



MINISTRY OF EDUCATION

Te Tāhuhu o te Mātauranga

What factors make a difference to getting a degree in New Zealand?

Report

What factors make a difference to getting a degree in New Zealand?

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Abstract

The aim of this study was to better understand some of the factors in New Zealand that influence whether someone completes their bachelors degree or not. Logistic regression was used to model the six-year completion rate for approximately 38,000 students starting their bachelors degree in New Zealand in 1998. Factors used in the regression included gender, age, ethnic group, highest school qualification, prior activity, decile of school, disability status, whether domestic or international, study load and part-time status, whether extramural or intramural, field of study, and institution.

Statistical modelling allows us to estimate the relative rates of completion for certain subgroups once all these other demographic and study-related differences are taken into account. For example, how do completion rates for older students compare with those for younger students, once part-time and extramural study differences are adjusted for?

The study found that study load was a highly influential factor in one's likelihood of completion. The more full-time a student was, the higher was their likelihood of completing. Similarly, intramural students did noticeably better than extramural students.

The study also found that women did better than men both in actual and adjusted terms. Younger students did better than older students in actual terms, but once adjusted for other factors, notably part-time study, older students did better than younger students. In actual terms, Asian students had slightly higher rates of completion than European students, but after adjusting for other factors, this difference was no longer significant. Māori and Pasifika students had lower completions rates even after other factors have been adjusted for.

Students with higher school qualifications had higher completion rates than those with lower or no school qualifications. Also students who came directly from school did better than those who didn't. Those coming from employment had the lowest rates, probably because many of them were still combining work with study. Having a disability made only a marginal difference to one's chance of completion, once other study-related and demographic characteristics were adjusted for, as did the decile of the last secondary school the student went to.

Students studying health or education had the highest rates of completion, with those in natural and physical sciences and information technology the lowest. This difference remained after adjusting for other demographic and study-related factors. Generally, students in colleges of education had the highest completion rates, followed by universities, then polytechnics.

1 Introduction

What factors make a difference to a student's chances of completing a degree in New Zealand? How do these factors compare with overseas countries? These are the questions discussed in this study.

In this study we model six-year completion rates for students who started their bachelors degree in 1998, using a wide range of demographic and study-related characteristics. The results of our statistical analysis are then discussed in the light of some of the relevant New Zealand and overseas research. Set out below are some of the key themes in this research, which has been sampled from a very extensive base of literature available on this topic.

Information about what influences retention and completion in tertiary education is important to three broad groups. Firstly, it is important to students, for whom information about factors influencing completion may help in their decision-making processes. Secondly, it is important to tertiary education organisations, who are interested in providing high quality education that equips society with skills, knowledge and credentials that are deemed useful and relevant. This, for the most part means retaining and graduating students. Finally, it is important to government, which is concerned with having a national tertiary education system that is accessible, relevant, affordable and efficient. This study aims to provide information that may be useful to all three groups.

Not everyone can be successful in tertiary study. In fact, the premium the labour market places on particular qualifications recognises the fact that some will have skills and abilities (as measured through credentials) that others don't have. While government and institutions have an interest in raising the level of participation and achievement in the general population, in particular to under-represented sections of society, ultimately not everyone will want to access tertiary education. Once accessed, not everyone will subsequently want, or be able, to complete. A student who has decided to try tertiary study may decide sooner or later that it is not for them, and leave to pursue other interests.

From a narrow financial viewpoint this may be seen as a loss (in terms of government funding, student out-of-pocket expenses, and institutional resources), but from the student's viewpoint, they may have achieved a better outcome. Notwithstanding this, there remains a large number of students who withdraw who would have preferred to have completed. At an institutional and national level, high levels of attrition, or more importantly, inequitable levels of attrition amongst different groups, remain an area of concern.

Is there then some optimal balance between access and completion? This argument has gained more focus in recent times, because of the dramatic expansion in sub-degree level participation in New Zealand from 1999. This has seen the development of a much wider range of provision, a range that is more flexible and attractive to non-traditional groups, often cheaper to provide from an institutional viewpoint, and often at low or no cost to students. This success, in terms of access gains, has also given rise to tensions related to cost and value. Some of the recent debate, for example, has been around the relatively lower retention and completion of sub-degree level students compared with degree level students.

This issue of access and completion has become more topical in Britain in recent years. The 2000 annual letter by the Secretary of State for Education and Employment to the Chairman of the Higher Education Funding Council for England stated:

"Notwithstanding progress on recruitment, institutions should focus on retaining students, particularly those from disadvantaged backgrounds. Widening access to higher education must not lead to an increase in the number of people who fail to complete their courses." (Blunkett 2000 – cited in Yorke and Longden 2004).

Also from the same publication, national UK indicator statistics have shown that a number of the best-performing institutions in terms of completion rates performed poorly in terms of access, and vice versa.

"In some newspapers the elite institutions, praised for their completion rates in the previous year, were criticised for the bias in their intakes against students from working-class backgrounds." (Yorke and Longden 2004, page 70).

This issue will remain a challenge in New Zealand, where many of the factors that have led to very successful gains in access are the same factors that are shown to be risk factors for completion. For example, this study later shows, as do studies overseas, that part-time students are less likely to complete. Successful strategies are therefore likely to be those that both enable prospective students to make better informed choices about whether to participate or not (ie supporting access), and enable effective academic and support activities for those who do decide to participate (ie supporting retention).

Much has been written on student attrition. It is one of the more widely researched aspects of tertiary education around the world. However, New Zealand-based research in this area remains light by comparison. The summary below discusses the factors that feature prominently in the literature, with a special focus on New Zealand research.

Many studies comment on the complex and interactive nature of factors in a student's decision to stay or leave. A number of studies point out that factors that influence some students negatively will be motivating influences for other students. One student's reason to leave is another's reason to stay. Many studies comment that a student's stated reason for leaving may, in fact, mask a combination of factors. A student citing family commitments may have done so after the culmination of other factors, such as also having to work part-time, and not having a great deal of interest in the course anyway. Often these factors interact in ways unique to each student.

"The research shows consistently that it is unusual for students to cite just one factor influencing their decision to leave. Distinguishing conceptually between so-called 'personal' and institutional reasons for non-completion does not make a lot of sense in reality." (Yorke and Longden 2004, page 41)

And in a later chapter, the authors conclude....

"...we remain unconvinced that a single theoretical formulation – a 'grand theory' – can be constructed to include all of the possible influences that bear, via the student's psychological state, on retention and success, whilst being practicable in terms of research and institutional practice."

As with other fields of study involving human processes, this should not stop, and has not stopped, the considerable discussion, debate, research and efforts to help those undertaking study to realise their education outcomes. Indeed a number of general themes have emerged from the literature, and some of these are summarised below.

A number of studies provide useful groupings of broadly-related factors, including demographic, institutional, sociological, psychological, economic etc. However the relative importance and interaction of each of these has been the subject of continuing debate (eg see Yorke and Longden 2004, Chapter 6).

While this study is not intended to provide a comprehensive review of this literature, such a study would not be complete without some discussion of the key themes in the literature. For a more extensive discussion of the literature, readers are referred to a number of good reviews on this topic (Prebble et al 2005; McInnis et al 2000; Pascarella & Terenzini 2005; Braxton 2000; Yorke and Longden 2004 (especially Chapter 6), and, more historically, Tinto's well-known 1975 review).

The work of Tinto, Bean and others in the United States has been particularly important in advancing the theoretical understanding of attrition. In his 1975 review of the literature, Tinto proposed a model where factors such as goal commitment and institutional commitment and how they lead towards academic and social integration with an institution were important factors (Tinto 1975).

Bean applied a work model of turnover to attrition, and used satisfaction and intent to leave as intervening factors to test the indirect effects of particular factors in the decision to withdraw. Factors found to be significant in addition to intent and satisfaction were institutional commitment, previous qualifications, grades, belonging to campus organisations, the perceived practical value of the study, the perceived opportunity to transfer, goal commitment, and low sense of gaining development (Bean 1980, 1983; Bean and Metzner 1985). Bean and Eaton (in Braxton 2000) review more psychologically-based theories that challenge the sociological constructs of Tinto's model.

Cabrera, Castañeda, Nora and Hengstler (1992) found significant overlap between the theories of Tinto and Bean, concluding that interactions between institutional, personal and external factors are all to a varying degree important. Braxton (2000) also provides a good review of the theory and models of student persistence and departure. This includes discussion where retention is about how institutions need to fit around the student, rather than how the student integrates with the institution. This adaptation versus assimilation discourse is elaborated further in, for example, Prebble et al (2005).

It is important to note that this research is based in a US setting. System-wide differences in the type of students, modes of learning, institutions and provision between countries will lessen the impact of some factors, and fail to recognise others when applied to the New Zealand context. For example, the factors influencing a full-time, degree-seeking freshman at a four-year US college, are not necessarily applicable to an older person with no previous qualifications returning to the education system to study part-time at a wānanga.

