CHAPTER 15

15

WOMEN IN STEM

HIGHLIGHTS

- The female STEM qualified labour force is growing faster than the male STEM qualified labour force. Between 2006 and 2016, the female labour force with VET STEM qualifications increased by 14% (11 698), whereas the male labour force with VET STEM qualifications increased by 13% (119 899). Across the same decade, the female labour force with university STEM qualifications increased by 74% (90 650), whereas the male labour force with university STEM qualifications increased by 57% (190 671).
- The large numerical increase in the female STEM qualified labour force has not translated to a large change in the gender split of the STEM qualified labour force.
  - For those with VET qualifications, females made up 8% of the STEM qualified labour force in both 2006 and 2016.
  - For those with university qualifications, females made up 27% of the STEM qualified labour force in 2006 and 29% in 2016.
- In 2016, STEM qualified females working full-time had lower incomes than males working full-time across the board. There was not a substantial difference between the inequities when comparing STEM and non-STEM fields.
- STEM qualified females who had a child between 2011 and 2016 were significantly less likely to remain employed than females who did not have a child. Nearly one-third (30%) of VET qualified females and nearly one-fifth (19%) of university qualified females who had a STEM qualification and were working full time in 2011 left the labour force after having a child.

For those with VET qualifications:

- Females made up 8% of the STEM qualified labour force.
- 31% of STEM qualified females in the labour force were born outside Australia, compared to 24% of males.
- 9% of STEM qualified females working full-time earned $104 000 or above, compared to 20% of males.
- 7% of STEM qualified managers were female.
- 18% of STEM qualified females in the labour force were aged 55 or over, compared to 23% of males.

For those with university qualifications:

- Females made up 29% of the STEM qualified labour force.
- 56% of STEM qualified females in the labour force were born outside Australia, as were 56% of males.
- 26% of STEM qualified females working full-time earned $104 000 or above, compared to 45% of males.
- 22% of STEM qualified managers were female.
- 9% of STEM qualified females in the labour force were aged 55 or over, compared to 15% of males.

Introduction

As highlighted in earlier chapters of this report, women are in the minority in Australia's STEM workforce and, on average, women with STEM qualifications experience poorer employment outcomes than men. In 2016, just 8% of people in the labour force with a VET STEM qualification were female, while almost one third (29%) of people in the labour force with a university STEM qualification were female (Chapter 3, Figure 3.5). STEM qualified females had higher unemployment rates than males in all STEM fields, regardless of whether they had a VET or university qualification (Chapter 3, Figure 3.12). Amongst university graduates, 39% of STEM qualified males earned above $104 000, while only 19% of STEM qualified females had an income in this top bracket (Chapter 4, Figure 4.15).

The driving forces behind women's underrepresentation in STEM are many and varied, but a lack of interest or aptitude in STEM is not the culprit (Office of the Chief Scientist 2016). Rather, women face a number of systemic challenges in society and the workforce that impact their engagement and experiences at work. Women spend more time than men performing unpaid care and domestic work[24] (Workplace Gender Equality Agency 2016), limiting the amount of time available for paid employment. Even women who work full-time tend to earn less than men, due to factors such as biased hiring practices, lack of workplace flexibility, a concentration of women in industries that have lower than average wages, and the tendency for women to have more time out of the workforce, impacting their opportunities for career progression (Workplace Gender Equality Agency 2018). Older women face particular societal barriers to employment that are not as common for their male counterparts, such as a perceived lack of relevant skills and a perceived limited ability to acquire new skills (Australian Human Rights Commission 2016).

Further barriers exist which can limit women's participation in STEM education and careers, from stereotypes and bias that deter girls from studying STEM subjects at school, to a lack of job security in workplaces, the impact of career disruptions, social and cultural barriers, and gender discrimination and sexual harassment in STEM workplaces.[25] Not all of these barriers are specific to women and girls in STEM, with many experienced by women in all areas of the workforce.

The drive to improve female representation in the STEM qualified workforce is part of a larger push to improve female workforce participation more broadly. In 2018, 73% of Australian women and 83% of Australian men aged 15 to 64 were in the labour force, representing a participation gap of 10 percentage points (OECD 2019a). It has been suggested that reducing the gender participation gap by 25% could add up to $25 billion to the Australian economy[26] (Department of the Prime Minister and Cabinet 2017).

This chapter takes a closer look at STEM qualified women at different stages in their career, from graduation to retirement. The following topics are covered: demographics, income, childcare and flexible work, business ownership and leadership, and mature aged women. These have been selected to shed light on a broad range of topics for which there was sufficient data from the Census to explore. The experiences of women in STEM, and women in the workforce more broadly, are complex, varied, and span across a wide range of themes, not all of which were able to be represented in this report.

24 This includes caring for children, the elderly, or sick family members, along with domestic work such as preparing meals, washing, gardening, home and car maintenance, household shopping, managing financial affairs, and any other domestic work performed by an individual for themselves or for their household.

25 A comprehensive list of barriers to girls' and women's participation in STEM can be found in the *Women in STEM Decadal Plan*, developed by the Australian Academy of Science and the Australian Academy of Engineering.

26 From the 2012 starting point of a 12.1% participation gap.

How many STEM qualified females are in the labour force?

In 2016, there were 95 306 females and 1 071 141 males with VET STEM qualifications in the Australian labour force (Table 15.1).[28] Females made up 8% of this population in both 2006 and 2016. Between 2006 and 2016, the number of females with VET STEM qualifications in the labour force increased by 14% (11 698), while the number of males with VET STEM qualifications in the labour force increased by 13% (119 899; data not shown).

For those with VET STEM qualifications, the most common broad field of education for females in 2016 was Engineering, accounting for nearly two-fifths (38%) of the female VET STEM qualified labour force. The next most common field of education was Agriculture and Environmental Science (28%), followed by Information Technology (18%), and Science (15%).

The Census asks respondents to state whether they are **male** or **female**, and this report uses these terms when reporting Census data.

While the 2016 Census made provisions to allow people to report a sex other than male or female, this information is not available for analysis due to limitations in the data. We recognise that the response options of male and female may not adequately capture those who are intersex or have a non-binary gender identity.

This report also uses the word **gender** rather than sex when reporting Census data. The Census question does not specifically mention sex or gender; as such, we have chosen to use the term gender as it may more closely align with respondents' self-reported identity.[27]

In 2016, there were 212 863 females and 525 209 males with university STEM qualifications in the Australian labour force (Table 15.1).[29] Females made up 29% of this population, an increase from 27% in 2006. Between 2006 and 2016, the number of females with university STEM qualifications in the labour force increased by 74% (90 650), while the number of males with university STEM qualifications in the labour force increased by 57% (190 671; data not shown).

For those with university qualifications, the most common broad field of qualification for females in 2016 was Science, representing 45% of the female STEM qualified labour force. The next most common field of education was Information Technology (21%), followed by Engineering (20%), Agriculture and Environmental Science (10%) and Mathematics (4%).[30]

Table 15.1: Number of females in the labour force with post-secondary qualifications, by field and level

	Science	Ag. & Enviro. Science	Information Technology	Engineering	Mathematics	Total STEM	Total non-STEM
Doctoral Degree	13 604	1 122	726	1 917	658	18 026	32 326
Master Degree	11 958	4 175	12 778	7 644	1 760	38 318	267 624
Postgraduate Degree not further defined	212	52	134	77	26	499	8205
Graduate Certificate or Diploma	2 782	1 505	2 679	898	498	8 370	183 042
Bachelor Degree	66 613	15 301	28 452	31 394	5 887	147 650	1 082 199
University total	**95 169**	**22 155**	**44 769**	**41 930**	**8 829**	**212 863**	**1 573 396**
Advanced Diploma and Diploma	7 659	8 814	9 535	8 951	200	35 183	641 968
Certificate not further defined	1 543	2 082	1 320	2 838	41	7 820	128 909
Certificate III & IV	4 583	12 949	4 474	22 467	28	44 505	652 764
Certificate I & II	369	2745	2296	2366	20	7798	80350
VET total	**14 154**	**26 590**	**17 625**	**36 622**	**289**	**95 306**	**1 503 991**
Level not stated	533	615	604	1 583	35	3 369	48 141
Level inadequately described	1 279	334	1 430	1 246	80	4 370	40 012

27 Further information on gender and sex in the 2016 Census is available in 2071.0—Census of Population and Housing: Reflecting Australia—Stories from the Census, 2016.

28 For a list of 'STEM' fields of education, refer to Chapter 1, page 2 of this report.

29 In 2016, a further 7 739 females and 37 725 males in the labour force held a STEM qualification but did not specify their level of education. These cohorts have been excluded from analyses in this chapter.

30 For the total numbers of qualified people in Australia, combining males and females, refer to Chapter 2, Table 2.1.

Are there fewer females than males with post-secondary qualifications in the labour force?

The underrepresentation of females in STEM is not simply due to an overall lower number of females with post-secondary qualifications; rather, females are less likely than males to pursue study in STEM fields. While females were outnumbered by males in STEM fields, they outnumbered males in non-STEM fields, making up 57% of the VET qualified non-STEM labour force and 61% of the university qualified non-STEM labour force (Figure 15.1).

How does female representation vary across the different fields of Science?

Of the STEM fields, Science had the most even gender split. As shown in Chapter 2, in 2016, females made up 56% of all people with VET Science qualifications and 50% of all people with university Science qualifications in Australia (Figure 2.4 and Figure 2.5). However, the distribution of females in the labour force varied with level of education and across the narrow fields of Science.

Of those in the labour force with VET Science qualifications, females outnumbered males in five of the ten largest narrow fields of education (Figure 15.2); Laboratory Technology, Natural and Physical Sciences not further defined, Medical Science, Earth Sciences not elsewhere classified, and Biological Sciences not further defined. Across the largest ten narrow Science fields, females had the highest representation in Laboratory Technology (making up 71% of the population with this qualification) and the lowest representation in Geology (18%).

