

CHAPTER 6

STEM PATHWAYS: CHEMICAL SCIENCES

WHAT ARE CHEMICAL SCIENCES?

The main purpose of studying and working in Chemical Sciences is to understand and apply knowledge of the fundamental properties of the elements, compounds and materials, and their reactions and transformations. Chemical Sciences is composed of: Organic Chemistry, Inorganic Chemistry and Chemical Science n.e.c. (not elsewhere classified). (ABS, 2001)

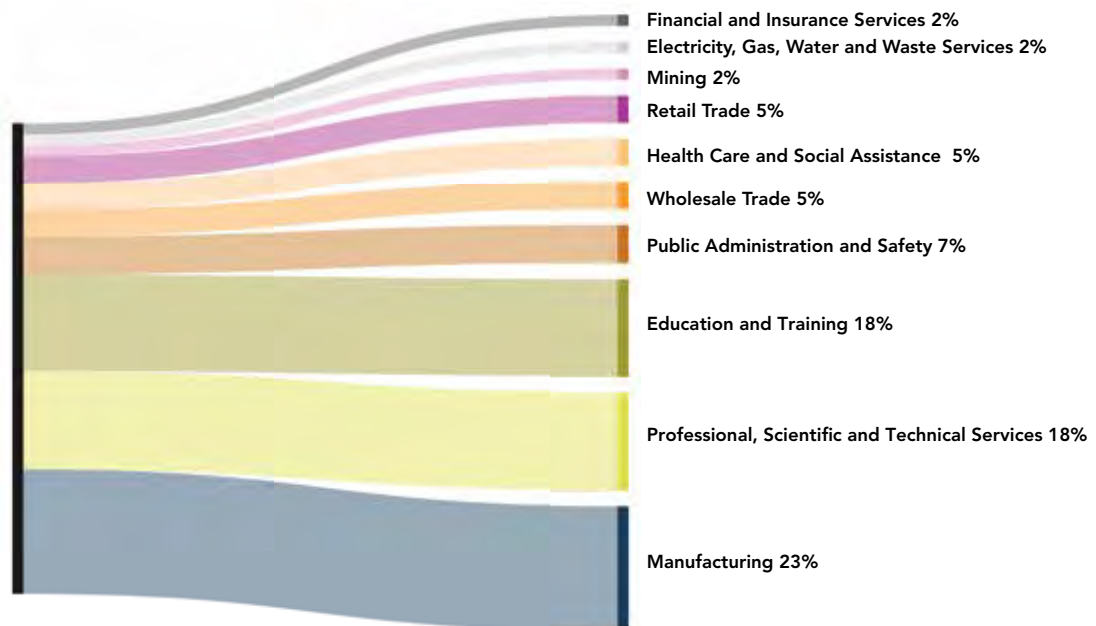
6

STEM PATHWAYS: CHEMICAL SCIENCES

KEY FACTS

- 1 In 2011, there were 23 147 Chemical Sciences graduates.
- 2 The majority of graduates in the workforce were male (64 per cent).
- 3 The private sector employed 72 per cent of all Chemical Science graduates—varying from 81 per cent of bachelors to 47 per cent of doctorates.
- 4 Almost 60 per cent worked in three industry divisions: Manufacturing (23 per cent), Professional, Scientific and Technical Services (18 per cent), and Education and Training (18 per cent).
- 5 Most graduates worked as Professionals or Managers (49 and 22 per cent, respectively).
- 6 At a more detailed level, the most common occupation was as Chemists, and Food and Wine Scientists (13 per cent).
- 7 Of those with doctorates, almost 87 per cent worked as Professionals, and the most common occupation was as University Lecturers and Tutors (34 per cent).
- 8 The proportion of graduates earning over \$104 000 per year increased from 22 per cent to 40 per cent from bachelor to doctorate level of qualification.

Top ten industry sectors of employment for Chemical Sciences graduates



HOW MANY CHEMICAL SCIENCES GRADUATES ARE THERE IN AUSTRALIA?