In their 2000 review of non-completion, McInnis et al provide the following summary of factors affecting non-completion:

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"Factors such as wrong choice of course or subject, poor preparation and lack of readiness and commitment, figure prominently in the reasons for non-completion."

"...the quality of the initial student experience" ... "student dissatisfaction with the university experience, style and quality of teaching and learning, workloads, and a lack of fit between student capacities and institutional demands..."

They go on to summarise:

"This interaction between personal, institutional and external/societal factors seems the most fruitful way to proceed..."

One of the key factors established in the literature is academic ability. This is often measured by using proxies such as, school grades or qualifications, or by prior tertiary grades or qualifications. External commitments such as work, finances, health and family are also cited as factors established in the literature as impacting on non-completion.

Perhaps the most comprehensive New Zealand review of the literature to date is Prebble et al (2005). While this report is principally concerned with two broad institutional factors, namely student support services and academic staff development, it nevertheless provides a useful frame for retention. This frame is expressed in terms of 13 propositions grouped under the two broad themes of assimilation and adaptation.

Assimilation

- Institutional behaviours, environments and processes are welcoming and efficient
- The institution provides opportunities for students to establish social networks
- Academic counselling and pre-enrolment advice are readily available to ensure students enrol in appropriate programmes and papers
- Teachers are approachable and available for academic discussions
- Students experience good quality teaching and manageable workloads
- Orientation/induction programmes are provided to facilitate both social and academic integration
- Institutions provide and foster academic learning communities
- A comprehensive range of institutional services and facilities is available
- Supplemental Instruction (SI) is offered for difficult subjects
- Peer tutoring and mentoring services are provided.

Adaptation

- There is an absence of discrimination on campus, so students feel valued, fairly treated and safe
- Institutional processes cater for diversity of learning preferences
- The institutional culture, social and academic, welcomes diverse cultural capital and adapts to diverse students' needs.

The two broad discourses of *assimilation* and *adaptation* are further discussed in a separate, related paper from two of these authors:

"...the Tinto assimilationist model is still predominant. The institution's role is to assimilate students, socially and academically, to foster their academic success..... But a new discourse is emerging in recent theoretical and research literature. The

assimilationist model is being challenged and alternative processes are proposed. Central to this emerging view is the idea that students should maintain their identity in their culture of origin, retain their social networks outside the institution, have their cultural capital valued by the institution and experience learning that fits with their preferences..." (Leach and Zepke 2003).

Stewart and Rawrhiti (2004) cite two models in their discussion of institutionally based retention strategies for indigenous students at Victoria University of Wellington. The *Beatty-Guenter Strategy Model* involves five broad categories: Sorting (activities to improve how well students are placed to enter an institution); Connecting (activities that help 'bond' students and make them feel they belong to an institution); Supporting (activities that help support the student, eg child care, health services etc); Transforming the Student (activities that help the student meet their academic expectations, eg skill improvement workshops, goal setting, academic advice etc); and Transforming the Institution (adjustments required by the institution to meet the needs of a diverse student body).

Secondly, they discuss the application of Durie's *Whare Tapa Wha* model (Durie 1994). In this holistic model, Māori development is seen as "a four-walled house where each wall represents a core dimension necessary to ensure good health". These four walls are "Te Taha Wairua" – the spiritual dimension, "Te Taha Hinengaro" – the emotional dimension, "Te Taha Tinana" – the physical dimension, and "Te Taha Whānau" – the family dimension.

Other New Zealand literature also includes discussion of strategies that could be, or have been, put in place at New Zealand institutions (Billings 2003; Clark and Crome 2004; Acheson 2004). Other literature is based more around specific research, at a course, qualification or institution level (Manthei 1994; Unitec 2000; Wilson 2002; Bunn 2004; Boddy and Neale 1997; Brookefield and Macfarlane 1996; Brown 2000). These are not summarised here, except that factors found to be significant in influencing retention are included in Table 1 below. National level analysis of retention and completion has also become available in recent years (Scott 2004a, 2004c, 2005; Ministry of Education 2004). These provide useful insights in a New Zealand context, which are particularly important when attempting to generalise from the overseas literature.

A summary of factors from the literature reviewed by the authors is presented in Table 1 below. Factors have been arranged according to the authors' own groupings, which are broadly consistent with the literature. The aim of the table is to give the reader a flavour of factors that are reasonably established or discussed in the literature reviewed. The sampled literature covers a mixture of original research, meta-analyses, reviews and strategies. It doesn't aim to cover all the factors, nor does it claim to comprehensively include all factors cited in any referenced study. Readers will see that many factors can clearly be located in more than one group, although they have been listed once only in this table.

When making generalisations from the literature, it is important to recognise that many studies relate to particular courses, qualifications or institutions. Many of the students who withdraw from a course or qualification, or from an institution, often enrol and complete somewhere else, and so attrition from an institutional viewpoint is not necessarily attrition from a student, or national system, viewpoint. Because many studies often relate to a particular environment, be it course, qualification, institution, institution type, type of student, mode of learning, or country, attempts to generalise outside of that environment should be taken mindfully and, in some cases, not be taken at all.

Table 1: Summary of factors affecting attrition and completion

Each number in the references column is indexed to a corresponding reference in the References section at the back of this report.

Factor	References	Factors	References
Ability	29	Commitment and motivation	
• high school achievement, (qualifications or grades)	1,2,4,13,15,25,26,40,41	• commitment and readiness to study, motivation,	6,19,25,30,40,41,46
• performance, grades at a tertiary institution	1,2,3,15,26,40,41,47	• commitment, loyalty to the institution	2,40,41
Background/ Demographic		• goal commitment	2,40,41,43
• parental income	43	• intent to complete or leave	3
• parental education	13	External commitments	8,10,22
• socio-economic status, family background	24,40,41,45,46	• family/whānau, care of dependants	16,25
• non-English-speaking background	24,45	• full- or part-time work	13,25,46
• age	4,23,24,26,27,34,44,45	• time commitments	16
• gender	23,24,27,34,43,44,45	Opportunity	2,6
• ethnicity	4,24,26,27,34,43,44,45	• economy and job market	
• physical and mental well-being	16,22,25	• marriage and family	3
• urban/rural	24,45	• opportunity to transfer	2,3,26
• occupation (industry training)	38	Resources and support	
• literacy	44	• computer-related, technical support	1,8,10
Transition, engagement, integration	14,31,38	• campus location, distance & travel costs	22,46
• socially (students, teachers, extra-class activities)	19,25,30,31,40,41	▪ lack of information	46
• academically (tutors, mentors, study facilities)	19,20,25,31,40,41	• lack of finances	6,30,41,46,49
• academic counselling	31	• student support services	1,10,31,38
• participation (eg in campus activities)	2,3,40,41	• borrowing to study	18
• environment didn't suit	6	Teaching/Institution	40,41
• on-campus employment	12	• style and quality of teaching	25,31
• sense of belonging	20,40,41	• academic staff development	31,49
• initial/first-year student experience	13,25,49	• cultural inclusiveness	31
• direct from school vs delayed entry	43	• curriculum adaptation	49
• transition to tertiary	25	• class size	9
• length, stage of study	49	• workloads	25,31
• welcoming and induction activities	31,49	• materials (access to, quality of – relates to distance-based)	8,10
• lack of preparedness	25,	• milestone protocols	20
• mismatching expectations	16,25	• type of institution	4,13,27,34,43
• perceptions of practical value, eg for employment	2,3,26,38,46	• institution-specific factors	23
• class attendance	4	• timetabling	47
• perceptions of self-development	2,40	• personal or peer tutoring, mentoring	31, 49
• study load, full- or part-time study	4,23,24,26,28,37,43,45	• supplemental instruction	31
• distance-based isolation, extramural	8,10,45	Subject choice	
• pre-entry and early engagement activities	22,28,30,34,37,41,42	• subject major, field of study	15,20, 23,24,45
Satisfaction	2,3,26,38,41,46	• wrong, did not like or poor choice of subject	2,3,6,25,30
• with course	6,25		
• with teachers, with the institution	25		

2 Method

Scope, aims and data

This study relates to approximately 38,000 domestic students who started a bachelors degree at a public tertiary education institution in New Zealand in 1998. The aim of the study was to model the probability of successful completion of a bachelors degree by 2003 (ie six years after starting), and the factors that influenced it.

The study is based on data drawn from a longitudinally matched dataset of student enrolments and completions. This, in turn, is drawn from administrative returns provided by institutions to the New Zealand Ministry of Education. Up until 2003 no unique national student identifier existed that allowed for accurate tracking of a student over time or across institutions¹. A matching algorithm was developed during 2003 to statistically match students in data prior to 2003, and it is the data set resulting from this matching exercise that is used for this study².

