

CHAPTER 7

STEM PATHWAYS: EARTH SCIENCES

WHAT ARE EARTH SCIENCES?

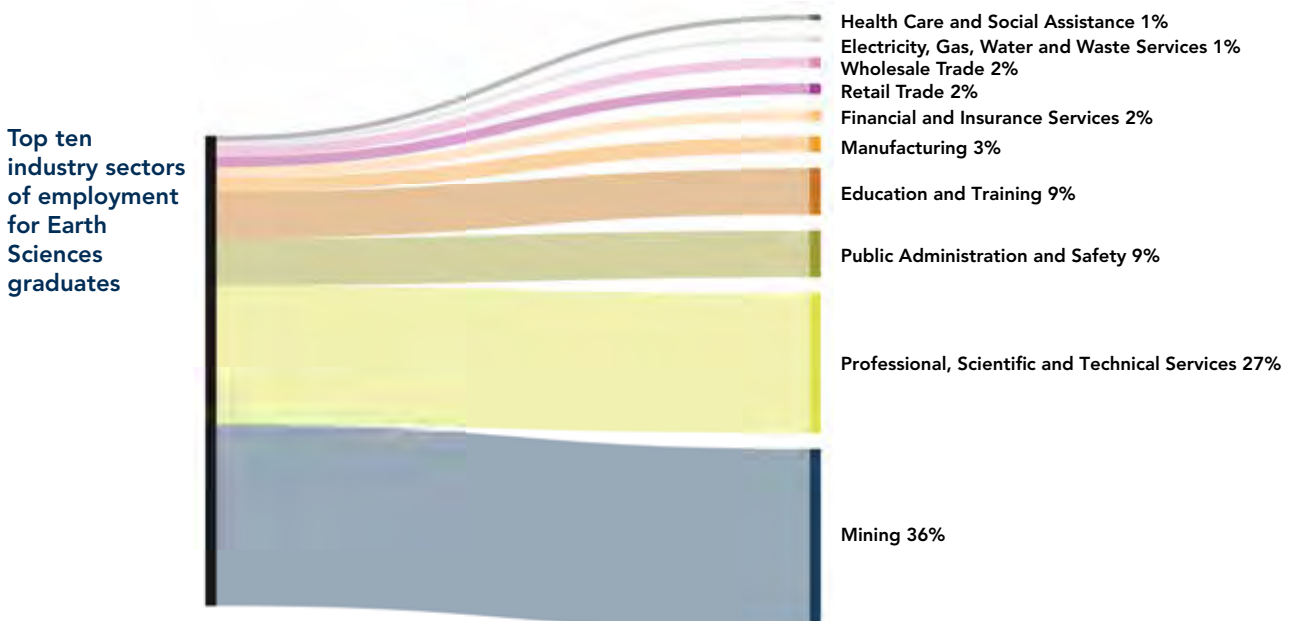
The main purpose of studying and working in Earth Sciences is to understand and apply knowledge of the physical properties of the Earth's crust and the characteristics of its soil, landforms, climate, hydrosphere and atmosphere. Earth Sciences are composed of: Atmospheric Sciences, Geology, Geophysics, Geochemistry, Soil Science, Hydrology, Oceanography and Earth Sciences n.e.c. (not elsewhere classified) (ABS, 2001).

7

STEM PATHWAYS: EARTH SCIENCES

KEY FACTS

- 1 In 2011, there were 18 396 Earth Sciences graduates.
- 2 The majority of graduates in the workforce were male (76 per cent).
- 3 The female workforce was younger than the male workforce: one quarter of females were aged 45 or over (25 per cent), compared to half of males (51 per cent).
- 4 79 per cent were employed in the private sector, with the proportions varying from 85 per cent of bachelors to 52 per cent of doctorates.
- 5 Just over one-third worked in the Mining industry (35 per cent), and just over one quarter in the Professional, Scientific and Technical Services industry (27 per cent).
- 6 Doctorate holders were more commonly employed in the Professional, Scientific and Technical Services (33 per cent) and Education and Training (27 per cent) than Mining (20 per cent) industries.
- 7 The majority worked as Professionals (72 per cent), and the most common occupation was as Design, Engineering, Science and Transport Professionals (57 per cent).
- 8 A higher proportion of Earth Sciences graduates with a bachelor degree had a personal income more than \$104 000 (40 per cent), compared to both the STEM (25 per cent) and Non-STEM (15 per cent) cohorts.



