University attrition: what helps and what hinders university completion?

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Table of contents

Overview

This is a background paper for the *Dropping out: the benefits and costs of trying university* report, which is available on the Grattan Institute website. The two documents contain overlapping material, so that each can be read independently of the other.

The main purpose of this background paper is to provide additional information on the Grattan Institute's statistical analysis of completion from bachelor degrees at public universities. It includes more detailed consideration of some non-completion high-risk factors mentioned in the main report and possible explanations for their impact. It also discusses some lower-risk factors that were omitted in the main report, the statistical methodology used and the regression results.

1 How high is attrition?

Attrition is a natural part of higher education. The trend is not getting significantly worse in Australia, but because many more students attend university now than in the past, many more students leave without a degree.

1.1 Non-completion trends

Students leave university at different times. Many leave in their first year. Some don't leave until after several years of study. Some students leave permanently; some return. Students moving in and out of study make calculating a non-completion rate complex.

The Department of Education and Training counts as attrition a commencing student who reached their first census date (which is at least 20 per cent of the way through the semester.) but is not enrolled the next year without completing.[1] The higher education regulator, the Tertiary Education Quality and Standards Agency (TEQSA), uses this first-year attrition rate to monitor each university's year-to-year commencing student attrition statistics.[2] While attrition statistics do not measure final completions, they are a useful leading indicator.

Figure 1.1 shows a slight deterioration in first-year attrition. Students were less likely to return after their first year in 2015 compared to 2008, although the rate is only slightly higher than in 2006.

1. Department of Education and Training (2017a, appendix 4) and DIICCSRTE (2013, section 6.30). Some prospective students leave before the first census date, see Norton et al. (2018, Chapter 1) for a detailed discussion.
2. TEQSA (2017).

In theory, students can still return and complete a degree long after starting.[3] In addition to first-year attrition rates, the Department produces completion statistics over longer time periods.[4] Figure 1.2 suggests that students commencing after 2008 are marginally more likely to leave without a degree.[5] The 2008 cohort has the highest completion rate of recent cohorts, whether we look over six, five or four years. The four-year analysis suggests that the deteriorating trend will continue until at least the 2013 cohort, and Figure 1.1 suggests it will continue further slightly.

While the *share* of students leaving university without a qualification is not growing drastically, the *number* of such students is growing more substantially – because about 40 per cent more people go to university now than in 2008.[6]

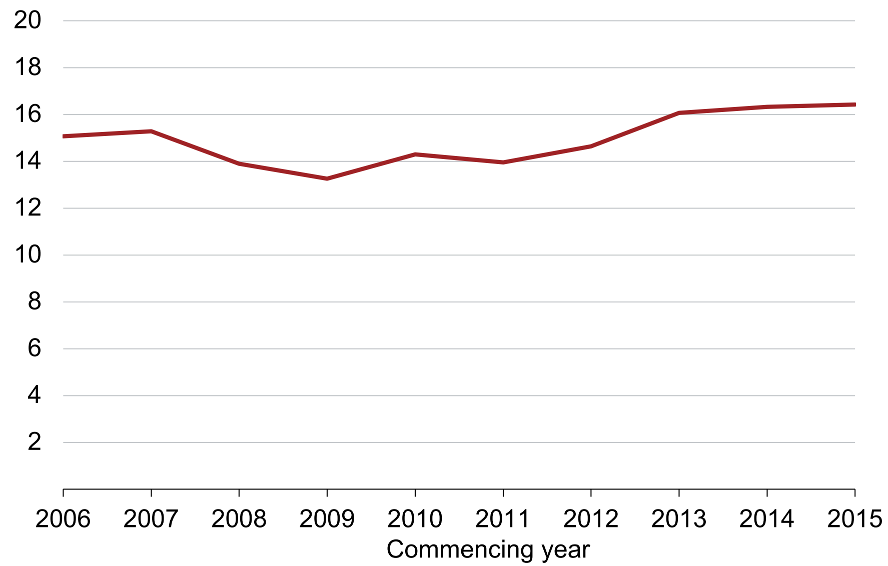
In 2018, about 240,000 commencing domestic students enrolled at Australia's public universities.[7] Even using the best recent commencing

3. Universities typically have maximum completion times between seven and ten years for a bachelor degree course. However, students can move to another course or university.
4. Department of Education and Training (2017b).
5. Using Grattan Institute's calculation method, which is different from the Department of Education and Training's method. The main differences are that Grattan excludes non-bachelor degree completions, and Grattan focuses on students' first enrolment at a Table A provider.
6. The growth in unique CHESSNs for commencing enrolments between 2008 and 2014 at public universities was 40 per cent, Department of Education and Training (various years). Applications and offers statistics suggest another year of stable numbers in 2017. As a result, zero growth is assumed between 2016 and 2018 throughout this report.
7. In 2016 there were about 240,000 enrolments with a unique CHESSN, Department of Education and Training (ibid.). With Department of Education and Training (2017c) suggesting similar numbers in 2017, zero growth is assumed between 2016 and 2018 throughout this report.

cohort, 2008, as a guide, 23 per cent, or about 55,000 of these students, are likely to leave without completing by year eight (Figure 1.3). Given subsequent trends, the actual proportion is likely to be higher than this. They will add to the large pool of people who have started but not finished a degree. In 2015, the Australian Bureau of Statistics (ABS) estimated that at least 776,500 people had an incomplete bachelor degree (other than one they were currently enrolled in).[8]

Another measure again is to take the degree length and then add some time. Anyone who finishes within this period is counted as a completion; everyone else is a non-completion. The OECD uses this method. Australia's non-completion rate is about average in the OECD.[9]

Figure 1.1: Early student departures are trending up
Proportion of students who did not return in second year to a bachelor degree, per cent



Notes: Students returning to a bachelor degree; not necessarily their original course or institution. The Department of education and Training also publishes attrition time series: one showing the proportion of commencing students leaving each university, and another showing the proportion of students leaving the higher education system, Department of Education and Training (2017a, appendix 4). Due to transfers between universities, attrition from the system is lower than attrition from individual universities. The Department's system-level attrition number is lower than the numbers in this chart because it counts students who have downshifted to a diploma or associate degree and completions in those courses as enrolments. These are not counted in this chart.

Source: Grattan analysis of Department of Education and Training (various years).

8. Calculated from ABS (2016a). There are differences between the methodology used in this report and the ABS methodology. The report's figures are for domestic students only; the ABS figures include residents with overseas qualifications and former international students. The report includes only bachelor degree commencements from 2006; the ABS includes higher education commencements at any time. The report counts as a completion someone who finishes a bachelor degree, whether or not it was the course they commenced originally. The ABS counts each incomplete qualification. To make the numbers more comparable, people with a university qualification who also report an incomplete bachelor degree are excluded from the total cited above. The ABS question asked about the most recent non-school qualification the respondent had not completed. Some respondents with an incomplete bachelor degree would have nominated some other qualification, for example a vocational education or certificate, as their most recent incomplete qualification.
9. Based on the theoretical length of the degree plus three years for a student commencing on a full-time basis: OECD (2016, pp. 166–170). On this basis, Australia's completion rate was 70 per cent, compared to an average of 69.2 per cent for the 15 countries in the analysis. In Australia, 8.5 per cent of students were still enrolled compared to 7.6 per cent on average.

1.2 Student choices are not always well informed

More than two-thirds of young Australians intend to go to university after school.[10] By age 19, more than 40 per cent are enrolled.[11] But students' aspirations and decisions aren't always clear or well-informed.

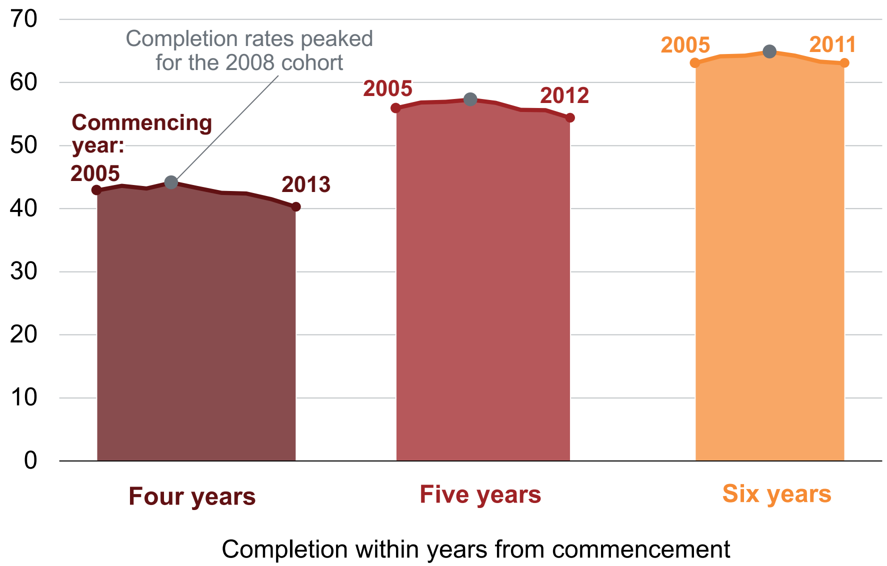
Student indecision about their course and university choice is clearly seen in surveys. South Australian research into Year 12 student decision-making found that one-in-five were uncertain about their university preferences, but were going to apply anyway, and only 60 per cent were certain or very certain about their first preference.[12]

A 2015 survey of two universities found that more than a third of first-year students believed that they did not have a good understanding of which course would be best for them.[13] A 2014 survey of first-year university students found 4 per cent were unclear about why they were at university, and 20 per cent agreed with the proposition that they were 'marking time'.[14]

Many students do not get enough help with their post-school decisions. While most students receive careers information, 20 per cent do not personally discuss their options with a careers adviser. The students who do have this discussion believe it is more useful than any other source of advice except their parents.[15] In the 2014 first-year student survey, a third did not agree that they had received good career advice at school.[16] Prospective mature-age students have much less access to course and career advice. For them, personalised government-funded career guidance is generally available only if they are unemployed.[17]

10. Mission Australia (2016, p. 16).
11. Grattan Institute calculation from ABS (2017).
12. Parks et al. (2017, p. 8).
13. Harvey et al. (2016, p. 58).
14. Baik et al. (2015, p. 31).
15. NCVER (2016a).
16. Baik et al. (2015, p. 31).
17. PWC (2017, chapter 2).

Figure 1.2: Completion rates are deteriorating slightly
Proportion of students completing a bachelor degree by year of commencement, per cent



Notes: See Figure 1.1 and footnote 5.

Source: Grattan analysis of Department of Education and Training (various years).

As discussed in the main report, *Dropping out: the benefits and costs of trying university*, having made an important educational decision without good advice, many people soon made a quick exit.[18] About one-third of the original applicant pool were either rejected by university or departed by the first-semester census date. Another 8 per cent left before their second semester. A similar proportion exited again before reaching the second year. More or better information about university study will not eliminate these attritions. But with so many prospective students who are uncertain about their direction, better advice can better inform their decisions.

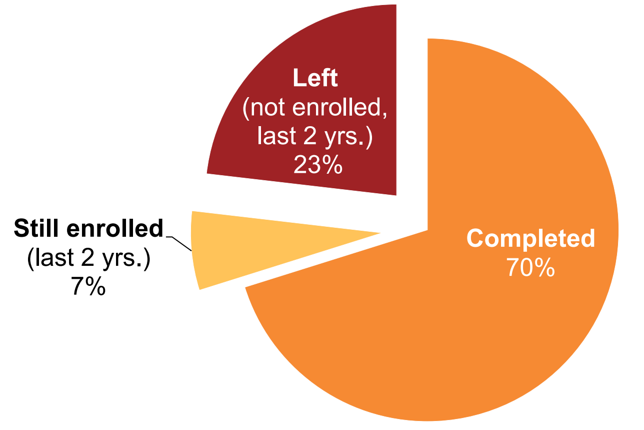
1.3 Understanding students' risk of non-completion

University is not just a place where students satisfy known preferences about what they want to do with their lives. They also learn more about themselves and their possible alternative futures. Over the summer of 2017-18, the Grattan Institute conducted an online survey of students who dropped out of university.[19] Nearly a third of students who dropped out (and who have no other degree) believe that their time at university helped clarify their career goals. Adapting to these discoveries while studying is sensible and desirable.

Universities, too, legitimately trigger dropping out by failing students. Typically, students failed about 10 per cent of their subjects taken each year by bachelor degree students are failed.[20] Students who persistently fail decide to leave or are excluded by their university. A 100 per cent pass rate would suggest that academic standards are not being enforced, rather than that universities are doing an excellent job at reducing attrition.

Figure 1.3: About three in every ten students do not complete a degree within eight years

Proportion of bachelor degree students who commenced in 2008



Notes: Commencing domestic students with a CHESSN who first enrolled in 2008. 'Completed' includes any bachelor degree completion, including students completing a different degree from the one they started. 'Still enrolled' includes students who were enrolled in the 7th or 8th year from commencement, or both. 'Left' is classified as students who have not completed and were not enrolled in the 7th or 8th year. Bachelor graduate entry students, permanent humanitarian visa-holders, students studying entirely offshore, and those who completed in the same year they commenced are excluded (less than 3 per cent).

Source: Grattan analysis of Department of Education and Training (various years).

18. Norton et al. (2018, chapter 1).
19. See Norton et al. (Ibid., chapter 11) for more detail.
20. Domestic students at Table A institutions only.

Inevitably, too, circumstances arise that prevent some students from completing their degrees. These are not always predictable. 'Family responsibilities', another commonly cited reason for considering leaving university, may change in ways that were not foreseen when a student began their course.[21] Work commitments and opportunities may also change unexpectedly, making finishing a degree a second priority.

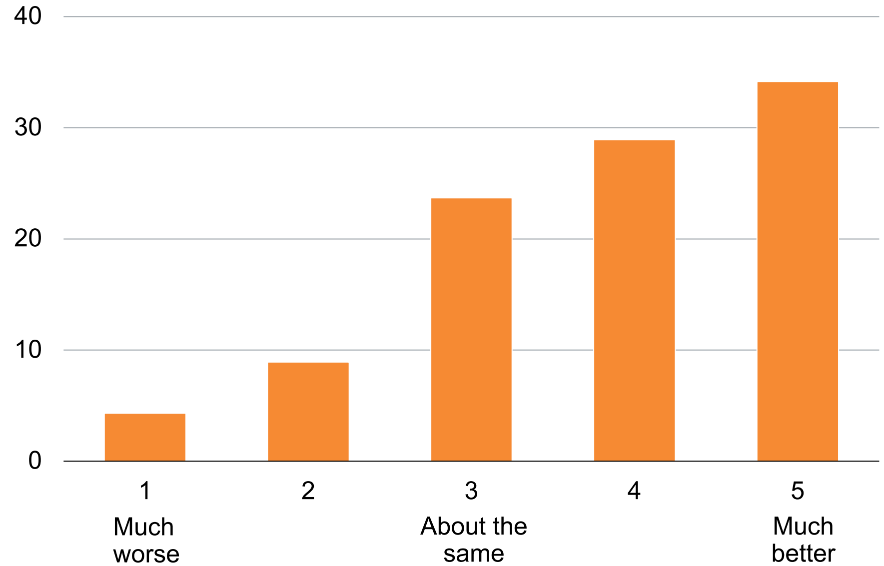
Despite not getting a degree, most students report some benefits. The most commonly cited benefit was that the 'course was interesting' (about 55 per cent). About 45 per cent suggested that they gained employment-related benefits.[22]

But in some cases, the benefits could have been greater than they were. More than 60 per cent of the people who dropped out and have no other degree think that their position would be better if they had finished (Figure 1.4). For some, this might be a general recognition that graduates usually earn more, not a belief that they could have done things differently. Yet around a quarter of those who would begin their degree again if they had their time again, would not drop out again.[23] There is potential to improve completion rates, through students making better-informed decisions.

The Department of Education and Training reports average completion rates over nine years by broad student characteristics.[24] Mature-age, part-time and online students have among the lowest average completion rates, as Figure 1.5 shows. But the risk of early departure could arise from any of these characteristics.

Figure 1.4: Most people who don't complete their degree believe they would have been better off if they had completed

"Do you think you would be in a better position now if you had finished your incomplete degree?", per cent



Source: Grattan incomplete university course survey 2017-18, see Norton et al. (2018, chapter 11).

This report uses statistical analysis to disentangle the effects of these characteristics on completion. The model uses the Government's higher education enrolment data collection from 2005 to 2015, which can track nearly all domestic bachelor degree students at public universities over time and across institutions, using a unique identifier – CHESSN.[25]

21. Social Research Centre/Department of Education and Training (2017, p. 12). This survey includes respondents who consider leaving after their first year.
22. Grattan online survey of students who didn't complete. See Norton et al. (2018, chapter 2) for details.
23. Grattan online survey of students who didn't complete, 2017-18.
24. Department of Education and Training (2017d).
25. Commonwealth Higher Education Student Support Number (CHESSN) is a unique identifier introduced in 2005. Each student who receives Commonwealth support is assigned a CHESSN. Students retain the same CHESSN irrespective of their institutions, Department of Education and Training (2015).

Grattan's analysis focuses on students' risk of not completing over eight years; our timeframe choice is driven by various trade-offs. For the earliest cohorts, we can extend the completion period to nine or ten years. However, few students complete in these late years. An eight-year timeframe means the analysis can combine data from three commencing cohorts – 2006 to 2008 – to increase sample size. The larger sample size increases the scope for statistical analysis. In theory, students can eventually return. But in practice, only a small number of students complete soon after eight years.[26]

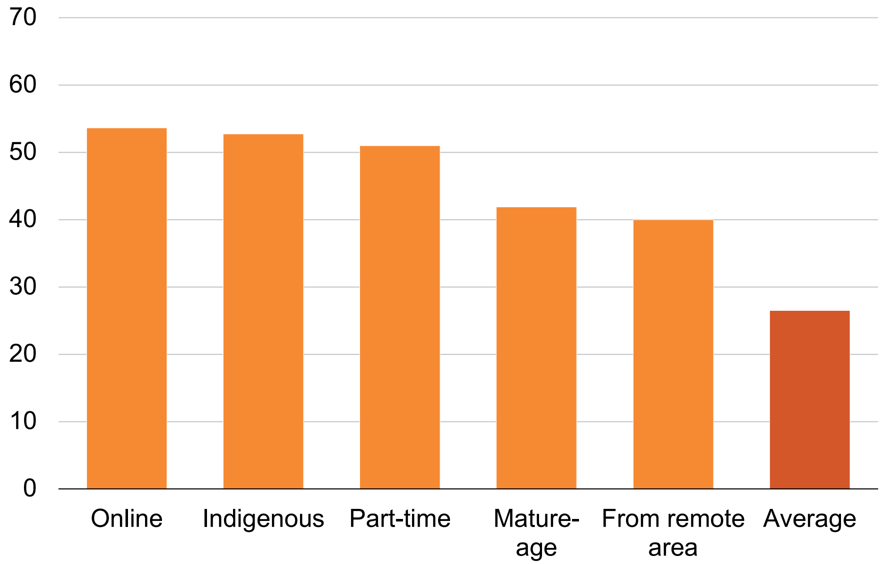
This report aims to help students make better decisions at the time of enrolment. It therefore focuses primarily on factors known at or prior to enrolment. These factors don't necessarily directly cause a student to complete or not complete a degree, but they are associated with or are proxies for the underlying causes. These include academic ability, motivation, persistence, time put into study, study practices, financial support, social support, academic support and teaching quality.

Figure 1.6 shows the factors included in our analysis. It estimates the effect of these individual factors on students' risk of not completing within eight years, using a regression model.[27] Risk estimates are only included in this report if they are statistically significant; that is, if it is very unlikely that they have occurred by chance.[28] Chapters 2 to 5 discuss how these factors affect students' risk of not completing.

26. Data was available only for the years 2005 to 2015, limiting the scope for 9- or 10-year cohorts. About an additional 2 per cent of students are expected to complete in years 9 and 10. Our data does not extend further, but it is possible that some students will eventually return after even longer periods. See Appendix A.2 on page 53.
27. For details of the modelling technique, see Appendix A.
28. Based on a significance level of 0.05 which indicates that there is a 5 per cent risk of concluding that a relationship between the characteristic and completion exists when it does not.

Figure 1.5: Online, part-time and mature-age students have among the lowest completion rates

Per cent of 2006 domestic commencing students who did not complete a course within nine years



Notes: 'Mature-age' refers to students who commenced at 25 or older. 'Online' refers to off-campus. The Government's analysis is different from this report's analysis (and the figures previously cited in this report). The Government's analysis includes completion from any award course and does not track students back to their first enrolment. For example, students who commenced in a university in 2005, left in the same year, and enrolled in at a different university in 2006, are included in both cohorts.

Source: Department of Education and Training (2017d, table 7).

Figure 1.6: The student and course characteristics included in this report's regression model

Personal and family	Academic performance	Institution and course	Engagement with study
1. Gender	1. ATAR	1. Institution	1. Type of attendance
2. Age	2. Highest qualification	2. Field of education	2. Mode of attendance
3. Aboriginal and Torres Strait Islander	3. Basis of admission	3. Course length	3. Remoteness of campus
4. Disability		4. Credit used	4. Move away from home
5. Citizenship			5. Travel time
6. Socio-economic			6. Commencing in semester 2 rather than semester 1
7. Language spoken at home			
8. Country of birth			
9. Remoteness of home			
10. Year 12 state or territory			

Notes: For detail of each variable, see Table A.2 in Appendix A.

2 Engagement with study

How students engage with their study has a significant impact on their risk of not completing their degree. Among these choices, a decision to study part-time has the largest impact. This chapter explores the effect on completion of studying part-time, and other engagement choices.

2.1 Full-time versus part-time

About 18 per cent of commencing domestic bachelor degree students begin their studies on a part-time basis. Part-time study is defined as less than 75 per cent of a full study year – equivalent to fewer than six out of eight subjects a year.[29] But as some full-time students do not return in the second semester, a larger share of commencing students take fewer than six subjects in their first year, as Figure 2.1 shows. About a quarter of commencing students take fewer than six subjects in their first year, and just over half take eight subjects a year or more. The most common study load for a part-time student is four subjects, half the full-time level.