Figure 15.1: Size of the STEM and non-STEM qualified labour forces, by gender, field and level

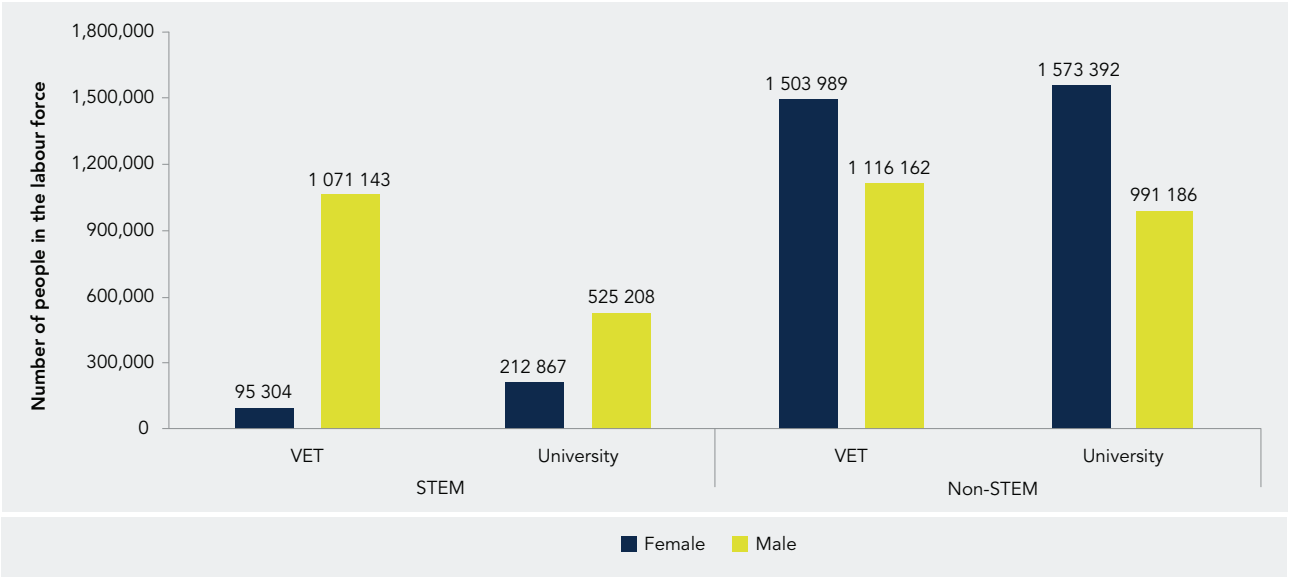
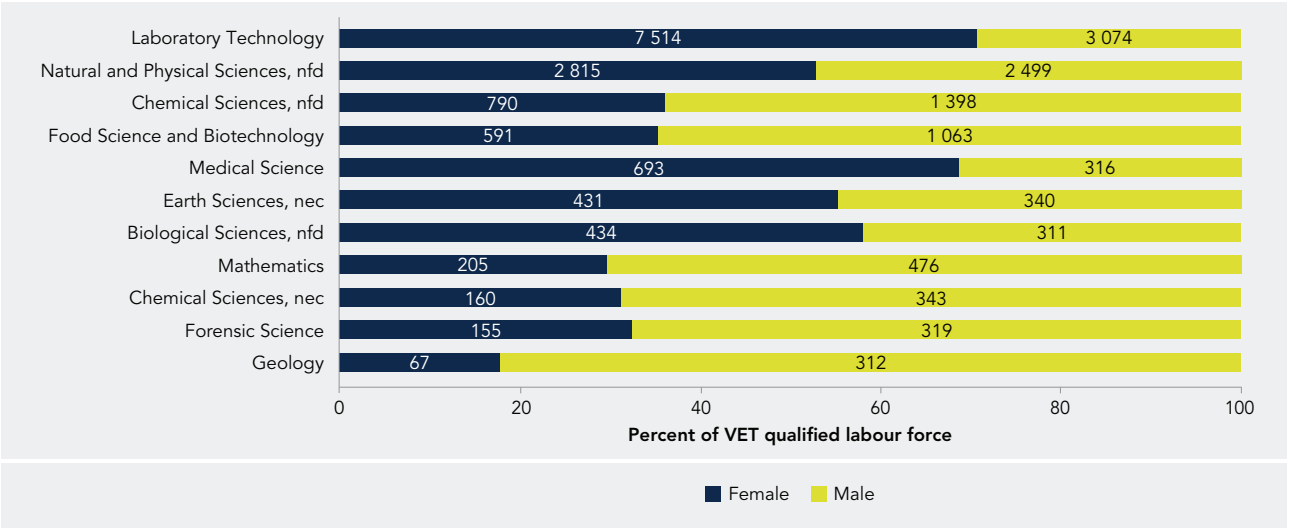


Figure 15.2: Gender distribution of the VET science qualified labour force. Data labels show the number of qualified people in the labour force



Of those in the labour force with university Science qualifications, females outnumbered males in six of the ten largest narrow education fields of Science (Figure 15.3), including Natural and Physical Sciences not further defined, Medical Science, Biological Sciences not further defined, Food Science and Biotechnology, Biochemistry and Cell Biology, and Microbiology. Across the largest ten narrow Science fields, females had the highest representation in Medical Science (making up 65% of the population with this qualification) and the lowest in Physics (19%).

Are females more likely than males to pursue higher qualifications?

The Australian Census Longitudinal Dataset was used to look at the number of people who had a post-secondary qualification in 2011 and a higher level of qualification in 2016. STEM qualified females were more likely than STEM qualified males to gain a higher level of qualification in this time period, across all levels of qualification (Figure 15.4). For example, of people who had a STEM qualification at the certificate level in 2011, 15% of females and 7% of males had a higher level of qualification in 2016.

Figure 15.3: Gender distribution of the university Science qualified labour force. Data labels show the number of qualified people in the labour force

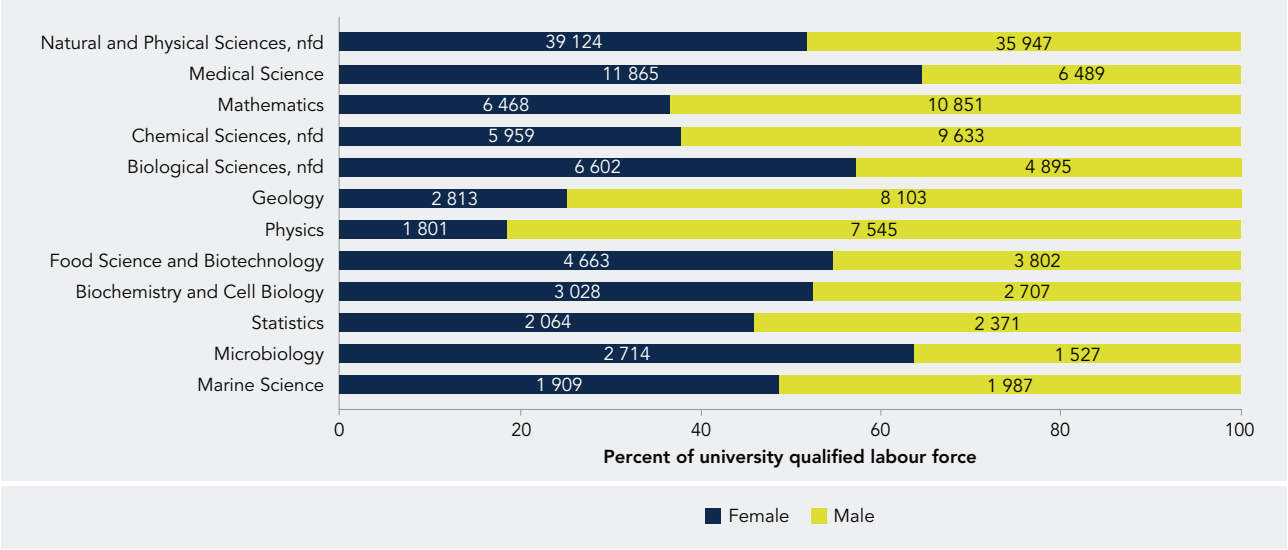
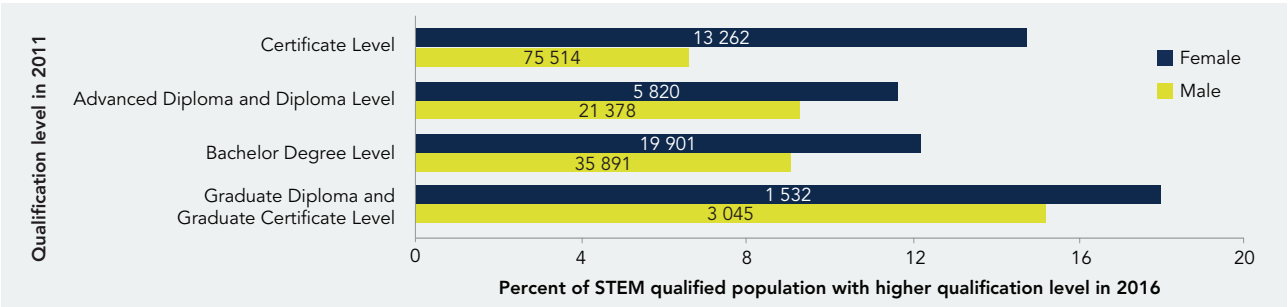


Figure 15.4: Percent of the STEM qualified population who increased their qualification level between 2011 and 2016. Bars are labelled with the number of people who increased their qualification level[31]



31 Those who had master and doctoral level qualifications in 2011 are not analysed here as they had already attained the highest qualification available (when analysing qualification level at the broadest grouping). Data for this figure was sourced from the Australian Census Longitudinal Dataset, 2011-2016.

What is the age distribution of STEM qualified females?

In 2016, the majority (55%) of females with VET STEM qualifications in the labour force were aged under 45 (Figure 15.5). This was slightly greater than the proportion of males with VET STEM qualifications in the labour force aged under 45 (52%). Of females with university STEM qualifications in the labour force, almost three-quarters (73%) were aged under 45 in 2016 (Figure 15.6). This proportion was considerably higher than the proportion of males with university STEM qualifications in the labour force aged under 45 (65%).

Although the majority of the female STEM qualified labour force were aged under 45 in 2016, the proportion of the labour force aged 45 and over has increased over the decade. Between 2006 and 2016, the proportion of females with VET STEM qualifications aged 45 and over increased by 12 percentage points, from 33% to 45% (Figure 15.5). The largest growth was in the 55 to 64 age bracket, where the number of VET STEM qualified females in the labour force increased by 7 216 (or 96%, data not shown). In contrast, the smallest growth occurred in the 25 to 34 age bracket, where the number of VET STEM qualified females in the labour force decreased by 1 709 (-8%). The 35 to 44 age bracket also saw a decrease of 1 749 females (-7%).