HOW MANY EARTH SCIENCES GRADUATES ARE THERE IN AUSTRALIA?

In 2011, there were 18 396 Earth Sciences graduates (bachelor and above) in Australia. Nineteen per cent of graduates (3489) were not in the labour force or were unemployed (17 and 2 per cent, respectively). Approximately 76 per cent of all graduates in the workforce were male.

The majority of graduates held degrees in the field of Geology (72 per cent). The next most popular fields of study were Earth Sciences n.e.c. (not elsewhere classified), and Geophysics, both with 8 per cent of graduates.

HOW OLD IS THE EARTH SCIENCES GRADUATE WORKFORCE?

The age distribution of the Earth Sciences graduate workforce was somewhat different to that of the Non-STEM workforce, especially for males (Figure 7.1).

Just over half (51 per cent) of the male Earth Sciences graduates were aged 45 or over, while only 41 per cent of the male Non-STEM workforce were in the same age range. By contrast, around a quarter of females were aged 45 or over for Earth Sciences graduates and one-third for Non-STEM educated workforce, at 25 per cent and 35 per cent, respectively.

WHERE DO EARTH SCIENCES GRADUATES WORK?

The private sector employed 79 per cent of all Earth Sciences graduates. The proportion employed in the private sector varies with qualification as follows:

- ▶ Bachelor level: 85 per cent
- ▶ Postgraduate level: 69 per cent
 - Masters: 84 per cent
 - Doctorate: 52 per cent

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.

Two industry divisions employed the majority of graduates in Australia—Mining, which employed around one third of graduates (5207 individuals, 35 per cent), and Professional, Scientific and Technical Services, which employed around

Figure 7.1: Age distribution of employed graduates with qualifications at bachelor level and above, by field and gender

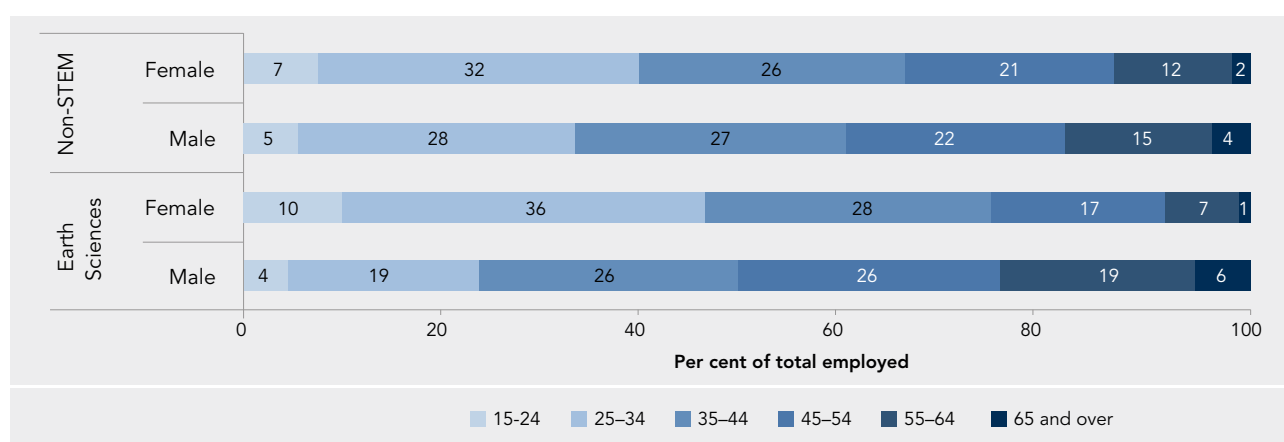
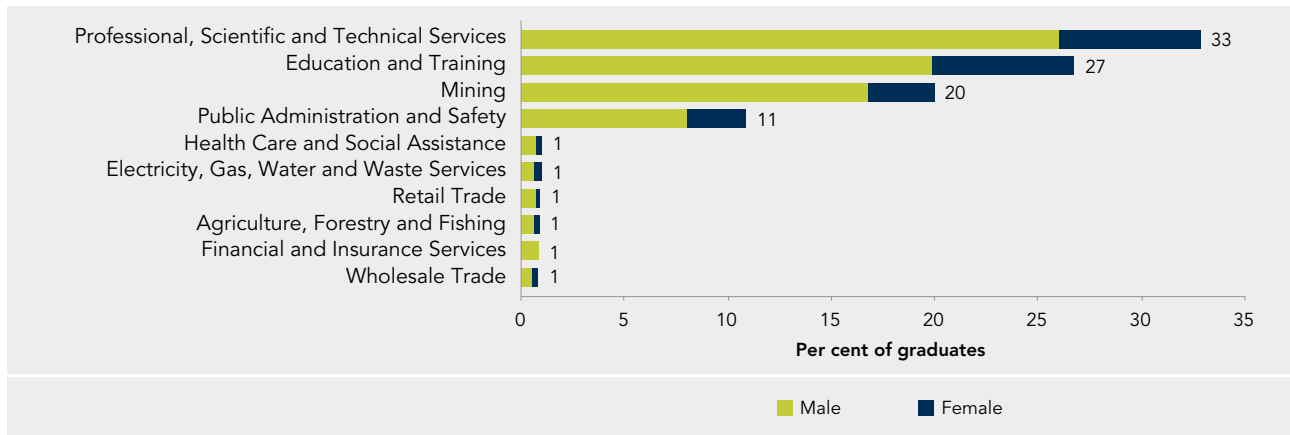