Students who begin with full-time enrolment usually stay with it. Of the commencing students in our analysis, in any subsequent year less than eight per cent are enrolled part-time. Students who originally enrol part-time are more likely to change their status. About 20 per cent of commencing part-time students switch to full-time in second year, about 40 per cent remain part-time, and the rest do not continue with their studies.[30]

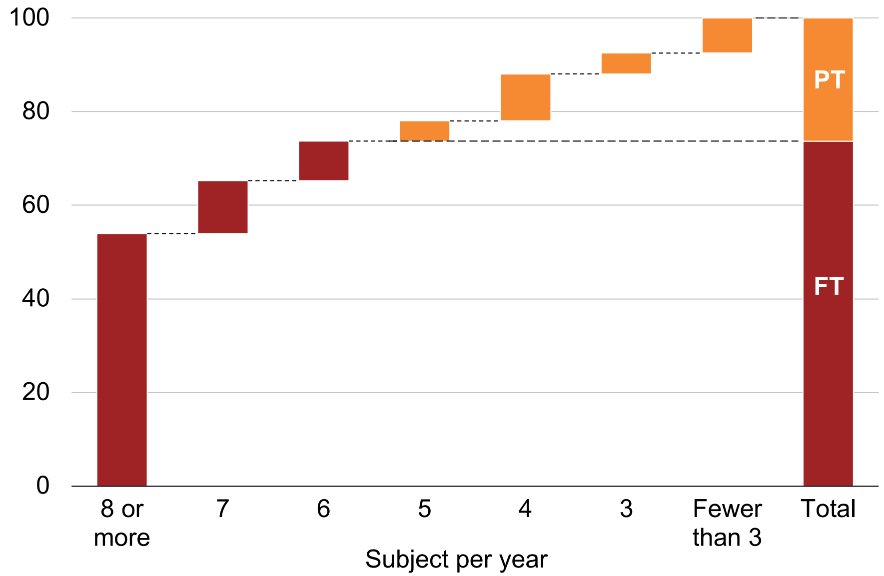
Part-time students are much less likely to complete than full-time students. The Government's completion analysis finds that half of

29. This is the definition used by the Department of Education and Training. It largely corresponds to historical and current eligibility for Austudy and Youth Allowance, Daniels (2017) and Department of Human Services (2017).

30. Using commencing students between 2006 and 2008.

Figure 2.1: Just over half of students study the standard full-time number of subjects

Per cent of commencing students by number of subjects in their first year, 2015



Notes: Students' subjects in their first two semesters of study. One subject is defined as 0.125 of an Equivalent Full-Time Student Load (EFTSL). While it is not uncommon for later-year subjects to be longer than a semester and are worth more than 0.125 EFTSL, it is rare for first-year subjects. Categories take account of the variation in subject EFTSLs. For example, the category 7 includes an annual average load size of at least 87.5 per cent and less than 100 per cent. The proportion of part-time study in this figure is higher than in Figure 7.3 on page 50 because this figure uses actual enrolment records from students' first two semesters rather than classifications at commencement. Because some students do not return in the second semester, even though they took four subjects (equivalent to full-time annually) in the first semester, they would be classified as part-time here.

Source: Department of Education and Training (various years).

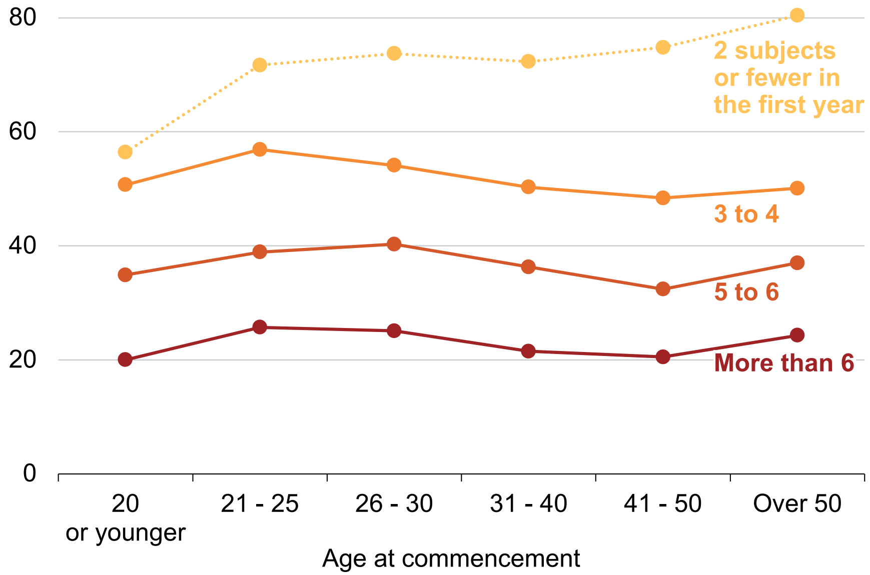
part-time students complete within nine years, compared to nearly 80 per cent of full-time students.[31] But, as mentioned in Section 1.2, part-time student outcomes may be caused by their tendency to study off-campus and later in life.

Even after controlling for other observable attributes, the effect of part-time study on completion remains strongly negative. Figure 2.2 shows the risk of not completing increases as students enrol in fewer subjects among students with otherwise similar backgrounds. Students who take more than six subjects – 75 per cent of a full study year – in their first year are least likely to drop out. Those who commence before turning 20 have the lowest risk of dropping out, at about 20 per cent. This means 2-in-10 students, who otherwise have an average background representative of all commencing students, will not complete with 8 years. With the same number of subjects, students who commence in their 20s have a higher risk – about 25 per cent. If students enrol in one or two fewer subjects, their risk of dropping out increases by about half. Their risk ranges between about 30 per cent and 40 per cent depending on their age. Those who study three or four fewer subjects have an even higher risk – about 50 per cent or higher, which is more than twice that of students taking more than six subjects.

Students who enrol in two subjects or fewer in their first year are most likely to drop out, although this result should be interpreted with caution. Our analysis tracks students over eight years. Students who consistently study fewer than three subjects would take 12 or more years to complete their degree, putting them out of the tracking range. But tracking a sub-sample of students for longer than eight years shows that few of them complete their degree in subsequent years.[32]

Figure 2.2: Studying part-time increases the risk of not completing, and the fewer subjects the higher the risk

Risk of not completing within eight years controlling for other factors, per cent not completing



Notes: Average predicted probability controlling for other factors (predictive margins) is shown. To interpret the chart, as an example for students aged 20 or younger, the average risk for students who take more than six subjects in their first year is 20 per cent and 50 per cent for those who take three or four subjects; thus taking three or four subjects rather than more than six subjects increases the risk of dropping out to two and a half times the original (or 30 percentage points) controlling for other factors. Caution is required when interpreting the results for the over-50 age group because of the low sample size. Based on subjects taken in the first two semesters. See also Figure 2.1, and Appendices A and B.

Source: Grattan analysis of Department of Education and Training (various years).

31. Using the same dataset as our analysis in this report, Department of Education and Training (2017d, table 2).
32. See Appendix A.2.

The low completion rate for students who do few subjects in their first year could be partly by-design. Some students take one or two subjects as part of an experiment with study; students who like it and pass their subjects continue, while the others leave.[33] Departing students found out whether university is for them at low cost. Other students taking very few subjects may be seeking specific skills or knowledge without planning on taking a full degree. Universities offer not-for-award subjects for such students, but these attract no government subsidies and students must pay upfront fees. It is cheaper for the student to enrol in a course, and then drop out. Students who already have a degree and enrol in only one subject in a subsequent bachelor degree could be in this category.[34]

Yet not all non-completion is intentional. Many students study part-time because they are time poor. And studying part-time seems to deal with their lack of time available for study. The Department of Education and Training data collection has no information on employment and family responsibilities, so this report uses the ABS Education and Work survey to fill this gap.

Part-time students are more likely to work and to work longer hours than full-time students (Figure 2.3 on the following page). Median weekly working time is less than 10 hours for full-time students; for part-time students it is at least three times that at 30-to-39 hours.

While studying part-time accommodates work commitments for some, for many students their work commitments are the reason they leave. The Government's Student Experience Survey shows that among students who are considering leaving early, part-time students are more than twice as likely as full-time students to nominate paid work responsibilities as a reason (Figure 2.4 on the next page).[35]

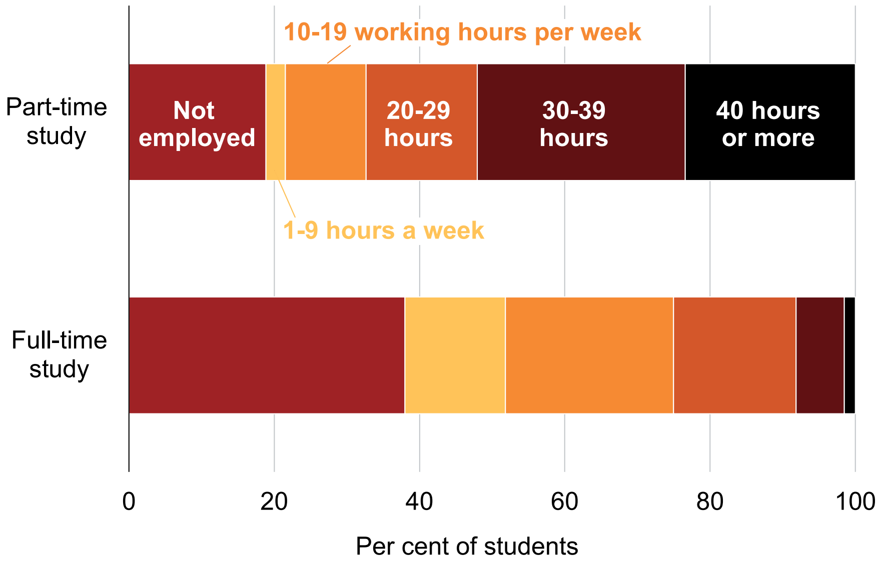
Adding to their time commitments, part-time students are also much more likely than full-time students to have young children. Among students aged 25-44, nearly 40 per cent of part-time students have a youngest child aged under 15, compared to about 25 per cent of full-time students.[36] Juggling family responsibilities and study can be challenging, and increases the risk of not completing for part-time students. Among students considering leaving university, part-time students are twice as likely as full-time students to nominate family responsibilities as their reason (Figure 2.4).

Many part-time students clearly have other responsibilities that can make it hard for them to complete their degree. Yet these responsibilities do not fully explain the negative effect of part-time study. A Monash University study tracked students from 14 universities using enrolment data. It found that part-time study significantly increases the risk of dropping out before the second year, even after controlling for caring

33. In a separate analysis, nearly 2 per cent of commencing bachelor pass degree enrolments enrolled in one subject between 2006 and 2015. Of those, 60 per cent were categorised as potentially trialling university – with prior education of less than a bachelor degree and either increasing their study load or leaving university after first semester. Another possible category, although not one we can easily identify in the data, is students who always intended to be full-time but dropped most of their subjects prior to the census date, perhaps after realising that they had chosen the wrong course. These students intended to take a different course in a later year.
34. In the separate analysis of one-subject bachelor pass degree enrolments (footnote 33), 6 per cent were classed as potentially in this group because they already had a bachelor degree or above and did not re-enrol in semester two after taking one subject, Department of Education and Training (various years).
35. Excluding international students and non-bachelor degree students, Social Research Centre/Department of Education and Training (various years). Curtis and Shani (2002) found a similar result in the UK. The longer hours students worked, the more likely it was that they would miss classes, hand-in assignments late, and agree that they would receive a better grade if they were not working. Note the survey has a small sample size (359 students).
36. Including bachelor degree students at universities and other providers; ABS (2016b).

Figure 2.3: Part-time students are more likely than full-time students to work full-time

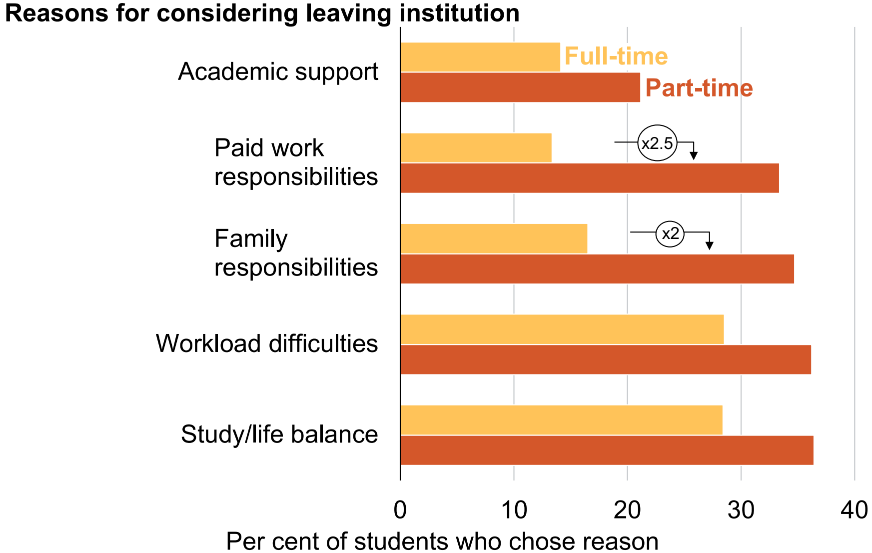
Per cent of students by type of attendance, 2016



Notes: Including bachelor degree students at universities and other providers and all ages.

Source: ABS (2016b).

Figure 2.4: Part-time students are much more likely to cite work and family responsibilities as reasons for considering leaving



Notes: Health and stress is also a top reason, at about 30 per cent. Domestic bachelor-degree students. Data from 2012-2015.

Source: Social Research Centre/Department of Education and Training (various years).

and work commitments, and that full-time study significantly reduced the risk of leaving early.[37]

The negative impact of part-time study may reflect weaker engagement with university. Higher education research suggests that student engagement matters to completion.[38] Students with good relationships with their peers, and with staff at their university, are more likely to complete. These relationships make it easier for students to seek and receive help with their academic work, or with other issues affecting their studies. The potential benefits of stronger engagement are psychological as well as practical. In the words of a leading American researcher on completing college, 'decisions to leave or stay are shaped, in part, by the meaning students attach to their involvement, [and] the sense that their involvement is valued. . . '[39]

Engagement is a weak point for Australian universities. In the Student Experience Survey, questions on engagement consistently receive the most negative answers.[40] Work based on an earlier survey noted that Australian students were 'far less engaged than their North American peers'.[41]

Part-time students who are busy with non-study activities have less time for the personal connections conducive to high engagement. Compared to full-time students, part-time students are much less likely to work or socialise with other students, and moderately less likely to participate in online or face-to-face discussion about their course. Perhaps part-time students get less social and psychological reinforcement in their studies than full-time students. But any engagement deficit seems to be only with other students. Full and part-time students have similar views on whether teaching staff actively engage students or are helpful and approachable.[42]

2.2 On-campus versus off-campus study

Overall, off-campus students have low rates of completion (Section 1.2). But after controlling for their age, part-time study and other attributes, the negative effect associated with off-campus study falls significantly, as Figure 2.5 shows. For students at a similar age and taking a similar number of subjects, studying off-campus increases their risk of not completing, but only slightly.

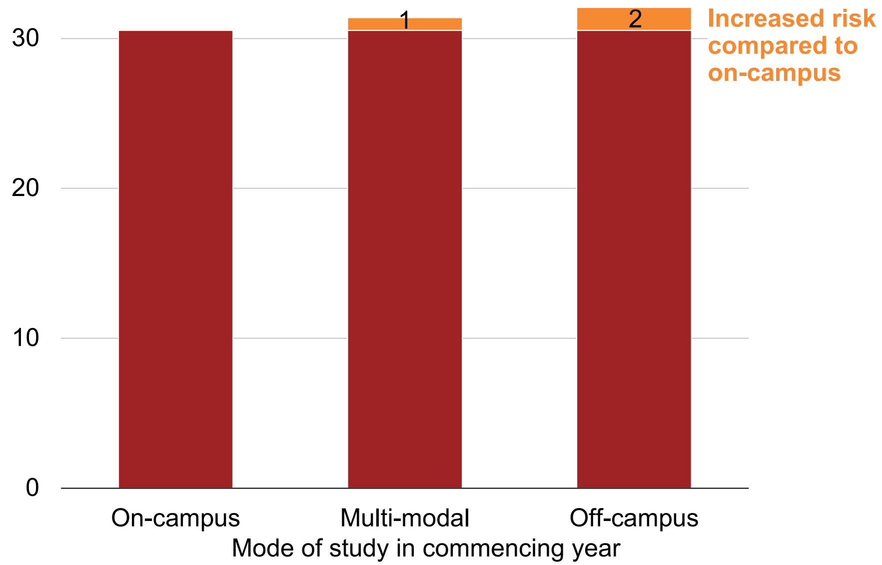
On-campus students have an average risk of dropping out of 31 per cent; off-campus students have a marginally higher risk at 33 per cent. Unsurprisingly, students whose courses mix on- and off-campus study, known as multi-modal enrolment, have a risk level in between the other two groups.

Given the low average completion rates of off-campus students, this small negative effect may seem surprising, but it is consistent with other research. The previously mentioned Monash University study of students commencing in 2004 finds little effect of off-campus study on drop-out rates by the second year.[43] Another study, using the University Experience Survey from 2012 and 2013, finds a significant negative effect of off-campus study on the chance of first-year students

37. Long et al. (2006, table A.5).
38. Tinto (2012, esp. chapter 5); Mayhew et al. (2016, esp. chapter 7); and Coates and McCormick (2014, esp. chapter 4).
39. Tinto (2012, p. 66).
40. Social Research Centre/Department of Education and Training (2017, p. 3).
41. Radloff and Coates (2014, p. 62).
42. Work with other students: full-time students 66 per cent, part-time students 37 per cent often or very often. Interact with other students outside study requirements: 50 per cent/21 per cent. Discussion about the course: 60 per cent/46 per cent. Teaching staff actively engage: full-time students 62 per cent, part-time students 63 per cent quite a bit or very much. Teaching staff are helpful and approachable: 71 per cent/72 per cent. Domestic bachelor degree students, 2012-2015: Social Research Centre/Department of Education and Training (various years).
43. Long et al. (2006, p. 197).

Figure 2.5: Studying off-campus marginally increases the risk of not completing a degree

Risk of not completing within eight years controlling for other factors, per cent



Notes: See Figure 2.2.

Source: See Figure 2.2.

re-enrolling for a second year.[44] But the effect is much smaller than of age or part-time study. When looking at later-year students, the effect of off-campus study disappears.[45] High drop-out rates for off-campus students seem to largely reflect characteristics other than their mode of study.

44. Compared to on-campus study. The study supplements the UES with the Department of Education and Training's higher education data collection (the same dataset as this report's study) to assess if a student reenrols: Li and Carroll (2017, pp. 52–53).
45. The estimate becomes small and statistically insignificant, Li and Carroll (ibid., pp. 52–53).

The small remaining negative effect of off-campus study may reflect less engagement with other students. Compared to on-campus students, off-campus students are much less likely to say that they work or socialise with other students, and moderately less likely to say they have online or face-to-face discussions with other students. However, the differences between on- and off-campus students disappear for questions about their teachers. Off- and on-campus students are equally likely to agree that teaching staff are approachable and helpful, and that teaching staff actively engage students.[46] These results suggest that universities are working to overcome, as far as possible, the apparent pedagogical limitations of online study.[47]

2.3 Campus location

Australia has about 150 university campuses.[48] More than two-thirds are in major cities, a quarter in inner regional areas and the rest in outer regional or remote areas (Figure 2.6).

On average, without controlling for other factors, students are much less likely to complete their degree if they are enrolled at a regional rather than a metropolitan campus, as the line on Figure 2.7 shows. Nearly half of students at an inner or outer regional campus do not complete their degree within eight years, compared to fewer than one in three at a major city campus.

46. Work with: On-campus 67 per cent, off-campus 24 per cent often or very often. Interact with outside study requirements: 50 per cent/15 per cent. Discussion: 60 per cent/41 per cent. Actively engage: 63 per cent/60 per cent quite a bit or very much. Helpful and approachable: 71 per cent/71 per cent. Domestic bachelor-degree students, 2012-2015: Social Research Centre/Department of Education and Training (various years).
47. See the discussion in Norton et al. (2013, chapter 3).
48. Table A institutions only. Campuses with at least 20 bachelor-degree enrolments by domestic and international students in 2015 located in Australia, Department of Education and Training (2015).

The average non-completion rate from studying at a regional campus is overstated without controlling for other attributes. The main contributor is part-time study. Compared to metro campuses, regional campuses have more than twice the share of students studying part-time. As Section 2.1 shows, part-time study significantly increases the risk of not completing.

After controlling for other attributes, the differences in risk are significantly reduced. An average student at a major city campus has a non-completion risk of about 30 per cent. Studying at an inner regional campus increases the risk to 32 per cent. Studying at an outer regional campus increases the risk further, to 35 per cent. While the differences in risk are reduced after controlling for other factors, studying at a regional campus still poses a higher risk to completion within eight years than studying at a metro campus.

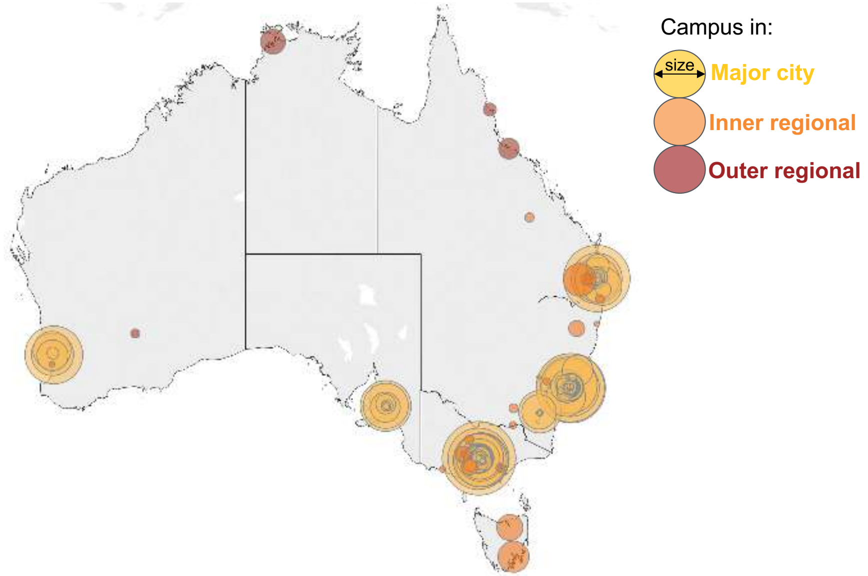
The negative effect of studying at a regional or remote campus could reflect the lack of engagement with university. On average, fewer than half of students at regional and remote campuses are satisfied with learning engagement, compared to about 60 per cent of students at metro campuses. For students at a regional or remote campus who are considering leaving, about one in five nominate inadequate academic support as a reason, compared to one in seven students at a metro campus.[49]

2.4 Travel time

Students who live far away from their university face an added challenge in getting to classes and engaging in campus life. A small proportion of students considering leaving university without a degree cite commuting difficulties as one of their reasons.[50]

49. Social Research Centre/Department of Education and Training (various years); and Department of Education and Training (various years).
50. Social Research Centre/Department of Education and Training (2017, p. 12).

Figure 2.6: Australia has about 150 university campuses, and most are in major cities



Notes: Bubble size represents the number of 2015 commencing bachelor-degree enrolments at a university campus. Table A institutions only. Mapped using Tableau software.

Source: Department of Education and Training (various years).