Over the same time period, the proportion of females with university STEM qualifications aged 45 and over increased by 4 percentage points, from 23% to 27% (Figure 15.6). The largest growth was in the 35 to 44 age bracket, where the number of STEM qualified females in the labour force increased by 32 633 (or 99%, data not shown). The smallest growth occurred in the 15 to 24 age bracket, where the number of STEM qualified females in the labour force increased by 1 716 (12%).

Figure 15.5: Age distribution of labour force with VET STEM qualifications, by gender and year. Data labels show the percentage of the population in each age group

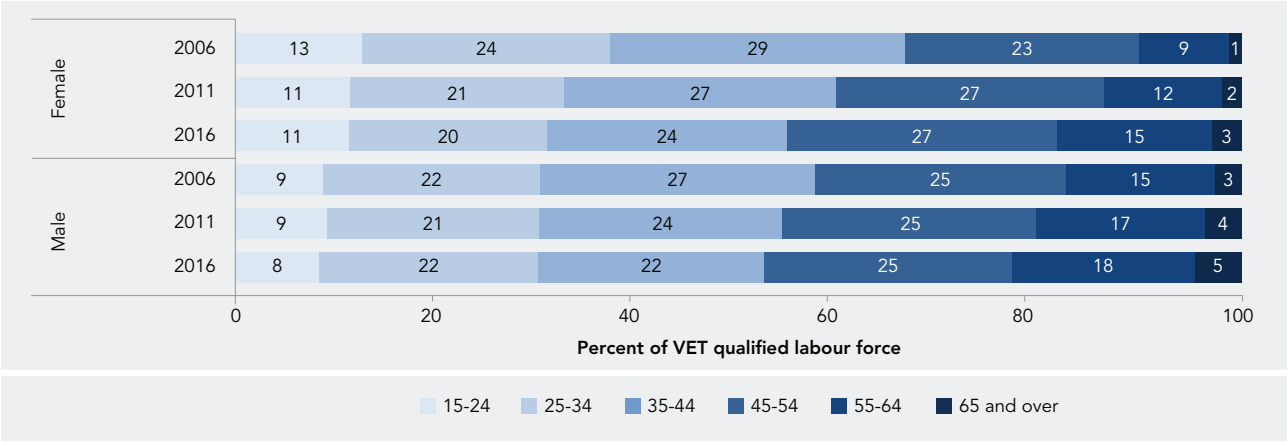
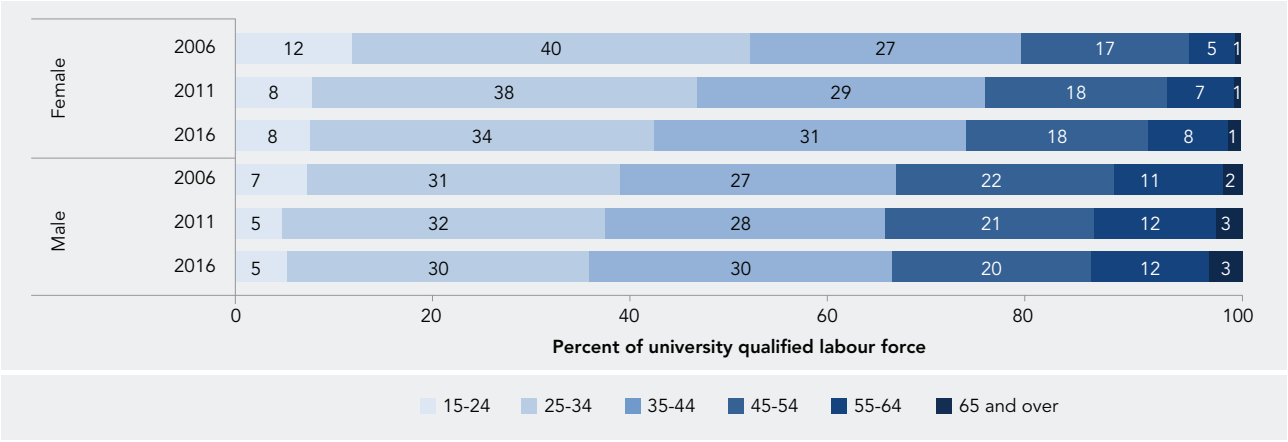


Figure 15.6: Age distribution of labour force with university STEM qualifications, by gender and year. Data labels show the percentage of the population in each age group



How many STEM qualified females speak a language other than English at home?

In 2016, just over one-fifth (21%) of females in the labour force with VET STEM qualifications spoke a language other than English at home (Figure 15.7). Across all STEM fields, a greater proportion of VET qualified females compared to males spoke a language other than English at home, with this difference largest amongst those with Engineering qualifications. For males and females, speaking a language other than English was most common amongst the Information Technology qualified labour force.

In 2016, nearly half (45%) of females in the labour force with university STEM qualifications spoke a language other than English at home (Figure 15.8). Across most STEM fields, a greater proportion of university qualified females compared to males spoke a language other than English at home, with the exception of the Agriculture and Environmental Science qualified labour force, where a greater proportion of males (20%) compared to females (18%) spoke a language other than English at home. Speaking a language other than English was most common amongst the Information Technology qualified labour force, for males and females.

Figure 15.7: Percent of VET qualified labour force who spoke a language other than English at home, by field and gender[32]

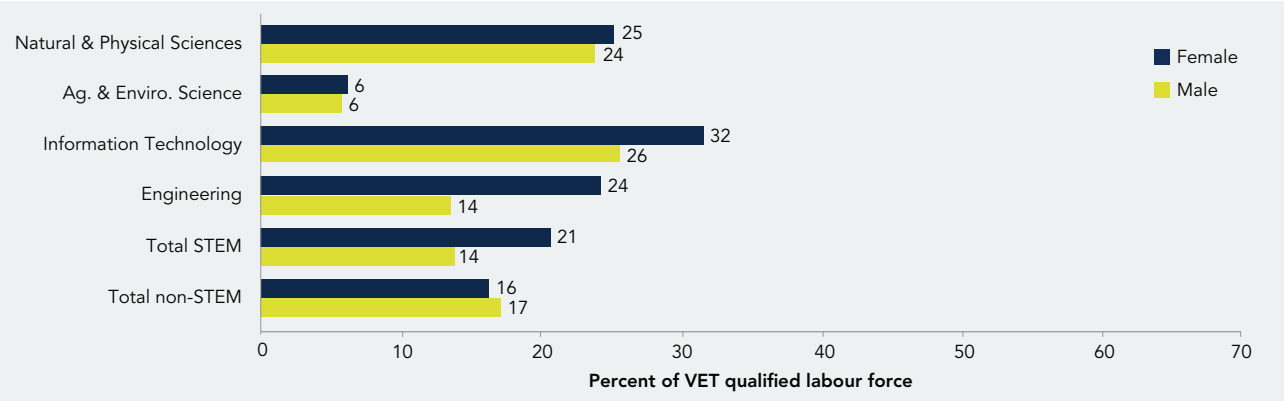
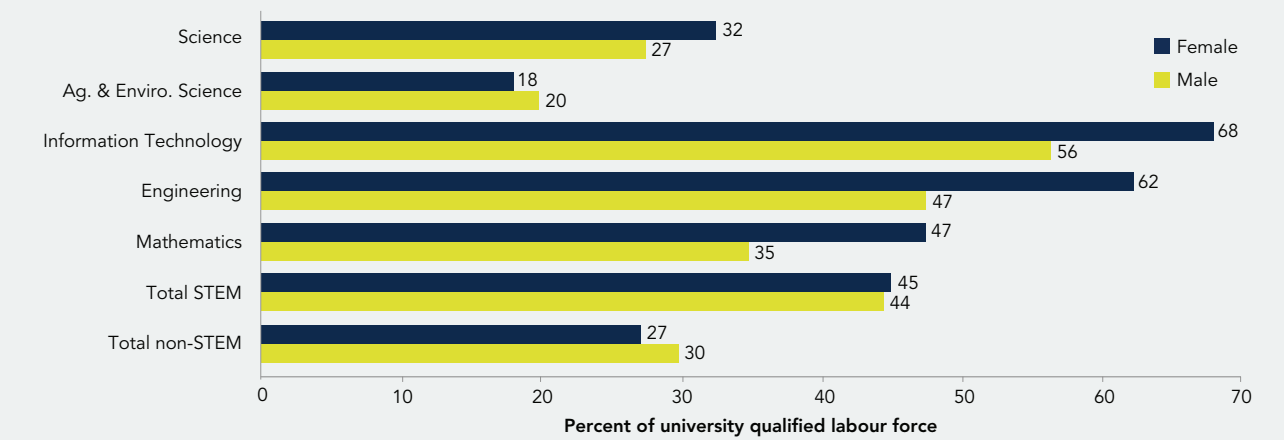


Figure 15.8: Percent of university qualified labour force who spoke a language other than English at home, by field and gender



32 Due to the small number of females with VET qualifications in Mathematics (628), this field has been combined with Science in the field Natural and Physical Sciences.

How many STEM qualified females were born overseas?

In 2016, nearly one-third (31%) of females in the labour force with VET STEM qualifications were born overseas (Figure 15.9). This proportion has remained relatively stable since 2006, increasing by 1 percentage point over the decade. A similar trend was seen in males with VET STEM qualifications, of which the proportion born overseas was 24% in both 2006 and 2016.

In 2016, over half (56%) of females in the labour force with university STEM qualifications were born overseas (Figure 15.10), an increase of 11 percentage points since 2006. The proportion of males in the labour force with university STEM qualifications who were born overseas increased by a similar proportion over the decade, from 46% in 2006 to 56% in 2016.

For context, in 2016, 32% of all males and 30% of all females in the Australian labour force were born overseas, including many people who arrived in Australia in the recent five year period of 2011 to 2016 (data not shown). Of the female STEM qualified labour force who were born overseas, 15% (4 325) of the VET qualified labour force and 30% (35 400) of the university qualified STEM labour force arrived in Australia between 2011 and 2016 (data not shown). Of the male STEM qualified labour force who were born overseas, 14% (34 339) of the VET qualified and 28% (80 358) of the university qualified STEM labour force arrived in Australia between 2011 and 2016 (data not shown).