Figure 7.2: Top ten industry divisions of employment for Earth Sciences graduates with qualifications at bachelor level and above, by gender



Figure 7.3: Top ten industry divisions of employment for Earth Sciences doctoral graduates, by gender



one quarter (3995 individuals, 27 per cent). Significantly fewer graduates were employed in the next most common industry, which was Public Administration and Safety, employing 9 per cent of graduates (Figure 7.2).

The top ten industry divisions were the same for male and female graduates, and they were employed in roughly the same proportion across the industry sectors, despite the difference in absolute numbers.

The top ten industry divisions for doctorate holders were similar to the graduate cohort as a whole; however, doctorate holders were more commonly found in Professional, Scientific and Technical Services (33 per cent) and Education and Training (27 per cent) than Mining (20 per cent)(Figure 7.3). These top three industry sectors

for Earth Sciences doctorate holders were the same for both males and females. Manufacturing was not in the top ten industry divisions for doctorate holders, and was replaced by Agriculture, Forestry and Fishing.

Just over 50 per cent of graduates were accounted for in the top ten industry classes (Figure 7.4). As expected from Figure 7.2, most of the top ten industry classes were drawn from either the Mining or Professional, Scientific and Technical Services industries. The most common industry classes were Engineering Design and Engineering Consulting Services, Mineral Exploration, and Gold Ore Mining (8, 7 and 6 per cent of graduates, respectively).

Figure 7.4: Top ten industry classes of employment for Earth Sciences graduates with qualifications at bachelor level and above, by gender