It is important to note that in this study, completion only relates to those who have completed after six years. Some 6 percent of 1998 degree starters were still studying in 2003, and some of these are likely to go on and gain their degree. This will mean that the model results will slightly overestimate the differences in final adjusted completion rates for those groups over-represented in this still studying group, ie part-time and extramural students.

Because of the particular group chosen, care is needed when generalising results beyond this group, for example, to non-bachelors degree qualifications.

Logistic regression

As students either complete their bachelors degree, or not, the dependent variable in this type of regression analysis is dichotomous in nature and takes a value of 1 or 0. Use of ordinary least squares is not appropriate in this case as it will violate the assumption of normality and homoscedasticity of residuals and there is no assurance that the predicted value will lie between 1 and 0 (Ramanathan 1998). Therefore, logistic regression is used to analyse the impact of student characteristics on the probability of students completing their degree³.

Logistic regression applies maximum likelihood estimation after transforming the dependent variable into a logit variable. In this way, logistic regression estimates the probability of a student completing their bachelors degree, or not.

The advantage of using multiple regression is that it allows for the effect of multiple factors on the chances of completion to be analysed. Specifically, the method enables us to control for a subset of explanatory variables and examine the effect of a selected independent variable. For example, the effects of part-time study, or differences in age-structure, can be accounted for in this way.

¹ From 2003 a national student number was introduced, which now provides for accurate tracking of students across time and across institutions.

² For full details of this matching, the algorithm used, and the quality of the results, refer to Scott 2004b.

³ The statistical package used to estimate the regression parameters was Stata 8.1. Statacorp (2005), Stata Statistical Software: Release 8.1 College Station, TX: Stata Corporation.

A number of models were estimated as part of this analysis using different variables and different subgroups of the dataset. In particular, these models were repeated on the cohort of students starting their bachelors degree in 1999, in order to check consistency between the two years and highlight any potential model or cohort issues with 1998 data. Models for both years were largely consistent.

The reported results in Appendix 2 are the optimal main effects model selected for the 1998 student cohort. The results of the subgroup regressions are not reported in this paper, but are available from the authors.

While no model can isolate 'true causes' of completion or withdrawal, they can indicate the amount that certain factors contribute to one's chance of completion, independent of other factors in the model. However, the true cause for one student failing and another succeeding still remains largely indeterminate. In the studies that were reviewed by the authors and which involved quantitative statistical regression, the majority typically accounted for less than a quarter of the observed variance in attrition. The explanatory power of the models used in this study was also of a similar magnitude. Therefore, while this study provides some useful, new insights, there is much that is left unexplained.

Student characteristics impacting on degree completion

As with any model, it is limited by the variables that are included. Importantly, this model includes only those variables for which a nationally collected longitudinal time series is available. As a result, it does not include many of the other factors that have been shown to matter in the literature. In particular, psychological factors such as commitment, motivation, sense of value, satisfaction etc, and institutional factors such as mentoring activities, student support services, academic counselling etc. are not included. While, a proxy for ability is included, in terms of the student's highest school qualification, no information was available on the student's high school grades, or previous tertiary grades, both of which are shown to be significantly linked to chances of completion.

In effect, the factors modelled relate to solely demographic and study-related characteristics. However this does include over 80 variables relating to 12 demographic and study-related factors. The other advantage of this study is that it covers all 38,000 students who began a bachelors degree in 1998, providing national coverage, and a high degree of statistical power for comparing actual rates with modelled or adjusted rates.

The student characteristics included as independent variables in the logistic regression analysis are discussed in turn below.

Gender

A dummy variable was included in the regression analysis to capture the effect of gender on the probability of bachelors degree completion. The reference category was women.

Age

The age of the student at 1 July was also included as a variable in the regression analysis. A variety of functional forms were explored, including linear, quadratic, cubic and quartic models. A linear functional form suggests that the change in the probability of completion is constant the older the student. A quadratic functional form suggests that the probability of completion decreases at a declining rate with age. A cubic functional form assumes that the

rate of the decrease in the probability of completing initially declines as students are older, before increasing again once students reach a certain age. The quartic model suggests two peaks and two troughs. The cubic or quartic models most closely resemble the graph of observed rates, with the best fit provided by the quartic model.

Ethnic group

The impact of ethnic group on the probability of completing a bachelors degree was included in the analysis by using a set of dummy variables for Māori, Pasifika, Asian and Other ethnic groups. In addition, a dummy variable for those students whose ethnicity was unknown was also included. The reference ethnic group is European students.

International students

A dummy variable was used to control for the effect of the student coming from another country. If a student is not a New Zealand citizen or permanent resident, or an Australian citizen, then they are considered to be an international student. The reference category was non-international (ie domestic) students.

Disability

Information on whether a student considered they had some form of disability or not was first collected in 1998. A dummy variable was included to control for the impact of students who declared a disability. The reference category was students without a declared disability.

Highest school qualification

The influence of academic ability on completion was assessed using a student's highest school qualification as a proxy. Highest school qualification forms only a coarse proxy for ability, particularly for those older students entering tertiary some time after leaving school. It also has limited capacity, for example, to capture the range of ability between those just passing and those passing easily. Decisions to stay on in school and complete higher level qualifications are also often influenced by factors other than ability, such as the strength of the labour market.

Where data is available, high school or tertiary grade point averages, or previous tertiary qualifications are often used as alternative proxies in modelling studies. In Australia, the Tertiary Entrance Rank (TER) score, based on school achievement, has been used in studies as a proxy for ability. Other proxies include more direct assessments of ability such as IQ or SAT scores.

The introduction of national student numbers in New Zealand in 2003 will, in time, enable national longitudinal data linking a student's tertiary achievement with school achievement in the National Certificate of Educational Achievement. For this study, however, the only national proxy available is the student's highest school qualification. Dummy variables were included for students with year 11, year 12 and year 13 qualifications, as well as for those with overseas qualifications, and for those whose qualifications were unknown. The reference category was students with no formal school qualification.

Decile of last secondary school

Although there is no variable available that directly measures the socio-economic status of the individual student and the impact this has on the likelihood of completion, the decile of the student's last high school was included as a proxy variable. In New Zealand, secondary schools are assigned a decile status which is an indicator of the socio-economic status of the area where the schools are located that is used for government funding purposes. The decile measure ranges from 1 to 10, with 10 representing schools that are located in areas of highest relative advantage. Deciles are grouped into bands in the model. Dummy variables are included in the regression analysis for decile 1-3 schools, decile 4-6 schools, decile 7-10 and decile unknown. The reference category was decile 1-3 schools.

Care is needed when generalising about the effects of socio-economic status from this variable. The decile of the last secondary school attended being area-based may fail to reflect the range of socio-economic conditions of the people living within it. Also, it could be argued that decile loses its significance the longer someone has been out of school and living away from where they went to school. Finally, there is a reasonably high level of non-response for this field, and some suggestion that this unknown group is biased towards older ages.

Prior activity

Prior activity relates to the student's main activity at 1 October in the year prior to enrolment at the current institution. The impact of the immediate prior activity of the student on the chances of completion was analysed by including a set of dummy variables in the logistic regression model. Dummy variables were included for students that were: previously at secondary school, employed, non-employed or beneficiary, a houseperson or retired, a tertiary education student, or overseas and unknown. The reference category was students who were previously at secondary school.

Study load

Two alternative independent variables were used to capture the effect of a student's study load on the probability of completion.

Firstly, a dummy variable was used to indicate if a student was full-time or part-time. For the purposes of this study, a student with a study load of at least 0.9 EFTS for a minimum of 34 weeks is considered full-time⁴. The reference category was students who study on a part-time basis. This characterisation of a student into either full-time or part-time is the most common way of recording study load in the literature. However, how full-time is defined is likely to differ among countries.

Then the average equivalent full-time student (EFTS) load over the duration of their studies was used to measure the study load of students. One equivalent full-time student is approximately equivalent to 1,200 hours of study a year – including contact time with tutors or lecturers plus time spent in independent study, doing assignments and examinations – or 35 hours a week for 34 weeks a year and each student's total annual study load can be represented as a fraction of one EFTS⁵.

⁴ Full-time, in this sense, is essentially defined as someone studying full-time for a full year, and so excludes the many students who study full-time for part of the year.

⁵ These are approximate rules for full-time equivalent study. Actual EFTS values are determined by each provider and submitted to the Tertiary Education Commission for approval for funding purposes. This report is based on these approved

A variety of functional forms for the EFTS load variable were trialled in the model. These included a linear, quadratic and cubic functional form. For example, a linear form indicates that the probability of completion rises in a constant way as study load increases.

Alternatively, a cubic functional form would indicate that the probability of completing a degree initially increases as the study load of the student rises. However, eventually as the study load increases to a stage where it becomes unmanageable, the probability of completing may fall.

Intramural or extramural

A set of dummy variables was included in the model to control for the effect of the mode of study on the likelihood of degree completion. Dummy variables for extramural study and a combination of intramural and extramural study were included in the regression analysis. The reference category was students who studied on a fully intramural basis over the duration of their study.