Figure 15.9: Percent of VET qualified labour force born overseas, by gender, year and field of qualification

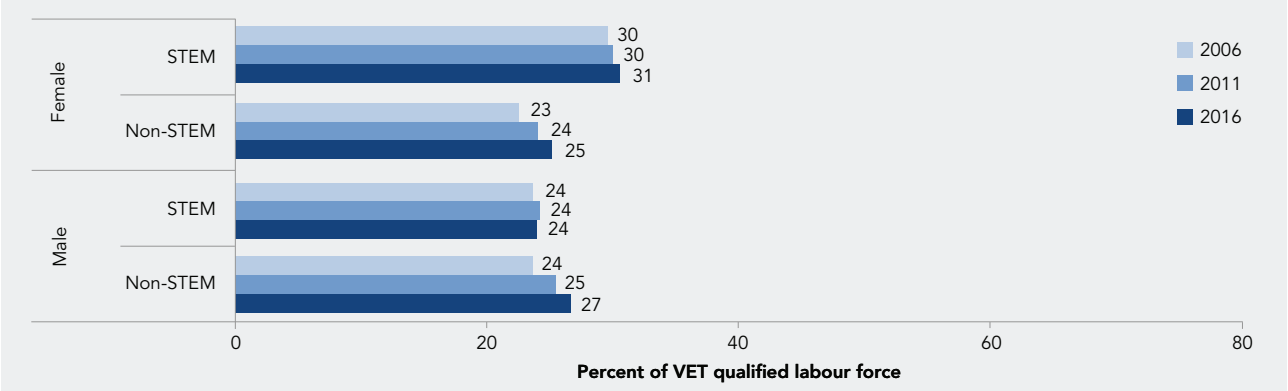
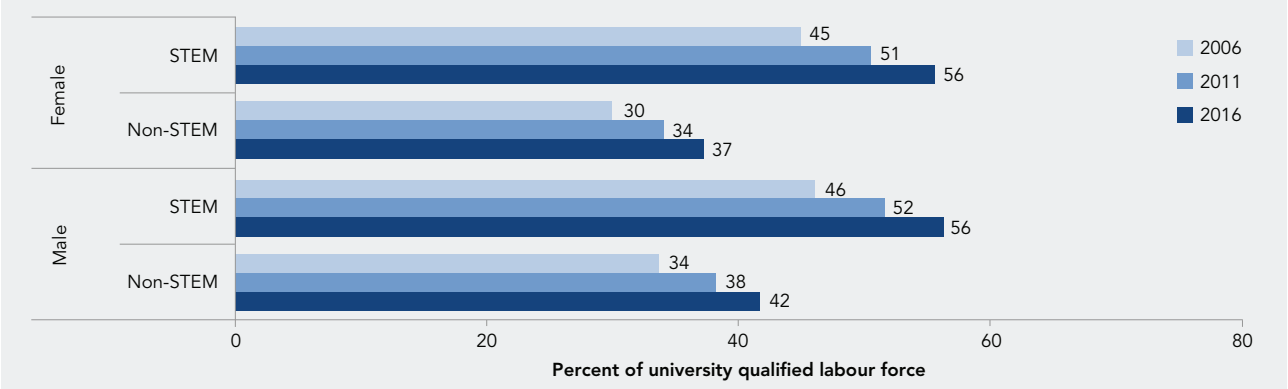


Figure 15.10: Percent of university qualified labour force born overseas, by gender, year and field of qualification



What are the unemployment rates of STEM qualified females born overseas?

In general, people who arrived in Australia between 2006 and 2016 had higher unemployment rates than those who were born in Australia or had lived in the country for over a decade.

Among the female population with VET STEM qualifications, females who were born in Australia had an unemployment rate of 7.1%, females born overseas who arrived prior to 2006 had a slightly lower unemployment rate of 6.5%, and females born overseas who arrived between 2006 and 2016 had the highest unemployment rate of 13.2% (Figure 15.11). This pattern did not hold true for males with VET STEM qualifications, where the highest unemployment rate (6.0%) occurred among those who were born overseas and arrived in Australia between 2006 and 2016, and the lowest (4.6%) among those born in Australia.

Females with VET STEM qualifications had higher unemployment rates than those in non-STEM fields regardless of whether they were born in Australia or not; conversely, STEM qualified males with VET qualifications had lower unemployment rates than males qualified in non-STEM fields.

Among the female population with university STEM qualifications, females who were born in Australia had an unemployment rate of 3.3%, while females born overseas who arrived prior to 2006 had a higher unemployment rate of 5.0%, and females born overseas who arrived between 2006 and 2016 had the highest unemployment rate of 14.1% (Figure 15.12).

Figure 15.11: Unemployment rate of people with VET qualifications, by gender, field, and date of arrival in Australia

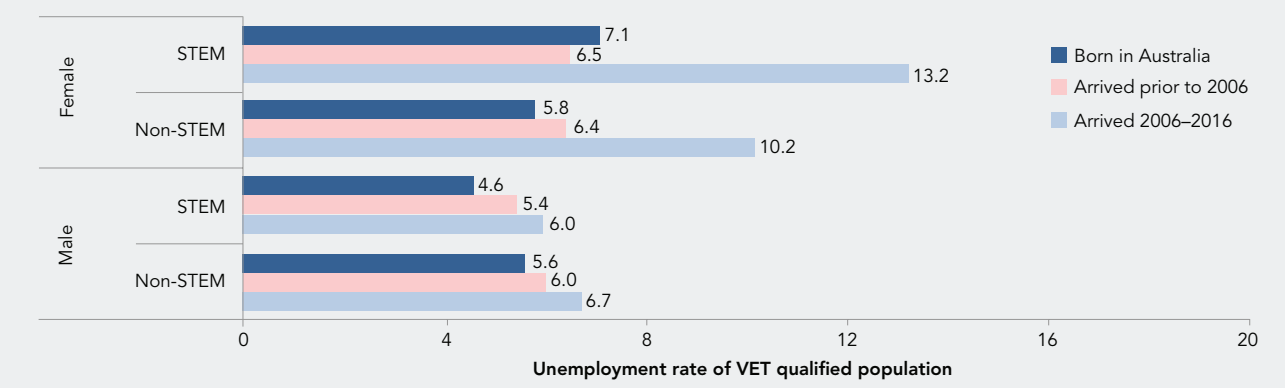
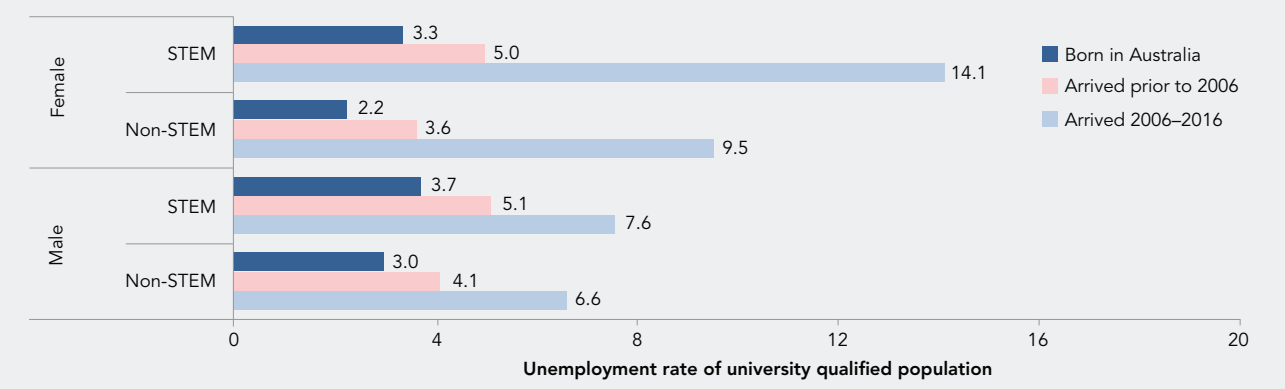


Figure 15.12: Unemployment rate of people with university qualifications, by gender, field, and date of arrival in Australia



This pattern of unemployment also held true for males; among males with university STEM qualifications, the lowest unemployment rate (3.7%) occurred among those born in Australia, while the highest unemployment rate (7.6%) occurred among males born overseas who arrived in Australia between 2006 and 2016.

Both males and females with university STEM qualifications had higher unemployment rates than those with university qualifications in non-STEM fields, regardless of whether they were born in Australia or not.

Income

As shown in Chapter 3 of this report, people with STEM qualifications tended to have higher incomes than the non-STEM qualified population.

This section takes a closer look at how gender affects income levels.[33]

Do females in STEM earn less than males?

The distributions of income for full-time workers with VET qualifications in 2016 are shown in Figure 15.13. A higher percentage of females than males earned an income in all brackets below $65 000, while a lower percentage of females than males earned an income in all brackets of $65 000 or above.

9% of VET STEM qualified females earned $104 000 or above, compared to 20% of VET STEM qualified males, 17% of VET non-STEM qualified males, and just 6% of VET non-STEM qualified females.

The distributions of income for full-time workers with university qualifications in 2016 are shown in Figure 15.14. A higher percentage of females than males earned an income in all brackets below $104 000, while a lower percentage of females than males earned an income in all brackets of $104 000 or above.

33 Income figures in the Census include both earned and non-earned data, comprising income from salaries, government benefits, pensions, allowances, and any other income the worker usually receives, before deductions.