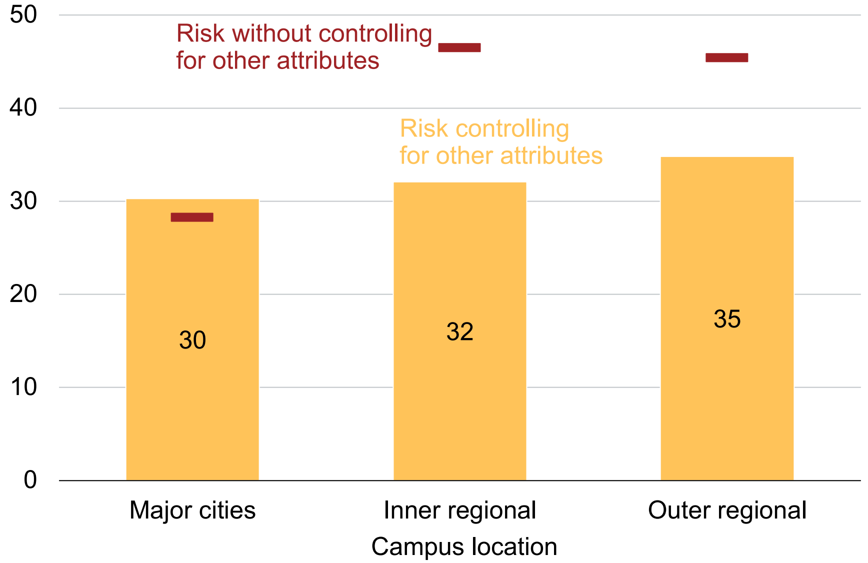
The Government does not collect data on travel time from home to campus. This report used the Google Maps database to estimate driving times between student's home postcodes and their university campus. This can only approximate travel times. Students move, and so their location recorded in the enrolment data is not always accurate. Particularly in metropolitan areas, many students take public transport to university rather than drive. For students who do drive, data collected in 2017 may not reflect driving conditions in the past.

With these caveats, Figure 2.8 shows estimated travel times. Most on-campus students live near their university. A third live within 20 minutes' drive from campus and three quarters within 40 minutes. Nearly 90 per cent live within an hour's drive from their university campus.

Despite the time costs, long commutes have little impact on the risk of a student not completing their degree within eight years. Long commutes increase the risk, but only marginally. Given the data issues, the result should be used with caution. However, the Monash University study referred to earlier asked students about their travel time and reached a similar result.[51]

Figure 2.7: Studying at a regional campus increases the prospect of dropping out

Non-completion rate (line); risk of not completing a degree within eight years (column), per cent

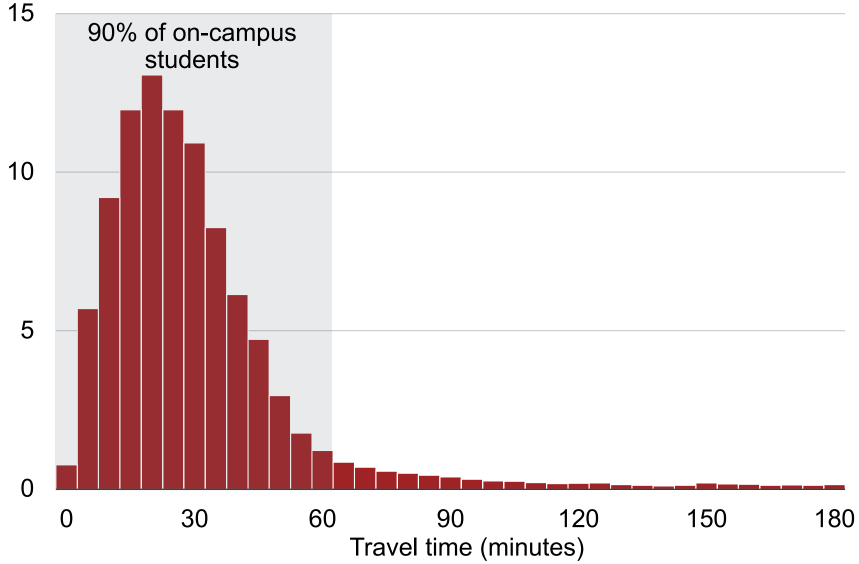


Notes: Outer regional includes remote and very remote. Very few students are enrolled in a remote or very remote campus. See also Figure 2.2.

Source: See Figure 2.2.

51. Long et al. (2006) found a small negative effect of travel time between half-an-hour and an hour, compared to less than 30 minutes. They also found a larger negative effect of travel time more than 90 minutes.

Figure 2.8: Most students live near their campus
Driving travel time from term address to campus (one way), minutes



Notes: Travel time for 2015 commencing domestic on-campus bachelor-degree enrolments at universities, rounded to the nearest 5 minutes. See also Appendix A.3.

Source: Department of Education and Training (various years) and Google (2017).

3 Prior academic achievement

A strong prior academic foundation can improve a student's chance of completing their degree, while weak prior performance can significantly increase the risk of dropping out. For school leavers, their high school performance – Australian Tertiary Admission Rank – is a good indicator of risk. The higher the ATAR, the better their chances of completing. For those who don't have an ATAR, their prior highest qualification can give insights into their level of risk.

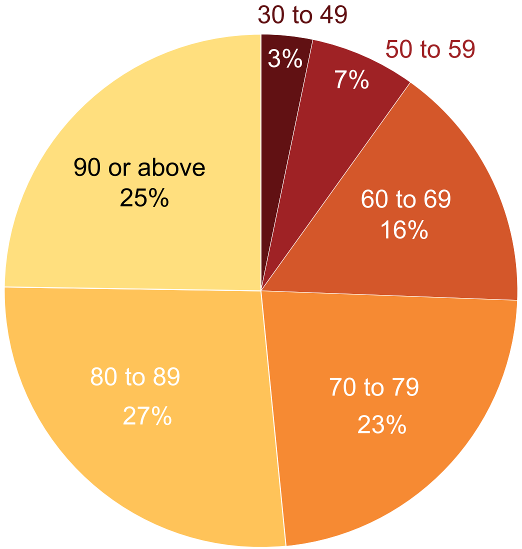
3.1 ATAR

About 60 per cent of commencing university students have an ATAR. The share is even higher among school leavers – about 90 per cent. And about three-quarters have and use their ATAR to enter university. Overall, their ATARs are generally high. More than half have an ATAR of 80 or above, as Figure 3.1 shows.

ATAR incorporates the effects of ability and effort in school.[52] These attributes are important at university as well, so it is unsurprising that ATAR levels and completion prospects are linked.[53] Figure 3.2 shows the risk of not completing by ATAR band. The quarter of commencing students with ATARs of 90 or above have a low risk – below 20 per cent. The risk is marginally higher for men than women, but both are low risk.

The risk of not completing rises as ATAR falls. Students with an ATAR of between 70 and 79 have nearly twice the risk of not completing

Figure 3.1: Most university students have a high ATAR
Proportion of commencing students with an ATAR from 2006 to 2008



Notes: Commencing students who were first enrolled between 2006 and 2008 and have an ATAR. The Overall Position (OP) was converted into ATAR by the Queensland Curriculum and Assessment Authority.

Source: Department of Education and Training (various years).

52. Baik et al. (2015) find that lower-ATAR students do much less private study at university than higher-ATAR students.
53. Cardak et al. (2017) also found a strong positive impact of ATAR using the 2006 Longitudinal Survey of Australian Youth (LSAY) data. With LSAY data, Lim (2011) also found a positive effect of Programme for International Student Assessment (PISA) scores on completion. PISA is an international test of the skills and knowledge of 15-year-olds.

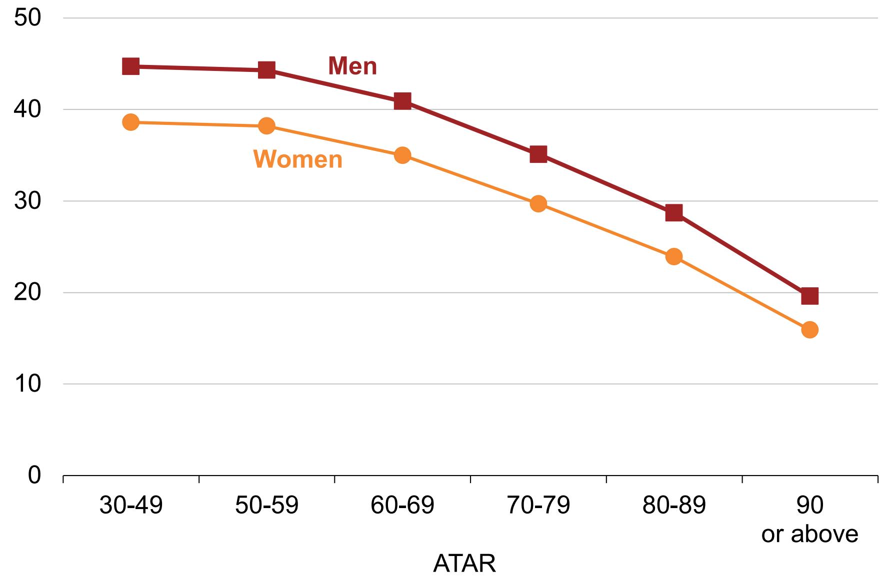
as those with an ATAR of 90 or above. Since ATAR is correlated with university marks, the positive impact of ATAR on completion is perhaps unsurprising.[54]

The impact on completion risk weakens as ATAR declines. Students have the same risk of non-completion whether their ATAR is between 30 and 49 or between 50 and 59. The risk for women is about 40 per cent and men about 45 per cent.

This risk plateau partly reflects the relationship between ATAR and the underlying school study score. ATAR is not a direct measure of academic ability. It represents students' performance relative to their peers, ranking them from lowest to highest based on aggregate study scores. While the states use different calculations, about the same proportion of students receive each ATAR in each state.[55] Since many students have a study score in the upper middle levels, ATAR exaggerates the academic differences between them, as Figure 3.3 demonstrates. For example, in Victoria, the study score increases 11 points between ATARs of 55 and 65 but increases by 23 points for

Figure 3.2: High-ATAR students are at much lower risk of not completing a degree

Risk of not completing within eight years, controlling for other factors, per cent



Notes: See Figure 2.2.

Source: See Figure 2.2.

54. Li and Dockery (2014, table 4) used first-year student data from 2011 to 2013 from an anonymous Australian university and found ATAR to be a strong determinant of university marks. Birch and Miller (2007) also found that TER (Tertiary Entrance Rank used as a tool for selection to universities and replaced by ATAR from 2010) has a statistically significant impact on first-year weighted average marks for students from the University of Western Australia between 2001 and 2004. Data from an anonymous university reported in a government review of the demand-driven system show a mild positive correlation between ATAR above 70 and first-year marks for students who commenced between 2007 and 2010: Kemp and Norton (2014, figure 2). A study of a Victorian university also found a positive correlation for higher ATARs, most strongly among students with ATARs above 60, Messinis (2015). McKenzie and Schweitzer (2001) also found a relationship between ATAR and university scores, but with a very small sample size.
55. Including those who did not complete year 12. For Victoria, see VTAC (2016). Raw study scores are scaled based on the difficulty of the subject, and scaling is different across states. The scaled scores are then aggregated into an aggregate study score. Queensland uses OP rather than ATAR as the primary relative performance indicator, but this can be converted into an ATAR.

ATARs between 85 and 95.[56] As the underlying academic differences among students in lower ATAR bands are small, so are the differences in completion risk.

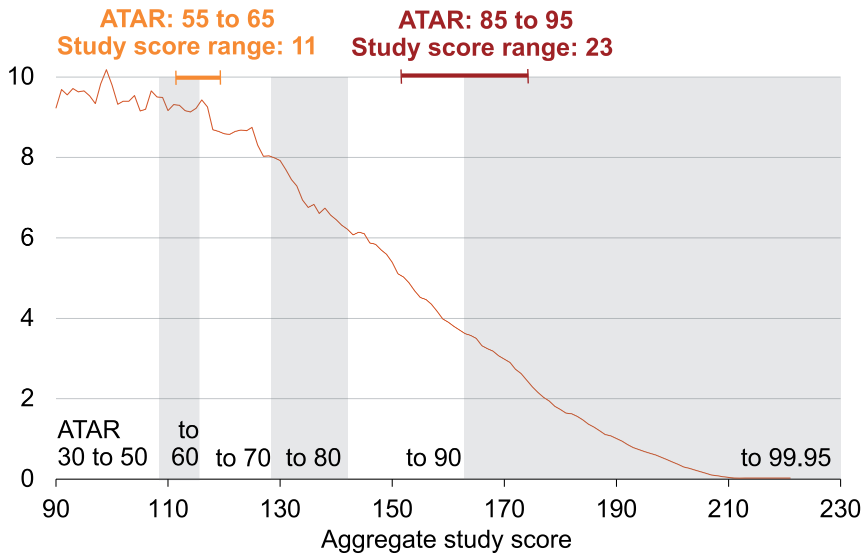
3.2 Highest qualification

For the approximately 40 per cent of commencing students with no ATAR, this report uses their highest previous qualification as a proxy for academic preparation. This tells us something about the level of academic challenge they have faced in the past.

Students who finished a post-secondary qualification prior to commencing university generally have a lower risk of not completing, as Figure 3.4 shows. On average, students whose highest educational attainment is Year 12 have a risk of not completing of about 30 per cent. Students with a vocational qualification have a risk of 28 per cent, and students with a higher education diploma or associate degree have a risk of 27 per cent, both marginally lower than Year 12 students.[57]

Typically, people who begin their higher education in associate degrees or diplomas have lower ATARs than students who enter a bachelor degree directly from Year 12.[58] So how do associate degree and diploma students end up with a lower risk of not completing? Completing a diploma or associate degree indicates that the student has the ability, and has put in the effort, needed to finish a course.[59]

Figure 3.3: Lower-ATAR students have similar school study scores
Per cent of Year 7 Victorian school students in 2010



Notes: Analysis is based on the 2015 VTAC ATAR to scaled study score aggregates. Density is approximated based on ATAR distribution. Moving average is shown to smooth out extreme fluctuations.

Source: VTAC (2016).

56. Data from 2015, VTAC (2016).
57. Diplomas include pathway courses that normally have a remedial element as well as specialised courses such as diplomas of languages. However, language diplomas are typically taken concurrently with a bachelor degree, and so are unlikely to be reported as a highest prior qualification.
58. For example, in 2015 median ATARs for commencing students were: bachelor pass degree students who finished school in 2014 80, associate degree 65, and diploma or advanced diploma 52: Department of Education and Training (2017e).
59. The analysis controls for credit received from a previous qualification, so the effect of completing a post-school qualification is in addition to the benefit from receiving credit. For the full list of variables, see Appendix A.

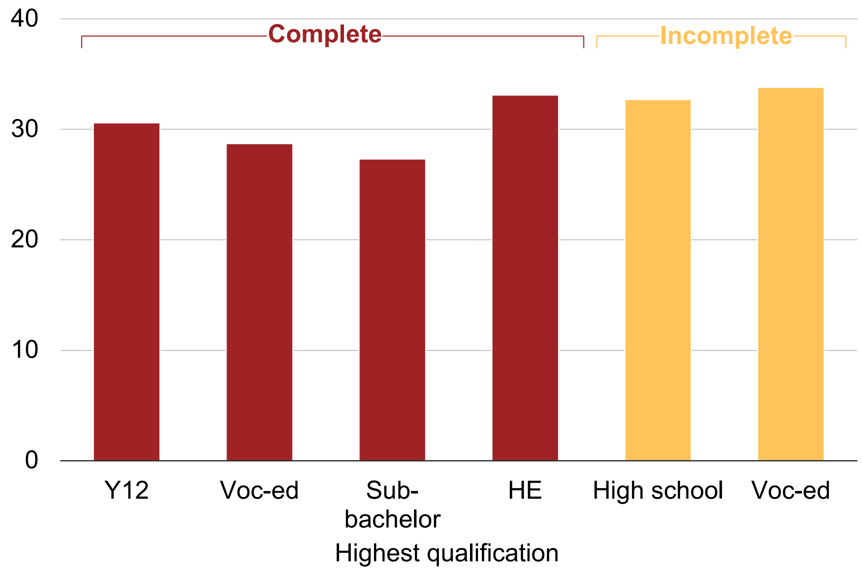
Enrolment in the diploma or associate degree program helps identify people with attributes related to academic success. It may also help remedy academic weaknesses. For example, pathway diploma courses typically teach the first-year curriculum of a target bachelor degree, but with additional academic support. Students who enter their bachelor degree via a pathway course often do better than expected, given their prior school results.[60]

Similar reasons are likely to explain the completion risk of vocational education diploma graduates. Only 15 per cent of them go to university the year after completing their diploma.[61] These students are likely to be the most academically able and motivated of this group. They understand what post-school study involves than those who do not have the experience. Some continue at the same university. The extra selection process with additional knowledge is likely to improve the matching of students with appropriate courses.

While completing a lower-level post-school qualification has a positive impact on the prospects of completing a university degree, already having a bachelor degree or above marginally increases the risk of not completing. This negative effect may reflect a small marginal benefit of obtaining another qualification, compared to the cost.[62] Although another qualification may expand the range of jobs the student could apply for, people with a bachelor degree already have access to the graduate labour market.[63] As a result, another bachelor degree may not significantly improve their financial position, especially taking into account forgone wages for graduates while studying.

60. Kemp and Norton (2014, pp. 18–19).
61. NCVER (2016b).
62. For example, double degree graduates are slightly less likely to be over-educated for their job soon after completing their course: Li and Miller (2013).
63. This report's analysis excludes graduate-entry courses because they are generally in selective disciplines and therefore may bias the overall results.

Figure 3.4: Students with a post-secondary qualification (other than a bachelor degree or above) have a lower risk of dropping out of university
Risk of not completing within eight years, controlling for other factors, per cent



Notes: See Figure 2.2.

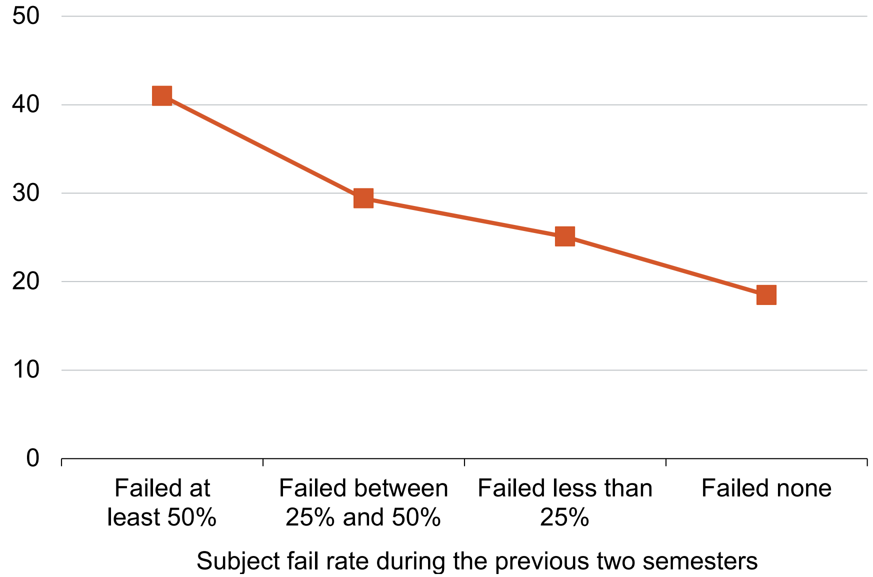
Source: See Figure 2.2.

Nearly 20 per cent of commencing bachelor degree students have incomplete higher education.[64] At least for students who complete a full year of study before switching, changing courses does not of itself have a major negative effect on completion prospects. But previous university performance does predict their risk of not completing. Students who passed all their subjects in the year prior to changing courses have a non-completion risk of about 20 per cent, making them relatively low risk. Non-completion risks increase quickly with the fail rate. Students who failed half their subjects have a non-completion risk of more than 40 per cent (Figure 3.5).[65]

A small proportion of commencing university students did not finish high school and have no post-school qualifications. These students have a marginally higher risk of not completing a bachelor degree than people who finished Year 12 (see Figure 3.4). Students who started but are yet to complete a vocational course face a marginally higher risk not completing within eight years compared to school leavers, and a moderate increase in risk compared to students who complete a vocational course prior to enrolment.

Figure 3.5: Previous higher education success predicts completion prospects

Risk of not completing within eight years, controlling for other factors, per cent



Notes: Based on a sub-sample of students commencing in 2008. Only includes students admitted based on incomplete higher education and who were enrolled in 2007. Predictive margins are shown. See also Figure 2.2 on page 13.

Source: Grattan analysis of Department of Education and Training (various years).

64. In recent years, 17.5 per cent of commencing bachelor degree students have an incomplete higher education course as their highest previous education. This is not necessarily their basis of admission: Department of Education and Training (various years).
65. In recent years, 1.5 to 1.8 per cent of commencing bachelor degree students failed half or more of the subjects they took in the previous year: Department of Education and Training (ibid.).

4 Discipline

What discipline students study affects their chances of completing university. Health-related courses have the lowest risk of dropping out; IT and engineering have the highest risk. This chapter looks at how a student's discipline choice affects their risk of not completing, and explores some possible reasons for differences between disciplines.

4.1 Completion rates differ between disciplines

The rate of not completing a degree within eight years differs significantly by discipline, as the left panel of Figure 4.1 shows. IT, agriculture, education and commerce students are more likely than average to leave their courses without finishing. Students in health-related courses are less likely than average to leave without finishing, as are architecture, creative arts and science students.

Completion differences between disciplines are influenced by student characteristics such as ATAR, gender, age, and full or part-time enrolment. After controlling for these and other factors, discipline-related risks change. The new results are shown in the right panel of Figure 4.3.[66]

Health-related courses remain relatively low risk after taking into account student characteristics. Medical students have very high completion rates. Students in nursing and other health fields (such as physiotherapy, optometry, and public health) also still do better than average. IT and humanities students continue to have relatively high risk, but this is partly due to factors other than the discipline itself.