In 2011, there were 23 147 Chemical Sciences graduates in Australia. Thirty per cent of graduates (6836) were either not in the labour force or were unemployed (27 and 3 per cent, respectively).

Approximately 24 per cent of graduates in the workforce held a doctorate degree, compared to eight per cent of STEM graduates and three per cent of graduates from Non-STEM fields.

The majority (64 per cent) of graduates were males. At the doctoral level, this disparity was higher, with males making up 73 per cent of Chemical Science doctorate holders.

HOW OLD IS THE CHEMICAL SCIENCES GRADUATE WORKFORCE?

The age distribution of graduates in the workforce was comparatively different from Non-STEM-qualified graduates in the workforce (Figure 6.1).

Compared to the male Non-STEM-qualified workforce, the male Chemical Sciences workforce is ageing, with only one fifth aged under 34, compared to one third of Non-STEM graduates. The difference is much less pronounced for females.

WHERE DO CHEMICAL SCIENCES GRADUATES WORK?

The private sector employed 72 per cent of all Chemical Sciences graduates; however the proportion varied depending on level of qualification as follows:

- ▶ Bachelor level: 81 per cent
- ▶ Postgraduate level: 56 per cent
 - Masters: 76 per cent
 - Doctorate: 47 per cent

Figure 6.1: Age distribution of employed graduates with qualifications at bachelor level and above, by field and gender

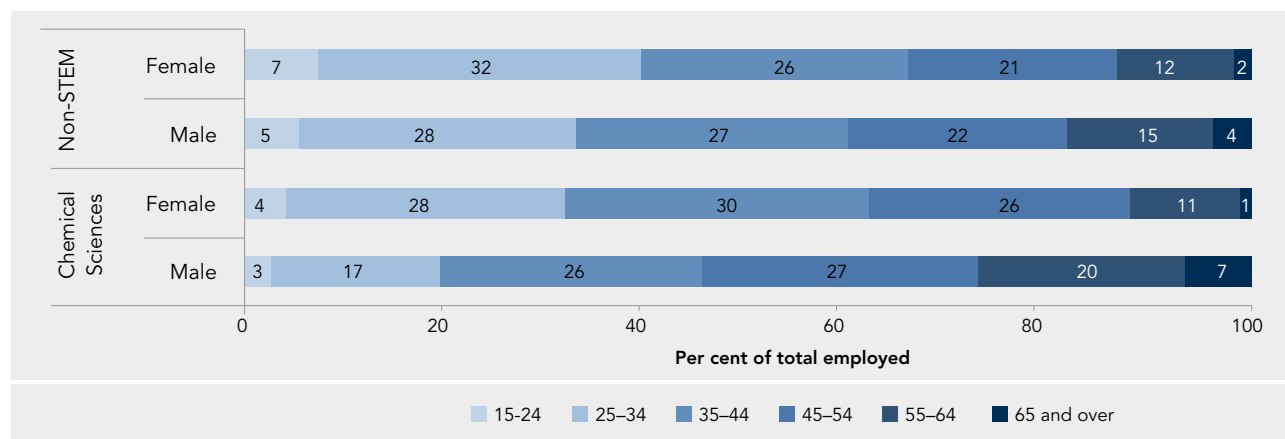


Figure 6.2: Top ten industry divisions of employment for Chemical Sciences graduates with qualifications at bachelor level and above, by gender