Figure 15.13: Income distribution of full-time workers with VET qualifications, by field and gender

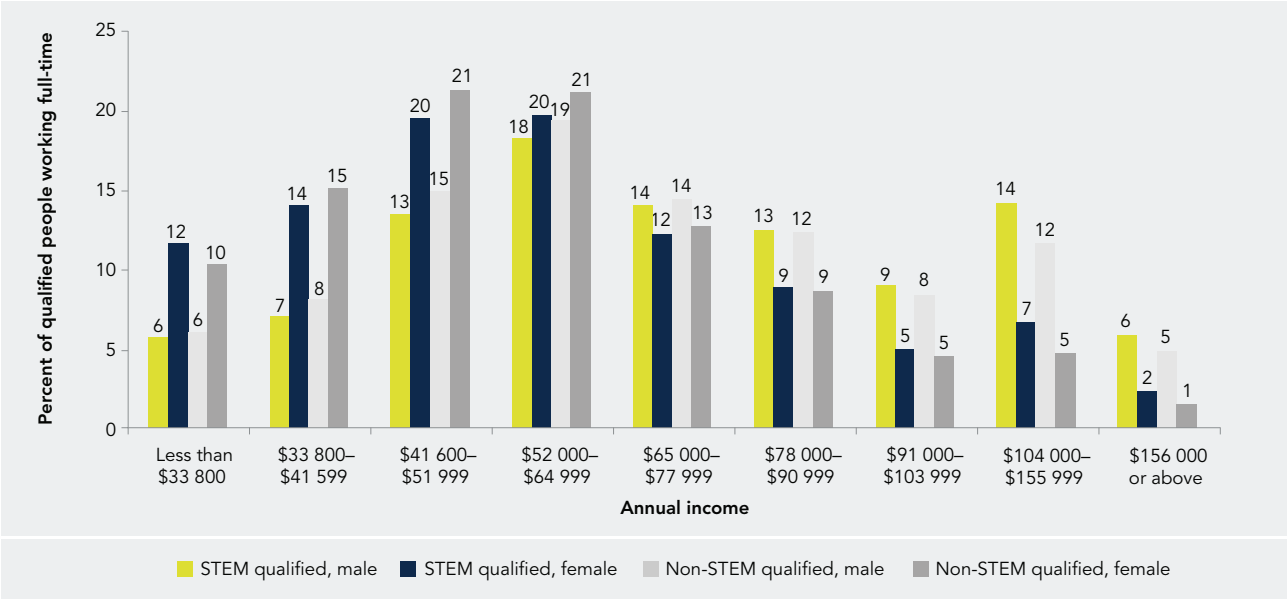
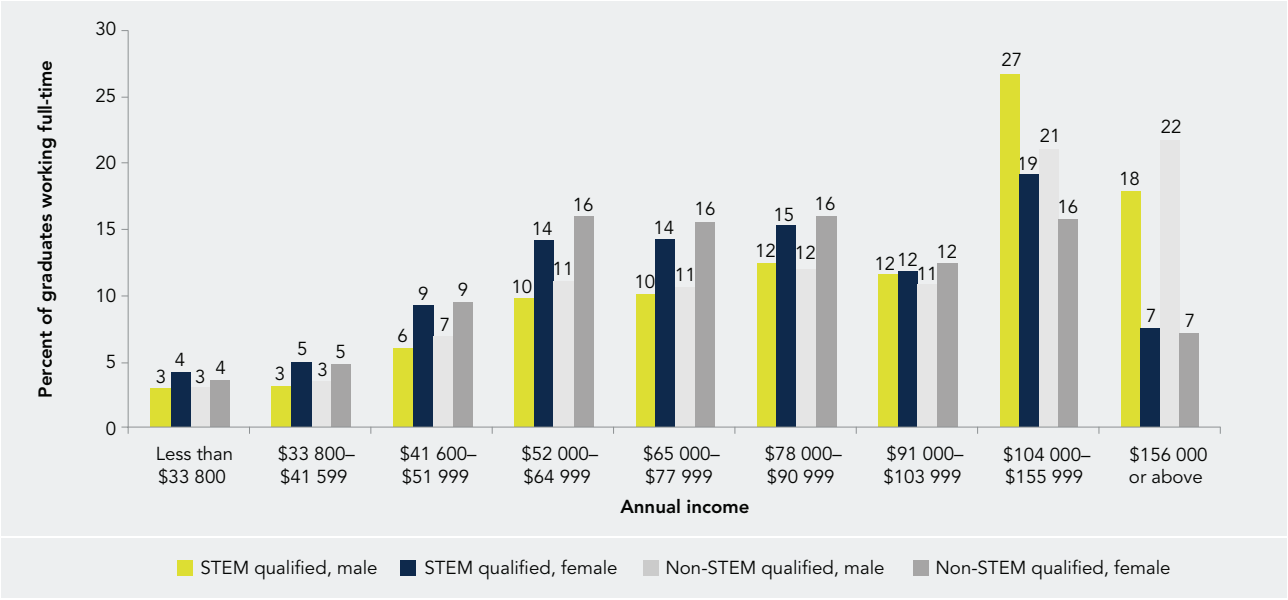


Figure 15.14: Income distribution of full-time workers with university qualifications, by field and gender



26% of university STEM qualified females earned $104 000 or above, compared to 45% of university STEM qualified males, 43% of university non-STEM qualified males and 23% of university non-STEM qualified females.

Although these distributions show that STEM qualified females working full-time had lower incomes than males working full-time across the board, there was not a substantial difference between the inequities when comparing STEM and non-STEM fields.

Childcare and flexible work

Caring for children is a leading barrier to labour force participation for females in Australia (Australian Bureau of Statistics 2017a). This section explores how having a child affects labour force status and income, and what proportion of the STEM workforce engages in flexible work.

Flexible work arrangements are often seen as a way for individuals to manage their paid work alongside family commitments. The term 'flexible workplace arrangements' includes flexibility regarding when people work (such as variable start and finish times and compressed working weeks), where they work (such as working from home or somewhere outside their usual workplace), and how they structure their work (such as working part-time and job sharing).

Does having a child interrupt a woman's career?

Having children is associated with decreased labour force participation and lower average incomes for STEM qualified females. Conversely, the labour force participation of STEM qualified males appears to remain largely unaffected by the birth of a child, and males with children tend to earn more than males without children.

The Census Longitudinal Dataset was used to investigate the impact that having a child can have on employment status.[34] This dataset estimates that, in 2011, there were approximately 11 400 females with VET STEM qualifications working full-time aged 15 to 34 who had not given birth.[35] By 2016, 32% of these females had given birth to one or more children, while 68% had not. Figure 15.15 shows the employment pathways of these cohorts. Of the females that were working full-time in 2011 and had a child between 2011 and 2016, 20% were working full-time in 2016. A further 38% were working part time, 9% were away from work, and nearly one-third (30%) were not in the labour force. Of those who were working full-time in 2011 and did not have a child between 2011 and 2016, the majority (72%) were still working full-time in 2016, 16% worked part time, 4% were away from work, and 3% were not in the labour force.

This dataset estimates that in 2011, there were approximately 42 100 females with university STEM qualifications working full-time aged 15 to 34 who had not given birth. By 2016, 45% of these females had given birth to one or more children, while 55% had not. Figure 15.16 shows the employment pathways of these cohorts. Of the females who were working full-time in 2011 and had a child between 2011 and 2016, 34% were working full-time in 2016. A further 28% were working part-time, 16% were away from work, and nearly one-fifth (19%) were not in the labour force. Of those who were working full-time in 2011 and did not have a child between 2011 and 2016, the majority (80%) were still working full-time in 2016, 9% worked part-time, 3% were away from work, and 4% were not in the labour force.

34 The Census Longitudinal Dataset uses data from the three most recent Censuses to look at how Australian society is changing over time. The 2011-2016 Census Longitudinal Dataset brings together a representative 5% sample from the 2011 Census with corresponding records from the 2016 Census. The data presented in this analysis is based on population estimates, unlike the reporting of normal Census data which provides an actual count of the population on Census day.

35 This age bracket was chosen to capture females of typical childbearing age. The Census collects data on the number of children ever born (live births) for each female, and this data was analysed along with field of qualification, age, and labour force status. This data does not include adopted, step-children or fostered children, and does not indicate if those children are currently living.

The Census does not collect data on the number of children fathered by males. While there are other Census indicators to identify men with children, none are directly equivalent to the one used in Figure 15.15 and Figure 15.16 to examine the pathways of women with children. To present an overall comparison, the employment trajectories for males with STEM qualifications who were working full-time in 2011 and aged 15 to 34 was investigated, with analysis showing that the employment pathways of these males were similar to those of females without children (data not shown). In 2011, there were approximately 280 800 males with VET STEM qualifications in this age bracket who were working full-time, of whom 94% were employed and 84% were still working full-time in 2016. In 2011, there were approximately 152 000 males with university STEM qualifications who were working full-time, of whom 95% were employed and 88% were still working full-time in 2016.

Figure 15.15: Employment pathways for females with VET STEM qualifications aged 15 to 35, by whether or not they had a child between 2011 and 2016[36]