A few disciplines change their position after adjusting for their student characteristics. Retention in commerce and education is slightly better than we would expect given their student characteristics, such as ATAR levels, proportion of part-time students and other factors discussed in this report. Science, creative arts, and engineering all have higher risk than we would expect, given the students they enrol. The following sections discuss factors likely to help explain these discipline differences.[67]

4.1.1 Teaching quality and academic success

Student surveys persistently show differences between disciplines in students' satisfaction with the teaching. Among recent students, engineering and IT students have the lowest and equal second lowest levels of satisfaction respectively with teaching (and overall education experience) of all broad fields of education, as Figure 4.2 shows.[68] IT and engineering students are not unusually likely to consider leaving university without completing, but are more likely to cite concerns about quality as a reason for doing so.[69] This data is collected in second semester; by then many of the first-year students who are not going to complete have already left.[70]

The teaching experiences of the earlier student cohorts in this report's completion risk analysis are not known. In the past, the main national teaching satisfaction survey only covered students who completed their course. The students this paper is most interested in, those who left

66. For the full list of controls, see Figure 1.6 in Section 1.2.

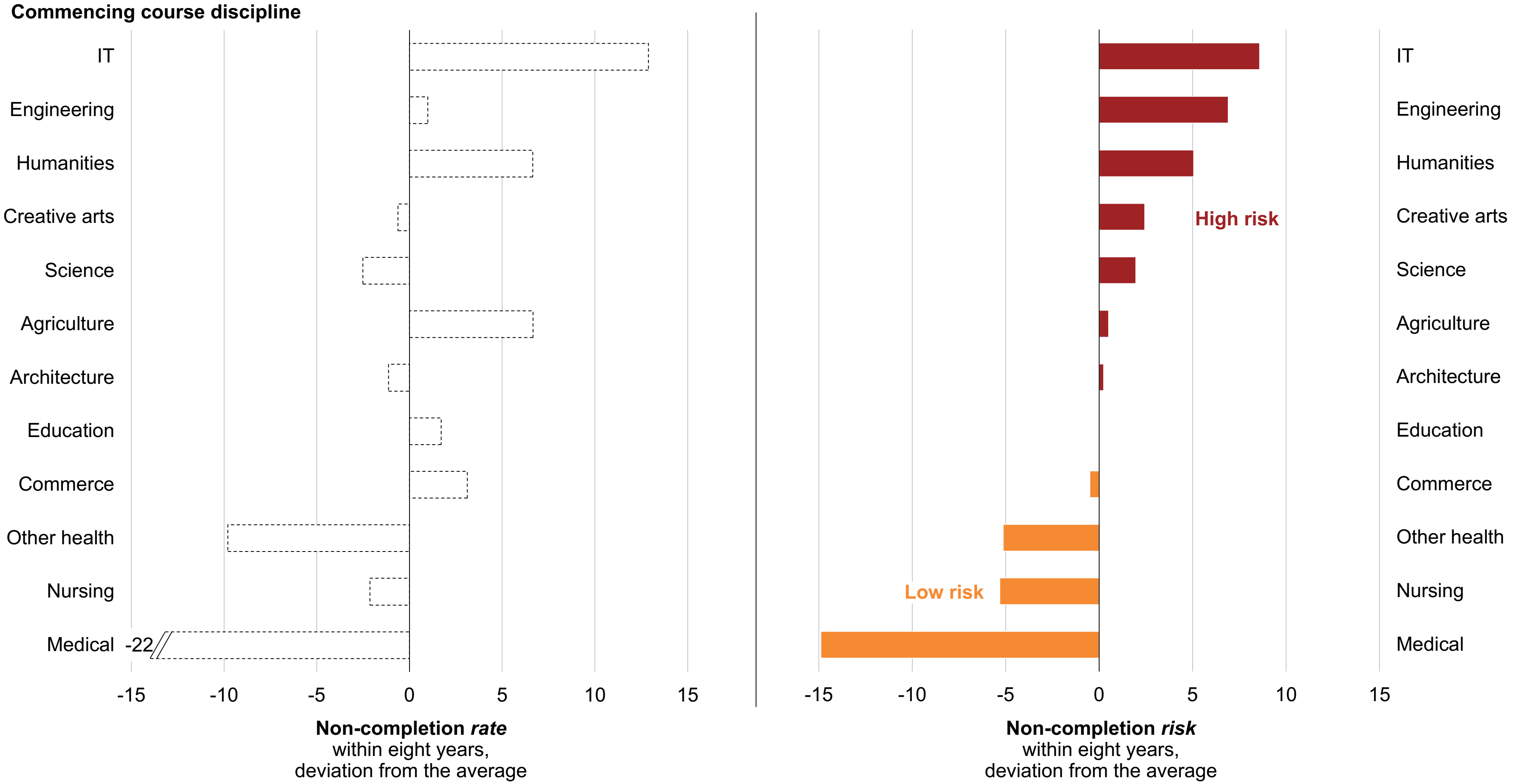
67. Students in double degrees have many different combinations of fields and are excluded from the results reported above. However, as a test they were included using the 'primary' field of education reported in the enrolment data. The results remained consistent with those reported in this section.

68. Social Research Centre/Department of Education and Training (2017, p. 7).

69. IT and Engineering students are more likely to cite 'quality concerns' and 'expectations not met'. Using domestic students in 2016, Social Research Centre/Department of Education and Training (various years).

70. See Norton et al. (2018, chapter 1) for details of students leaving university.

Figure 4.1: The risk of not completing a course varies significantly by discipline



Notes: Discipline of commencing enrolment course. The risk shows deviation from the average rate across fields and universities based on an average person. Law is excluded because it has a much higher share of double degree students than other disciplines. See also Figure 2.2 on page 13.

Source: See Figure 2.2.

early, did not receive the survey. But for the remaining students, the pattern is similar: engineering graduates are the least satisfied with teaching, and IT graduates are among the least satisfied.[71]

IT students are more likely to fail than students in any other disciplines. One in five IT students fail at least half of their subjects in the first semester.[72] Engineering students also have a relatively high fail rate (Figure 4.3). If this continues in the second semester, students risk unsatisfactory progress and being precluded from returning. Across year levels, IT subjects have the highest fail rate, despite an improvement between 2015 and 2016.[73] The more subjects a student fails, the less likely they are to complete their course.

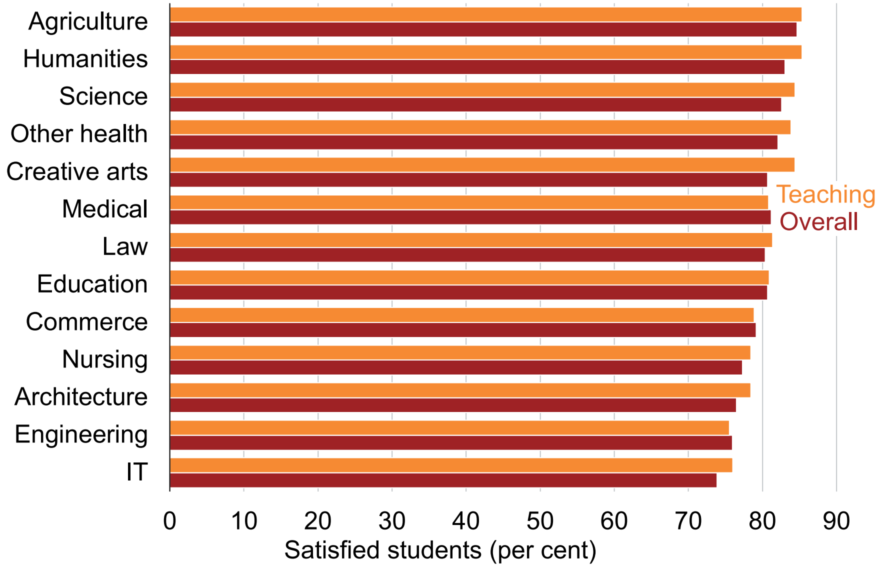
But perceptions of teaching quality cannot solely explain variations in completion risk. While students in health fields are more satisfied with teaching than are IT or engineering students, they are less satisfied than average. Humanities and creative arts students have above-average satisfaction with teaching (and creative arts students have low fail rates), but they have an elevated risk of leaving without a degree.

4.1.2 Career prospects

Most university students are there, at least in part, for career reasons. A long-running survey of first-year students consistently finds about three-quarters of them are training for a specific job, and a larger proportion hope to improve their job prospects.[74] Career factors affect course persistence. In a survey of students who commenced their

71. Graduate Careers Australia (2012, p. 10).
72. See notes for Figure 4.3.
73. The fail rate among IT subjects was about 18.5 per cent in 2015 and 15.5 per cent in 2016. IT has had the highest fail rate since 2006, Department of Education and Training (various years).
74. Baik et al. (2015, p. 24).

Figure 4.2: Engineering and IT students are least satisfied with the teaching and overall quality of their course



Notes: Responses from domestic bachelor students in the 2016 Student Experience Survey.

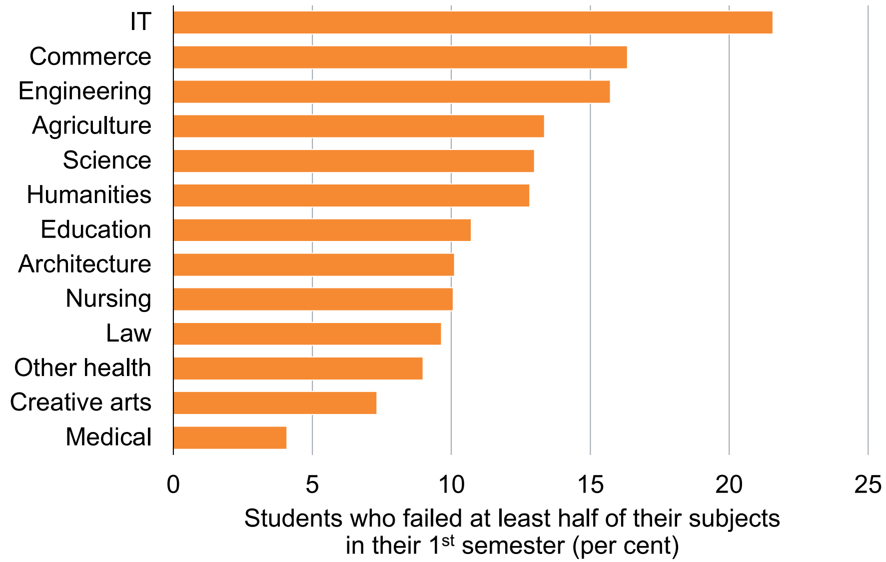
Source: Social Research Centre/Department of Education and Training (various years).

studies in 2004, career issues were common reasons for not returning to the same university in 2005.[75]

Fields with elevated risk of not completing have mixed employment outcomes. Creative arts graduates usually have the worst short-term employment outcomes, and in the long run are the least likely to report working in their field (Figure 4.4).[76] The humanities and science are generalist degrees, and this translates into difficultly finding high-skill work.[77] Poor job prospects may decrease motivation to study and increase the risk of dropping out. Among the students who were considering leaving in recent years, those in science and creative arts are most likely to cite ‘career prospects’ as a reason.[78]

While humanities, science and creative arts students face uncertain careers, this is less of an issue for IT and engineering students. In the longer run, graduates in these fields have relatively high rates of professional and managerial employment, and often find work relevant to their degree (Figure 4.4).[79] It may be that shorter-term issues with skills mismatches (IT) and the business cycle (engineering) discourage some students. IT students especially can get a professional job without a degree.[80] Overall, however, employment issues seem unlikely to explain why IT and engineering have a high risk of not completing.

Figure 4.3: IT students are most likely to fail at least half of the subjects in their first semester



Notes: Discipline of commencing course. Domestic bachelor students commencing between 2006 and 2016. Measured by EFTSL. Only students who are taking more than 0.125 EFTSL (more than one standard unit) in their first semester are considered. Units with ‘not yet determined’ or ‘missing’ status were excluded (about 1 per cent).

Source: Department of Education and Training (various years).

75. Long et al. (2006, table B.1). Reasons included ‘I changed my career goals’ (23.5 per cent citing as a large influence), ‘I found a better path to my career goals (22 per cent) and ‘course would not help me achieve my career goals’ (16.4 per cent).
76. Short-term: Graduate Careers Australia (2016).
77. Norton and Cakitaki (2016, p. 80); and Department of Education and Training (2017f, p. 13).
78. Student Experience Survey, 2013-2015 data, Social Research Centre/Department of Education and Training (various years).
79. Norton and Cakitaki (2016, p. 80); and Department of Education and Training (2017f, p. 13).
80. Norton and Cakitaki (2016, p. 94).

Supporting this conclusion, these students are not unusually likely to mention employment issues as reasons for dropping out.[81]

The health-related courses with low risk of dropping out all have good employment prospects, along with high rates of working within their field of study (Figure 4.4). Knowing that their course will almost certainly result in relevant employment may motivate some students and increase retention.

4.2 The role of interests

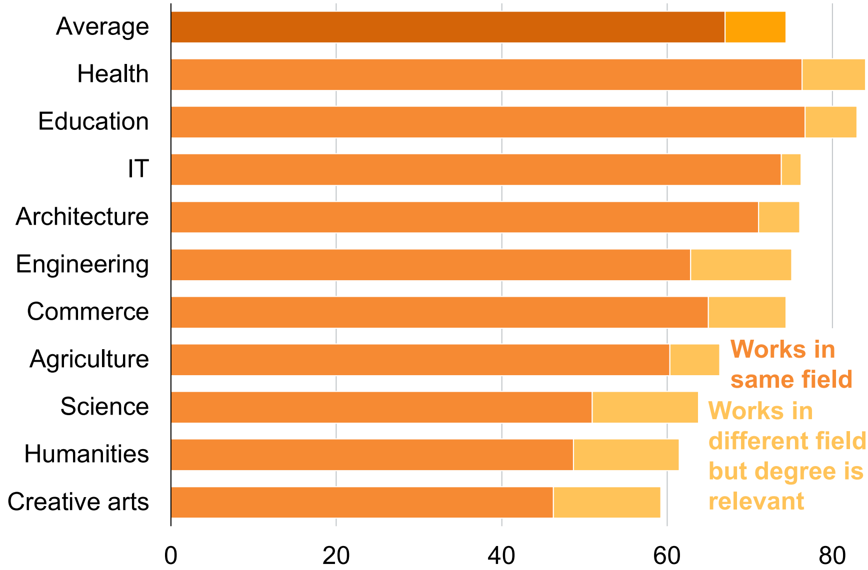
Completion rates vary between disciplines, but this does not mean that prospective students should choose an apparently low-risk field. Taking a course they are not interested in would increase, rather than decrease, their risk of dropping out.

4.2.1 Interests are usually within a limited range

Students overwhelmingly choose courses that interest them, with 95 per cent of first-year students agreeing that 'studying in a field that really interests me' is an important reason for enrolling. This reason is more frequently cited than getting a specific job or improving general job prospects.[82]

Students can have multiple course interests, but usually within a limited range. Interests are an aspect of personality, trait-like preferences for particular environments, activities and outcomes. Only some courses and careers satisfy these preferences, which helps explain why they are chosen. Higher levels of congruence between interests and courses or jobs are associated with better performance.[83]

Figure 4.4: Health fields provide the highest chance of 'relevant' work
Working graduates with a bachelor degree or above, 2015, per cent



Notes: The discipline classification used in this chart is different from the one used in the completion analysis. This chart is based on the ABS two-digit field-of-education classification.

Source: ABS (2016a).

81. Student Experience Survey, 2013-2015 data, Social Research Centre/Department of Education and Training (various years).
82. Baik et al. (2015, p. 24).
83. Nye et al. (2012).

Figure 4.5: Students choose their course preferences within specific areas

Distribution of later preferences by first-preference field

Notes: Domestic bachelor-degree applicants who applied through a tertiary admission centre between 2014 and 2016.

Source: Department of Education and Training (various years).

Interests evolve during childhood, and stabilise during adolescence and young adulthood.[84] In an Australian study, most school children from years 3 to 12 had an occupational aspiration. Students were asked why they chose the job they did. The most common reasons were that the job is related to something they like or love (32 per cent) or something that they are interested in or good at (16 per cent), that the job involves helping other people (14 per cent), and that the job is well paid (8 per cent).[85]

Subsequent findings by the same research team show that the preferred professions shift as students get older (fewer nominate medicine or veterinary science, more nominate nursing; fewer nominate the visual or performing arts, more nominate teaching and social and welfare jobs).[86] These changes reflect interests evolving during adolescence, and students becoming more realistic about how to satisfy them, given course entry requirements and job prospects.

Older Australian research used an international test of vocational interests and matched the results with Year 12 students' course preferences.[87] It showed strong skews to particular fields based on interests. For example, students applying for teaching and health-related courses were most likely to have 'social' interests, and students applying for science, engineering, and computing were most likely to have 'investigative' interests.[88]

Because people hoping to attend university can simultaneously apply for multiple courses, Australian applications data shows how field-of-education preferences cluster. Circle sizes in Figure 4.5 indicate where second and subsequent preferences go. Many applicants apply for several courses in the same field of education (see the diagonal line of large circles). Applicants also preference in moderately consistent ways, reflecting underling patterns of interests.

For example, 59 per cent of preferences from engineering applicants go to other engineering courses, and 15 per cent go to science. Engineering applicants show very low interest in humanities (3 per cent of lower preferences), education or creative arts (1 per cent each), and no interest in nursing. Applicants who are interested in nursing preference other nursing courses 68 per cent of the time, with 13 per cent going to other health courses. They have little interest in commerce or science, and no interest in IT, architecture or creative arts. Medical and dentistry applicants are intent on doing health courses, overwhelmingly preferencing alternative courses in health, or science, which can be used to re-apply for medicine or dentistry later. Law applicants show relatively broad interests, with a third of preferences going to other law courses, and humanities and commerce their most frequent alternatives. Creative arts applicants give their later preferences to other creative arts courses, humanities, commerce and architecture.

Some preference flows are weaker than we might expect. For disciplines drawing on similar 'investigative' personality types, IT and engineering have low rates of cross-preferencing. Although nursing

84. Stoll and Trautwein (2017, esp. pp. 407-409); and Rounds and Su (2014, esp. pp. 100-102).
85. Gore (2015).
86. Gore et al. (2017, pp. 1389–1390).
87. The RIASEC typology matching personality and career, named after the first letters of the following: 1) **R**ealistic: includes occupations where people work with their hands such as building, repairing, and making objects. 2) **I**nvestigative: includes occupations where workers experiment, research, and analyse. 3) **A**rtistic: includes occupations involving painting, writing, sculpting, dancing, and playing music. 4) **S**ocial: includes occupations directed towards helping others. 5) **E**nterprising: includes occupations oriented to organising others and selling. 6) **C**onventional: includes occupations to do with record-keeping and organising information. See Holland (1997, esp. chapter 2).
88. Harvey-Beavis and Elsworth (1998, chapter 4). The most detailed source of occupations classified to RIASEC categories is the US Department of Labor's O*NET Online website.

and teaching both appeal to people with more 'social' interests, few applicants preference both.

Some fields are common second preferences, seen in the vertical lines in Figure 4.5. These are commerce, humanities, science and other health courses.

4.2.2 Matching interests

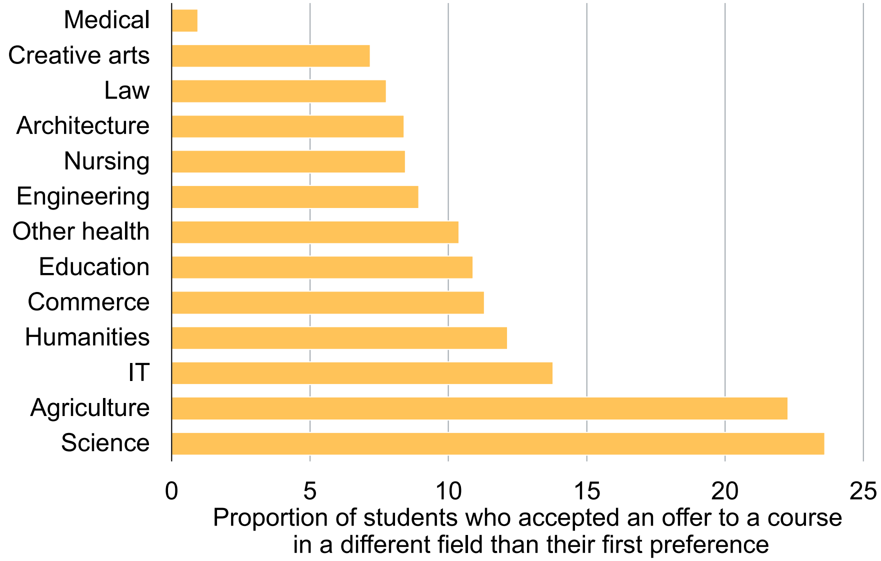
Interests theory suggests that motivation and retention will be higher if students take courses that interest them. Fortunately, most university applicants are offered a place in their first-preference field of education, although not necessarily at their first-preference university. The overall first-preference field offer rate is generally above 80 per cent, although consistently much lower in medicine, dentistry and veterinary science.[89]

If interest matches are important to retention, students in lower-preference fields could be at greater risk of not completing their course. We don't have preference data for the student cohorts in our main analysis. But discipline-level offer rates show stable patterns over time, so recent data can be used as a guide. In 2015 more than a quarter of students who accepted a place in science did not put it as their first preference (Figure 4.6). It is a discipline with a higher risk than we would expect, given other student characteristics (Figure 4.3). Three other 'under-performing' disciplines – IT, humanities and agriculture – also have relatively large numbers of students enrolled on a second or lower preference.

But other examples tell a different story. Completions in other health and commerce are higher than we would expect, given those disciplines have significant minorities of lower-preference students.

89. Universities Australia (2008, p. 3) and Department of Education and Training (2017g, p. 20). A caveat to this is that preferences incorporate adaptation to the reality of entry requirements. For example, someone who wants to be a doctor may not apply for medicine if they know they will not be accepted.

Figure 4.6: Some disciplines have significant minorities of lower-preference students



Notes: Domestic applicants who applied through a tertiary admission centre in 2014 and were enrolled in a bachelor course in 2015. Medical, education and nursing students are only those in courses leading to professional admission.

Source: Department of Education and Training (various years).

Engineering has a higher risk of not completing than we would expect, given its relatively small proportion of lower-preference students. Complicating the theory further, the 2014 commencing cohort shows only very small differences between first- and lower-preference students for retention into 2015, with lower-preference students having higher retention in some fields.

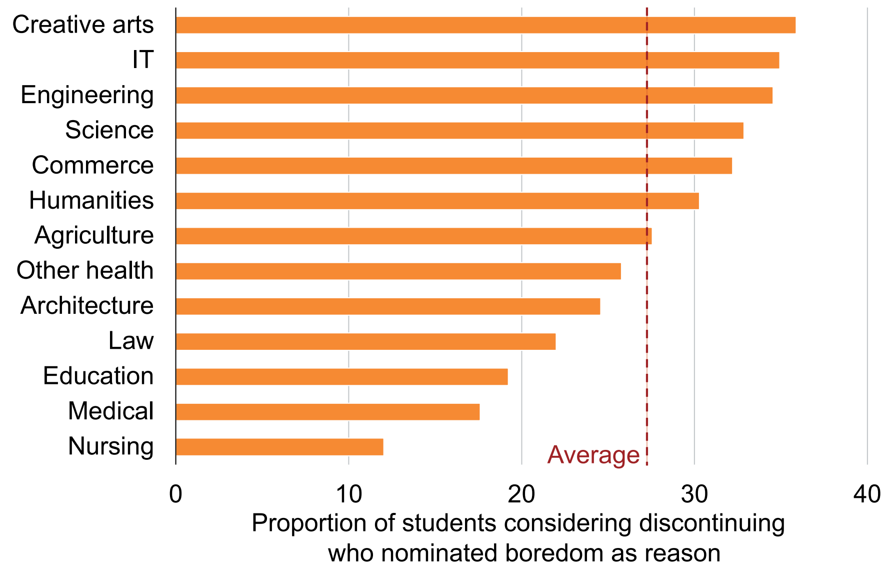
One reason for this is that students admitted to their second- or lower-preference course often have ATARs above the median for that discipline. Higher-ATAR students hedge their bets with preferences for lower-ATAR courses (for example, medical applicants preference science, and law applicants preference humanities, as seen in Figure 4.5). As a result, they are more academically able than other students in their course.

Another possible reason is that lower preferences are not necessarily weak preferences. Applicants are forced to rank courses that may be close substitutes. Offers for courses in fields that are genuine weak preferences are not accepted.[90]

Although people's interests tend to be stable, they do not always last. Among students considering leaving, those in all five of the disciplines with higher-than-expected risk give boredom or a lack of interest as a reason (Figure 4.7). Academic staff don't always help maintain students' interest. In engineering and IT, 9 per cent of students report that their teachers stimulate them intellectually 'not at all' or 'very little', the highest rates of any field. But this does not explain high attrition for science or the humanities, in which 5 per cent or less of students are not intellectually stimulated, among the lower rates across the disciplines.[91] In earlier research, subjects not being as interesting as expected was one of the more common reasons given for not re-enrolling.[92]

A range of factors contribute to completion differences between disciplines. From personal aspirations to employment outcomes to faculty quality, they can all play a role.