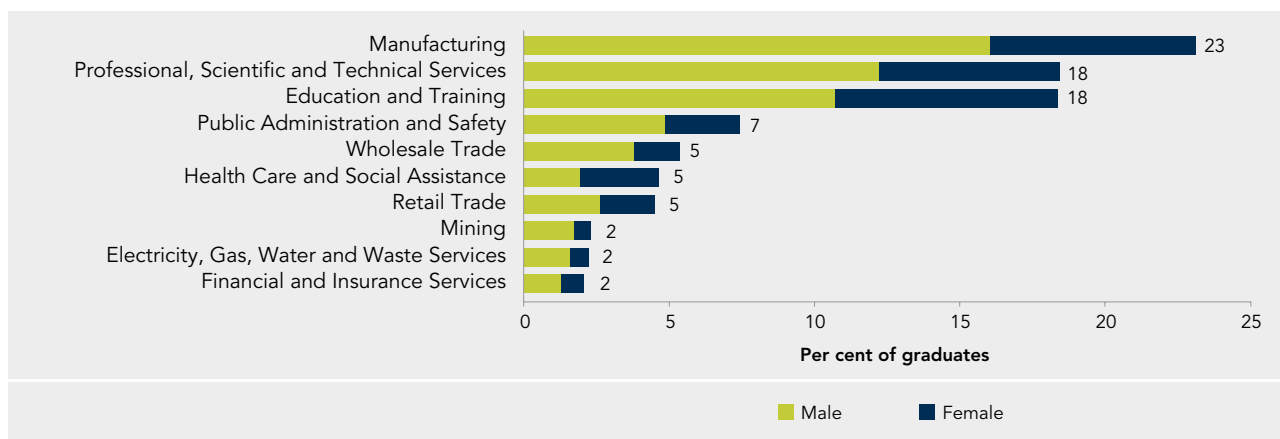
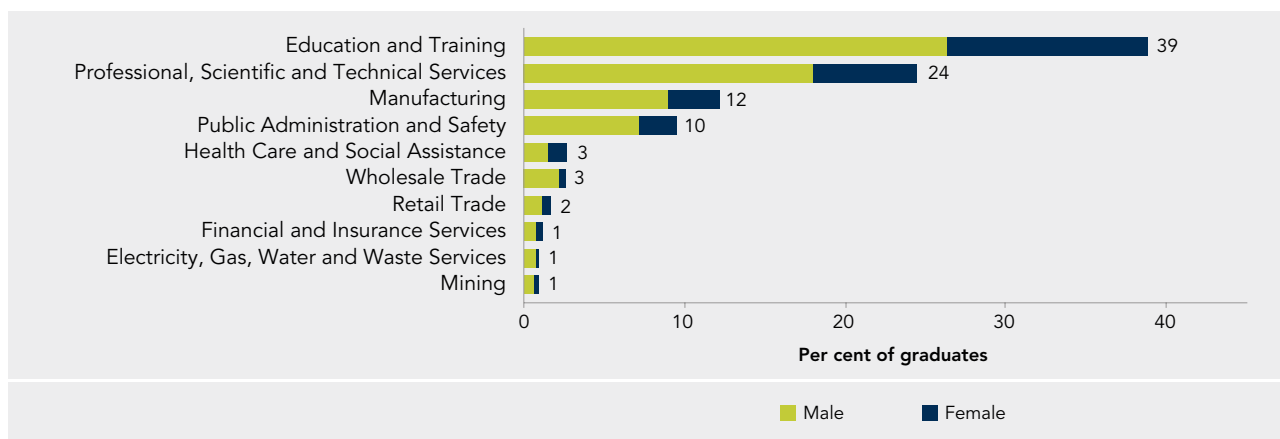


Figure 6.3: Top ten industry divisions of employment for Chemical Sciences doctoral graduates, by gender



INDUSTRY SECTORS OF EMPLOYMENT

The top three industry divisions of employment for Chemical Sciences graduates were Manufacturing; Professional, Scientific and Technical Services; and Education and Training (23, 18 and 18 per cent of graduates, respectively) (Figure 6.2). There were more males compared to females employed in all of the top ten industries, except for Health Care and Social Assistance.

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.

For individuals with a doctorate degree, the top industries of employment were Education and Training, and Professional, Scientific and Technical Services (39 and 24 per cent of graduates, respectively) (Figure 6.3). There were higher proportions of males compared to females in all of the top ten industry sectors of employment.