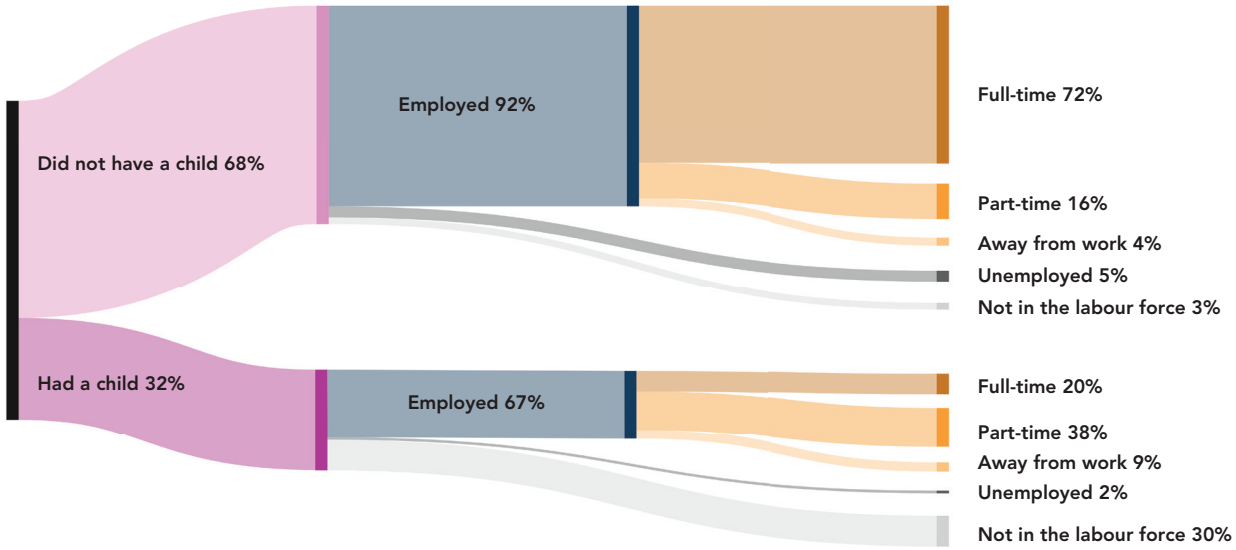
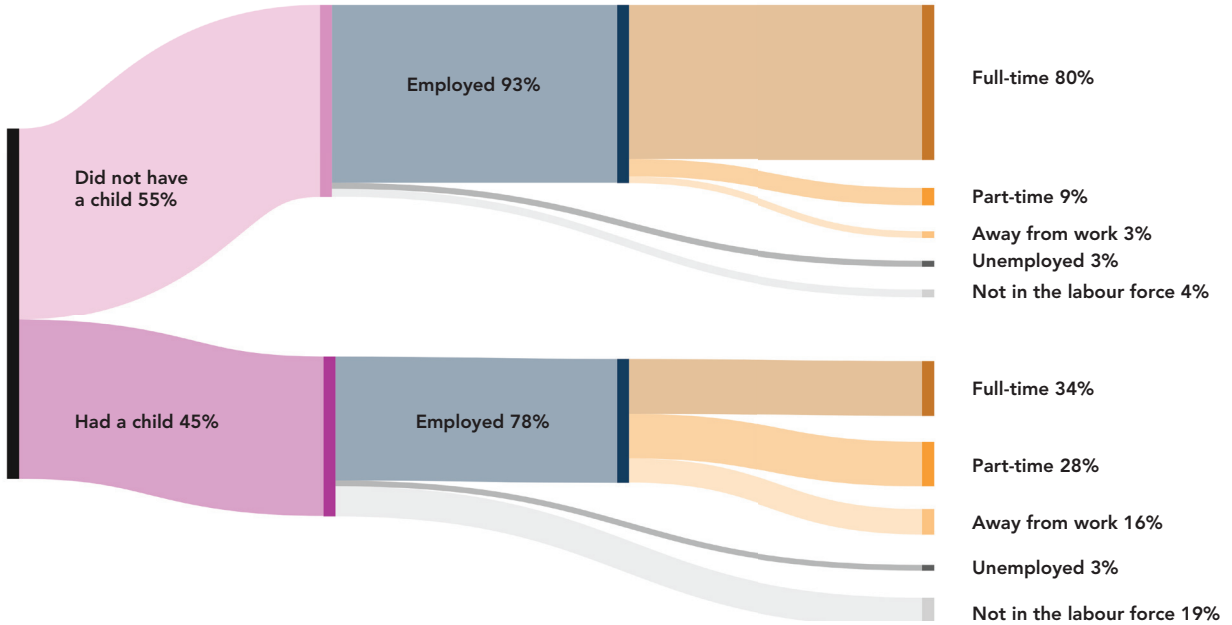


Figure 15.16: Employment pathways for females with university STEM qualifications aged 15 to 35, by whether or not they had a child between 2011 and 2016[37]



36 Data for this figure was sourced from the Australian Census Longitudinal Dataset, 2011–2016.

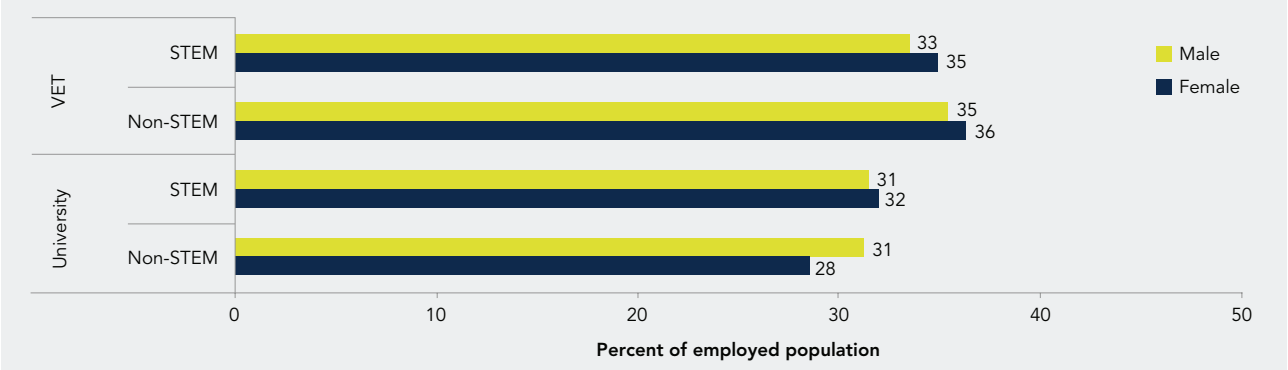
37 Ibid.

How many employed STEM qualified females look after children?

Figure 15.17 shows the percentage of the employed STEM and non-STEM qualified population who provided unpaid childcare to their own child or children in 2016.[38] Of those with VET STEM qualifications, a lower percentage of females (28%) than males (31%) provided unpaid childcare. For those with VET non-STEM qualifications, a similar percentage of females (32%) and males (31%) provided unpaid childcare.

Of the population with university qualifications, similar percentages of STEM qualified females (36%) and males (35%) and non-STEM qualified females (35%) and males (33%) provided unpaid childcare.

Figure 15.17: Percent of employed population that provided unpaid childcare, by gender and field



How does looking after children impact income?

Across almost all age brackets and levels of qualification, a smaller percentage of females who provided unpaid childcare to their children[39] had an income of $104 000 or above, compared to females who did not provide unpaid childcare. The opposite was true for males (Figure 15.18 and Figure 15.19).

For females with VET STEM qualifications, those aged 20 to 49 who provided unpaid childcare to their children were less likely to earn $104 000 or above compared to females who did not have childcare responsibilities. In the 50 to 59 age bracket a similar percentage of females who did and did not provide childcare earned $104 000 or above. For VET STEM qualified males, a greater percentage of those who provided childcare earned $104 000 or above compared to males who did not provide childcare across all age brackets.

38 This includes people who were employed on a full- or part-time basis and who reported spending time caring for their own child, or caring for their own child as well as other children. It is the best indicator in the Census dataset of which adults have children and spend time looking after them.

39 Ibid.

For females with university STEM qualifications, those who provided unpaid childcare to their children were less likely to earn $104 000 or above compared to females who did not have childcare responsibilities. This trend was apparent across most age brackets analysed. For university STEM qualified males, a greater percentage of those who provided childcare earned $104 000 or above compared to males who did not provide childcare across all age brackets.

Figure 15.18 and Figure 15.19 analyse all people who earned an income, including both full-time and part-time workers. The lower income for females with childcare responsibilities can be largely attributed to their higher tendency to take on part-time work (see Chapter 3, Figure 3.8). When analysing only full-time workers, the income discrepancy between genders reduced (data not shown). However, STEM qualified males who worked full-time and provided unpaid childcare were more likely to earn an income of $104 000 or above compared to males who worked full-time and did not have childcare responsibilities, at both the VET and university levels of qualification.

Figure 15.18: Percent of VET STEM qualified population who earned $104 000 or above, by age bracket, gender, and childcare responsibilities

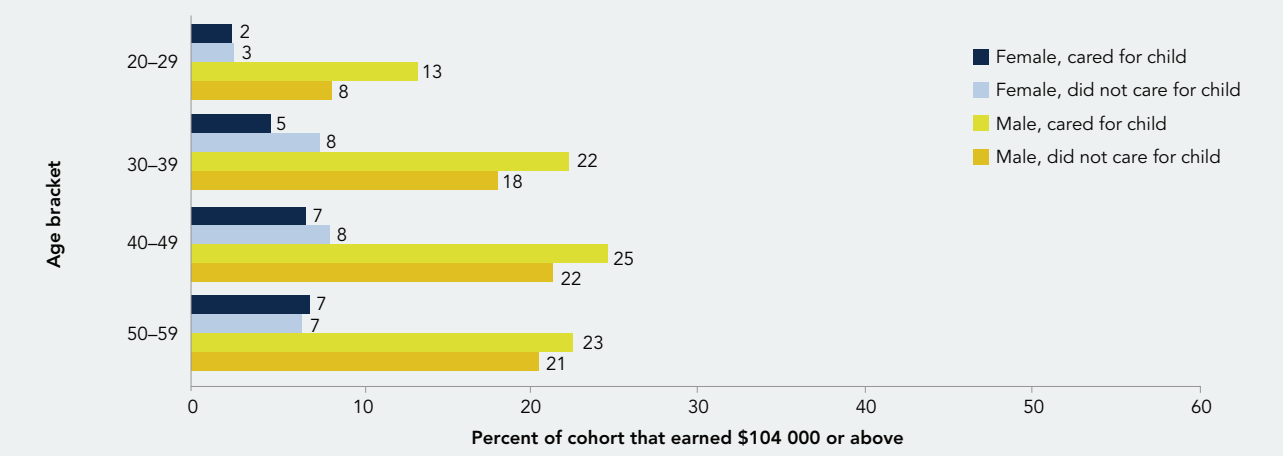
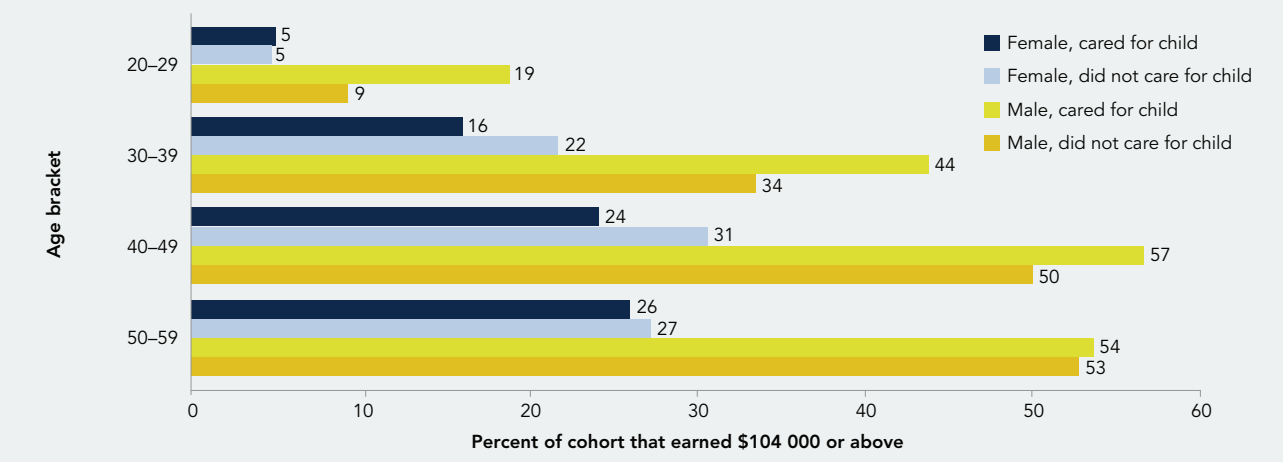