Field of study

To control for the effect of the field of study on degree completion, a set of dummy variables was also included in the model. Dummy variables were included for each of the 12 broad level groups of the New Zealand Standard Classification of Education. These are natural and physical sciences, information technology, engineering and related technologies, architecture and building, agriculture, environmental and related technologies, health, education, management and commerce, society and culture, creative arts, food hospitality and personal services, mixed field programmes and field of study unknown. The reference category was natural and physical sciences.

Provider type⁶

A set of dummy variables was included in the regression model for each of the institutions at which students began a degree in 1998. This allows for specific institution effects to be taken account of in a student's likelihood of degree completion. However, a number of historical and matching quality issues affect the use of the matched data at institution level.

The dataset used to model completion was derived from a statistical matching of enrolments and completions across time and institutions. This matching is considered very robust at provider type level, but because of the statistical nature of the matching, and because of historical data quality issues at particular institutions, the data cannot be fairly compared for all institutions (See Scott 2004b, page 30, for a discussion of this). The inclusion of dummy variables for each institution is useful in adjusting for institution effects, whether they are real institutional effects, or due to data or limitations. Because we were not able to distinguish actual institutional effects from those due to data or matching limitations, an analysis of relative factors has not been included in this report. Despite this, one can look at patterns in these institutional effects across all providers and draw some reasonably reliable general conclusions among universities, polytechnics and colleges of education.

values. For a detailed description of how EFTS is determined, refer to section 4 of the 2005 Tertiary Funding Guide, available online from the Tertiary Education Commission.

http://www.tec.govt.nz/funding_guide/student_component/4_4.htm

⁶ Provider type refers to whether the institution where the bachelor degree student studied at was a university, polytechnic or institute of technology, or college of education.

Notwithstanding this, care is still needed in drawing inferences between types of provider. For example, a number of polytechnics have agreements with universities to provide the university degree at their polytechnic. Degrees in education or teaching became more common at colleges of education in 1999. In 1998, students enrolled in diplomas could also enrol in degree courses at a university. It is likely that the university component for these students is not well captured in the data. In 1999, we see a large percentage of college of education students that were enrolled in diplomas in 1998, switching to degrees.

Interaction effects

It may be that there are differences among various subgroups in the probability of a student successfully completing their degree. For example, there may be a difference in the factors that influence male and female Māori students successfully completing their degree. To allow for interaction effects among the independent variables, the logistic regression analysis was repeated for selected subgroups of the dataset⁷. Separate logistic regressions were carried out for males, females, Māori and Pasifika ethnic subgroups, extramural students, different types of providers and different age groups.

⁷ An alternative approach of including interaction variables in the full dataset would prove problematic as a result of the large numbers of dummy variables leading to multicollinearity issues.

3 Results

Summary statistics⁸

A total of 37,893 student records was available for the analysis of the 1998 cohort of degree starters. Of this group, 61 percent were female and 39 percent male. Europeans were the largest ethnic group (64 percent) followed by Māori (12 percent) and Asians (11 percent).

Approximately 70 percent of students started their degree at a university, 20 percent at a polytechnic, and 10 percent at a college of education. International students made up a relatively small group in the cohort (4.2 percent), as did students who declared some form of disability (3.3 percent).

Around 44 percent had a year 13 school qualification and 25 percent had a year 12 qualification. Secondary school student (34 percent) was the most common prior activity for the 1998 cohort of degree starters. This was followed by students who were previously beneficiaries or non-employed (27 percent). Students who had previously been in tertiary study made up 11 percent of the cohort.

Students who studied fully intramurally for the duration of their study made up the majority of the cohort (83 percent). Nearly 10 percent studied extramurally for the duration of their study, while 7 percent had a mix of both intramural and extramural study.

The most common fields of study for students were society and culture (33 percent) and management and commerce (25 percent). Areas of study such as architecture (1.7 percent) and agriculture (1.6 percent) were less common among students.

Logistic regression results⁹

A variety of logistic regression models were estimated for the 1998 cohort. Overall, the pseudo R^2 s ranged from 0.15 to 0.22, which indicates a reasonable fit, given the size and cross-sectional nature of the dataset¹⁰.

The models that used average EFTS studied per year as the measure of student load provided a better fit than those which used the dummy full-time/part-time variable, and are therefore the ones reported in the results. Similarly, the models that used a polynomial functional form for age and average EFTS studied per year were superior to the models that used a linear functional form for these variables¹¹.

For each of the independent variables in the analysis, the results are presented for the main effects model first, followed by discussion of results of the subgroups analysis, if relevant.

The results of the logistic regression are presented as adjusted six-year completion rates. The adjusted completion rates are calculated using the logit regression coefficient estimates and the modal (most commonly occurring) values of the independent variables in the 1998 student cohort. The modal values equate to a domestic student who was aged 18, female,

⁸ Full summary statistics for the dataset used in this analysis can be found in Table 4 in Appendix 2.

⁹ The full logistic regression results are presented in Appendix 2. Note that the number of observations used in the logistic regression is lower than that indicated in the summary statistics, as where a variable predicted successful completion perfectly, the observations were dropped.

¹⁰ The majority of studies involving statistical regression that were reviewed by the authors typically accounted for less than a quarter of the observed variance in attrition.

¹¹ A more detailed discussion of the regression diagnostics and functional forms can be found in Appendix 1.

European, did not have a disability, had a year 13 qualification, came directly from a decile 4-7 secondary school, was fully intramural, studying society and culture related fields, and with an average annual study load of 1.0 EFTS.

By then changing the value of the independent variable from its modal value to its actual value the effect of the student characteristic on the probability of completion can be found. It is important to note that the adjusted or modelled probability rates will vary slightly depending on the choice of reference group. Similarly, the size of the relative difference in completion rates between one subgroup and another will vary slightly depending on the reference group selected. However, factors that were found to be significant in the model will continue to be significant regardless of reference group.

Gender

In actual terms, the six-year completion rate for women was 1.2 times that for men. After adjusting for other demographic and study-related characteristics, men continued to have a lower chance of completing their degree than women. Holding other factors at their modal values, the adjusted six-year rate of completion for women was 1.1 times that of men. This result was statistically significant at the 1 percent level.

The degree to which men were outperformed by women varied across subgroups. Differences between men and women were lowest for Māori students, and highest for extramural students.

The finding is consistent with much of the literature reviewed (see Table 1). The Department of Education, Science and Training (DEST) in Australia undertook an exercise in 1999 (which was updated in 2001) to model rates of award completion in Australian universities (Urban et al 1999; Martin et al 2001a). There are a number of important differences to consider when making comparisons with these studies. DEST analysed all undergraduate awards, not just bachelor degrees, and their cohort was based on 1992 and 1993 starters, compared with the 1998 starters used here. Their rates are based on students completing at the institution started, whereas this data is based on completion at any institution. Also, they developed a model which predicted final lifetime completion rates, whereas this study is based on the actual completion status after six years. Those still studying after six years (some 6 percent for the 1998 cohort) are included in this study and treated as not completed, whereas in the DEST study they are excluded from the model.

However, notwithstanding these differences, the 2001 DEST study found the completion rate for women to be 1.1 times that of men (Martin et al 2001a, page 8).

Age

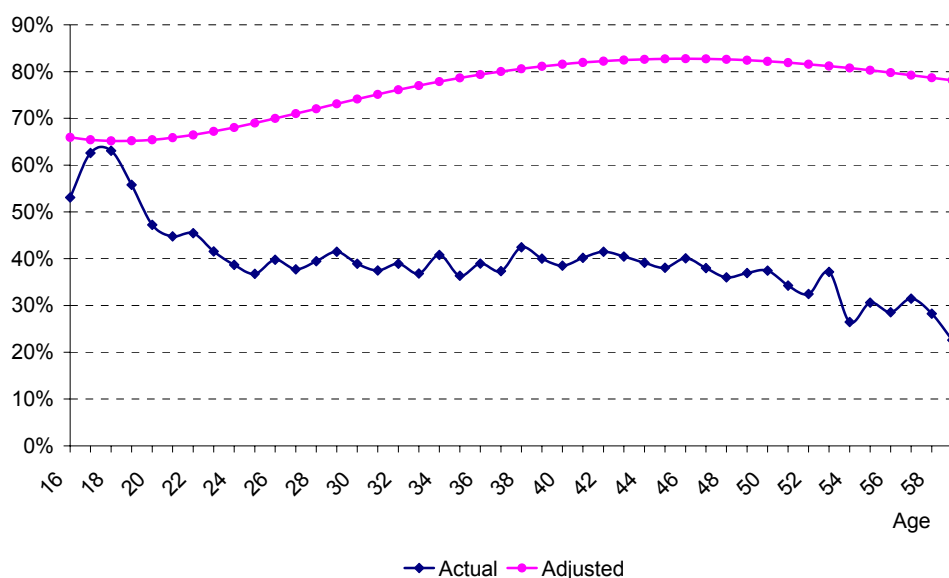
For the 1998 cohort, a quartic functional form provided the best fit for the adjusted six-year rate of completion by age. There were significant differences in rates of completion both in actual terms and once adjusted for other demographic and study-related factors. Furthermore, while younger students did better in actual terms, older students did better once other demographic and study-related factors are adjusted for.