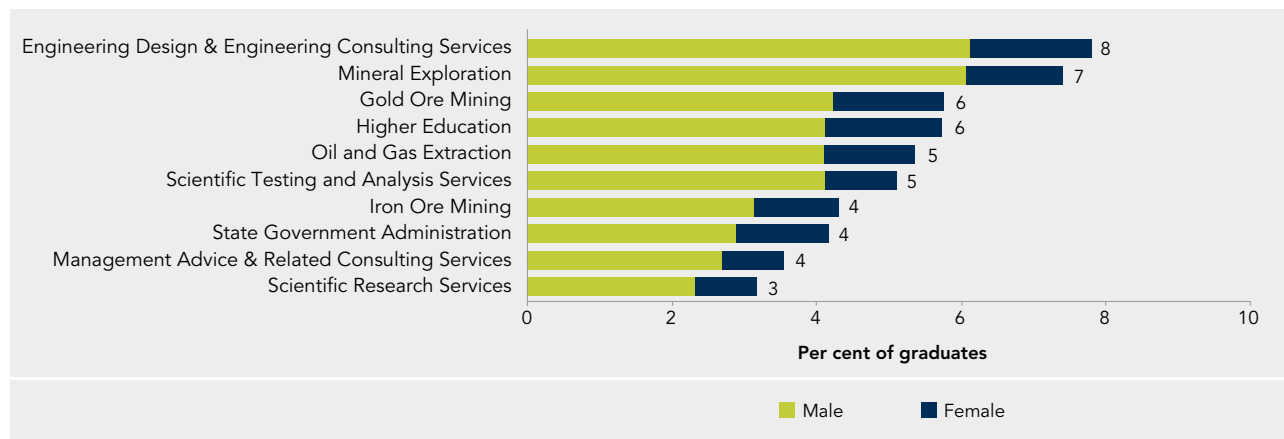
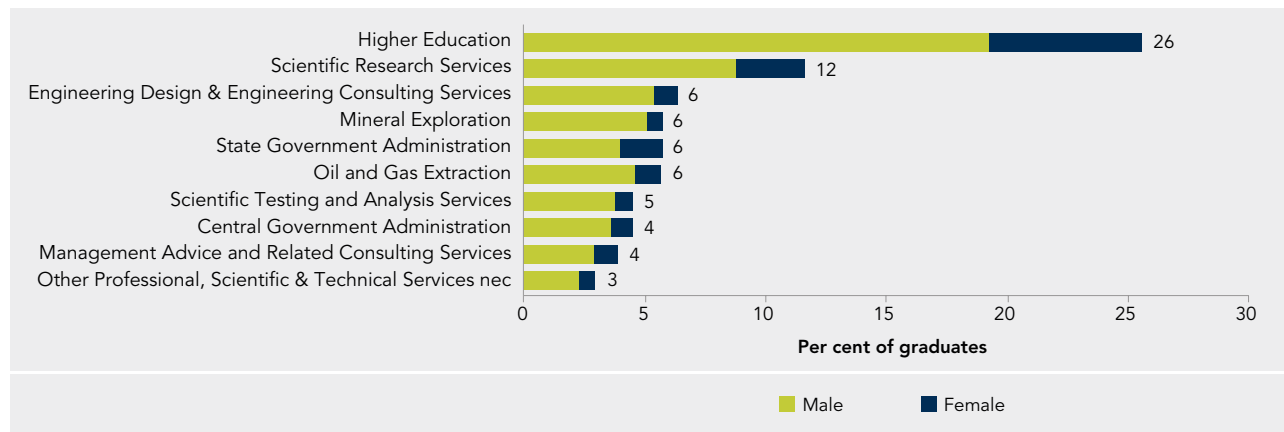


Figure 7.5: Top ten industry classes of employment for Earth Sciences doctoral graduates, by gender



Doctorate holders were most commonly employed in Higher Education, which employed 26 per cent of doctoral graduates, but only 6 per cent of Earth Sciences graduates as a whole (Figure 7.5). Scientific Research Services was the second most common industry class for employing Earth Sciences doctoral holders (12 per cent).

WHAT ARE THE OCCUPATIONS OF EARTH SCIENCES GRADUATES?

Over two-thirds of Earth Sciences graduates worked as Professionals (72 per cent). This was the largest category for both males and females, with 70 per cent of male and 82 per cent of female graduates. The next most common occupation was as Managers (15 per cent).

Figure 7.6: Top ten sub-major group level occupations of Earth Sciences graduates at bachelor level and above, by gender