Figure 15.19: Percent of university STEM qualified population who earned $104 000 or above, by age bracket, gender, and childcare responsibilities



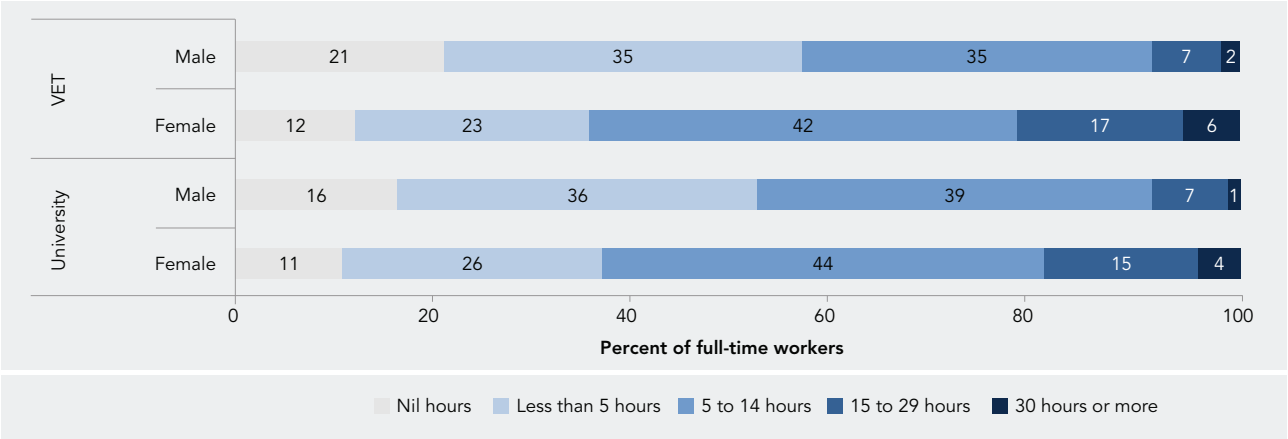
How much unpaid domestic work do STEM qualified females perform each week?

Although similar proportions of STEM qualified males and females had childcare responsibilities (Figure 15.17), females performed more hours of unpaid domestic work[40] each week than males (Figure 15.20).

Among full-time workers with VET STEM qualifications, more than twice the percentage of females (23%) then males (9%) performed 15 hours or more of domestic work per week. Over half (56%) of males performed domestic work for less than five hours per week, compared to just over a third of females (35%).

Among full-time workers with university STEM qualifications, more than twice the percentage of females (19%) than males (8%) performed 15 hours or more of domestic work per week. Over half (52%) of males performed domestic work for less than five hours per week, compared to over a third of females (37%).

Figure 15.20: Number of hours of domestic work performed each week by STEM qualified full-time workers, by gender and level of education



40 Domestic work includes preparing meals, washing, gardening, home and car maintenance, household shopping, managing financial affairs, and any other domestic work performed by an individual for themselves or for their household.

How many STEM qualified people work from home?

Table 15.2 shows the proportion of the employed population who worked from home on the day of the 2016 Census.

Among those with VET STEM qualifications, a higher percentage of females than males worked from home, and more of those working part-time than those working full-time worked from home.

Among those with university STEM qualifications, similar proportions of males and females working full-time worked from home, while slightly more males who worked part-time than females who worked part-time worked from home. A greater proportion of those working part-time than those working full-time worked from home.

Working from home is one flexible practice that may help both males and females balance their paid and unpaid work, however it is not available to all workers, particularly those in roles that require them to work at a specific location. While there are a number of other ways to work flexibly, such as having flexible start and end times, a compressed working week, and job sharing, the Census does not collect data on these.

Table 15.2: Percent of people working full- and part-time who worked from home on Census day, by field and level of education

		Full-time		Part-time	
		Male (%)	Female (%)	Male (%)	Female (%)
VET	STEM	3	6	8	11
	Non-STEM	3	5	7	9
University	STEM	5	5	14	13
	Non-STEM	4	4	13	11

Business ownership and leadership

National and international research has shown that males are more likely to hold senior positions in large organisations compared to females (Chief Executive Women 2018), and that women are underrepresented in legislative, senior official, and managerial roles more generally (World Economic Forum 2017). This section further examines the representation of STEM qualified women in leadership positions in Australia.

HOW MANY STEM QUALIFIED FEMALES ARE IN SENIOR OCCUPATIONS?

Table 15.3 shows the gender distribution of the total employed population, compared to those working as managers and those working as executives, across STEM fields of education.[41] This analysis shows that a lower proportion of females than males worked in these senior occupations.

Among the employed population with VET STEM qualifications, females made up 8% of the total employed population, but only 7% of managers and 3% of executives. The greatest discrepancy across STEM fields occurred in Natural and Physical Sciences, where females made up over half (56%) of the total employed population, but only 37% of managers and 21% of executives. The field of Engineering had the lowest representation of VET qualified females in senior occupations, with females making up 3% of managers and 1% of executives. Among the non-STEM VET qualified population, females made up over half (57%) of the total employed population in 2016, but only 43% of managers and less than a third (31%) of executives.

Among the employed population with university STEM qualifications, females made up 28% of the total employed population, but only 22% of managers and 13% of executives. The greatest discrepancy across STEM fields occurred in Science, where females made up almost half (49%) of the total employed population, but only 39% of managers and 24% of executives. The field of Engineering had the lowest representation of university qualified females in senior occupations, with females making up 11% of managers and 6% of executives. Among the non-STEM university qualified population, females made up nearly two-thirds (61%) of the total employed population, but slightly under half (48%) of managers and slightly less than a third (32%) of executives.

There has been a small increase in the proportion of females in management positions across both levels of education since 2006 (data not shown). In 2006, among the VET qualified population, females made up 8% of the total STEM qualified employed population, 6% of managers and 2% of executives. Among the university qualified population, in 2006, females made up 27% of the total employed population, 18% of managers and 9% of executives.

Table 15.3: Gender distribution of total employed population, managers, and executives, by field, 2016

	VET		
	Total Employed (% female)	Managers (% female)	Executives (% female)
Natural and Physical Sciences*	56	37	21
Ag. and Enviro. Science	21	14	11
Information Technology	19	16	12
Engineering	4	3	1
Total STEM	8	7	3
Total non-STEM	57	43	31
	University		
	Total Employed (% female)	Managers (% female)	Executives (% female)
Science	49	39	24
Ag. and Enviro. Science	42	30	19
Information Technology	22	19	12
Engineering	15	11	6
Mathematics	39	35	21
Total STEM	28	22	13
Total non-STEM	61	48	32

* Due to the small number of females with VET qualifications in Mathematics (628), this field has been combined with Science in the field Natural and Physical Sciences.

41 Managers refers to those in the occupation major group of 'Managers', and executives refer to those in the occupation minor group of 'Chief Executives, General Managers and Legislators'. The term 'senior occupations' refers to both of these groups.

Do females in senior occupations earn the same as males in senior occupations?

In 2016, a lower proportion of STEM qualified females than STEM qualified males had an income of $104 000 or above, across all levels of occupation.

Figure 15.21 shows that among the VET qualified population who worked full-time, the proportion of STEM qualified people who earned $104 000 or above increased with increasing seniority of occupation (from all workers, to managers, to executives[42]). A smaller proportion of women earned $104 000 or above compared to men in all three occupation groups, and this gap between female and male earnings increased with increasing seniority.

Figure 15.22 shows that among the university qualified population who worked full-time, the proportion of STEM qualified people who earned $104 000 or above increased with increasing seniority of occupation (from all workers, to managers, to executives). A smaller proportion of women earned $104 000 or above compared to men in all three occupation groups, but this gap between female and male earnings decreased with increasing seniority.

Figure 15.21: Percent of employed VET qualified population who earned $104 000 or above, by occupation, gender and field of qualification

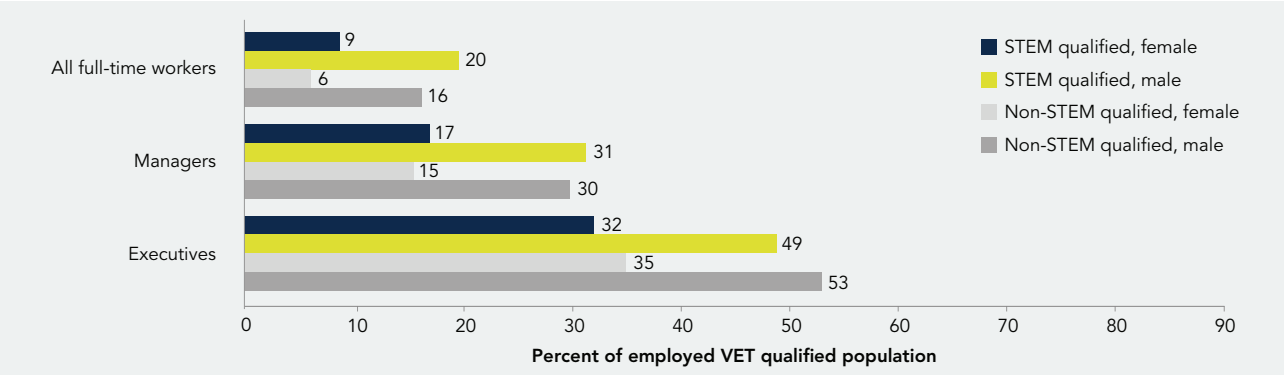
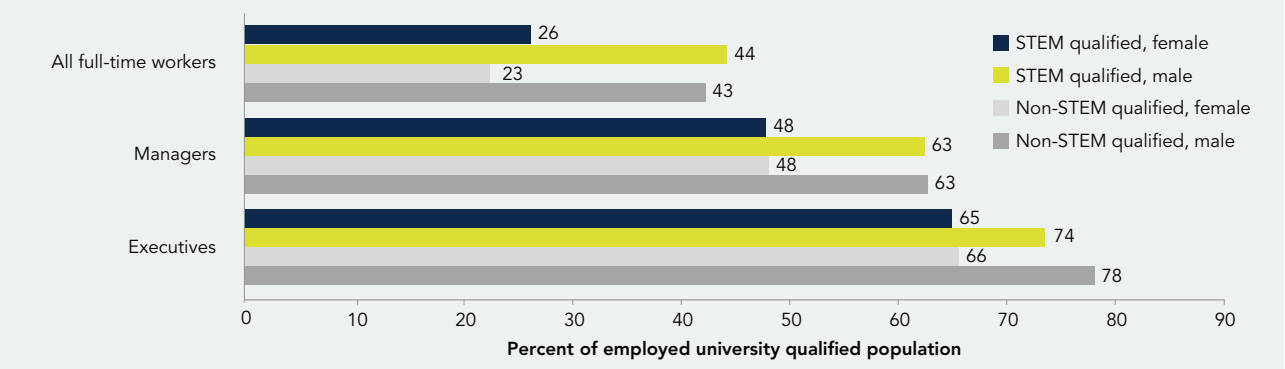


Figure 15.22: Percent of employed university qualified population who earned $104 000 or above, by occupation, gender and field of qualification



42 Managers refers to those in the occupation major group of 'Managers', and executives refer to those in the occupation minor group of 'Chief Executives, General Managers and Legislators'.