These differences are shown in Figure 1 below. In actual terms, the rate of completion is highest for students starting their degree at aged 18 (ie those coming directly from school). The rate of completion is lower for those under 18, and declines steadily after 19 until age

25. Actual rates are relatively constant between the ages of 25 and the mid to late 40s, before falling away again after this. Around one in three domestic bachelors students was aged between 25 and 50 in 2004.

However, when adjusted for other demographic and study-related factors, rates of completion are lowest at ages under 20 and rise with each year of age up to a peak in the mid to late 40s. Older students are more likely to be studying part-time or have external work or family commitments that limit their ability to commit as fully as younger students. These factors are likely to explain why actual rates are higher for younger students. What this study indicates, however, is that once adjusted for these factors, older students do better than younger students.

Figure 1: Actual and adjusted six-year completion rates by age



Note: The values of actual rates should not be compared directly with the values of adjusted rates. This is because of differences in how they are constructed and what each represents. However, the relationship between age and actual rate and the relationship between age and adjusted rate can be usefully compared. In particular, note that the value of the adjusted rate is based on the modal reference group, and will vary if a different reference group is selected.

Modelling completion for males and females separately showed similar shaped graphs, with females consistently higher than males at all ages.

While the differences in actual completion rates by age seem consistent with much of the literature the authors reviewed, the finding that older students do better once other factors are adjusted is new. The DEST studies, for example, showed a broadly similar age pattern for actual rates, but flatter differences once adjusted (Urban et al 1999, page 9).

Ethnic group

Students in the Māori and Pasifika ethnic groups were less likely than their European counterparts to complete their degrees. Holding other factors at their modal values, the results showed that the adjusted six-year completion rate for European students was 1.3 times that of Māori and Pasifika students. These results were statistically significant at the 1 percent level.

While this confirms earlier analysis (Scott 2004a), more importantly it provides some quantitative estimates of the relative chances of completing a degree, once other demographic and study-related characteristics are accounted for. It is also consistent with overseas literature (see Table 1), where indigenous groups, or minority groups in general, did not perform as well as the majority ethnic group. For example, in Australia, non-Aboriginal and Torres Strait Islander students were 1.6 times more likely to complete than their Aboriginal counterparts (Martin et al 2001a, page 9).

The lower rate of completion for Māori and Pasifika students was consistent across all the subgroups analysed. For example, even after controlling for school qualifications, Māori and Pasifika students still showed lower completion rates than their European counterparts. Māori students who had a prior activity of houseperson or retired had the smallest chance of completing their degree, compared with European students. Māori students who had previously been in tertiary study had the best relative performance compared with European students.

Much of the literature hints at the value of belonging and integration, and these factors are likely to be particularly relevant for students who are not part of the majority cultural student body. Issues such as cultural inclusiveness and curriculum adaptation also feature in the literature, and these may be exacerbated when Māori and Pasifika students are the first in their families to undertake a degree. The rate of participation at degree level has increased by over 10 percent for both these groups since 1998, and now exceeds European participation rates, which have remained constant. Projected demographic changes are likely to see this trend increase over the next generation, and it will be interesting to see the impact that more tertiary-educated Māori and Pasifika have on subsequent generations.

Financial commitments may be another factor for some Pasifika students. There are often expectations on those Pasifika students who are also working and earning, to contribute financially to their family. This may add to the pressures being faced by some students to the point that it becomes too hard to continue.

Earlier analysis (Scott 2004a) has shown that domestic Asian students have higher rates of degree completion. However, the actual difference is small (around 1.04 times). When adjusted for the demographic and study-related factors used in this model, this difference reduces very slightly, and becomes only marginally statistically significant ($p=0.07$). Domestic Asian students are more likely to be younger and studying full-time, which is why the observed rates are slightly higher. What is interesting, however, is that Asian students generally do no worse than European students. The 'cultural minority' barriers postulated for lower performance for Māori and Pasifika students do not seem to apply to the same degree for Asian students.

Disability

Once adjusted for demographic and study-related characteristics, there was very little difference in six-year degree completion rates between students with disabilities and students with no disabilities. For the 1998 cohort the difference between the two groups was only significant at the 7 percent level. However, the difference was statistically significant at the 5 percent level for the 1999 cohort of starters, with the chances of a student with no reported disability completing their degree being 1.05 times that of a student with a disability.

Analysis at the subgroup level showed that the gap was greater at polytechnics between students with disabilities and students with no disabilities. Interestingly for university students, having a disability made no statistically significant difference to a student's chances of completing their degree.

Students with a disability face additional challenges to their no-disability counterparts. Aside from physical or learning impairments that might make it harder to study and complete, there are often environmental barriers that have to be contended with. These include a range of factors relating to travel, access, facilities and classroom delivery. Finally, unfairly placed stigmas from other students may also contribute to someone with a disability struggling to integrate socially or academically, and lead to subsequent withdrawal. However, there was no empirical statistical evidence in the literature reviewed by the authors which included disability.

International students

International students had a much greater probability of completing their degree than domestic students. In actual terms, the six-year completion rate for international students was 1.2 times that of a domestic student. Holding other factors at their modal values, the adjusted six-year completion rate for an international student was 1.3 times that of a domestic student. This result was statistically significant at the 1 percent level.

The type of provider that international students were enrolled at impacted on the likelihood that they completed their degrees. International students in universities had a relatively higher adjusted rate of completion, while international students in polytechnics had a similar adjusted completion rate compared to their domestic counterparts.

International students are subject to a very different set of influences than their domestic counterparts. Principal among these is that most pay upfront the full cost of their tuition, which on average in 1998 meant over \$8,000 more than their domestic counterparts (who were also able to borrow from the Student Loan Scheme). Having undertaken this financial commitment, which may incur some real or moral obligation to family, one might assume that there is a higher degree of motivation and commitment to succeed. However, there was no researched evidence of this in any of the literature reviewed by the authors.

Over 80 percent of international students are from Asia, where it has been speculated that attitude towards study may play a part in rates of completion. For example, while the DEST studies related just to domestic students, they did show that students with non-English-speaking backgrounds did better than their English-speaking background counterparts. One might postulate from this that many of those who are recent arrivals to Australia bring with them a different attitude to study that equips them better. However, there was no established evidence to support this in the literature reviewed by the authors.

International education has expanded dramatically in New Zealand since 1998 (when the international students in this study started their degree). While there were 4,800 international students enrolled in a bachelors degree in 1998, in 2004 there were 25,000. The proportion and mix from Asian countries have also changed noticeably since 1998. Issues of pastoral care and safety also feature more prominently now than they did in 1998. It will be interesting to see how the completion rates of today's expanded body of international students compare with those of the 1998 cohort.

Highest school qualification

Ability, as measured by previous academic achievement, has long been established in the literature as a factor for success in tertiary study (see Table 1). This relationship was also significant in this study (with a p-value < 0.01). As one would expect, the higher the secondary school qualification of the student, the greater was their adjusted rate of completion. Holding other factors at their modal values, students with a year 13 qualification were 1.4 times more likely to complete after six years than a student with no formal school qualification, after adjusting for demographic and study-related differences. Students with a year 12 qualification were only slightly less likely to complete than someone with a year 13 qualification. Students with a year 11 qualification were 0.8 times as likely to complete as someone with a year 13 qualification (holding other factors at their modal values).

The analysis by subgroup produced similar results. In particular, when adjusted for level of school qualification, both Māori and Pasifika students still showed lower completion rates than their European counterparts.

There was, however, one exception. The adjusted rate of completion for students who came directly from school was not affected by the level of their school qualification. Those coming directly from school are likely to arrive with year 12 or 13 qualifications only, with the majority having year 13 qualifications. Those coming directly from school with year 12 qualifications are likely to include those more academically gifted or motivated students.

Decile of last secondary school

On an actual basis, students from higher decile schools did better than those from lower deciles. However, when adjusted for other factors, the decile of the last secondary school one attended was only a marginally statistically significant factor in completing a degree. When adjusted for other demographic and study-related factors, students from high and medium decile schools (ie deciles 4-10) had similar rates of completion, and these were just 2 percent higher than the adjusted rate for students from low decile schools (ie deciles 1-3). Similarly, for most subgroups analysed, results were either not significant or marginal. In particular, the decile of those coming directly from school was only a marginally significant factor in a student completing their degree (the p-value was 0.07).

However, one possible exception was for male students, where adjusted rates were significant at the 5 percent level, showing that a male student from a higher decile school completed at a slightly higher rate than a student from a lower decile school.