At the industry class level, Higher Education employed 23 per cent of all graduates and 33 per cent of doctorate degree holders. For all graduates, the second highest industry class for employment was Scientific Research Services (5 per cent of bachelor and above and 12 per cent of doctorates) (Figure 6.4 and Figure 6.5).



Figure 6.4: Top ten industry classes of employment for Chemical Sciences graduates with qualifications at bachelor level and above, by gender

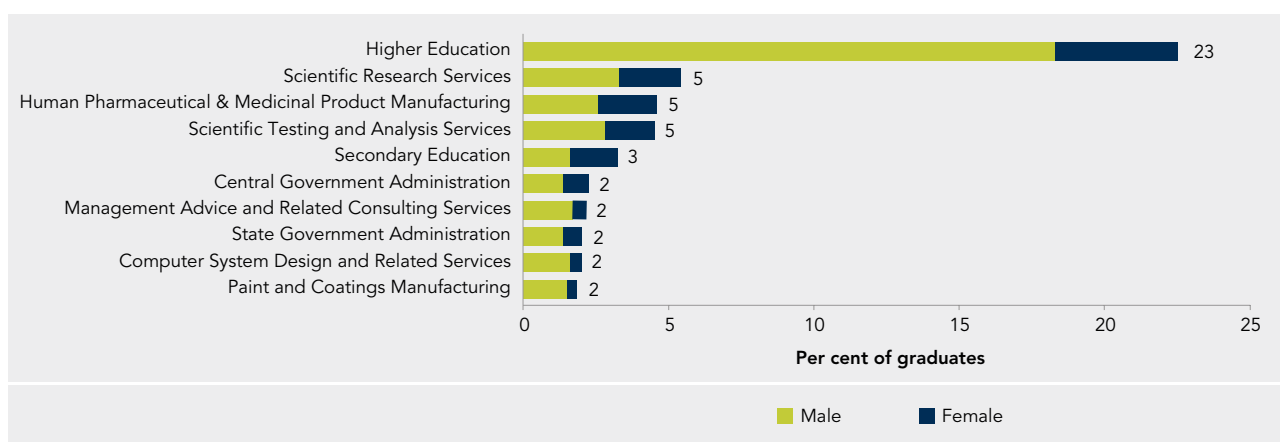


Figure 6.5: Top ten industry classes of employment for Chemical Sciences doctoral graduates, by gender

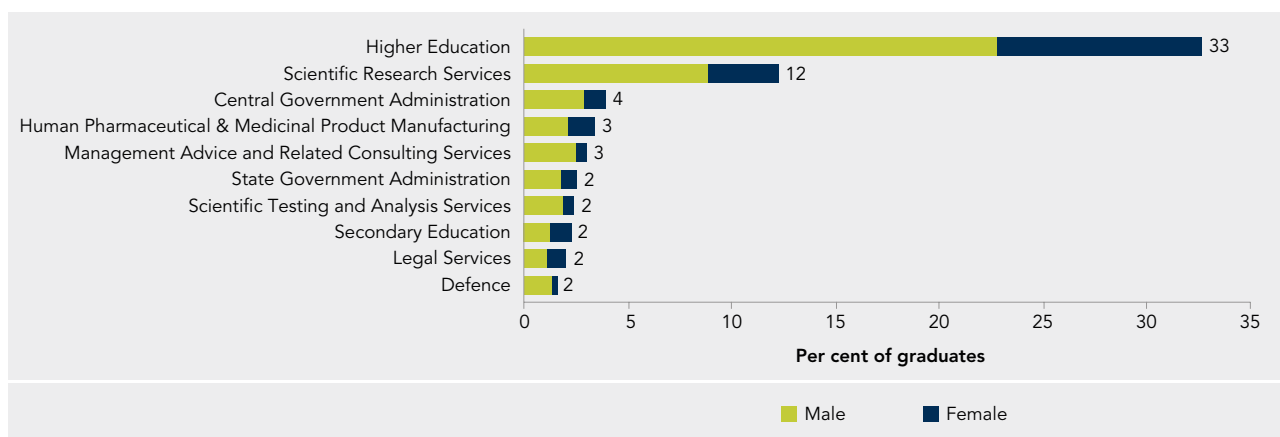


Figure 6.6: Top ten unit group level occupations of Chemical Sciences graduates with qualifications at bachelor level and above, by gender