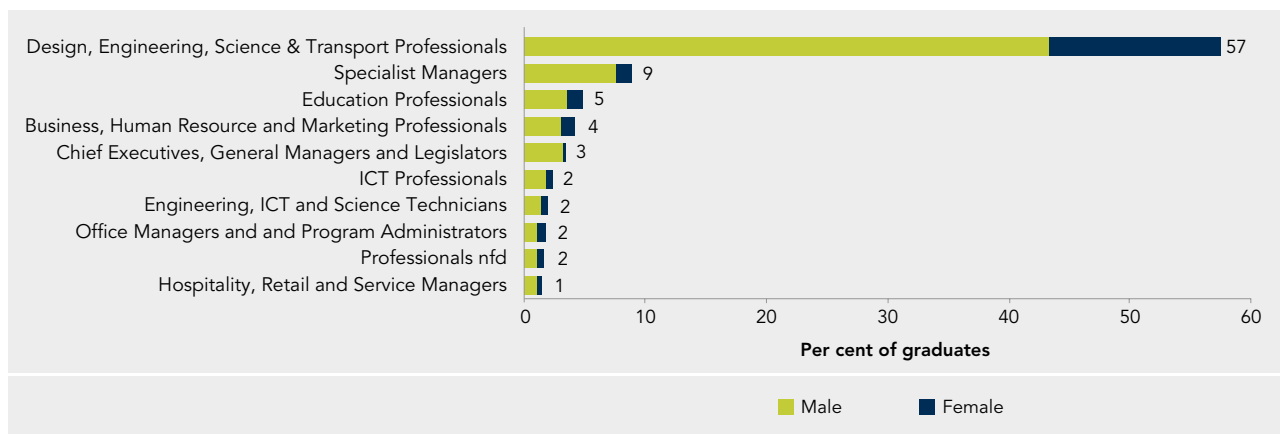
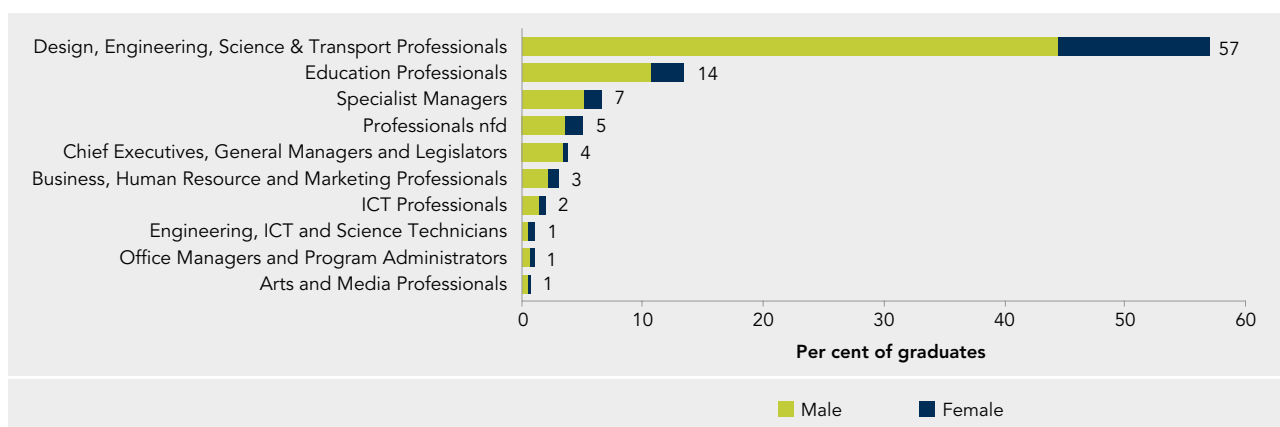


Figure 7.7: Top ten sub-major group level occupations of Earth Sciences doctorate graduates, by gender



As shown in Figure 7.6, the common occupations at the sub-major group level were mostly derived from Professionals and Managers. By a large margin, the top occupation at this more detailed level was as Design, Engineering, Science and Transport Professionals (57 per cent). The next most popular occupation was Specialist Managers (9 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.

Doctorate holders were also most commonly employed as Design, Engineering, Science and Transport Professionals (57 per cent). However, in comparison to bachelor level graduates, they were more likely to be employed as Education Professionals than Specialist Managers (14 and 7 per cent, respectively) (Figure 7.7).

The occupation groups can be further broken down to the Unit-group level (Figure 7.8 and Figure 7.9). The top occupation by a substantial margin for both genders was Geologists and Geophysicists (45 per cent of both male and female graduates). Males were next most commonly employed as Other Specialist Managers, and Chief Executives and Managing Directors (both with 3 per cent of graduates). For female graduates, the next most popular occupations were as Environmental Scientists and Other Natural and Physical Science Professionals (5 and 3 per cent, respectively).

Figure 7.8: Top ten unit group level occupations of Earth Sciences graduates with qualifications at bachelor level and above, by gender