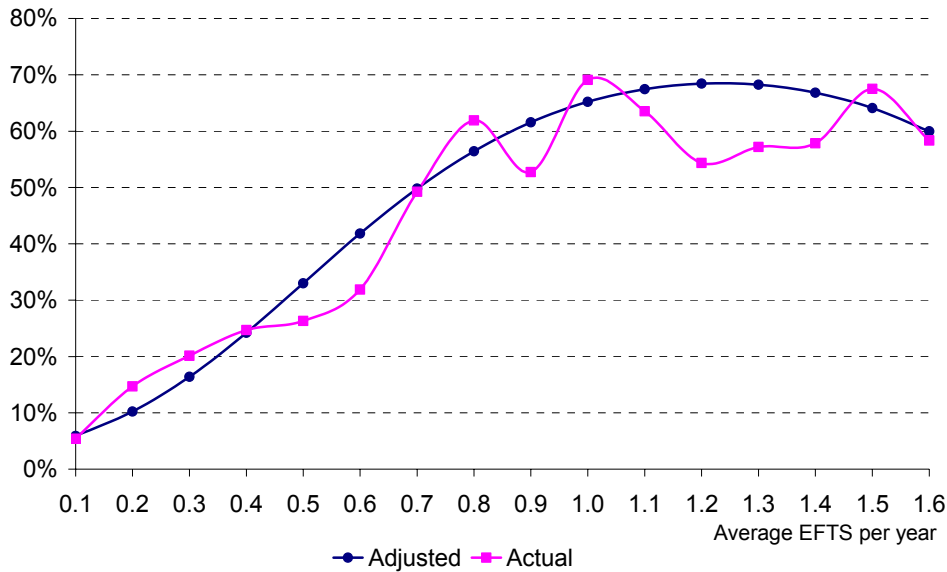
Care is needed when generalising about the effects of socio-economic status from these results. The decile of the last secondary school attended being area-based may fail to reflect the range of socio-economic conditions of the people living within it. Also, it could be argued that decile loses its significance the longer someone has been out of school and living away from where they went to school. Finally, there is a reasonably high level of non-response for this field, with a bias in this unknown group towards older ages.

The DEST study of 1999 showed a small socio-economic effect, and this was confirmed in the 2001 update (Urban et al 1999; Martin et al 2001a). Background variables have long been established as factors that can affect a student's decision to stay on in study, although a range of variables has been used to measure this, including, for example, parental income and parental education (see Table 1).

Study load

The effect of study load was highly influential on one's chance of completion. In actual terms, the completion rate for students studying at 1.0 EFTS was 69 percent, 21 percentage points higher than the 48 percent completion rate for the cohort as a whole. As in other countries, those who spend more time in study on average do better than those who don't. This holds after demographic and other study-related factors are adjusted for, with results statistically significant at the 1 percent level. The actual and adjusted effects of study-load on six-year degree completion are shown in Figure 2 below.

Figure 2: Actual and adjusted six-year completion rates by study load



Note: The values of actual rates should not be compared directly with the values of adjusted rates. This is because of differences in how each is constructed and what each represents. However, the relationship between study load and actual rate and the relationship between study load and its adjusted rate can be compared. In particular, note that the value of the adjusted rate is based on the modal reference group, and will vary if a different reference group is selected.

The results suggested that a quadratic or cubic functional form was the most appropriate for the dataset. This suggests that, initially, the probability of completion rises as the study load of a student increases. However, eventually, as the study load reaches a certain level (at some point over 1.0 EFTS) the probability of successful completion will begin to fall.

Care is needed in interpreting final degree completion rates from these six-year completion results. By definition, part-time students will take longer to complete than full-time students, and the majority of students still-studying after six years are studying part-time. Around 6 percent of 1998 degree starters were still studying after six years. If every one of these were to go on to complete, the completion rate for part-time students would still be lower than those who studied full-time.

That part-time students have higher attrition rates than full-time students is also well established in other countries (see Table 1 for references). In the DEST 2001 study, nearly 70 percent of full-time undergraduate university students were likely to complete an award, compared with 52 percent for part-time students.

Like other countries, New Zealand has seen a large growth in part-time students since the late 1990s, as the range of provision has expanded and become more flexible, allowing access to those not able to participate previously. While full-time and intramural students do better, part-time or extramural study is the only way that many students are able to access tertiary education. Another factor likely to influence completion is that a higher proportion of part-time students will not have a degree as their primary goal. There will always be a trade-off in this regard between providing opportunities to access and maximising one's chances of completion.

For example, McInnis writing in Yorke and Longden 2004 says:

"Managing the quality of the part-time experience or external student experience has been a quite separate and long-standing challenge for Australian universities. While the system actively encourages people in full-time employment or with family responsibilities to enrol, it is still the case that these students are amongst the most likely to withdraw from their studies."

Extramural or intramural

The mode of delivery also had an impact on the likelihood of successful degree completion by students. Fully intramural students had the highest actual six-year completion rates, almost five times those of fully extramural students. However, once adjusted for other factors, in particular part-time study, this relative factor reduced to 1.4 times (holding other factors at their modal values).

After adjusting for demographic and study-related factors, those who studied on both an intramural and extramural basis (about 7 percent of the 1998 cohort) did marginally better than those who studied on a fully intramural basis. Students who studied on a fully extramural basis over the duration of their degree (around 10 percent of the 1998 cohort) were less likely to complete than their intramural counterparts.

The subgroup analysis confirmed that students studying on an extramural basis were the least likely to complete. A notable result was that Pasifika students who studied extramurally had a noticeably lower likelihood of completing their degree than other groups studying extramurally. However, while statistically significant, this result was based on only 90 extramural Pasifika students starting a degree in 1998.

These results are consistent with those found in the DEST 2001 study of completion in Australian universities, where 40 percent of external students were likely to complete an award, compared with 52 percent for internal part-time and nearly 70 percent for internal full-time students.

The particular difficulties faced by distance learners are well-documented in the literature. These include issues of isolation, access to materials, and access to technical support to help with computing difficulties. Distance students, by definition, will experience a lack of face-to-face engagement with both academic staff and fellow students, and are therefore less likely to integrate, both socially and academically, to the same degree as intramural students. Such factors are well established as being important to one's chance of success (see Table 1). As with part-time students, it is likely that a higher proportion of extramural students are not studying with a degree goal in mind and, as with part-time students, extramural study is the only way many students are able to access tertiary education. So while extramural study

remains a factor in lower completion rates, this needs to be seen in the context of the opportunity that extramural study allows for some people to study for and complete a bachelors degree.

Prior activity

Students who were employed as their main activity in October of the year prior to enrolment were the least likely to complete their degree after six years, while students direct from secondary school were the most likely. Adjusted six-year completion rates for students coming directly from secondary school were 1.5 times higher than for students coming from employment (holding other factors at their modal values). Students who had previously been tertiary students, and beneficiaries or non-employed had similar chances of completion. Those coming directly from school were 1.1 times more likely to complete than these groups (holding other factors at their modal values).

That students coming to tertiary directly from school do better (even after adjusting for age and study load) is consistent also with findings in the United States (NCES 2005). In part, this may reflect relatively fewer work or family commitments, or a relatively easier path to social or academic integration into tertiary life.

That students coming from employment do worse may highlight the difficulties many students have combining study with work. Current data collections do not allow us to distinguish whether current students are working or not, but it is conceivable that many students whose prior activity was employment are still working. For many students, employment is the only way to finance their study. While a great number of students are successfully able to combine work with study and complete their degree, it is clear from the literature that full-time students do better overall than those who are only able to commit part-time. This model shows an effect even after adjusting for part-time study load, suggestive of the extra difficulties faced by employed students through lack of available time or finances, or having to combine too many external commitments.

Field of study

The field of study had an impact on the probability of completion for students. Students who studied in the areas of health and education had the greatest likelihood of completion. The adjusted rates of completion after six years for students in health and education were 1.6 and 1.5 times, respectively, the rate of a student studying natural and physical sciences (holding other factors at their modal values). Students studying in the area of natural and physical sciences and information technology, and society and culture had the lowest rates of completion.

These were mirrored to a degree by overseas research. The DEST 1999 and 2001 studies had both health and education as the fields of study with the highest completion rates, and despite major differences in those studies and this one (including classification differences), the relative order of the fields was very similar. This is shown in Table 2 below.

In their 2003 study, DesJardins, Kim and Rzonca showed that health, business and engineering students were more likely to graduate in four years than social science students. This study also showed that, as in New Zealand, students majoring in natural and physical sciences were less likely to graduate than those majoring in other fields.

The results suggest that, even after adjusting for other demographic and study-related factors, students who enter study with a more vocationally focused degree tend to do better than students in more general degrees. More general bachelors degree students in fields such as science, and society and culture performed the least successfully. One factor maybe to do with how structured, or flexible, is study in the respective fields. Vocationally oriented programmes tend to be more structured, and highly structured programmes, or programmes with relatively fewer study options, may be a factor in higher retention and completion.