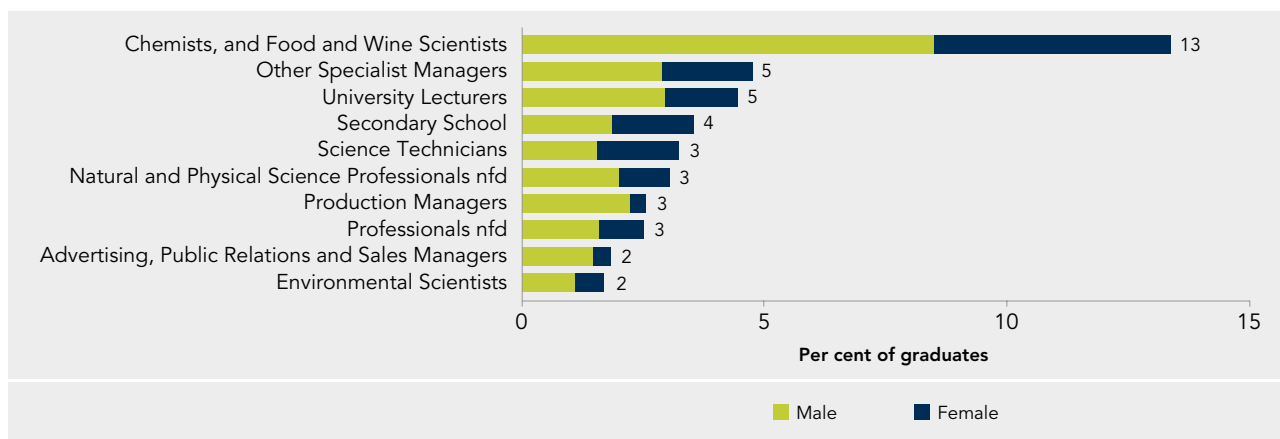
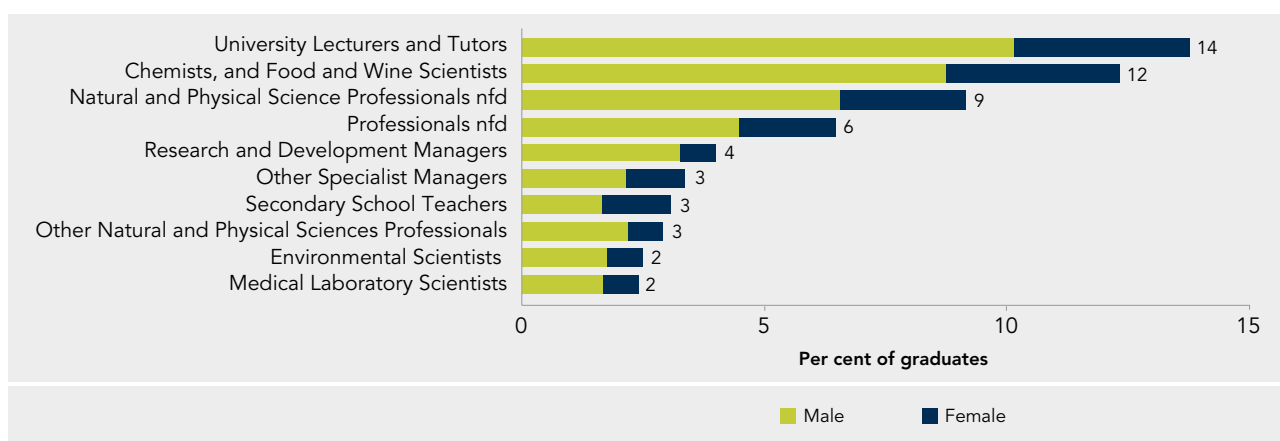


Figure 6.7: Top ten unit group level occupations of Chemical Sciences doctoral graduates, by gender



WHAT ARE THE OCCUPATIONS OF CHEMICAL SCIENCES GRADUATES?