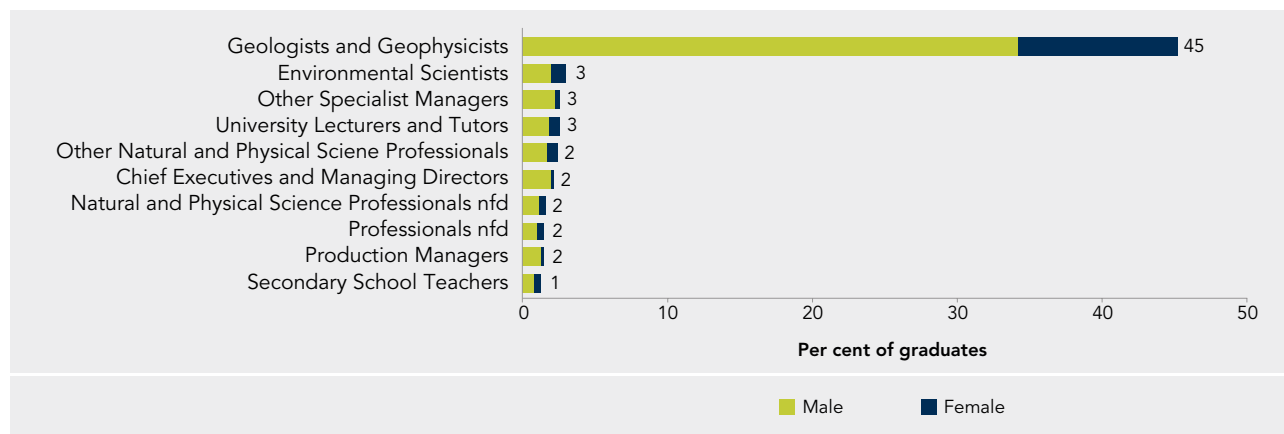
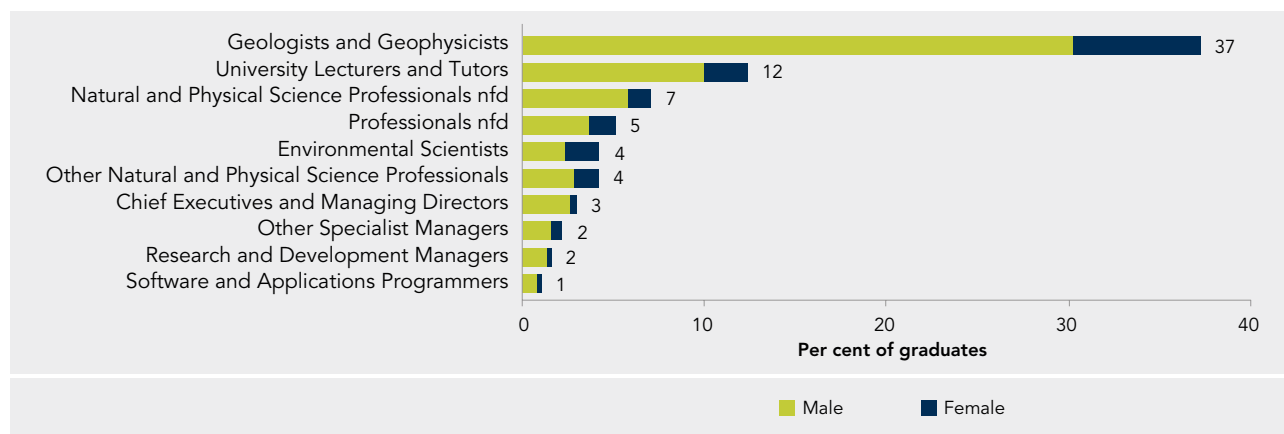


Figure 7.9: Top ten unit group level occupations of Earth Sciences doctorate graduates, by gender



Doctorate holders also most commonly worked as Geologists and Geophysicists (37 per cent). They were then more likely to be employed as University Lecturers and Tutors (12 per cent).

ARE EARTH SCIENCES GRADUATES HIGH EARNERS?

There were more Earth Sciences graduates at the bachelor level with a personal income in the highest bracket (more than \$104 000) than in either the STEM or Non-STEM cohorts (41, 25 and 15 per cent, respectively) (Figure 7.10).

At the doctorate level, the distribution of people across the three income brackets was similar between Earth Sciences and Non-STEM cohorts, with 44 per cent and 45 per cent in the highest income bracket, respectively.

Graduate income levels were dependent on both gender and full-time or part-time employment. Fewer females and fewer part-time workers earned an income in the highest bracket for both bachelor and doctorate holders (Figure 7.11).

More females worked part-time across both qualification levels and at all income levels, except at the highest income bracket: at the bachelor level, 44 per cent of women and 21 per cent of men worked part-time, while at the doctorate level 35 per cent of women and 19 per cent of men worked part-time.