Table 2: Adjusted relative rates of bachelor degree completion by field of study

New Zealand (all 1998 bachelors degree starters completion by 2003)		Australia (1993 all undergraduate award starters in universities – excluding those still studying in 1999 – projected lifetime completion)	
Field of study	Adjusted relative rate	Field of study	Adjusted relative rate
Health (includes nursing, veterinary science)	1.6	Health (excludes nursing, veterinary science)	1.3
Education	1.5	Education	1.2
Architecture and building	1.3	Architecture, building	1.1
Engineering and related technologies	1.3	Engineering, surveying	1.0
Management & commerce	1.2	Business, administration, economics	1.1
Agriculture, environmental and related studies	1.2	Agriculture, animal husbandry	1.1
Society and culture (includes law)	1.2	Arts, humanities and social science (excludes law)	1.0
Natural and physical sciences	1.0	Science	1.0

Notes:

1. The adjusted relative rate is the adjusted six-year completion rate divided by the adjusted six-year completion rate for science. This rate is based on holding other factors at their modal values.
2. Because of differences in the study, direct comparisons cannot be made, and are displayed only to provide indicative sense of relative ordering of one's chances of completing for different broad groups of fields.
3. The source for the Australian data is Martin et al 2001a, pages 8-9.
4. See Appendix 2 for full results for all 12 broad New Zealand fields of study.

Provider type

Students who studied at colleges of education had the highest chance of completing after six years. University students were the next most likely to complete, followed by students who studied at polytechnics.

A subgroup analysis for all students starting a bachelors degree in the broad field of education in 1999 showed the adjusted six-year rates of completion at colleges of education were neither consistently higher nor lower than the adjusted rates for students at universities.

As discussed earlier, care is needed in drawing inferences among types of provider. For example, a number of polytechnics have agreements with universities to provide their degree locally. Similarly, degrees in education or teaching became more common at colleges of education in 1999. In 1998, students enrolled in diplomas could also enrol in degree courses at a university. It is likely that the university component for these students is not well captured in the data. In 1999, we see a large percentage of college of education students that were enrolled in diplomas in 1998, switching to degrees.

Actual and adjusted 6-year completion rates for all variables are shown in table 3.

Table 3: Actual and adjusted six-year completion rates

Characteristic	Actual completion rate after 6 years	Adjusted completion rate after 6 years ¹
All Students	48.7%	65.2% ¹
Gender		
Female	51.8%	65.2%
Male	43.7%	57.3%
Ethnic group		
European	50.2%	65.2%
Māori	40.7%	51.1%
Pasifika	35.2%	48.9%
Asian	52.3%	66.8%
Other	45.0%	61.9%
Disability		
Does not have a disability	48.8%	65.2%
Has a disability	43.2%	62.3%
Domestic or international		
Domestic	48.2%	65.2%
International	57.3%	82.5%
Highest school qualification		
No school qualification	33.6%	45.3%
Year 11 qualification	36.8%	50.0%
Year 12 qualification	47.6%	61.5%
Year 13 qualification	56.3%	65.2%
Overseas qualification	45.1%	55.1%
Decile of last school		
Deciles 1-3 (low)	46.4%	64.3%
Deciles 4-7 (medium)	49.8%	65.2%
Deciles 8-10 (high)	52.3%	65.8%
Prior activity		
Secondary school student	61.5%	65.2%
Employed	31.1%	43.3%
Non-employed or beneficiary	38.3%	59.3%
Tertiary student	47.4%	58.1%
Houseperson or retired	35.0%	54.2%
Overseas	54.7%	66.8%
Intramural or extramural		
Fully intramural	53.2%	65.2%
Both intra- and extramural	47.3%	68.3%
Fully extramural	10.9%	47.3%
Field of study		
Natural and physical sciences	39.2%	56.0%
Information technology	36.5%	60.0%
Engineering and related technologies	63.6%	74.0%
Architecture and building	61.4%	74.4%
Agriculture, environmental and related studies	52.1%	66.4%
Health	67.7%	88.7%
Education	70.5%	86.1%
Management and commerce	43.0%	66.5%
Society and culture	43.8%	65.2%
Creative arts	62.7%	75.5%
Mixed field programmes	63.0%	77.5%

Notes:

1. The adjusted completion rates are calculated using the logit regression coefficient estimates and the modal values of the independent variables in the 1998 student cohort. The modal values related to a student who was domestic, aged 18, female, European, with no disability, who enrolled directly from a decile 4-7 secondary school with a year 13 school qualification, and who studied fully intramurally with a average annual study load of 1.0 EFTS in society and culture.
2. The values of actual rates should not be compared directly with the values of adjusted rates. This is because of differences in how they are constructed and what each represents. However, actual rates can be compared with other actual rates, and adjusted rates can be compared with other adjusted rates. In particular, note that the value of the adjusted rate will vary depending on the choice of reference group.

What factors make a difference to getting a degree in New Zealand?

4 Summary

The aim of this study was to model the probability of completing a bachelors degree, and the factors that influence it in New Zealand. Having a better understanding of these factors can aid the decision-making of students, institutions and government alike, in the areas which they can influence, with the aim of improving educational outcomes for those students wanting to complete a degree.

There is a long and extensive history of research into this area, particularly in the United States. What is evident from this is that there is no single range of factors that can satisfactorily explain why one student stays and another leaves. Instead, there is a large and complex range of factors that interact in ways often unique to a student. One person's reason to stay is another person's reason to leave. Nonetheless many themes appear consistently in the literature, such as those relating to academic and social integration and assimilation, commitment, motivation and satisfaction, innate ability, background, teaching and institutional effects, financial, and external work or family commitments.

Not everyone that undertakes study does so with the intention of completing a qualification. For example, in the United States some 10 percent of beginning bachelors students do not have a bachelors degree as their goal (US Department of Education, 2002). It is important also to note that in an open access system such as in New Zealand, many will try study, only to realise it is not for them. From the student's viewpoint, leaving is their best outcome. Despite this, where attrition levels are high and, in particular, high relative to other groups, there remain grounds for society to try to do better.

This study used data relating to approximately 38,000 students who began a bachelors degree in a New Zealand public tertiary education institute in 1998, and whether they had completed or not by 2003. Logistic regression was used to model the six-year completion rate for this cohort. Statistical modelling provides estimates of the relative rates of completion for certain subgroups once all other factors selected for the model are taken into account. For example, how do older students compare with younger students once part-time and extramural study differences are adjusted for?

While this study was not able to include many of the factors shown in the literature to matter, it did include over 80 individual variables relating to the following demographic and study-related characteristics: gender, age, ethnic group, disability status, domestic or international, highest school qualification, decile of last school, main activity prior to study, study load, full-time or not, whether intramural or extramural, field of study, and provider type. The model accounted for 22 percent of the variance in observed completion rates, very comparable with other models reviewed by the authors in the literature.

The study found:

- Study load was a major factor influencing six-year completion rates. The actual six-year completion rate for students studying at 1.0 EFTS was 69 percent compared with 48 percent for the cohort as a whole. Both actual and adjusted six-year completion rates increased steadily with study load, up to values of 1.2 EFTS, beyond which rates decreased. Allowing for part-time students still studying after six years, completion rates remain higher for full-time students.

- Actual six-year completion rates for fully intramural students were almost five times those of fully extramural students. However, once adjusted for other factors, in particular part-time study, this relative factor reduced to 1.4 times. After adjustments, those who studied on both an intramural and extramural basis did marginally better than those who studied on a fully intramural basis.
- While full-time and intramural students do better, for many students part-time or extramural study is the only way that they are able to access tertiary education. Like a number of countries overseas, there will always be a trade-off in this regard between opportunities to access and maximising one's chances of completion.
- Students with year 13 school qualifications were 1.4 times more likely to complete than someone entering with no school qualification, and 1.1 times more likely than someone with a year 12 qualification. However, for those coming directly from school, there was no difference between those with year 12 and those with year 13 qualifications, when adjusted for other factors.
- Women were 1.2 times more likely than men to complete their degree in actual terms, and 1.1 times after adjusting for other demographic and study-related factors.
- In actual terms, students aged 18 or 19 had the highest six-year completion rate. Rates reduced after this until age 25, and were similar at aged 25 to 50, before falling again for those over 50. However, once adjusted for other factors, in particular, part-time and extramural study, younger students had the lowest rates, with rates increasing up to the mid 40s, before decreasing again at ages over this.
- Asian students had a marginally (1.04 times) higher actual completion rate than European students. This difference remained after adjustment, but was only marginally statistically significant. Māori and Pasifika students had lower completion rates, both in actual and adjusted terms. Adjusted European and Asian rates were 1.3 times higher than those of Māori and Pasifika students.
- International students were more likely to complete in six years than domestic students, 1.2 times in actual terms, and 1.3 times when adjusted.
- Those studying in health and education had the highest six-year completion rates, with those in natural and physical sciences and information technology the lowest.
- On an actual basis, students with no disability were 11 percent more likely to complete a degree after six years than students with a disability. However, once adjusted for other demographic and study factors, the difference reduced and was only marginally statistically significant.
- On an actual basis, students from higher decile schools did better than those from lower deciles. However, when adjusted for other factors, decile was only marginally statistically significant. Decile forms only a crude proxy of socio-economic status, so while it does not appear to be a significant factor in this study, inferences from this to the real effects of socio-economic status remain inconclusive.
- Students coming directly from school have the highest six-year completion rates, 1.5 times, in adjusted terms, those coming from employment. Adjusting for other factors removes much of the difference in the actual rates for students coming from unemployment, non-labour force, or previous tertiary study. Each of these groups was 0.9 times as likely to complete as those coming directly from school.
- College of education students generally had the highest six-year completion rates, followed by those at universities and then those at polytechnics.