The majority of graduates in the Chemical Sciences field were engaged as Professionals and Managers (49 and 22 per cent, respectively). Amongst the graduates employed as Professionals, the most common occupation sub-major groups were:

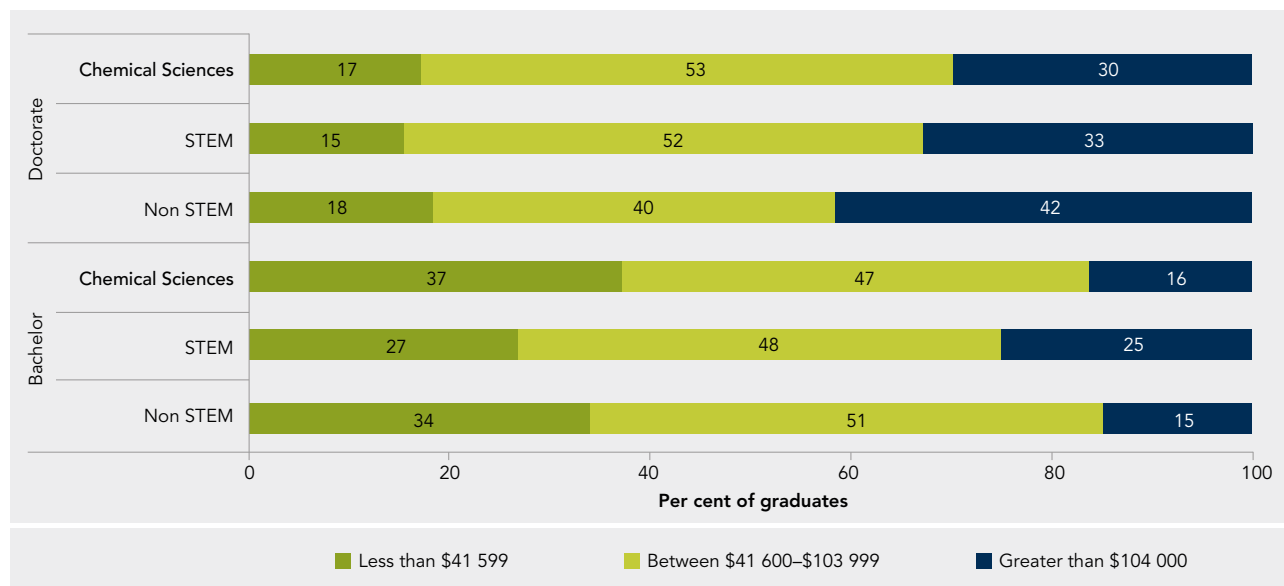
- ▶ Design, Engineering, Science and Transport Professionals (48 per cent)
- ▶ Education Professionals (20 per cent)
- ▶ Business, Human Resource and Marketing Professionals (14 per cent).

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.

Figure 6.8: Personal annual income of graduates, by field and level of qualification



At the finer, unit group level of detail, the most common occupations were as Chemists, and Food and Wine Scientists; Other Specialist Managers; and University Lecturers and Tutors (13, 5 and 5 per cent of graduates, respectively) (Figure 6.6).

The gender distribution in Chemical Sciences graduates was highly skewed where more males were in the majority for most occupations. In the top ten unit group occupations, only Science Technician roles were filled by a higher proportion of females compared to males (Figure 6.6).