Figure 4.7: Boredom is a factor in high-attrition disciplines



Notes: Domestic bachelor-degree students. Data from 2013 to 2015.

Source: Social Research Centre/Department of Education and Training (various years).

90. Second-preference field offers are accepted or deferred 64 per cent of the time, compared to 74 per cent for first-preference field offers. Tertiary admissions centre applications data, 2014-2016, Department of Education and Training (various years).
91. Student Experience Survey, 2013-2015 data, Social Research Centre/Department of Education and Training (various years).
92. Long et al. (2006, table B.1). 46 per cent rated it as a reason for leaving, with 13 per cent reporting it as a 'large' influence on their decision not to continue.

5 Personal characteristics

Students' characteristics affect their likelihood of completing university. Men have a higher risk of dropping out than women. Students from remote areas have a higher risk than their city peers. Younger students have a lower risk than older students. This chapter looks at how these and other characteristics affect students' risk of not completing their course within eight years.

5.1 Gender

Women are more likely to complete university than men. Figure 5.1 shows that, controlling for other observable attributes, the risk of not completing is about 29 per cent for women and 34 per cent for men.

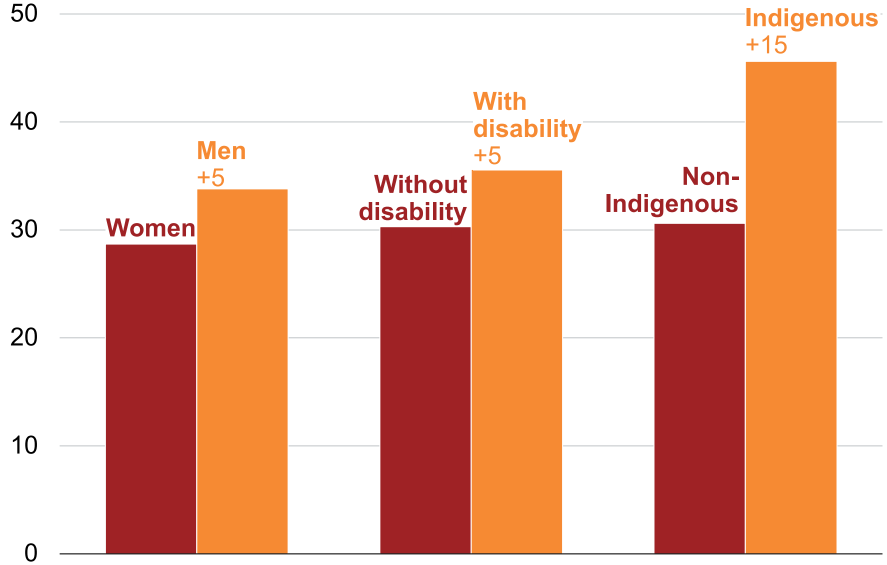
The comparative lack of good career alternatives for women may influence their persistence at university. Women have fewer options than men for well-paying careers without a bachelor degree. As Figure 5.2 shows, female and male graduates earn $350 and $410 a week respectively more than school leavers in early career, when they are aged 25-34. However, for men but not women, upper-level vocational qualifications also offer a wage premium over Year 12. For men, leaving university without finishing has less financial risk, provided they transfer to vocational education.

5.2 Students with a disability

Students with a disability have a higher risk of not completing. Disability can include learning, medical or physical attributes, or a combination of these. Most of these students report a medical disability. As Figure 5.1 shows, students with a disability face an average non-completion risk of about 36 per cent, about five percentage points higher than students without a disability, after controlling for other observable attributes.

Figure 5.1: The risks of not completing are higher for men, students with a disability, and Indigenous students

Risk of not completing within eight years, controlling for other factors, per cent



Notes: See Figure 2.2 on page 13.

Source: See Figure 2.2.

Financial stress among students with a disability may contribute to their higher risk of not completing. In a 2014 survey of first-year students from nine universities, 28 per cent of those without a disability reported they had experienced financial stress. But among the students with a disability, the figure was more than 50 per cent.[93]

Students with a disability also experience a higher level of social isolation at university; they are more likely to refrain from interacting with classmates.[94] Social isolation is a significant reason cited by students with a disability who leave university before second year.[95]

5.3 Indigenous students

Indigenous students represent less than 2 per cent of commencing bachelor-degree students.[96] The proportion has been growing, but Indigenous people are still under-represented at universities.[97]

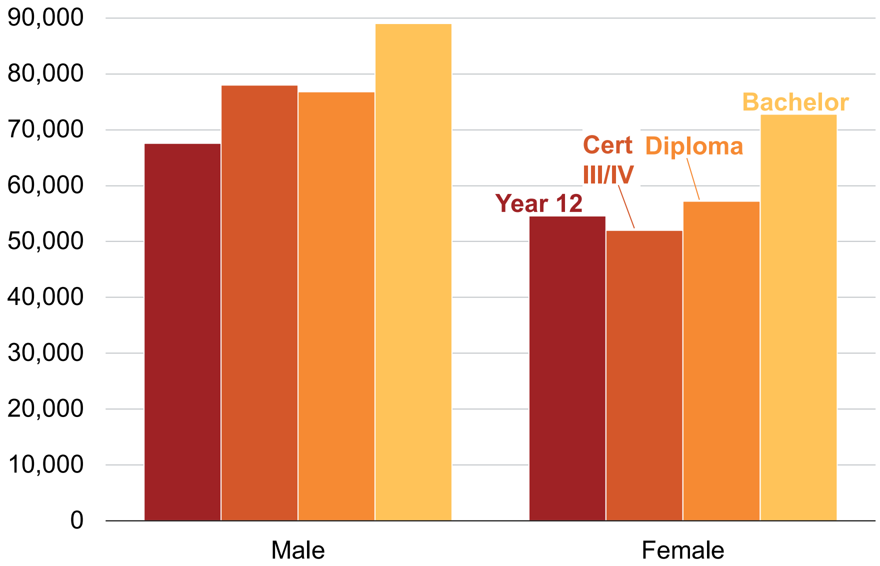
The enrolment share of Indigenous students is reduced further by high attrition. Non-Indigenous students face an average risk of dropping out of about 30 per cent. The risk increases by half for Indigenous students, after controlling for other observable attributes such as ATAR, age and remoteness.

Our analysis of prior academic achievement (Chapter 3) probably does not fully capture how this affects Indigenous students. Many universities have special admissions criteria for Indigenous applicants.[98] A relatively large proportion of Indigenous students are admitted on an

93. Baik et al. (2015, p. 82).
94. A higher proportion of students with a disability reported never making presentations or asking questions in class, Baik et al. (Ibid., p. 82).
95. Long et al. (2006, table A.9).
96. Indigenous includes students with Aboriginal origin, Torres Strait Islander origin, or both.
97. Department of Education and Training (2016, appendix 5.3).
98. For example, see the links at VTAC (2018); UAC (2017).

Figure 5.2: Women gain little financial benefit from upper-level vocational qualifications but a lot from a bachelor degree

Median annual income ($) from all jobs, 25-to-34 years old in 2016



Notes: Sample includes people born in Australia or born overseas and arrived in Australia at least ten years ago, employed and not studying. Weighted by weekly earnings in all jobs. Including people who are not working.

Source: ABS (2016c).

‘other’ basis, meaning their school results or previous tertiary education were not the main basis for their admission. It’s likely these Indigenous students begin their higher education studies with relatively weak academic preparation.

Compounding the effects of adapting academically to university study, Indigenous students face high rates of financial stress at university. More than 40 per cent say their financial circumstances have a negative effect on their study, compared to about a quarter of non-Indigenous students.[99]

Some studies report social isolation as an issue for Indigenous students.[100] Although the Student Experience Survey finds large proportions of Indigenous students report limited social interaction at university, this is also true for non-Indigenous students.

5.4 Age

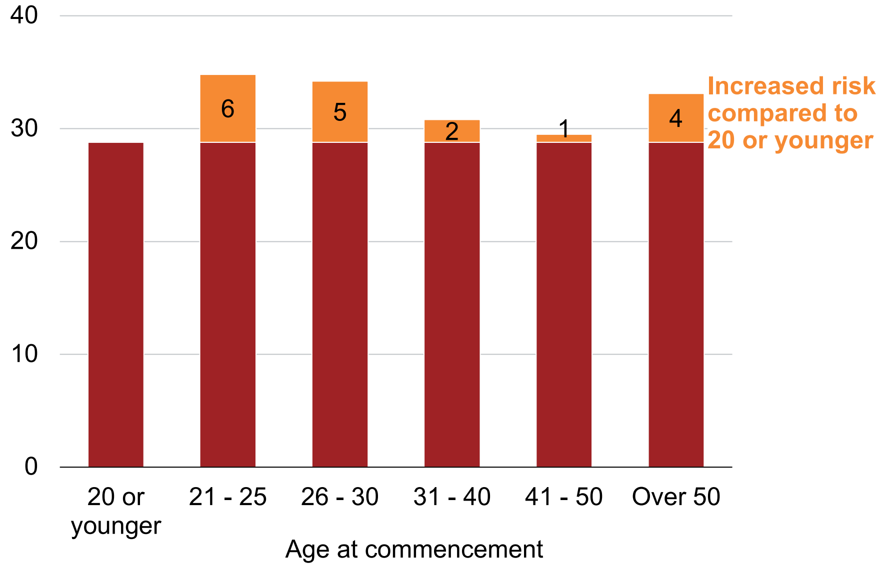
Students who commenced university age 20 or younger have the lowest average risk of not completing their course within eight years. They are the majority of commencing students and, as Figure 5.3 shows, their risk is about 29 per cent. Older students have a higher risk. Nearly a quarter of students commence in their early 20s. These students have a risk of about 35 per cent.

For part-time students, additional work commitments are a likely contributor to increased risk among older students. Figure 5.4 shows bachelor-degree students’ work patterns. For the youngest group – commencing at 20 or younger – most are either working part-time or not working while studying.[101] Students who commence later in their

99. Social Research Centre/Department of Education and Training (various years).
100. Baik et al. (2015, pp. 75–77).
101. A survey of first-year students found that the main sources of income for those aged 24 or younger are parents and family, part-time work, and Youth Allowance, Baik et al. (Ibid., table 5.4).

Figure 5.3: Older students have a higher risk of not completing

Risk of not completing within eight years, controlling for other factors, per cent



Notes: See Figure 2.2.

Source: See Figure 2.2.

20s are likely to still be studying in their late-20s or early-30s. At this stage of life, the share of students in full-time work rises rapidly.[102] Many students also start a family then, which adds to the calls on their time.

While older students are less likely to complete their course, the risk does not increase evenly with age. Students who commence in their 30s and 40s have lower risk than those who commence in their 20s. This may reflect declining work commitments. Rates of students working full-time fall in their mid-30s, while the part-time share rises. Risk falls marginally with age until the age of 50. Students commencing in their 50s face a similar risk of dropping out as those in their late-20s (although only a small proportion of students start studying in their 50s[103]).

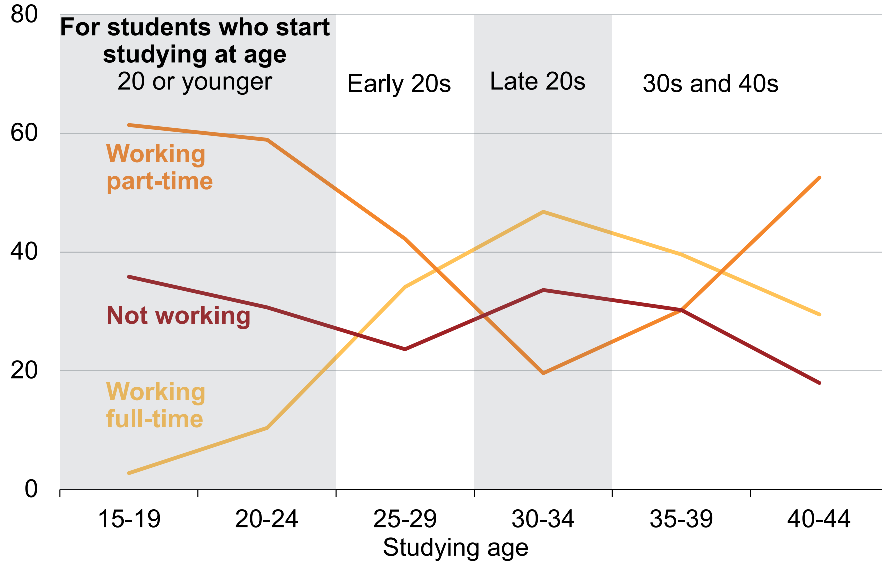
The higher risk of older students may also reflect their ATARs. As discussed in Section 3.1 on page 21, risks of not completing generally fall as ATAR rises. Most older commencing students have no ATAR recorded in the enrolment data, but on average they would have received an ATAR below that of school-leavers going direct to university. This is because most high-ATAR students enrol soon after finishing school, which is why more than half of recorded ATARs are above 80 (Figure 3.1).[104] This leaves a pool of lower-ATAR school students who do not go to university soon after finishing Year 12, but subsequently enrol at university as mature-age students.

5.5 Socio-economic status

Students need to finance their studies. A lack of money can lead them to spend too much time working rather than studying, or cause

102. The same survey of first-year students also found a rise in full-time work was one of the main sources of income for students aged 25 or over. But the age group is not further broken down.
103. About 1 per cent.
104. See Norton et al. (2018, figure 1).

Figure 5.4: Work commitments are the likely cause of an increased risk for students who commenced in their 20s and 30s
Per cent of bachelor-degree students enrolled



Notes: Bachelor-degree students who were born in Australia. Non-citizens cannot be identified in the 2011 Education and Work survey. Therefore, foreign-born students were removed to replicate this report's completion model. Includes non-commencing students. Students aged above 44 are not shown due to small sample size. 'Not working' includes unemployed and looking for work, and not in the labour force.

Source: ABS (2011).

distraction and stress that undermines their academic work. The enrolment data does not include any direct measures of student finances, but ABS socio-economic classifications of their home area can be used as a guide. This report's analysis uses the postcode of students' permanent home address to rank them according to the ABS socio-economic indexes for Australia. This report primarily uses the index of relative socio-economic disadvantage capturing various measures of income, education and employment in each postcode.[105]

Without controlling for other attributes, students in the lowest SES decile have a significantly higher risk of not completing (35 per cent on average) than those in the top decile (about 25 per cent). But these risks are partly due to other attributes that are often correlated with SES, such as ATAR. As discussed in Section 3.1 on page 21, students with lower ATARs tend to face higher risk.[106]

The difference in risk between high- and low-SES students reduces significantly after controlling for other observable attributes. While the risk remains higher for lower-SES students, the differences are small, as Figure 5.5 shows.[107] Students in the top decile have an average risk of 29 per cent; those in the lowest decile have a risk of 33 per cent.

On the standard low socio-economic status measure, which is based on the education and occupation levels of people living near the student's home address, completion risks differ even less than the relative disadvantage measure. Students from the top 10 per cent of home areas have a 30 per cent risk of not completing; students from the bottom 10 per cent have a 33 per cent risk of not completing.

Risk results for low socio-economic status students (and other equity groups such as Indigenous) require careful interpretation. While having a low-socioeconomic status does not of itself substantially add to risk, low-socioeconomic students are often over-represented among students with significant risk factors, such as weaker academic preparation or part-time study. Socio-economic factors may explain why the student had a relatively low ATAR, or why they need to work full-time and study part-time.

5.6 Remoteness of home location

Students enrolled at a regional campus or studying online have a slightly elevated risk of not completing a degree (sections 2.2 and 2.3).

105. Students' permanent home address is based on either their address in Year 12 (for school leavers) or their permanent home address (for others). The index also includes measures of occupation, housing, and social indicators such as the divorce rate: ABS (2013). The ABS also publishes three other indices as part of the Socio-economic Indexes for Australia (SEIFA). These are indexes of relative advantage and disadvantage, of economic resources, and of education and occupation. The index of education and occupation is used in the government's equity statistics. The index of relative socio-economic disadvantage (IRSD) was chosen for this analysis because this report is interested in the resources available to keep students studying, rather than socio-economic factors affecting the original enrolment. The other three indices were also tested in the regression. IRSD best describes the variation in completion. See also section Appendix A.

106. For the relationship between ATAR and SES, see Lamb et al. (2015, table 3.1) and Norton (2016, pp. 186–188).

107. The literature on SES is mixed. Cardak et al. (2017, p. 33) analyses the LSAY 2006 cohort and finds a similar result for SES. When ATAR is included in the regression, parental SES has a negative but statistically insignificant impact on completion by the age of 25. In the same regression, the study also includes another measure of available resources using a mix of school and personal SES information. Students are categorised into unlikely resource constrained (least disadvantaged), potentially resource constrained, and likely resource constrained (most disadvantaged). Surprisingly, it finds that being in the most disadvantaged group has a positive impact on completion compared to the least. Lim (2015) finds a negative effect on completion of low-SES when interacting with other characteristics such as gender and field of education. But the study includes few explanatory variables, probably because of sample size. Li and Carroll (2017) look at dropout at two stages: first-year and later-year. Using the government's University Experience Survey from 2013 and 2014, the study finds that low-SES has no effect on dropout for first-year students, while the effect is negative for later-year students, after controlling for other personal attributes but not ATAR. That is, later-year low-SES students are less likely to drop out. Note that the study uses the ABS index of education and occupation for SES, which is different to this report's analysis.

Regional and remote students increasingly move to city campuses to study.[108] Living far from home may contribute to financial stress. Regional and remote students are more likely to cite financial and fee difficulties as their reason for considering leaving.[109] Apart from financial concerns, regional and remote students are also more likely than metro students to cite issues with academic support.

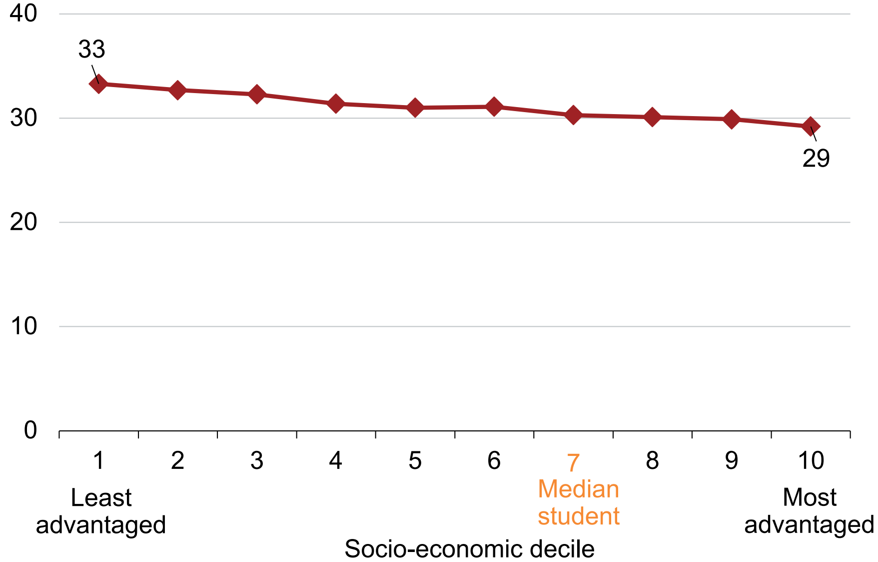
To overcome financial difficulties, many regional and remote students delay their study to work and increase their entitlement to government income-support. Youth Allowance recipients with an 'independent' status are exempt from the parental income test, usually increasing the amount they can receive. Currently, for students from regional areas to claim independence from their parents for Youth Allowance, they must work for at least 18 months after finishing school.[110]

An 18-month wait for independent Youth Allowance can delay starting university by two years. This shows in the number of regional students who take a gap year or two. About twice the share of regional students compared to metro students takes a gap year or two to work.[111] As

108. About 30 per cent of school leavers from regional and remote areas moved to the city in 2005. In 2015, the rate was nearly 60 per cent, Department of Education and Training (various years).
109. Note though that a similar proportion of regional and remote students cite health or stress as their reason for considering leaving as metro students. Based on a subsample of commencing students in the Student Experience Survey from 2013 to 2015 who have a CHESSN that could be matched with the enrolment records, Social Research Centre/Department of Education and Training (various years).
110. The analysis uses commencing students from 2006-2008. During this time, the criteria for Independent Youth Allowance is the same for both regional and metro students: working at least 30 hours a week for at least 18 months in the past two years, or working at least 15 hours a week in the past two years, or earning a specified amount of money over 18 months since leaving school. In 2011, independent status via work after school was restricted to outer regional or remote students, who were required to live away from home. Eligibility was extended to inner regional students in 2012: Daniels (2017).
111. Overall, young people were increasingly likely to take a gap year between 1999 to 2010. In 2009-10, the share among regional students was 37 per cent, compared

Figure 5.5: The non-completion risk difference between the top and bottom SES deciles is small

Risk of not completing within eight years, controlling for other factors, per cent



Notes: Based on the index of relative socio-economic disadvantage (IRSD). See Figure 2.2.

Source: See Figure 2.2.

discussed in Section 5.4, the longer students delay starting their degree, the higher the risk of not completing that degree.[112]

Despite these challenges, once we control for other attributes, regional students face a similar risk of not completing as major-city students – about 30 per cent, as shown in Figure 5.6. The similar rates suggest that the negative outcomes for regional students are triggered by other attributes, one of which is likely to be age.

Even after controlling for other attributes, coming from a remote location remains an added risk for completion. Remote students have a non-completion risk of about 33 per cent (about 3 percentage points higher than the risk for students from major cities), and students from very remote locations have an even higher risk, at 36 per cent. The increased non-completion risk makes their participation problem worse. Remote students represent about 2 per cent of school students, but only about 1 per cent of university students.[113]

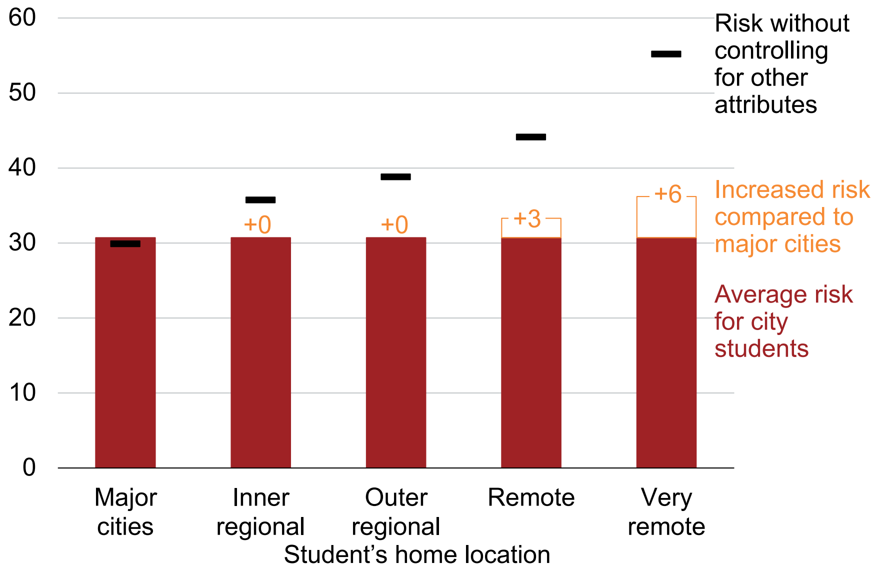
In early 2017, the Government amended the Youth Allowance independent rule for regional students. From 2018, the minimum working period required has been reduced from 18 months to 14 months.[114] This effectively cuts the eligibility waiting time from two years to one year. If this flows through to earlier university commencements, it could improve the average completion rate among regional students.

to 20 per cent for metro students, Lumsden and Stanwick (2012, table 5). As of 2017, successful regional applicants were twice as likely to defer their studies as metropolitan applicants: Department of Education and Training (2017c, p. 25).