Appendix 1: Model specification and diagnostics

In the logistic regression model the dependent variable is the natural logarithm of the probability of the student completing their bachelors degree divided by (1 minus the probability of the student completing their degree).

All the possible independent variables provided by the dataset were included in the model. However, as mentioned in the method section, there is a risk of model misspecification, due to the potential exclusion of important explanatory variables. For example, this analysis does not include variables that capture the financial situation of the student and the impact this has on degree completion.

The initial logistic regression equation took the form:

$$(A) \quad \ln[\text{Com}/(1-\text{Com})] = \beta_1 + \beta_2 \text{age} + \beta_3 \text{age}^2 + \beta_4 \text{age}^3 + \beta_5 \text{age}^4 + \beta_6 \text{gender} + \beta_7 \text{ethnicity}^* + \beta_8 \text{international} + \beta_9 \text{disability} + \beta_{10} \text{school_qual}^* + \beta_{11} \text{decile} + \beta_{12} \text{prior_activity}^* + \beta_{13} \text{study_load} + \beta_{14} \text{study_mode}^* + \beta_{15} \text{subject}^* + \beta_{16} \text{provider}^* + \mu$$

where Com is the probability of the student completing their bachelors degree by the end of 2003, age is the age of the student as at 1 July 1998, gender is a dummy variable for the gender of the student, ethnicity* is a vector of dummy variables for the ethnic group of the student, international is a dummy variable that indicates if the student is international or not, disability is a dummy variable indicating if the student had declared a disability, school_qual is a vector of dummy variables for the highest school qualification of the student, prior activity is a vector of dummy variables for the immediate prior activity of the student, study_load is a dummy variable indicating whether the student was full-time or part-time during their studies, study_mode* is vector of dummy variables indicating if the student was studying intramurally, extramurally, or a mix of both, subject* is a vector of dummy variables for the subject area that was the student's main area of study, provider* is a vector of dummy variables for the TEO that the student attended, μ is an error term and ln is the natural logarithm.

In the second model, the dummy variable indicating whether a student was full-time or part-time was replaced by an EFTS load variable. The regression model estimated using the EFTS load variable is presented below.

$$(B) \quad \ln[\text{Com}/(1-\text{Com})] = \beta_1 + \beta_2 \text{age} + \beta_3 \text{age}^2 + \beta_4 \text{age}^3 + \beta_5 \text{age}^4 + \beta_6 \text{gender} + \beta_7 \text{ethnicity}^* + \beta_8 \text{international} + \beta_9 \text{disability} + \beta_{10} \text{school_qual}^* + \beta_{11} \text{decile} + \beta_{12} \text{prior_activity}^* + \beta_{13} \text{EFTS_load} + \beta_{14} \text{EFTS_load}^2 + \beta_{15} \text{EFTS_load}^3 + \beta_{16} \text{study_mode}^* + \beta_{17} \text{subject}^* + \beta_{18} \text{provider}^* + \mu$$

The model that used average EFTS per year to measure study load had a significantly higher pseudo R^2 measure than the model that used a dummy variable to measure study load. Therefore the results of the model using EFTS load to measure the study load of the student is the one reported.

Log likelihood tests indicate that at least one of the independent variables was statistically significant in the model. Tests of the blocks of dummy variables indicated that all sets of dummy variables, apart from those representing the school decile of the student, were statistically significant at the 5 percent level¹².

¹² The block of dummy variables representing deciles was significant at the 10 percent level.

Appendix 2: Summary model statistics

Table 4: Summary cohort statistics

<i>Characteristic</i>	No.	%
Total cohort - students starting a bachelors degree in 1998	37,893	100.0
Completed status by 2003		
Yes	18,449	48.7
No (including those still studying)	19,444	51.3
Gender		
Male	14,914	39.4
Female	22,979	60.6
Age		
Mean (Standard deviation)	25.7	(9.7)
Minimum (Maximum)	13	(92)
Ethnic group		
European	24,392	64.3
Māori	4,446	11.8
Pasifika	1,353	3.6
Asian	4,263	11.3
Other	1,263	3.3
Unknown	2,176	5.7
Disability		
Does not have a disability	36,642	96.7
Has a disability	2,250	3.3
Domestic or international		
Domestic	36,299	95.8
International	1,594	4.2
Highest school qualification		
No school qualification	1,341	3.6
Year 11 qualification	2,972	7.8
Year 12 qualification	9,619	25.4
Year 13 qualification	16,654	43.9
Overseas qualification	2,072	5.5
Unknown qualification	5,235	13.8
Decile of last school attended		
Deciles 1-3 (low)	5,799	15.4
Deciles 4-7 (medium)	12,362	32.6
Deciles 8-10 (high)	11,358	29.9
Decile unknown	8,374	22.1
Prior activity		
Secondary school student	12,955	34.2
Employed	2,835	7.5
Non-employed or beneficiary	10,358	27.3
Tertiary student	4,336	11.4
Houseperson or retired	949	2.5
Overseas	1,846	4.9
Other, unknown	4,614	12.2
Full-time status		
Full-time	10,450	27.6
Part-time	27,443	72.4
EFTS-load		
Mean (Standard deviation)	0.8	(0.3)
Intramural or extramural		
Fully intramural	31,495	83.1
Both intra- and extramural	2,672	7.1
Fully extramural	3,726	9.8
Field of study		
Natural and physical sciences	1,612	4.2
Information technology	1,300	3.4
Engineering and related technologies	1,476	3.9
Architecture and building	650	1.7
Agriculture, environmental and related studies	618	1.6
Health	4,002	10.6
Education	3,797	10.0
Management and Commerce	9,365	24.7
Society and culture	12,532	33.1
Creative arts	2,406	6.4
Food hospitality and personal services	0	0.0
Mixed field programmes	135	0.4

Table 5: Logit regression results (Dependent variable $\ln\{\text{Com}/\{1-\text{Com}\}\}$)

Independent variables	Coefficient
Constant	-1.5507
Age	-0.4452***
Age ²	0.0203***
Age ³	-0.0003***
Age ⁴	0.0000***
Gender (<i>base = females</i>)	-0.3331***
<i>Ethnic group (base = European)</i>	
Māori	-0.5814***
Pasifika	-0.6703***
Asian	0.0741*
Other	-0.1398**
Not stated	-0.6171***
Disability(<i>base = student with no disability</i>)	-0.1255*
International student (<i>base = domestic student</i>)	0.9264***
<i>Highest school qualification (base = no qualification)</i>	
Year 11 qualification	0.1855**
Year 12 qualification	0.6556***
Year 13 qualification	0.8139***
Overseas qualification	0.3898***
Unknown qualification	0.3381***
<i>Decile of school (base = deciles 1-3)</i>	
Deciles 4-7	0.0401
Deciles 8-10	0.0654*
Decile unknown	0.1204**
<i>Prior activity (base = school student)</i>	
Employed	-0.8967***
Non-employed/beneficiary	-0.2521***
Tertiary student	-0.2994***
Houseperson or retired	-0.4596***
Overseas	0.0726
Other/unknown	-0.3555***
EFTS load	6.8191***
EFTS load ²	-2.7656***
<i>Mode of study (base = intramural)</i>	
Intra and extramural	0.1420***
Extramural only	-0.7356***
<i>Field of study (base = natural and physical sciences)</i>	
Information technology	0.1638**
Engineering and related technologies	0.8038***
Architecture and building	0.8231***
Agriculture, environmental and related studies	0.4390***
Health	1.8186***
Education	1.5856***
Management and commerce	0.4428***
Society and culture	0.3852***
Creative arts	0.8848***
Mixed field	0.9976***
Log likelihood	-20,468.6
Likelihood ratio	11,496.8
Pseudo R ²	0.22
n	37,844

Notes:

1. *** significant at the 1 percent level ** significant at the 5 percent level * significant at the 10 percent level.
2. Robust standard errors were used to measure the statistical significance of the independent variables.

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