ARE THE DESTINATIONS FOR CHEMICAL SCIENCES DOCTORATE HOLDERS DIFFERENT FROM BACHELOR DEGREE HOLDERS?

Almost 87 per cent of 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 unit group occupations for doctorate holders were as University Lecturers and Tutors; Chemists, and Food and Wine Scientists; and Natural and Physical Sciences Professionals, n.f.d. (not further defined) (14, 12 and 9 per cent, respectively) (Figure 6.7).

ARE CHEMICAL SCIENCES GRADUATES HIGH EARNERS?

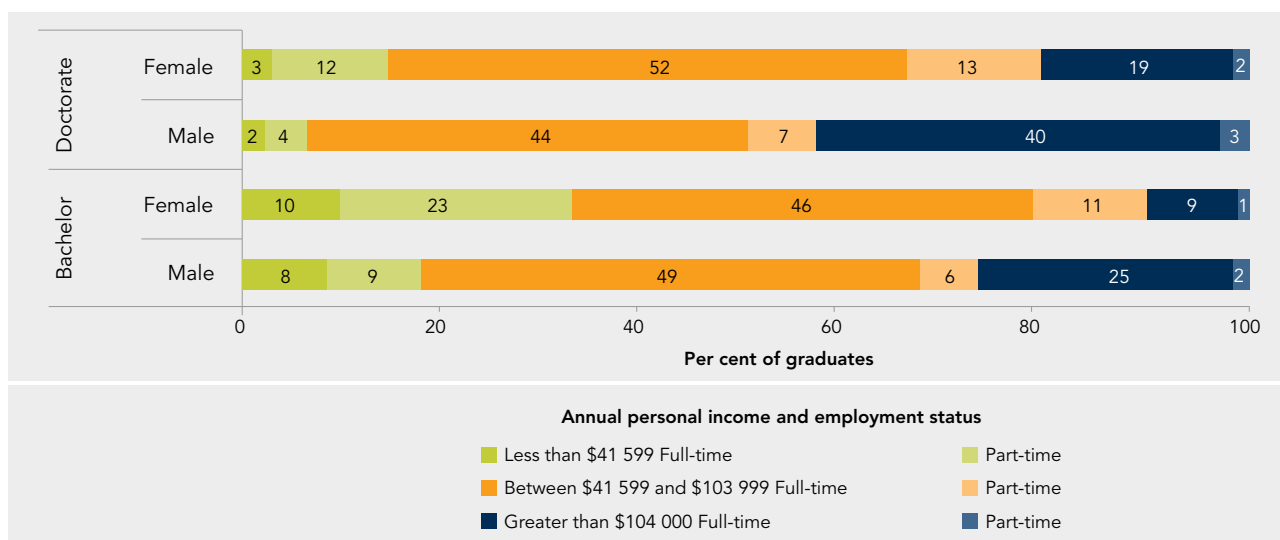
The personal income of graduates can be analysed using comparisons between income brackets and different fields of qualification, as illustrated in Figure 6.8.

At the bachelor degree level, 16 per cent of Chemical Sciences graduates earned a personal income in the highest income bracket (more than \$104 000), which is similar to the percentage of Non-STEM graduates.

Completing a doctorate in Chemical Sciences can be financially rewarding, with a higher percentage of doctorate holders in the highest income bracket; however at 29 per cent, this is less than doctorate holders from all STEM fields (33 per cent) and Non-STEM fields (42 per cent).

The proportion of Chemical Sciences graduates earning less than \$41 599 was 17 and 37 per cent at the doctorate and bachelor levels, respectively, which is higher than both the STEM and Non-STEM graduate cohorts.

Figure 6.9: Personal annual income of Chemical Sciences graduates working full-time and part-time, gender and level of qualification



Graduate income levels were dependent on both gender and full-time or part-time employment, with fewer females and fewer part-time workers in the higher income brackets (Figure 6.9). The largest income disparity is in the proportion of doctorate holders in the highest income bracket, which is 43 per cent for males, and less than half that for females at 21 per cent.

