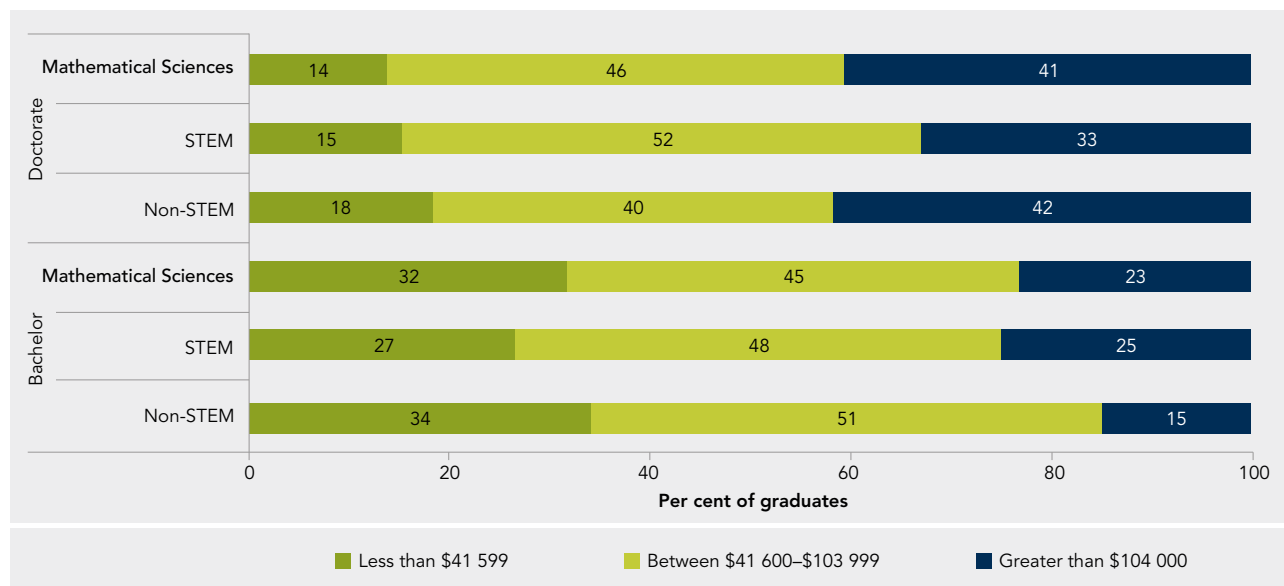
See Appendix C for a detailed list.

The majority of graduates in the Mathematical Sciences field were engaged as Professionals (60 per cent) and Managers (60 and 15 per cent, respectively). Within the graduates employed as Professionals, the most common occupation sub-groups were:

- ▶ Business, Human Resource and Marketing Professionals (30 per cent),
- ▶ Education Professionals (29 per cent), and
- ▶ ICT Professionals (27 per cent).

At the finer unit level of detail of occupation, Software and Application Programmers and Secondary School Teachers were the most common occupations, with 8 per cent of Mathematical Sciences graduates working in each (Figure 13.6).

Figure 13.8: Personal annual income of graduates, by field and level of qualification



The gender distribution in Mathematical Sciences graduates was highly skewed towards males, who made up the majority in all occupations. The difference was least prominent in Secondary School Teachers where there were 47 per cent females.

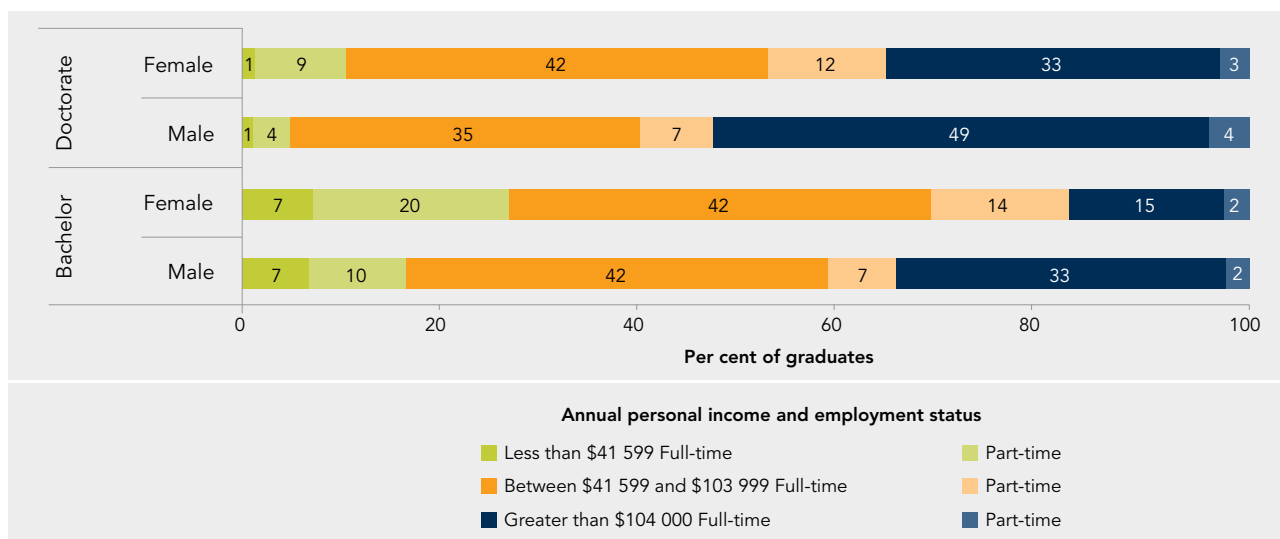
ARE THE OCCUPATIONS FOR MATHEMATICAL SCIENCES DOCTORATE HOLDERS DIFFERENT FROM BACHELOR DEGREE HOLDERS?