Figure 7.10: Personal annual income of graduates, by field and level of qualification

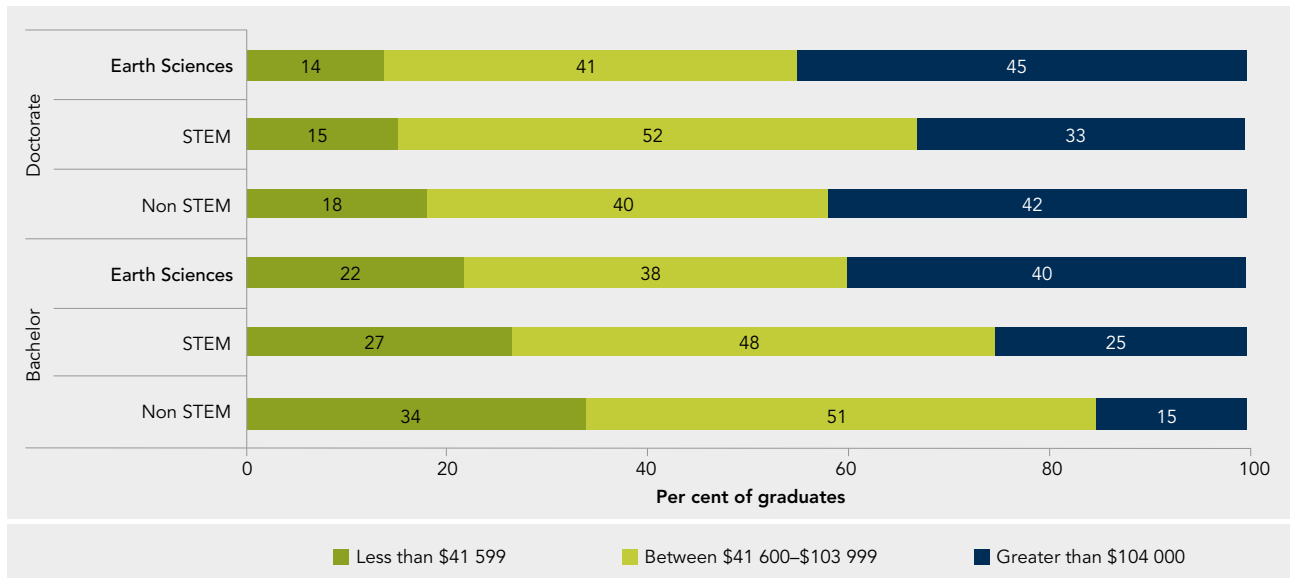
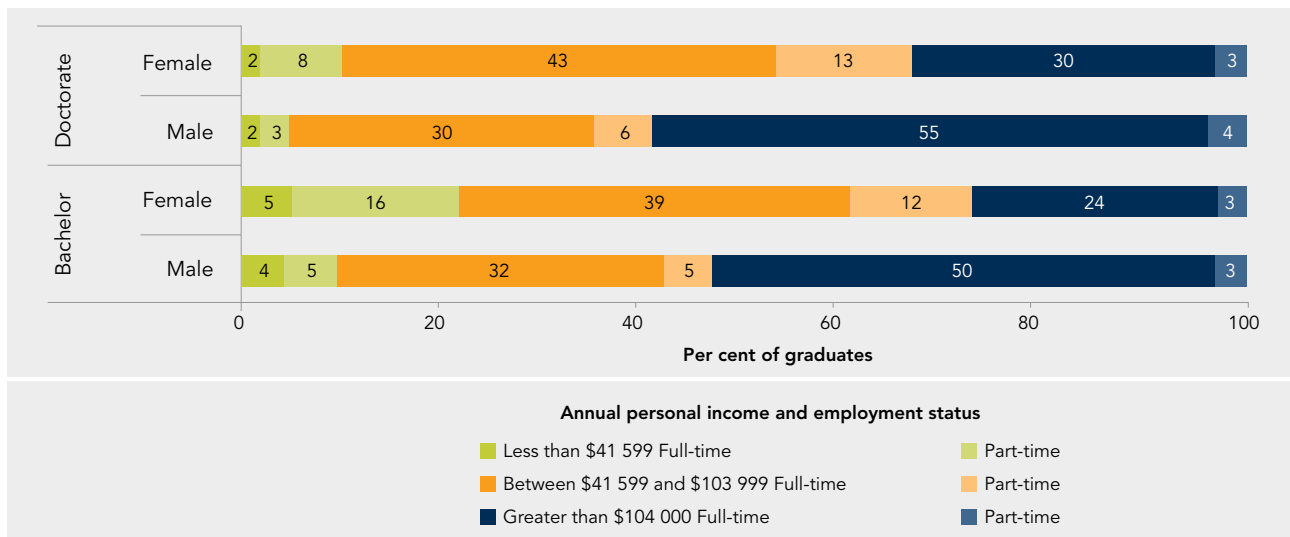