Over one-third (35 per cent) of females with a bachelor qualification in Chemical Sciences worked part-time, and the majority of these females had earnings in the lowest income bracket. In comparison, 17 per cent of males with a bachelor level qualification were employed part-time. At the doctorate level, 27 per cent of females and 14 per cent of males were employed on a part-time basis.

Compared to the STEM graduate cohort, lower proportions of both male and female Chemical Sciences bachelor graduates had a personal income in the highest bracket (Figure 6.10). The proportion of male bachelor graduates in the highest bracket was at least double that of female graduates for all age groups older than 29, reaching a maximum difference between the ages of 50 to 54.

At the doctorate level, higher proportions of male Chemical Sciences graduates between the ages of 35 to 54 were in the top income bracket compared to the STEM cohort (Figure 6.11). The difference between males and females was not as marked at the doctorate level compared to bachelor; however the difference was more than double between the ages of 40 to 44 and 50 to 64.

Figure 6.10: Percentage of bachelor level graduates earning greater than \$104 000 annually, by field, gender and age group

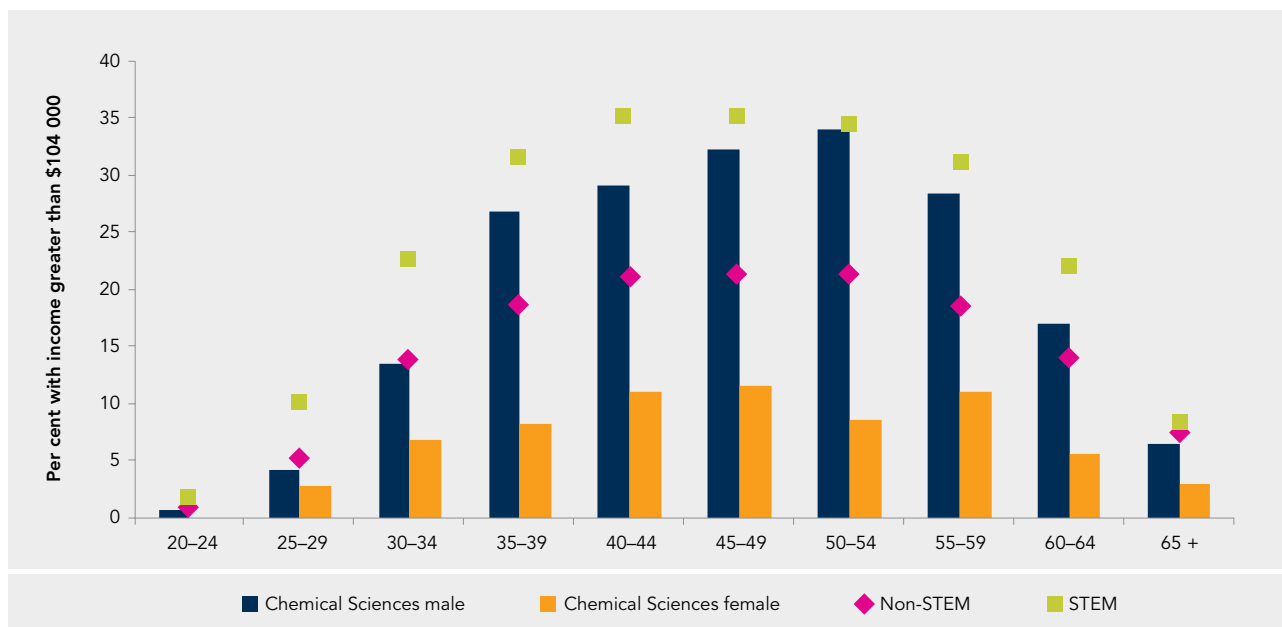


Figure 6.11: Percentage of doctoral level graduates earning greater than \$104 000 annually, by field, gender and age group