112. There is evidence that rural students continue to work (full-time), once they start university, at a higher rate than urban students, James et al. (2010, p. 50).
113. Based on 2006, which is the first year of the cohort in the regression analysis, Productivity Commission (2006, figure 3.5). Low school completion rates contribute to the participation problem. About half of remote students finished school by age 19, compared to nearly 80 per cent of metro students, Lamb et al. (2015, p. 42).
114. Social Services Legislation Amendment (Simplifying Student Payments) Act 2017.

Figure 5.6: Regional and metro students have the same risk of not completing, after controlling for other factors

Risk of not completing within eight years, per cent



Notes: Remoteness is classified according to students' permanent address and the ABS remoteness classification. See Appendix A.3 on page 54 for calculation detail. See also Figure 2.2.

Source: See Figure 2.2.

5.7 Language background and country of birth

About 10 per cent of commencing bachelor-degree students speak a language other than English at home. Students from non-English speaking backgrounds tend to do well at school. They are more likely to complete Year 12 and have a higher ATAR on average.[115] They also have high aspirations to attend university and have high participation rates.[116]

Once at university, language background is less significant. Generally, the risk of not completing is similar whatever language students speak at home, after controlling for other factors. The exception is students who speak an East Asian language such as Chinese at home; their risk is nearly 5 percentage points lower than students who speak other languages. In the PISA test taken during Year 10, students with an East Asian language background tend to perform much better in mathematics, reading and science than those without. They also perform well in broader areas such as cognitive and behavioural skills, so their lower risk of not completing is perhaps unsurprising.[117]

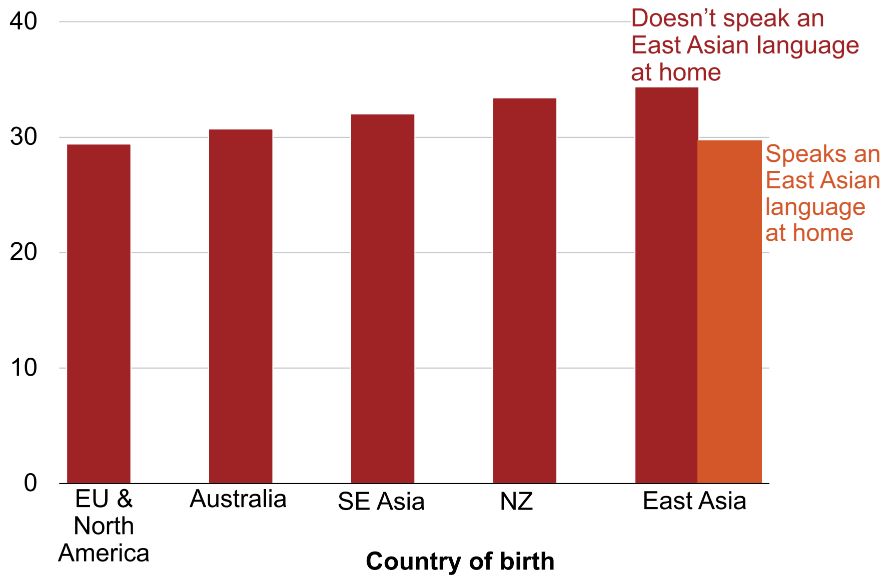
Where students were born has a stronger association with completion than language background, but the effect remains small. Figure 5.7 shows the risk of not completing university, by birth location.[118] Students who were born in Europe or North America have the lowest average risk, at 29 per cent controlling for other factors. The risk for Australian-born students is marginally higher at about 31 per cent.

East Asian-born students are an interesting case. Those who speak English at home are at relatively high risk of not completing their

115. Using language background other than English (LBOTE) group, Lamb et al. (2015, tables 3.1 and 3.5).
116. Meston (2016); and Bowden and Doughney (2010).
117. Lamb et al. (2015, tables 3.1 and 3.5).
118. When students arrive in Australia is not statistically significant. But this could be a result of small sample size.

Figure 5.7: Where students were born has some effect on their chance of completing a degree

Risk of not completing within eight years, controlling for other factors, per cent



Notes: Africa and South Asia are not shown because they are not statistically significant, which could mean their risk is similar to the Australian-born or that the sample size is too small. See also Figure 2.2.

Source: See Figure 2.2.

course. Yet those who speak their native language (or for Australian-born students, their parent's native language) at home are at relatively low risk. A similar effect is found at school in the United States, where East Asian-born students who speak Chinese at home have better results than East Asian-born students who speak English at home.[119] A possible reason is that East Asian cultures generally place greater emphasis on education, and speaking English at home suggests a weaker connection with East Asian cultures.[120]

Despite some variations, language and background and country of birth play only a small role in students' risk of not completing a bachelor degree, after controlling for other observable factors.

119. The study controls for personal characteristics including gender, number of siblings, family income and religion, Blair and Qian (1998, p. 368). Note that the study has a relatively small sample size of 253.
120. For discussion of British-Chinese families, see Francis and Archer (2004).

6 Cumulative risks

So far, this report has explored the effects of individual characteristics. While these effects can be small, students often have multiple risk attributes that together create a high risk of not completing university.

These factors can interact in complex ways. Simply adding up the effects of individual characteristics can give inaccurate results, especially for high-risk students. This chapter looks at a few examples of students and how their choices can affect their risk of dropping out.

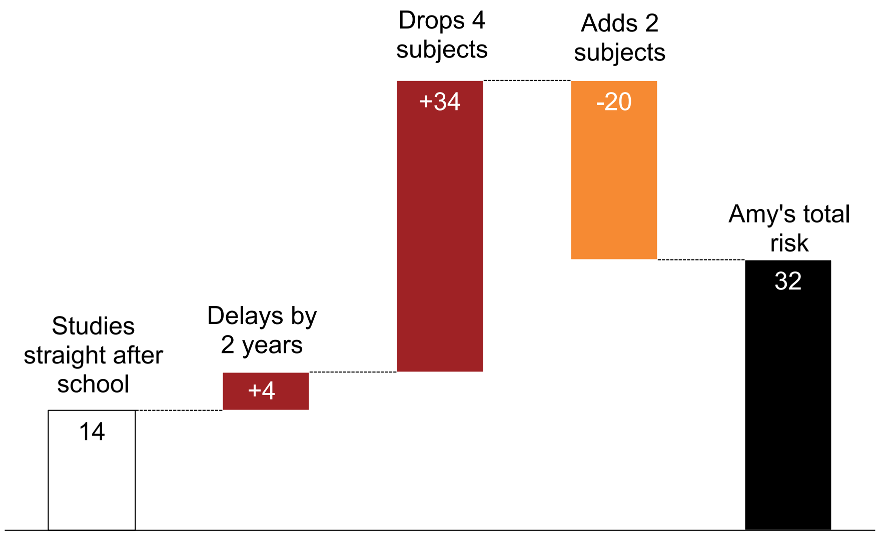
Amy – a nursing student

Amy is from inner regional Victoria. She was born in Australia and speaks English at home. After a delayed start, she finished school at age 20 and received an ATAR of 70. Her plan is to attend a local university campus. Amy is passionate about nursing but not sure if she should use money she has saved to travel for a couple of years before starting university. Currently, Amy's risk of not completing uni is low, at 14 per cent, as Figure 6.1 shows.

If Amy chooses to take two years off, her risk is expected to increase to 18 per cent. That is, of people with Amy's characteristics, about one in five do not complete a degree within eight years.

If Amy takes two years off to travel, she would use up her savings and would need to work while studying. So she would need to study part-time. Studying half time would increase her non-completion risk dramatically, to 52 per cent. But if Amy studied two more subjects, her non-competition risk would go down to 32 per cent. To maximise her completion prospects, Amy should try to keep down her paid work hours and take at least five subjects each year.

Figure 6.1: Amy's choices – studying straight after school minimises her risk of not completing university
Risk of not completing within eight years, per cent



Notes: Amy is assumed to be a non-Indigenous female Australian citizen who speaks English at home, reports no disability, lives in a median SES area in Victoria, does not move out of home, and starts university in the first semester. Amy uses high school as her basis of admission, studies on-campus, and lives 20-to-40 minutes from campus. For consistency, all the example students in this chapter are assumed to study at Australian Catholic University.

Source: Grattan analysis of Department of Education and Training (various years).

David – an uncommitted engineering student

David is in Year 10 and wants to be an engineer. He lives with his parents in Sydney. David did well at school when he was young, but since he started playing football he has spent most of his time training rather than studying. As a result, his academic results have declined. If David continues spending most of his time on football, he will struggle to achieve an ATAR of more than 70.

If David studied hard and achieved an ATAR of 80, his risk of not completing university within eight years of commencing would be 18 per cent, as Figure 6.2 shows. But if he doesn't, his ATAR could drop to 60, and his risk would increase substantially, to 30 per cent.

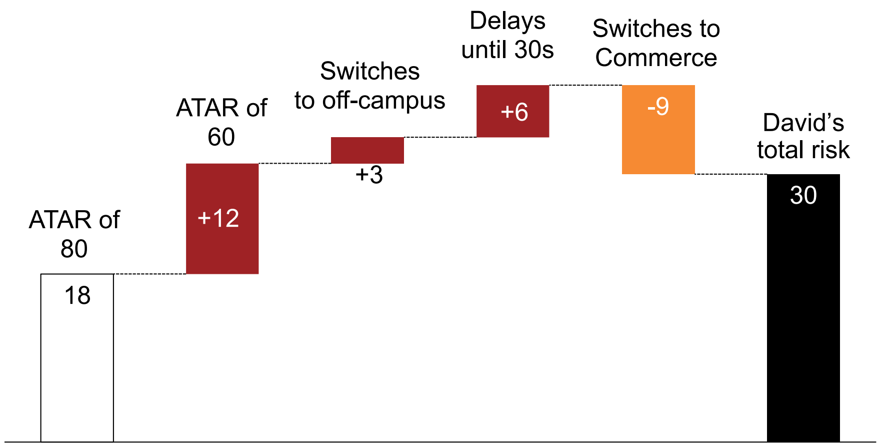
Unfortunately, David didn't spend enough time studying, and ended up with an ATAR of 60. He is now thinking of studying online. The difference in risk is quite small: if he studies on-campus, his risk is 30 per cent; if he studies off-campus, it rises to 33 per cent.

David is also considering working for a while and returning to education later. If he waits until his 30s before commencing university, his risk of not completing would increase further, to 39 per cent. So if David wants a degree, his best choice is to not delay his study.

But let's assume David does delay, and during the wait he loses his passion for engineering and becomes concerned that his maths is not strong enough. So now he is considering studying business instead. If he ends up choosing Commerce rather than Engineering, David's non-completion risk would come back down to 30 per cent.

Figure 6.2: David's options – he should study hard at school

Risk of not completing within eight years, per cent



Notes: David is assumed to be a non-Indigenous male Australian citizen who speaks English at home, reports no disability, lives in a median SES area in NSW, does not move out of home, lives 20-to-40 minutes away from campus, and starts university in the first semester. David uses high school as his basis of admission.

Source: Grattan analysis of Department of Education and Training (various years).

Karen – a mature-age science student

Karen is 35 and works in hospitality in Brisbane. She wants to up-skill, to improve her employment prospects. Karen left school in Year 10 and has no post-school qualification. She is planning to study part-time, so she can continue to work. Because she was good at science at school, she is considering doing a bachelor of science.

If Karen takes a light study load of four subjects a year, her risk of not completing the degree within eight years is 68 per cent, as Figure 6.3 shows. That is, most people in Karen's situation will not finish. If Karen were to take two extra subjects in her first year, her risk of not completing would fall substantially, to 50 per cent. But she can't take the extra subjects because she judges that she can't afford to reduce her hours at work. After noticing that science graduates have relatively bad employment outcomes, Karen decides to do teaching instead. Her risk of not completing university is reduced marginally, from 68 per cent to 63 per cent. Nonetheless, Karen's chances of completing a degree within eight years are still low.

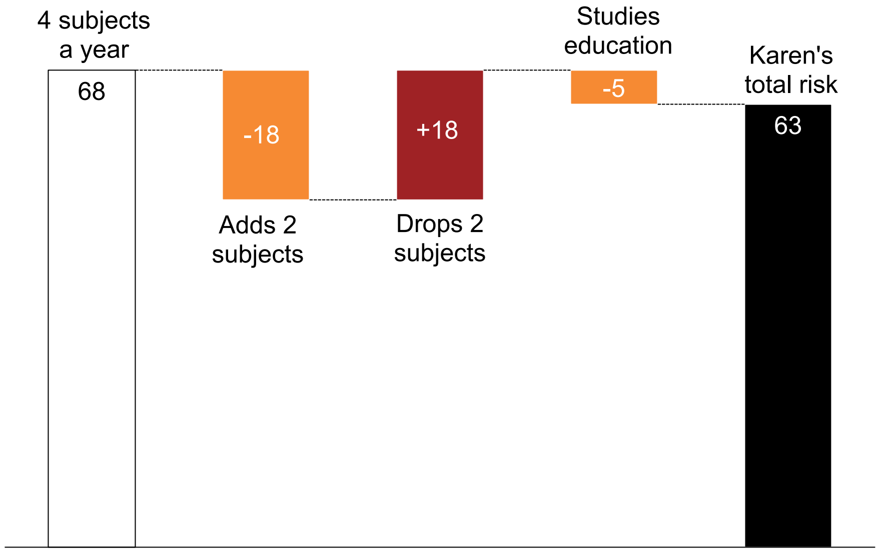
Tom – an Arts student

Tom is a 25-year-old from remote New South Wales. He has completed a diploma of professional writing. He was a reporter for a local paper, but was recently made redundant so is thinking of up-skilling by studying a bachelor of humanities and journalism. He can either study at an outer regional campus or move to the city.

If Tom studies at his nearby outer regional campus, his risk of dropping out would be 36 per cent, as Figure 6.4 shows. If he moves to Sydney to study, his risk would fall to 29 per cent.[121] But if Tom moves out of his parents' home, he would have to work to pay rent. Because of those work commitments, Tom would need to reduce the number of subjects he does by four. As a result, his risk of not completing university would leap to 64 per cent. That is, nearly two in every three students in Tom's situation are expected to not complete within eight years.

121. This includes the benefit of moving away from permanent home of about 1 percentage point.

Figure 6.3: Karen's situation – she is at high risk of not completing university unless she takes on a heavier study load
Risk of not completing within eight years, per cent



Notes: Karen is assumed to be a non-indigenous female Australian citizen who speaks English at home, reports no disability, lives in a median SES area of Queensland, does not move out of home, lives 20-to-40 minutes from campus, and starts university in the first semester. Karen does not have an ATAR; she uses mature age as her basis of admission.

Source: Grattan analysis of Department of Education and Training (various years).

Since rent is expensive in Sydney, Tom is also considering living on the outskirts of Sydney and studying off-campus while he works part-time as a clerk. If he studies off-campus, his risk would increase slightly to 66 per cent.[122] But because rent is cheaper on the city outskirts, Tom could work fewer hours and increase his study load by two subjects, which will reduce his risk to 46 per cent. He could reduce his risk even further by studying full-time, even if he has to stay at home in remote New South Wales and enrol at an outer regional campus.

Jane – an aspiring law student

Jane was born in China and now lives in Adelaide. She wants to study law full-time at university straight after school. According to her teacher, Jane is very bright and can get an ATAR of more than 90 if she applies herself.

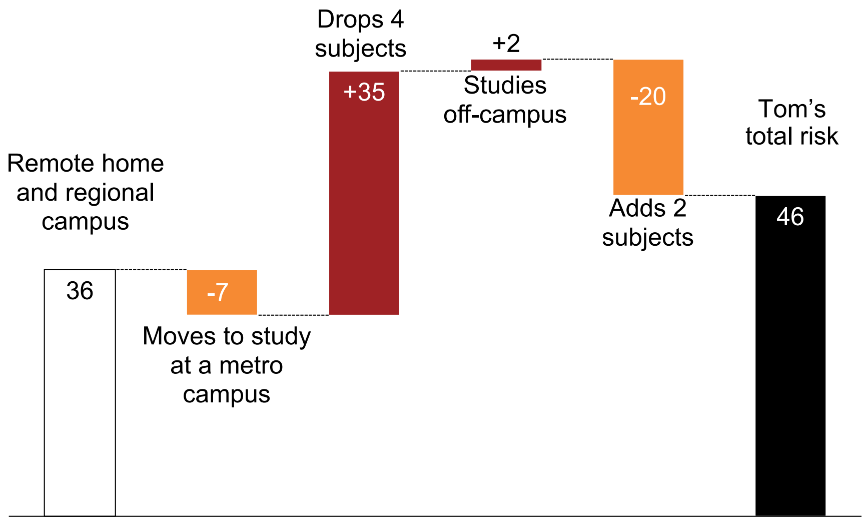
But like David, Jane was distracted in Year 12; she spent a lot of her time on social media. Her ATAR suffered as a result. If Jane studied hard and achieved an ATAR of 90, her risk of not completing university would be very low at 4 per cent, as Figure 6.5 shows. Instead, Jane got an ATAR of 75. Her risk more than doubles, but is still low at about 10 per cent.[123]

Because Jane did not get a high enough ATAR to do law, she is going to do Arts instead. Her risk of not completing university more than doubles again, to 24 per cent.

Jane's personal characteristics suggest a very low risk of dropping out of university. Her choices, however, could increase that risk by nearly six times. Instead of a one-in-25 chance of not completing, Jane ends up with a risk of one in four. Yet her final risk remains lower than David's, largely because of her higher ATAR.

122. Still assuming he takes four subjects a year.
123. Assumes she is studying law at a metro campus in Adelaide.

Figure 6.4: Tom's choices – he should study full-time
Risk of not completing within eight years, per cent



Notes: Tom is assumed to be a non-Indigenous male Australian citizen who speaks English at home, reports no disability, lives in a median SES area of NSW, lives 20-to-40 minutes from campus, and starts university in the first semester. Tom uses his previous diploma as his basis of admission.

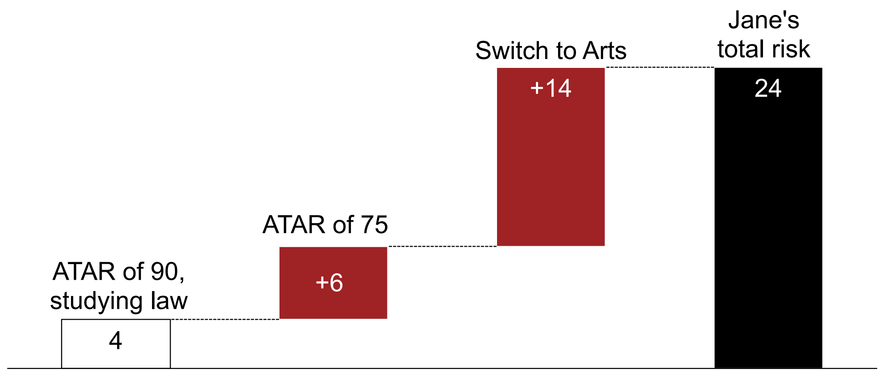
Source: Grattan analysis of Department of Education and Training (various years).

Among the example students, Karen and Tom have the highest risk of not completing university within eight years. Part-time study is a major risk for both; the fewer subjects they do, the higher their risk. Tom's circumstances let him choose between different options and use individualised risk data to minimise his risk. Karen's circumstances are different. She cannot take on a heavier study load. Karen can use this information to understand her likely challenges. This information may be unnerving, but hiding it from her will not help her to better prepare for these challenges.

The examples of Amy, David, Karen, Tom and Jane show how personal characteristics and study choices affect completion prospects. Karen end up with attributes and choices that make it more likely that they will drop out than complete, and Amy avoids one scenario that would put her risk of dropping out at more than 50 per cent.

Figure 6.5: Jane's options – her risk is low, but if she studies hard it could be lower still

Risk of not completing within eight years, per cent



Notes: Jane is assumed to be a non-Indigenous female Australian citizen born in China who speaks English at home, reports no disability, lives in a median SES area of SA, does not move out of home, lives 20-to-40 minutes from campus, starts university in the first semester, and studies on-campus. Jane uses high school as her basis of admission.

Source: Grattan analysis of Department of Education and Training (various years).

7 Overall student risk

Chapter 6 shows how the personal circumstances of individual students influence their prospects of completing university. This chapter examines the risks faced by the whole cohort of commencing students.

Most students are at a low to moderate risk of not completing within eight years. Of the students commencing bachelor degrees in public universities in 2015, more than a third have a 20 per cent or lower risk of not completing, and nearly 60 per cent have a 30 per cent or lower risk of dropping out.

But one in five – about 50,000 students – are more likely to drop out than to complete their course. And nearly one in ten – about 25,000 students – have a non-completion risk of more than 70 per cent (Figure 7.1).

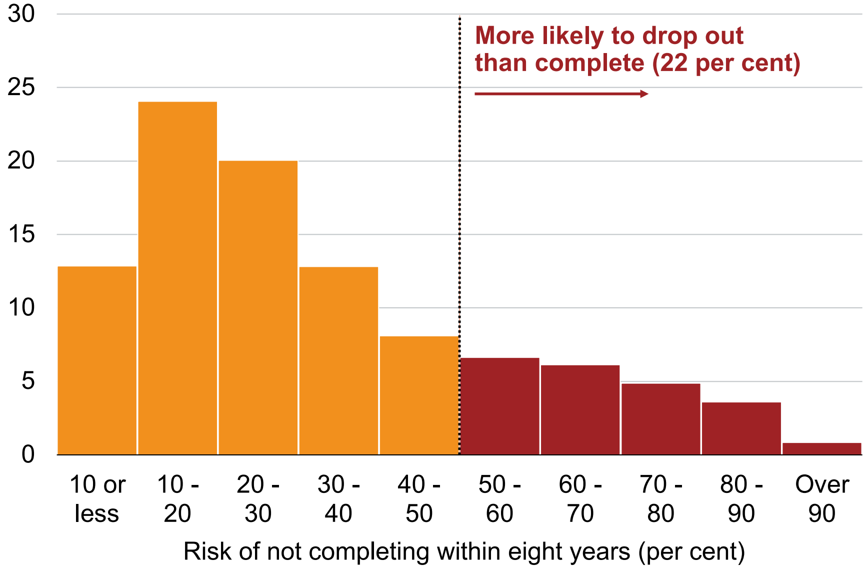
Most high-risk students study part-time, as Figure 7.2 shows. Among students who are more likely to drop out than to complete, more than 80 per cent take four subjects or fewer in their first year. Less than 5 per cent of students who study more than six subjects are more likely to drop out than to complete.