Figure 7.11: Personal annual income of Earth Sciences graduates working full-time and part-time, by field, gender and level of qualification



The proportion of male Earth Sciences graduates with earnings more than \$104 000 peaked at 63 per cent between the ages of 40-44 for bachelor and at 66 per cent for doctorate graduates (Figure 7.12 and Figure 7.13). Compared to the total STEM cohort, a larger proportion of male Earth Sciences graduates were in the highest bracket for all age groups at the bachelor level and above the age of 25 at the doctorate level.

The proportion of female graduates in the highest income bracket was markedly less than the male graduates for all age groups at both the doctorate and bachelor level of qualification. The proportion peaked at 30 per cent between the ages of 25-29 for female bachelor graduates, and 47 per cent between ages of 50 to 54 for female doctorates. Compared to the total STEM cohort, a higher proportion of female bachelor Earth Sciences graduates were in the top income bracket up to the age of 34, and between the ages of 30 to 39 for doctorates.

Figure 7.12: Percentage of bachelor level graduates earning greater than \$104 000 annually, by field, gender and age group

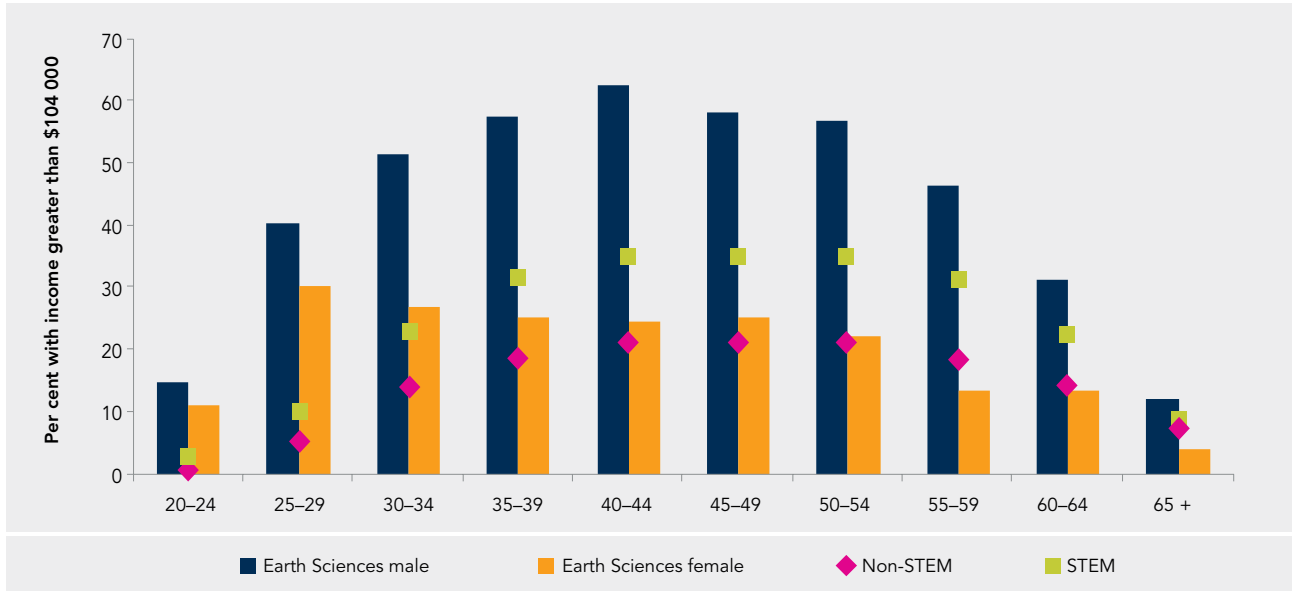


Figure 7.13: Percentage of doctoral level graduates earning greater than \$104 000 annually, by field, gender and age group