Does the rate of business ownership differ across genders?

A lower proportion of STEM qualified females owned a business that employed people compared to STEM qualified males, at all levels of education.

Among those with VET qualifications, 4% of employed STEM qualified females worked as owner-managers (and can be considered as owning a business) and employed at least one person, compared to 8% of employed STEM qualified males (Figure 15.23). Across STEM fields, people with VET qualifications in Agriculture and Environmental Science reported the highest rates of business ownership, at 6% of females and 12% of males.

Among those with university qualifications, 3% of employed STEM qualified females worked as owner-managers (and can be considered as owning a business) and employed at least one person, compared to 6% of employed STEM qualified males (Figure 15.24). For females, those with qualifications in Agriculture and Environmental Science and Mathematics reported the equally highest rates of business ownership, at 4% of each cohort. For males, those with university qualifications in Agriculture and Environmental Science reported the highest rates of business ownership across the STEM fields, at 9%.

Figure 15.23: Percent of employed VET qualified population who owned a business[43], by gender and field of education[44]

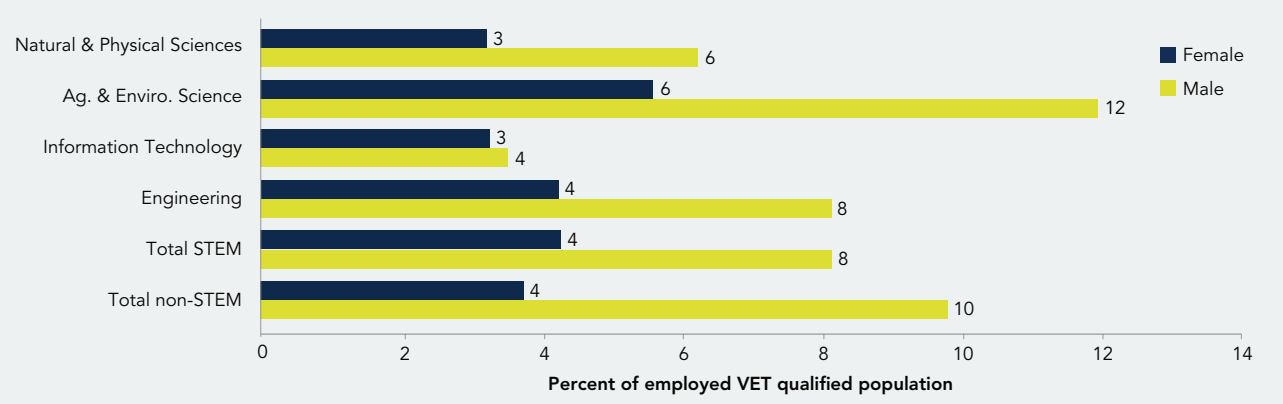
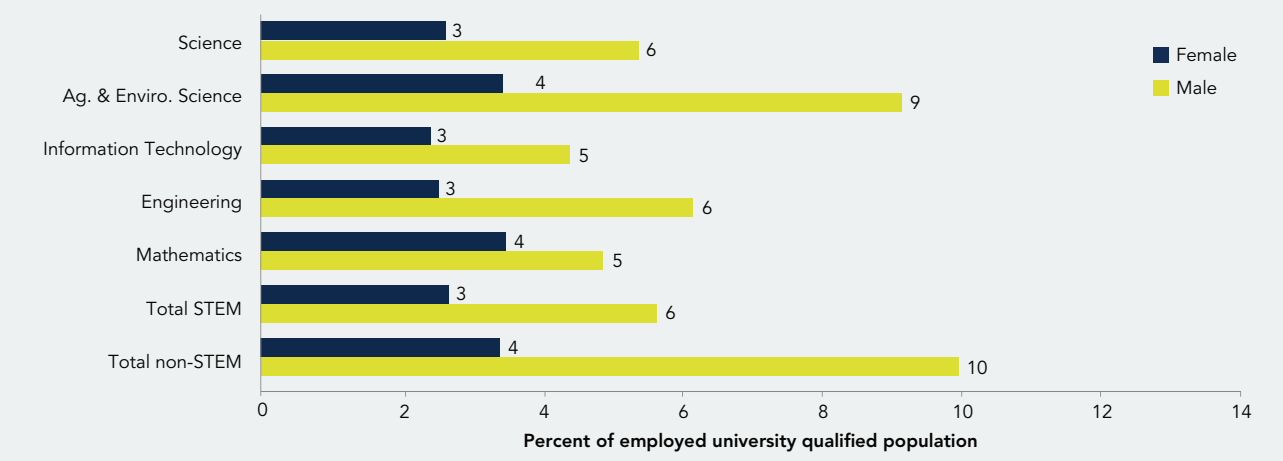


Figure 15.24: Percent of employed university qualified population who owned a business[45], by gender and field of education



43 Only business owners who employed one or more people were included in this analysis.

44 Due to the small number of females (628) with VET qualifications in Mathematics, this field has been combined with Science in the field Natural and Physical Sciences.

45 Only business owners who employed one or more people were included in this analysis.

Mature aged women

Australia's ageing population and growing life expectancy projections are placing increasing demands on labour force participation for older Australians (Australian Human Rights Commission 2016; Commonwealth of Australia 2015). In 2016, the Australian Human Rights Commission found that mature aged women may face particular societal barriers to employment that are not as common for their male counterparts, such as a perceived lack of relevant skills and limited ability to acquire new skills (Australian Human Rights Commission 2016).

The term 'mature aged women' used here refers to females aged 55 and over, consistent with the definition used by the Australian Human Rights Commission (2016).

What proportion of the STEM qualified labour force is aged 55 and over?

In 2016, among those in the labour force with VET STEM qualifications, 18% of females and 23% of males were aged 55 and over (Figure 15.25). These proportions have increased over time. In 2006, 10% of the female VET STEM qualified labour force and 17% of the male VET STEM qualified labour force were aged 55 or over (data not shown).

Among those in the labour force with university STEM qualifications, 9% of females and 15% of males were aged 55 and over (Figure 15.25). These proportions have also increased over time. In 2006, 5% of the female university STEM qualified labour force and 13% of the male university STEM qualified labour force were aged 55 and over (data not shown).

How does labour force participation change with age?

Table 15.4 shows the trend of decreasing labour force participation with increasing age. Among the population with VET STEM qualifications in 2016, 70% of females aged 55 to 59 were in the labour force, which dropped to just over half (52%) of females aged 60 to 64 and around only a tenth (11%) of females aged 65 and over. Among similarly qualified males, 85% of those aged 55 to 59, 67% of those aged 60 to 64 and 17% of those aged 65 and over were in the labour force in 2016.

Among the population with university STEM qualifications in 2016, over three-quarters (77%) of females aged 55 to 59, 57% of females aged 60 to 64 and 20% of females aged 65 and over were in the labour force. Amongst similarly qualified males, 87% of those aged 55 to 59, 68% of those aged 60 to 64 and over a quarter (26%) of those aged 65 and over were in the labour force.

Figure 15.25: Percent of STEM qualified labour force aged 55 and over in 2016, by gender and level of qualification

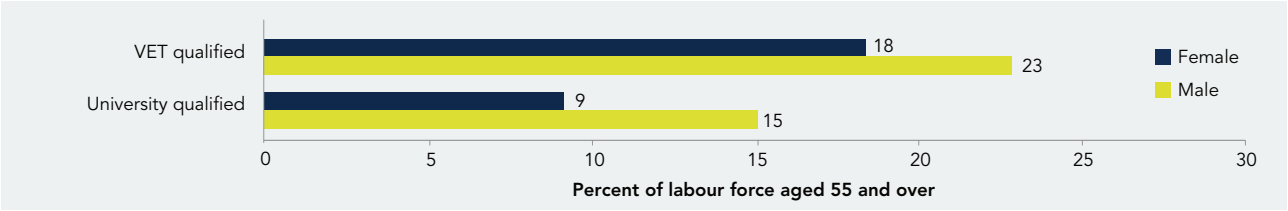


Table 15.4: Labour force participation rates of mature aged people with STEM qualification, by age, gender and level of education

	VET		University	
Age	Male (% in labour force)	Female (% in labour force)	Male (% in labour force)	Female (% in labour force)
55–59	85	70	87	77
60–64	67	52	68	57
65 and over	17	11	26	20

How has the labour force participation rate for mature aged females changed over time?

Mature aged females are increasingly likely to be in the labour force. Figure 15.26 shows the proportion of mature aged females and males with STEM qualifications who were in the labour force in 2006, 2011 and 2016.

Of the mature aged population with VET STEM qualifications, 28% of females were in the labour force in 2006, a proportion that rose considerably to 36% in 2016. The proportion of mature aged males who were in the labour force was 45% in 2006 and in 2016.

Of the mature aged population with university STEM qualifications, 49% of females were in the labour force in 2006, a proportion that rose to 52% in 2016. In contrast, the proportion of mature aged males who were in the labour force reduced from 58% in 2006 to 54% in 2016.

Figure 15.26: Proportion of STEM qualified mature aged people in the labour force, 2006, 2011 and 2016