Low ATAR is another major risk factor. As discussed in Section 3.1, students with an ATAR below 60 face double the non-completion risk as those with an ATAR of 90 or more among students with otherwise similar backgrounds.

Both part-time and low-ATAR student shares have increased in recent years. Part-time students grew from 16 per cent to 18 per cent of commencing enrolments between 2008 and 2016, as Figure 7.3 shows. The share fell slightly in 2016 but its level was still much higher than in most years since 2008. During the same period, below-60 ATAR students grew from about 5 per cent to more than 8 per cent of

Figure 7.1: One in five students is more likely to drop out of university than complete their course

Commencing bachelor-degree domestic students 2015, per cent



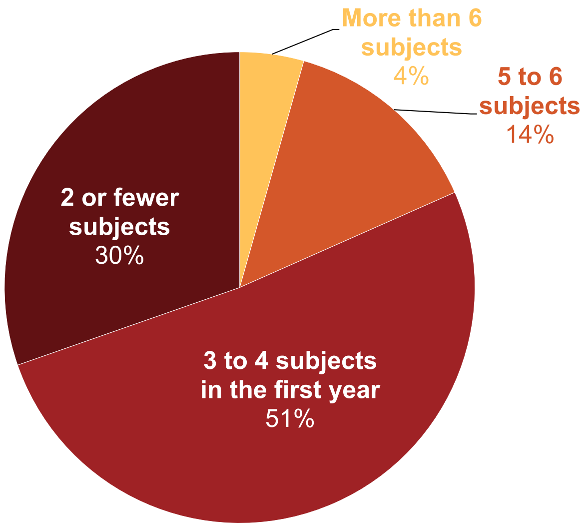
Notes: For details on the modelling techniques, see Appendix A..

Source: Grattan analysis of Department of Education and Training (various years).

students with an ATAR recorded in the enrolment data.[124] The growing numbers of part-time and low-ATAR students help explain why overall non-completion rates are increasing (Chapter 1).

124. Universities vary in whether and how they report ATARs. The true number of low-ATAR students is likely to be higher than shown in the figure; Cherastidtham and Norton (2018).

Figure 7.2: Of students who are more likely to drop out than complete, more than 80 per cent study part-time

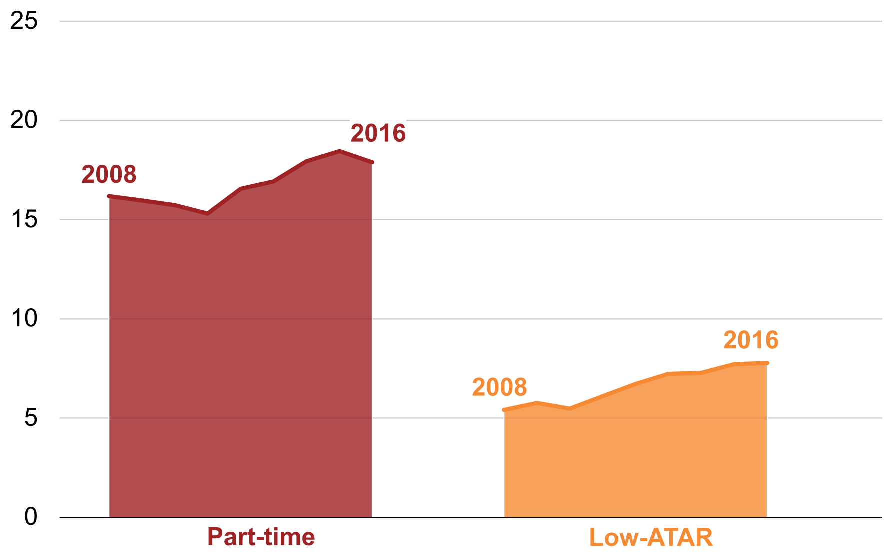


Notes: Rounding means the percentages do not add up to 100. For details on the modelling techniques, see the Appendix A..

Source: Grattan analysis of Department of Education and Training (various years).

Figure 7.3: The shares of part-time and low-ATAR commencing students are increasing

Commencing bachelor-degree students, 2008-2016, per cent



Notes: Low-ATAR is defined as students with an ATAR below 60, measured against the total number of domestic bachelor enrolments with an ATAR. The share of part-time students is based on classifications at commencement. But because some students drop out before the second semester, the actual proportion of students classified as part-time – studying fewer than three standard-size subjects over the first two semesters – is higher than in Figure 2.1 on page 12.

Source: Grattan analysis of Department of Education and Training (ibid.).

8 Conclusion

Attrition should not be eliminated but it could be reduced. Prospective university students in Australia are often not well-informed when making enrolment decisions. This report identifies high-risk factors associated with university non-completion. The analysis focuses on factors known at or before enrolment.

Because the underlying analysis in the risk calculation is restricted to data already collected by the Department of Education and Training, it cannot include all relevant information. None of the variables used directly measure key personal factors affecting academic success, such as intelligence, effort, or study practices. But some incorporate their effects. ATAR predicts completion because it reflects ability, organisation and effort. Part-time study is a sign that the student has other things going on that distract from their studies. Prospective students should incorporate other personal information into their decision.

But even with the key personal factors, no model can perfectly predict a student's outcome. Promising students sometimes leave university without a degree, while other students succeed against the odds. That's why the model predicts risk rather than an absolute outcome – nobody is given a 100 per cent chance of completion, and nobody is given a zero per cent chance of completion.

That said, this report uses the most comprehensive higher education dataset for Australia. The dataset includes all students and has the ability to track students across universities. And the results are predictive of completion prospects.

While statistical analysis cannot prove causal impact, Chapters 2 to 5 demonstrate that some factors known at or before enrolment are strongly associated with non-completion risk. Figure 8.1 on the following page summarises the main results.[125]

The most negative factor is part-time study. The fewer the subjects students take in their first year the lower their chance of completing within eight years. Part-time study might seem to deal with the competing demands of work and family, but for most students it does not, and they leave university without completing their course. Many prospective students are unaware of how hard part-time study is until it is too late.

For some students, studying full-time may be impractical. But some part-time students do transition to full-time. Their completion rates are much higher than those who continuously study part-time. So if at least periods of full-time study are possible, students should seriously consider it.

Prospective students should be given more information. The main report, *Dropping out: the benefits and costs of trying university*, proposes including analysis similar to this report on the Department of Education and Training's QILT (Quality Indicators for Learning and Teaching) website. Students could combine this information with their own knowledge of themselves and their circumstances, to make better decisions. With better information, students can plan for success by changing the way they study or at least preparing for the likely challenges.

125. For the full list of results, see Appendix B.

Figure 8.1: Summary of regression results by strength of characteristic impact on completion

High impact
• ATAR • Indigenous • Study load (part-time or full-time) • Field of education • Institution

Moderate impact
• Age • Gender • Disability • Remoteness of permanent home

Low impact
• Socio-economic status • Mode of attendance (online or on-campus) • Country of birth • Language spoken at home • Highest prior qualification • Remoteness of campus • Travel time from term home to university

Notes: 'Strong' impact refers to log odds of at least 0.5 between the most impactful category (except 'other') and the baseline. 'Moderate' refers to log odds of at least 0.3 and less than 0.5. 'Low' impact refers to log odds of lower than 0.3. See the full list of results in Appendix B.

Appendix A: Methodology

A.1 Data

The Department of Education and Training's Higher Education Student Data Collection is the main dataset used in this report. The collection includes course, fees, and student information at all public universities and other providers that receive subsidies or HELP from the Australian Government.[126] The latest data available at the commencement of this paper was for 2015.

Our analysis uses the Commonwealth Higher Education Student Support Number to track students over time and across institutions. Introduced in 2005, CHESSN is a unique student identifier issued by the Department for each student who receives Commonwealth support. The number is recorded as part of the higher education data collection.

The paper examines outcomes for domestic bachelor degree students starting at a public university (Table A institutions).[127] A small number of students without a CHESSN are excluded.[128] Groups that are excluded from this analysis, beyond those who don't have a CHESSN, are discussed in Appendix A.7.

The report also includes data on driving time collected from Google Maps API (Appendix A.3.3).

126. Higher education providers are required under the Higher Education Support Act 2003 to submit statistics to the Department, HESA 2003, Subsection 19-70 (1).
127. Except for Batchelor Institute of Indigenous Tertiary Education, because of low sample size. For a list of institutions, see Department of Education and Training (2017g).
128. About 0.44 per cent of domestic bachelor degree students (about 2,300 students) who commenced between 2006 and 2008 do not have a CHESSN, Department of Education and Training (various years).

A.2 Completion

Because students often move in and out of study or study fewer subjects than a full year's load, completion rates can vary significantly depending on how many years of data are included. The Department's analysis and many other studies use the longest possible timeframe.[129]

CHESSN was introduced in 2005, so that is the earliest possible starting date (because students cannot be tracked between institutions before then). Tracking students is important for ensuring that students' commencement year and completion status are accurately determined. We decided not to start in 2005, due to the high chance of that year's commencing students being first enrolled in 2004 or earlier. This leaves the 2006-to-2015 cohorts in the dataset, with a maximum timeframe of ten years.

A ten-year timeframe would limit the analysis to one cohort only – 2006 commencing students, reducing the potential sample size. While the overall sample size for each cohort is large, analysing smaller sub-groups such as some languages spoken at home or detailed study load is less reliable with one cohort. A timeframe of eight years was chosen in the interests of sample size. This means the regression population is students who first commenced between 2006 and 2008.[130] An eight-year timeframe still includes the vast majority of students who are likely to complete. As Figure A.1 shows, the marginal increase in completion rate is about 1 per cent in year nine and less than 1 per cent in year ten.

129. For example, see Li and Carroll (2017) and Cardak et al. (2017).
130. Some of these students may have enrolled in another course before 2005, but we are unable to track them.

To assess completion status, university completion records are matched to students in the regression population using CHESSN. A student has completed if they have at least one completion record in a bachelor degree at any public university. Students who change university and/or course are counted.

If a student is only associated with one completion record and the completion is in the same year as course commencement, the records are excluded.[131] The commencement record of the completed course must occur after the enrolment's commencing year.

Unlike the Department's completion study, our analysis includes only bachelor degree completions, rather than completions of any under-graduate award course including diploma. This means our completion rate is a couple of percentage points lower than the Department's.

A.3 Explanatory variables

Figure 1.6 in Section 1.2 lists the explanatory variables included in the regression analysis. Table A.2 on page 57 describes each variable and its corresponding element name in the Higher Education Student Data Collection. These control variables are mostly derived from the student's commencing year. For study load, the aggregate load of the first two semesters is used.

Some variables required significant manipulation. These are described in the rest of this subsection.

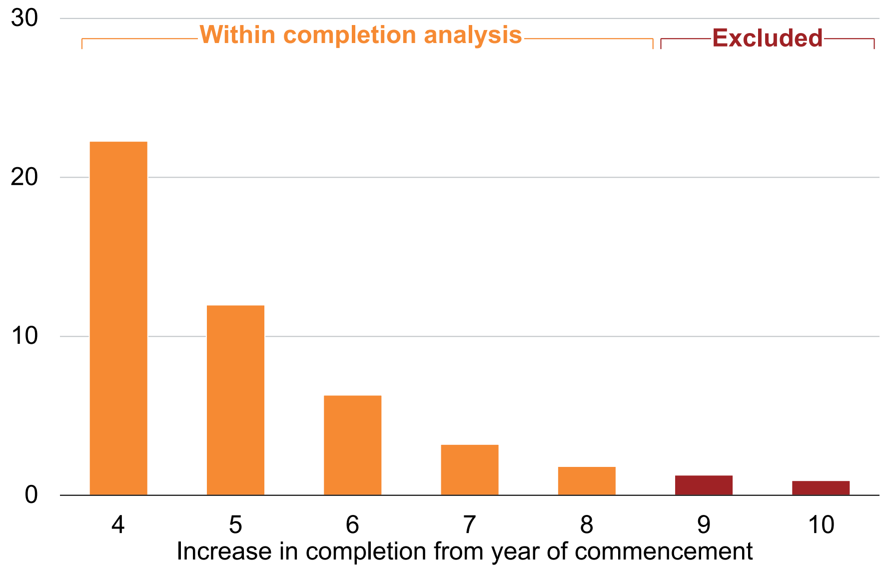
A.3.1 Permanent and term locations

Students' permanent and term locations are used to derive socio-economic status, home-remoteness indicator, travel time and a move-out indicator (not used in the report).

131. Less than 1 per cent of the observations were excluded.

Figure A.1: About 2 per cent of students complete in years nine and ten and are excluded from the regression analysis

Marginal increase in completion rate as timeframe increases by one year, percentage point



Notes: 2006 commencing students.

Source: Department of Education and Training (various years).

The Department data collection has three main address types:

- Term postcode
- Permanent home street address and postcode[132]
- Year 12 home postcode

While the Department provides some guidance for these terms, they are not consistently used across different universities. For example, The University of Melbourne asks for a contact address and a home address, noting 'Your home address is your permanent address, *e.g.* parents' address'.[133] But the Australian National University and Victoria University ask students for 'permanent home address' without clarification.[134] For both these providers, the definition of 'permanent' is left to the applicant.

To overcome some of these inconsistencies, Year 12 home postcode is used. For students aged under 25, their Year 12 address, when available, represents their permanent address. Otherwise, permanent address (converted into an ABS census collection district) is used. If a permanent address is not available, the student's permanent postcode is used.

A.3.2 Remoteness location

The ABS Remoteness Structure based on the Australian Standard Geographical Classification was used to classify each postcode as one of 'Major Cities', 'Inner Regional', 'Outer Regional', 'Remote', or 'Very Remote'.[135]

Remoteness Area classification represents both accessibility and remoteness characteristics. Due to their cut-off points, use of the Remoteness Area categories requires caution. For example, Tasmania and the Northern Territory do not have 'Major Cities', while some areas which are traditionally known as regional centres, such as Geelong in Victoria, are considered 'Major Cities'. Where a postcode was in more than one remoteness category (*e.g.* in both remote and very remote), the category with the largest proportion of people was used.

To classify students' remoteness location, their permanent address, as defined in Appendix A.3.1, is converted into a corresponding remoteness category. Students whose address is missing or whose postcode could not be classified according to the ABS remoteness area classification (about 1,000 to 2,000 observations per year) are omitted.

Campus remoteness location is determined by campus postcode. The Department collects campus postcode for each subject a student takes. Most students study at one campus in their first year. For students whose subjects are taken across different campuses, the most common campus based on equivalent full-time student load (EFTSL) was chosen. In the rare occasion of equal EFTSL for two or more campuses, the lowest numerical postcode was chosen. Each postcode is converted into a respective remoteness category. Because few students study at a remote or very remote campus, remote and very remote campuses were merged with outer regional campuses.

There are 25 postcodes in the data that are not in the correspondence table. Locations of these postcodes were manually assessed using the Remoteness Area classification of their neighbouring postcodes.

132. The Department collects each address and converts it into a collection district.
133. The University of Melbourne, accessed via eStudent portal.
134. The Australian National University, accessed via ISIS portal; Victoria University.
135. ABS (2006).

A.3.3 Driving time

Driving time between permanent address and campus, and between term address and campus, was generated using Google Maps database accessed via a statistical software package, R.[136]

The R package ‘placement’ was used to estimate drive time and distance between a student’s origin and destination.[137] The code follows the format below.

> drive_time(**origin**, **destination**, auth = “standard_api", clean = “FALSE", travel_mode = “driving", units = “metric", add_date = ‘today’)

in which:

- **origin** is the latitude and longitude coordinates of the centre-point from the collection district of a student’s term address. See Appendix A.3.1 for determination of a student’s term address collection district.
- **destination** is the full name of the provider, the campus postcode and state, followed by “, Australia”. This name-postcode-state-country formatting of the destination reduces the likelihood of error.

The remaining elements of the code ask for the driving time in metric units at a fixed point of the day, for consistency across results. For example, consider a student who lives in Fitzroy North, Victoria, and attends RMIT’s Melbourne CBD campus. Their origin is determined by taking the centre-point coordinates of their term residence CD:

> -37.7840, 144.9860

136. Google Maps API, see Google (2017).
137. Darves (2016).

Table A.1: Example distance calculation using Google Maps

	Origin	Destination	Drive time	Drive distance
Input	-37.7840, 144.9860	RMIT University, 3000 VIC, Australia		
Output	42 Mark St, Fitzroy North VIC 3068	124 La Trobe St, Melbourne VIC 3000, Australia	13 mins	3.9 km

Their destination is entered as:

> RMIT University, 3000 VIC, Australia

The ‘placement’ package submits this request to the Google Maps API, which converts the origin and destination to addresses and estimates the driving time and distance between the two points. Table A.1 shows the results for this example.[138]

This process was repeated for all 742,000 unique origin-destination routes within the usable data. Drive time and distance was then applied to each internal student using term residence collection district, provider name and campus postcode to define a match.[139] The process generated transit information for 99.3 per cent of students with a term address.

For the regression model, drive times for internal students were categorised into: less than 20 minutes, 20 to less than 40 minutes, 40 to less than 60 minutes, and greater than or equal to 60 minutes.

138. This example can be accessed via the link: https://tinyurl.com/grattransit.
139. An internal student is one who has all classes on campus. A multimodal student has some classes on campus.

Table A.2: List of controls or explanatory variables

Variable	Description	HEIMSHELP element/notes
Indigenous	A binary indicator for students who identified as Aboriginal and/or Torres Strait Islander	316
Disability	A binary indicator for students with one or more types of hearing, learning, mobility, vision, medical and other disability.	386
Citizenship status	A binary variable indicating whether a student is or is not an Australian citizen.	358
Socio-economic index	Socio-Economic Indexes for Areas (SEIFA) code for a student's permanent address. This is applied to a school leaver's year 12 home location and a non-school leaver's home location.	Derived from elements 320 and 476.
Home language	Groups reflecting a student's language spoken at home.	Derived from element 348
Country of birth	Groups reflecting a student's country of birth.	Derived from element 346
Year 12 home state	State of a school leaver's year 12 home address.	Derived from element 476
Home remoteness indicator	Remoteness of a student's home location. See sections A.3.1 and A.3.2 for details.	Derived from 320 and 476
ATAR	Student's ATAR rank.	369
Basis for admission	Student's basis for admission. This can take the forms: high school, higher education, vocational education, mature age, professional qualification and other.	327
Highest prior qualification	Student's highest prior qualification. This can take the forms: complete and incomplete year 12, higher education, sub-bachelor, vocational education and other	493
Campus remoteness indicator	Remoteness of a student's campus location.	Derived from element 459. See Appendix A.3.2 for details.
Value of credit used	A student's credit applied to their course from prior study.	560

Continued on next page

Table A.2 – *continued from previous page*

Variable	**Description**	**HEIMSHELP element/notes**
Course load	A binary variable indicating that a student's course has a full-time load of four years or greater. Note that students in courses less than three years or greater than five years are excluded from analysis (except for medical courses)	350
Moved out indicator	A binary variable indicating whether an internal student is attending an institution more than 120 minutes away from their year 12 home location.	Derived from element 476. See Appendix A.3.3 for details.
Participation age	A student's age on the 1st of July of their commencing year. Students with ages less than 12 and greater than 98 are excluded.	913
Student load	The aggregated equivalent full-time student load of the student in their first year.	Derived from elements 931 and 339
Semester 2 start	A binary variable indicating whether a student started their course in the second semester. Defined as having zero units with a census date before July in a student's commencing year.	Derived from elements 339 and 489
Mode of attendance and travel time	An indicator of a student's mode of attendance (internal, external or multi-modal). Internal students are broken into subgroups by driving time to campus.	Derived from elements 329, 459 and 319. See Appendix A.3.3 for details.
Gender	A binary variable indicating whether a student's gender is female.	315
Field of education	A student's field of education at enrolment, categorised into: Science, IT, Engineering, Architecture, Agriculture, Other health, Medical, Nursing, Education, Commerce, Humanities, Law, Creative arts.	Derived from 461. See Table A.3

Continued on next page

Table A.2 – *continued from previous page*

Variable	Description	HEIMSHELP element/notes
University	A Table A university where a student was first enrolled: Australian Catholic University Charles Darwin University Charles Sturt University CQUniversity Curtin University of Technology Deakin University Edith Cowan University Federation University Australia Flinders University Griffith University James Cook University La Trobe University Macquarie University Monash University Murdoch University Queensland University of Technology RMIT University Southern Cross University Swinburne University of Technology The Australian National University The University of Adelaide The University of Melbourne The University of New England The University of Newcastle The University of Queensland The University of Sydney The University of Western Australia University of Canberra University of New South Wales University of South Australia University of Southern Queensland University of Tasmania University of Technology Sydney University of the Sunshine Coast University of Wollongong Victoria University Western Sydney University Batchelor Institute of Indigenous Tertiary Education was excluded from analysis.	306

Note: For full detail of the elements, see Department of Education and Training (2017h)

Table A.3: List of controls or explanatory variables

Analysis discipline	Observations	ABS Field of Education code
Science	n = 32,207	01 (Natural and physical sciences)
IT	n = 11,371	02 (Information technology)
Engineering	n = 20,210	03 (Engineering and related technologies)
Architecture	n = 10,983	04 (Architecture and building)
Agriculture	n = 7,167	05 (Agriculture, environmental and related studies)
Medical	n = 5,564	0601 (Medical studies), 0607 (Dental studies), 0611 (Veterinary studies)
Nursing	n = 26,421	0603 (Nursing)
Other health	n = 26,600	06 (Health), excluding those included in medical and nursing
Education	n = 31,531	07 (Education)
Commerce	n = 66,540	08 (Management and commerce), and 0919 (Economics and Econometrics)
Humanities	n = 79,790	09 (Society and culture), excluding 0919 (Economics and Econometrics) and 0909 (Law)
Law	n = 5,720	0909 (Law)
Creative arts	n = 18,578	10 (Creative arts)

Note: 'Observations' represent the number of enrolments in the final regression analysis. See ABS Field of Education classification for details.

A.4 Modelling

The report draws from estimation results using a multi-level logistic model with two nested clusters where field of education is the first grouping and universities are clustered within each field of education.

A multi-level model is sometimes known as a hierarchical model because it allows data to cluster within groups.[140] In our case, because students attending the same university may be more similar to students at a different university, their responses may be correlated. Our multi-level model allows for similarities between students within a university and field of education. In matrix notation, the model is described below.

$$P(\mathbf{Y} = 1|\mathbf{X}, \mathbf{Z}, \mathbf{W}) = \Theta(\mathbf{X}\beta + \mathbf{Z}u + \mathbf{W}v + \varepsilon)$$

$\mathbf{Y}$ is a vector of completion results where 1 represents completion within eight years and zero otherwise. $\mathbf{X}$ is a matrix of covariates for the fixed effects. These covariates are listed in Table A.2 with regression coefficients as β, excluding field of education and university indicators. $\mathbf{X}$ and $\mathbf{W}$ are random intercepts where $\mathbf{X}$ is a vector containing field of education and $\mathbf{W}$ containing university data. The errors, ε, are distributed as logistic with zero mean and variance $\pi^2/3$. β is assumed to be uncorrelated with u or v. Θ is the logistic cumulative distribution. Statistical software, `STATA`, is used to estimate the model. The results are shown in Table B.1 in column 5.