Almost 87 per cent of Mathematical Sciences doctorate holders were employed as Professionals and 8 per cent were employed as Managers. Of the Professionals, 29 per cent were employed in the private sector.

The most common occupations at the unit level for Mathematical Sciences doctorate holders were University Lecturers and Tutors, and Actuaries, Mathematicians and Statisticians (34 and 15 per cent, respectively) (Figure 13.7). There were more male than female doctorate holders across all occupations.



Figure 13.9: Personal annual income of Mathematical Sciences graduates working full-time and part-time, gender and level of qualification



ARE MATHEMATICAL SCIENCES GRADUATES HIGH EARNERS?

Mathematical Sciences graduates had a similar pattern of income distribution to the total STEM graduate population. Almost one quarter of Mathematical Sciences bachelor graduates were in the highest income bracket (more than \$104 000) (Figure 13.8). Completing a doctorate can be financially rewarding, with the proportion of doctoral graduates earning in the highest bracket increasing to 41 per cent. In comparison, 15 per cent of bachelor and 42 per cent of doctorate level graduates from Non-STEM fields had incomes in the highest bracket.

Graduate income levels were dependent on both gender and full-time or part-time employment, with fewer females and fewer part-time workers reporting an income in higher brackets (Figure 13.9). More women were employed in a part-time role compared to men in all income brackets except those earning more than \$104 000 per year.

Graduates with a bachelor degree were more likely to work part-time compared to those with a doctorate degree. Over one third of employed females with bachelor degrees worked part-time female compared to 19 per cent of males.

At the doctorate level, 24 per cent of females and 15 per cent of males were employed on a part-time basis.

Compared to the total STEM and Non-STEM graduate cohorts, a larger proportion of male graduates in Mathematical Sciences reached the highest income bracket for most age groups at both the bachelor and doctorate level of qualification (Figure 13.10 and Figure 13.11). The percentage of male graduates reaching the highest income at both the bachelor and doctorate levels was larger than for females at all age groups, and for the bachelor level was at least twice that of females between the ages of 30 and 59.

The proportion of Mathematical Sciences graduates who reached the highest income bracket peaked for male bachelor graduates in the 45 to 49 age group at 43 per cent, and for females the peak was for the 50 to 54 age group at 19 per cent. At the doctorate level, the peak in income was at the 55 to 59 age group for both males and females at 59 and 54 per cent, respectively.

Figure 13.10: Percentage of bachelor level graduates earning greater than \$104 000 annually, by field, gender and age group

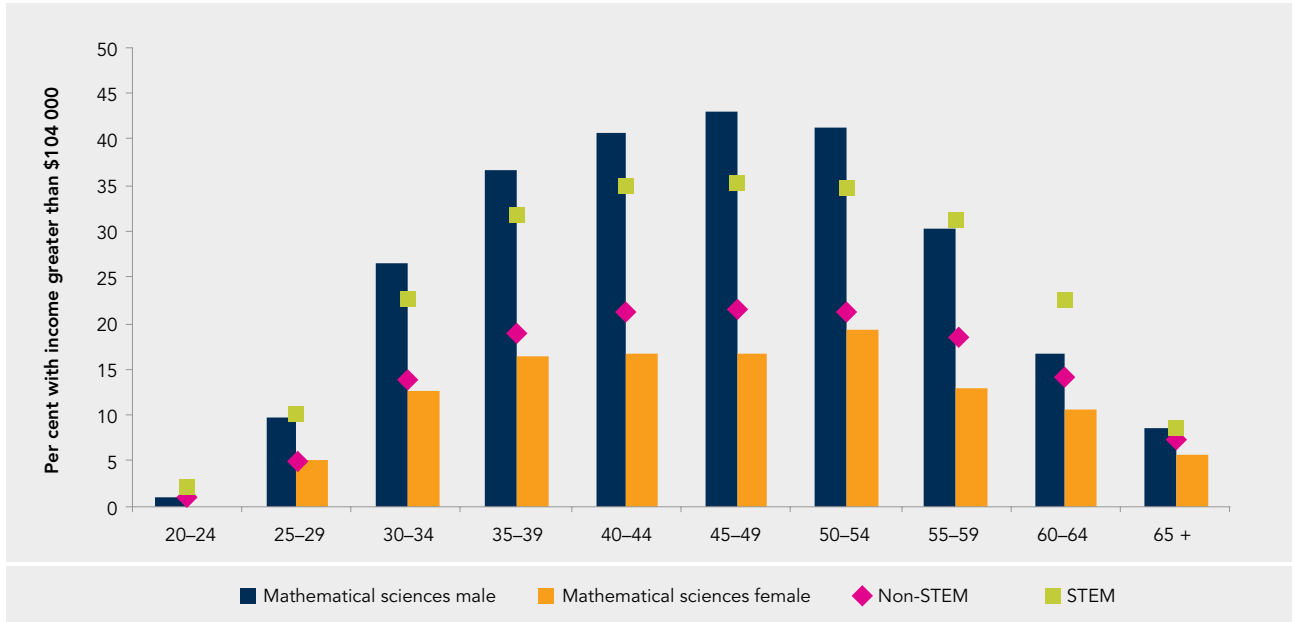


Figure 13.11: Percentage of doctoral level graduates earning greater than \$104 000 annually, by field, gender and age groups