Alternative modelling techniques have also been investigated. Column 4 in Table B.1 shows the results for a two-level level model where university is the second cluster. The model is not chosen because similarities of students within a discipline are significant.

Columns 1 to 3 show results from single-level models. Column 3 shows results from a logistic model that includes interaction terms between field of education and university, while column 2 shows results from the model that does not include the interaction terms. Single-level models assume that students within a discipline or a university are not more similar. Because the random effects are significant (similarities between students within a university or a discipline are sufficiently strong), these models are not chosen based on the likelihood-ratio test results. Column 1 shows results from an Ordinary Least Squares model. While OLS is often useful, it is not the most suitable technique for a binary-outcome model such as completion.

A.5 Predictive power

Two main characteristics define a model's predictive power: discrimination and calibration.

Discrimination represents if a model is able to accurately distinguish between those with and those without the outcome; in our case completion is the outcome. The concordance statistic, or c-statistic, is the most commonly measure of discrimination. For a binary outcome, the c-statistic is the same as the area under the Receiver Operating Characteristic (ROC). The curve plots the true positive rate (sensitivity) against 1 less a false positive rate (specificity) for consecutive cut-offs for the probability of an outcome.

To test the discriminative power of our model, we run two out-of-sample predictions. The first set is based on a randomly selected sample. Two-thirds of the observations were randomly selected. The estimated model is then used to predict the outcome of the remaining one-third. Figure A.2 shows the Receiver Operating Characteristic curve (or ROC curve) of this prediction. The area under the curve is about 78 per cent. Alternatively, we use the 2006 and 2007 cohorts to predict the 2008 student cohort. The ROC curve looks similar to the random selection method with a c-statistic of 78 per cent.

140. For details on multi-level and hierarchical models, see Raudenbush and Bryk (2002) and Goldstein (2011).

Calibration refers to the agreement between predictions and observed outcomes. For example, if the predicted completion rate of a group is 40 per cent, the observed frequency of completion should be about 40 in every 100 students. For a linear regression, a calibration plot is a simple scatter chart with predictions on the x-axis and outcomes on the y-axis. But for a binary-outcome model, the plot contains either 0 or 1 for the y-axis and therefore a smoothing technique is required.

Hosmer-Lemeshow proposes clustering observations with similar probability.[141] A graphical representation Hosmer-Lemeshow method plots observed outcomes by decile against the average prediction. The higher the correlation between the predictions (line) and the outcomes (circle), the better calibrated the model is. Using the two sets of out-of-sample predicted data, Figure A.3 and Figure A.4 show the out-of-sample prediction results based on the Hosmer-Lemeshow method. The results show a relatively good fit.

A.6 Omitted variables

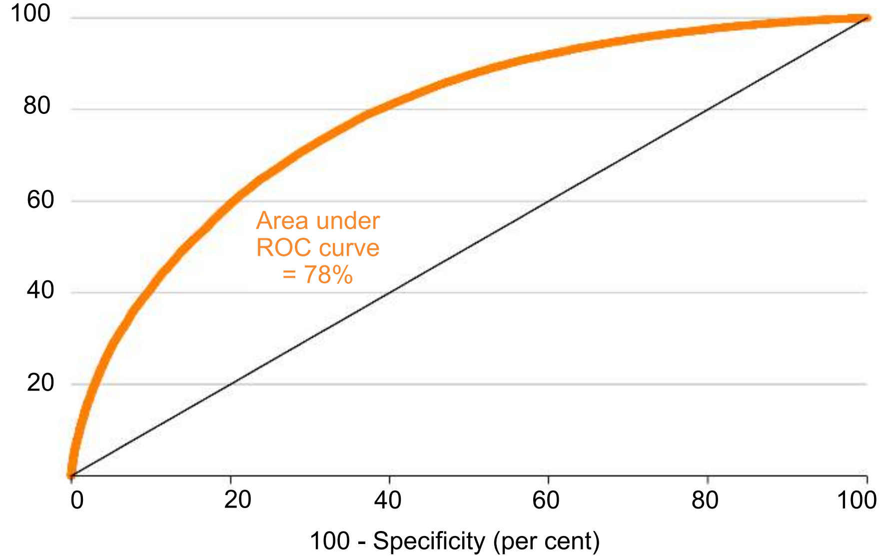
Omitted variable bias is a common problem in regression models where missing variables from the model make the effect of in-model variables inaccurate. Depending on how strong the relationship is between these omitted variables and the outcome variable, the bias can be quite large.

Omitted variables are unavoidable in many cases. Some variables are not directly observable, such as conscientiousness or intelligence. These traits are likely to manifest their effects through ATAR.

Some information is not part of the collection, including parental education. Our data is largely derived from the Department data collection, which only started collecting parental education from 2010. Parental education is often shown to be important for academic achievements of

Figure A.2: ROC curve for a randomly selected out-of-sample prediction

Sensitivity (per cent)



141. Hosmer and Lemeshow (2013).

Figure A.3: Hosmer-Lemeshow plot using randomly selected data from 2006 to 2008 cohorts

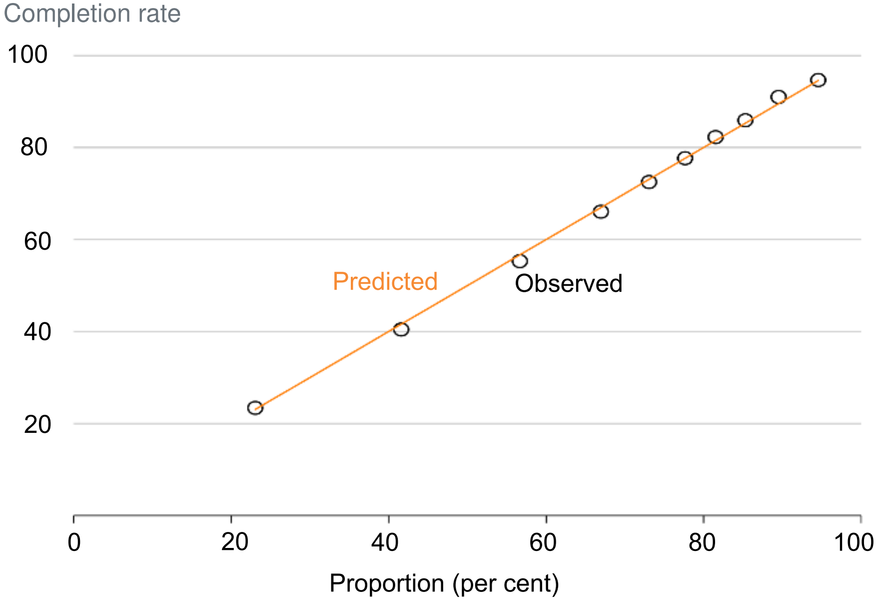
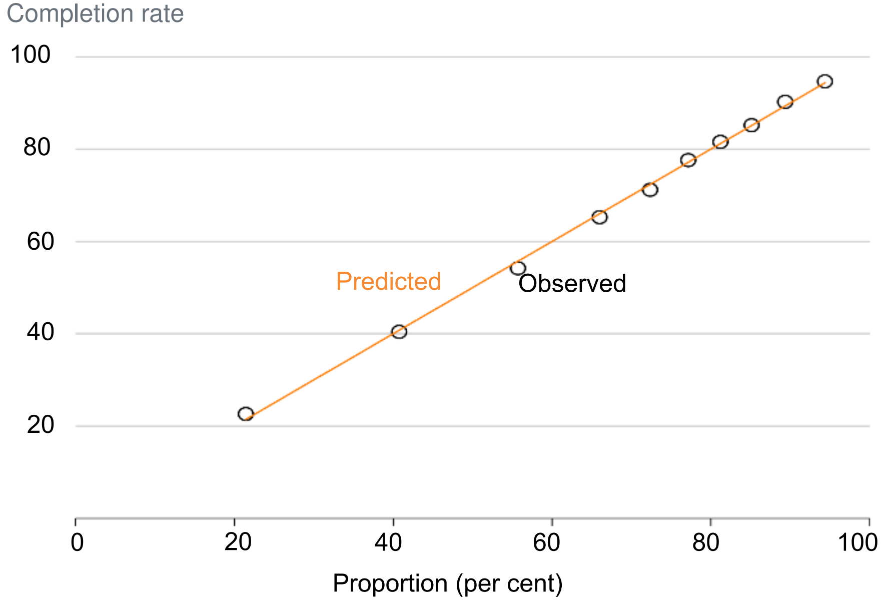


Figure A.4: Hosmer-Lemeshow plot using the 2006 and 2007 cohorts to predict outcomes for the 2008 cohort



children.[142] Within the data in our analysis, its effect is likely to manifest through SES and ATAR.

As discussed in sections 2.1 and 5.4, other commitments such as family or work obligations are likely to affect completion. Other obligations are likely to increase the significance of age and part-time study. While an omitted variable is common and largely unavoidable for many regression analyses, identifying and understanding its potential effects can help reduce incorrect conclusions.

A.7 Excluded groups

A number of observations were excluded from the model. Most are because of missing data, some are because the groups are too small to provide unbiased results, and others are because the observations may interfere with the accuracy of other variables. These groups are listed below.

- Students enrolled:
  - in a graduate entry course
  - in a double degree course
  - in a course primarily taught off-shore
  - at Batchelor Institute of Indigenous Tertiary Education
  - in a hospitality course or completed a hospitality course
  - in a bachelor degree with a course load of less than 3 EFTSL or greater than 5 EFTSL (except for medical courses)
- Students who completed within one year
- Students who hold a humanitarian visa at commencement
- Students who received credit of greater than 2 EFTSL
- Students without data on gender, permanent home location, term location, country of birth or arrival year to Australia
- Students without a CHESSN (thus, international students are excluded) or not enrolled in a bachelor degree

142. For example, Cardak et al. (2017, table 5) finds father having a university qualification to be important for high school completion.

Appendix B: Regression results

Table B.1 on the following page shows the regression results using various modelling techniques. The results discussed in the report are based on the multi-level logit model with 3 levels (model 5). Model 1 reports results in probability; models 2 to 5 report results in log odds.

Figure B.1 shows an anonymised institution effect on completion.

Figure B.1: Anonymised institution effect

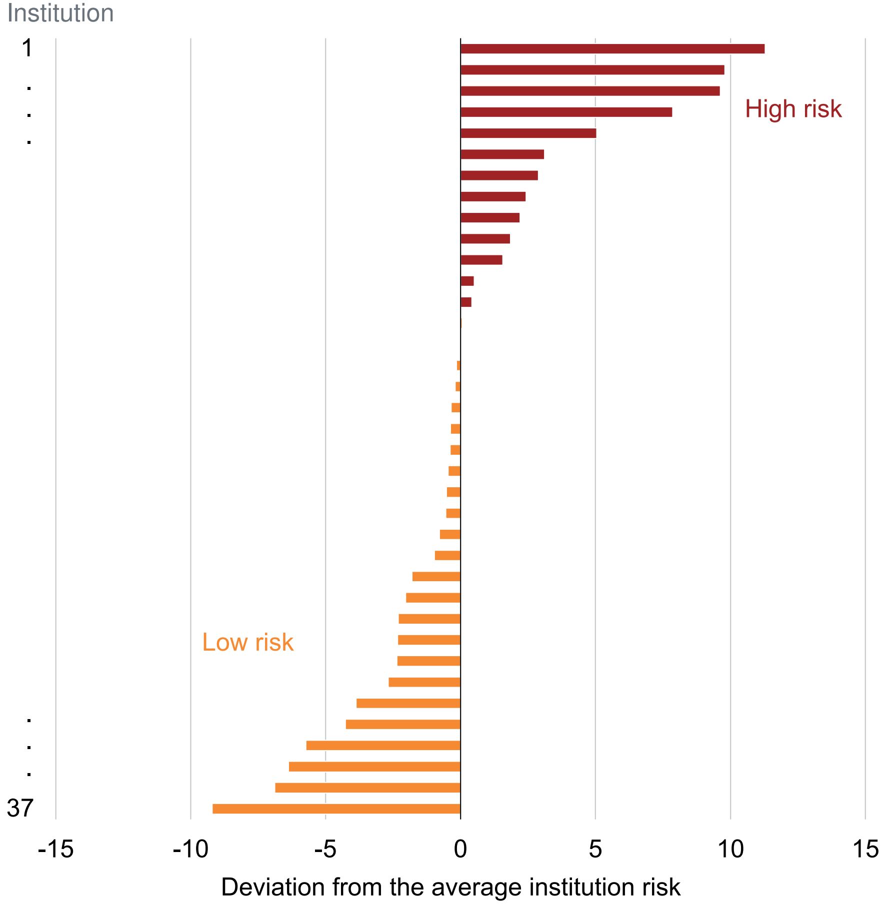


Table B.1: Regression results

Variables	(1) **OLS**	(2) **Logit**	(3) **Logit**: foe × inst	(4) **Multi-level logit** (2 levels)	(5) **Multi-level logit** (1 level: inst)
Female	0.048***	0.281***	0.289***	0.302***	0.294***
Indigenous	-0.166***	-0.829***	-0.828***	-0.838***	-0.840***
With disability	-0.060***	-0.325***	-0.320***	-0.307***	-0.310***
Not an Australian citizen	0.047***	0.271***	0.265***	0.261***	0.266***
Socioeconomic decile (IRSD)					
Lowest = *baseline*					
2	0.006	0.040	0.038	0.036	0.041
3	0.012**	0.064**	0.062**	0.062**	0.065**
4	0.020***	0.112***	0.111***	0.111***	0.115***
5	0.025***	0.142***	0.137***	0.137***	0.144***
6	0.025***	0.136***	0.131***	0.129***	0.137***
7	0.031***	0.173***	0.171***	0.173***	0.176***
8	0.033***	0.185***	0.181***	0.187***	0.191***
9	0.034***	0.195***	0.191***	0.196***	0.199***
Highest	0.040***	0.236***	0.235***	0.243***	0.242***
Language spoken at home group					
English = *baseline*					
South-west/central Asian	-0.006	-0.021	-0.004	-0.016	-0.034
South Asian	-0.001	0.001	0.022	0.009	-0.005
South-east Asian	-0.011*	-0.056	-0.051	-0.059	-0.067*
East Asian	0.017***	0.154***	0.147***	0.139***	0.143***
African	0.019	0.108	0.129	0.106	0.086
Other	-0.073***	-0.398***	-0.419**	-0.429***	-0.417***
Country of birth					
Australia = *baseline*					

*Note: * p<0.05, ** p<0.01, *** p<0.001.* *Continued on next page*

Table B.1 – *continued from previous page*

Variables	(1) **OLS**	(2) **Logit**	(3) **Logit**: foe × inst	(4) **Multi-level logit** (2 levels)	(5) **Multi-level logit** (1 level: inst)
New Zealand	-0.026***	-0.146***	-0.147**	-0.159***	-0.156***
Europe/North America	0.014***	0.077***	0.080***	0.078***	0.075***
Africa	0.004	0.033	0.036	0.013	0.013
South-east Asia	-0.014**	-0.072*	-0.067*	-0.079**	-0.080**
South Asia	-0.007	-0.032	-0.029	-0.049	-0.053
North-east Asia	-0.027***	-0.188***	-0.199***	-0.218***	-0.209***
Middle East/Central Asia	0.014	0.081	0.091**	0.080	0.070
Other	-0.036***	-0.188***	-0.181***	-0.188***	-0.192***
Age					
20 or younger = *baseline*					
21-25	-0.066***	-0.336***	-0.331***	-0.331***	-0.337***
26-30	-0.076***	-0.358***	-0.353***	-0.290***	-0.296***
31-40	-0.046***	-0.206***	-0.203***	-0.059	-0.071*
41-50	-0.034***	-0.149***	-0.152**	0.019	0.003
Over 50	-0.077***	-0.346***	-0.358***	-0.236**	-0.255**
Home remoteness area					
Major city = *baseline*					
Inner regional	-0.006*	-0.023*	-0.025	-0.023	-0.026
Outer regional	0.001	0.017	0.025	0.027	0.024
Remote	-0.032***	-0.171***	-0.166**	-0.152**	-0.153**
Very remote	-0.065***	-0.341***	-0.337**	-0.334***	-0.325***
Year 12 home state					
NSW = *baseline*					
VIC	-0.033***	-0.192***	-0.174***	-0.158***	-0.174***
QLD	-0.055***	-0.362***	-0.373***	-0.363***	-0.327***

*Note: * p<0.05, ** p<0.01, *** p<0.001.* *Continued on next page*

Table B.1 – *continued from previous page*

Variables	(1) **OLS**	(2) **Logit**	(3) **Logit**: foe × inst	(4) **Multi-level logit** (2 levels)	(5) **Multi-level logit** (1 level: inst)
Tas	0.029**	0.097	0.108**	0.107	0.112*
SA/NT	-0.028***	-0.205***	-0.206**	-0.199***	-0.195***
WA	-0.013*	-0.114***	-0.101**	-0.127***	-0.103**
Unknown	-0.008**	-0.096***	-0.093*	-0.090***	-0.086***
Not school leaver	-0.026***	-0.195***	-0.187***	-0.191***	-0.189***
ATAR					
Less than 50 = *baseline*					
50-59	0.001	0.004	0.012	0.013	0.008
60-69	0.038***	0.177***	0.185*	0.184***	0.182***
70-79	0.098***	0.477***	0.481***	0.482***	0.484***
80-89	0.159***	0.848***	0.842***	0.845***	0.856***
90 or over	0.228***	1.496***	1.441***	1.454***	1.507***
Other	0.087***	0.443***	0.438***	0.413***	0.418***
Basis for admission					
Year 12 = *baseline*					
Higher education	0.018***	0.0878***	0.086*	0.053**	0.056**
Voc-ed	0.012***	0.0610**	0.057	0.045*	0.047*
Mature age	-0.061***	-0.306***	-0.311***	-0.324***	-0.319***
Professional qualification	-0.013***	-0.0759***	-0.090*	-0.111***	-0.093***
Highest prior qualification:					
Complete year 12 = *baseline*					
Incomplete year 12	-0.020***	-0.117***	-0.108***	-0.120***	-0.131***
Complete higher education	-0.013**	-0.114***	-0.129**	-0.136***	-0.128***
Complete subbachelor	0.051***	0.256***	0.251***	0.218***	0.226***
Incomplete higher education	-0.006	-0.036*	-0.0352	-0.078***	-0.075***

*Note: * p<0.05, ** p<0.01, *** p<0.001.* *Continued on next page*

Table B.1 – *continued from previous page*

Variables	(1) **OLS**	(2) **Logit**	(3) **Logit**: foe × inst	(4) **Multi-level logit** (2 levels)	(5) **Multi-level logit** (1 level: inst)
Complete voc-ed	0.034***	0.167***	0.163***	0.128***	0.130***
Incomplete voc-ed	-0.032***	-0.155***	-0.159***	-0.179***	-0.171***
Other	-0.010*	-0.041	-0.035	-0.102***	-0.106***
Campus remoteness area:					
Major city = *baseline*					
Inner regional	0.008	0.028	-0.016	-0.100***	0.008
Outer regional	-0.016	-0.083	-0.127*	-0.262***	-0.115*
Value of credit used	0.121***	0.639***	0.624***	0.619***	0.629***
Course load is greater than 4	-0.002	0.019	0.030	0.046**	0.029*
Mode of attendance and transit					
Internal, driving time 0-19 minutes = *baseline*					
Internal, driving time 20-39 minutes	-0.0042*	-0.023*	-0.022	-0.021	-0.021*
Internal, driving time 40-59 minutes	-0.011***	-0.065***	-0.069**	-0.062***	-0.061***
Internal, driving time 60 minutes or more	-0.002	-0.016	-0.016	-0.008	-0.011
External	-0.033***	-0.125***	-0.099	-0.104***	-0.122***
Multi-modal	-0.008*	-0.049*	-0.031	-0.059**	-0.066**
Student load in first year					
Greater than 75 per cent = *baseline*					
51-75	-0.143***	-0.760***	-0.769***	-0.862***	-0.854***
26-50	-0.280***	-1.351***	-1.359***	-1.572***	-1.569***
Less than or equal to 25	-0.448***	-2.124***	-2.128***	-2.122***	-2.128***
Move out	0.011***	0.048**	0.047*	0.049**	0.049**
Field of Education:					
IT	-0.051***	-0.254***	0.373***	No	-0.256***
Engineering	-0.020***	-0.167***	-0.489***	No	-0.163***

*Note: * p<0.05, ** p<0.01, *** p<0.001.* *Continued on next page*

Table B.1 – *continued from previous page*

Variables	(1) **OLS**	(2) **Logit**	(3) **Logit**: foe × inst	(4) **Multi-level logit** (2 levels)	(5) **Multi-level logit** (1 level: inst)
Architecture	0.002	-0.001	0.361***	No	0.006
Agriculture	-0.012*	-0.056	0.705***	No	-0.064*
Other health	0.063***	0.422***	0.885***	No	0.439***
Medical	0.105***	1.042***	1.664***	No	1.009***
Nursing	0.081***	0.438***	1.023***	No	0.422***
Education	0.023***	0.133***	0.661***	No	0.119***
Commerce	0.021***	0.125***	0.639***	No	0.112***
Humanities	-0.019***	-0.105***	0.366***	No	-0.108***
Law	0.031***	0.134***	0.165***	No	0.168***
Creative arts	-0.006	-0.050*	0.094**	No	-0.038
Institutions	Yes	Yes	Yes	No	No
Institutions-fields of education	No	No	Yes	No	No
Age-load	No	No	No	Yes	Yes
Start Semester 2	No	No	No	0.796***	0.794***
Constant	0.672***	0.799***	0.286**	0.853***	0.656***
var(_cons[foe_grattan])				0.107*	
var(_cons[foe_grattan>inst_yr1_id])				0.120***	
var(_cons[inst_yr1_id])					0.084***
Observations	*342,682*	*342,682*	*342,681*	*342,682*	*342,682*
AIC	*367,153.3*	*352,648.4*	*350,421.0*	*349,075.2*	*349,838.5*
BIC	*368,464.2*	*353,959.2*	*350,818.6*	*350,063.7*	*350,945.2*

*Note: * p<0.05, ** p<0.01, *** p<0.001.*

Appendix C: Glossary

ABS	Australian Bureau of Statistics
ATAR	Australian Tertiary Admission Rank
CHESSN	Commonwealth Higher Education Student Support Number
Cohort	Group of students starting in a year
EFTSL	Equivalent full-time student load
Full-time study	Taking three-quarters of an EFTSL or more
IT	Information technology
Load	Subjects taken, expressed in full-time student units
LSAY	Longitudinal Survey of Australian Youth
Multi-modal	Mixing on-campus and off-campus study
Part-time study	Taking less than three-quarters of an EFTSL
Sub-bachelor	Associate degree and diploma courses
TEQSA	Tertiary Education Quality and Standards Agency
UES	University Experience Survey

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