MINISTRY OF EDUCATION
Te Tāhuhu o te Mātauranga

Te whai i ngā taumata atakura

Supporting Māori achievement in bachelors degrees

Technical paper

Learners in tertiary education

This paper provides the technical information for *Te whai i ngā taumata atakura – supporting Maori achievement in bachelors degrees.*

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Supporting Māori achievement in bachelors degrees – technical paper

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1 Overview

This document provides explanations and detailed results of the six logistic regression models that inform the main report on supporting Māori degree achievement.

1.1 The logistic regression models

Data for the models was sourced from enrolment and completion data supplied by tertiary education providers to the Ministry of Education. A data set was extracted that identified Māori first-year, first-time degree students. The national student number and the Ministry's statistically generated student number were used to match student records over time to identify which students were in their first year of a bachelors degree and had not previously studied at bachelors level.

The models were run using the SAS logistic procedure, with the logit link function. Effects were included or excluded from the model on the basis of 95 percent confidence or greater. All plausible main effects that could be derived from the data set were tested in the model. Interactions were identified on the basis of subject matter expertise and results from the main effects.

The models included a number of effects which have been treated as control variables. While they had no effect size in the model, including them did impact on the estimated effects for other variables. The year of first enrolment was also interpreted as a control variable to take account of improvements in data quality over the time period.

A summary of the results of each model is set out in the following chapters. Each chapter provides the overall description of the model, a selection of fit statistics and the key statistics for each effect. The estimated contribution of each effect has been derived from dividing the Wald Chi-square value for the effect over the total Wald Chi-square for the model. A more detailed analysis of each effect is then presented, including predicted probabilities and odds ratios.

First-year pass rates

These models covered first-year, first-time students enrolling from 2002 to 2005 inclusive. The outcome groups were those who passed 75 percent or more of their first-year courses and those who did not.

Pass rates were calculated by taking the average of two definitions of successful completion and dividing by the number of courses taken. The first definition was the number of courses for which a pass was recorded. The second was the number for which a pass was recorded plus courses for which the outcome had not been recorded.

Over this time period, the reporting of course outcomes has improved - that is, there is a smaller proportion of courses for which the outcome is not known. More detailed analysis suggests that the use of the midpoint approach is a reasonable estimate of course outcomes across the period. The midpoints are reasonably stable for the same groups of students over time. However, improvements in data quality may be hiding trends over time. Given the uncertainties with regard to data quality, the time variable in the models has been regarded as a control variable and left out of the interpretation.

First-year retention

These models covered first-year, first-time students enrolling from 2002 to 2004 inclusive. The outcome groups were those who continued in study after one year and those who did not.

Continuing in study was defined as returning to study towards a bachelors degree at any institution following the first year of study, anytime within the period to 2005. The following groups of students were included as continuing:

— Students who switched from one bachelors qualification to another.

— Students who moved from one provider to another.

— Students who returned to study after a gap of a year or more.

Students who studied in the earlier years covered by the model had more time to return to study than those who were in the later years. For example, a student enrolling in 2002 could return to study in 2003, 2004 or 2005, while students enrolled in 2004 could only be counted if they returned to study in 2005. To control for this, the enrolment year was included in the model and interpreted as a control variable.

Five-year completion

These models covered first-year, first-time students who enrolled in 2001 in a three-year degree programme and completed more than 2.9 EFTS of degree study in the period to 2005. The outcome groups were students who completed a bachelors or bachelors with honours degree by 2005 and those who did not.

The models were initially run with students who were enrolled for more than one year of study. This approach showed time in study to be the strongest factor – that is, a student needs to complete at least 3.0 EFTS of study to complete a three-year bachelors degree. This is a self-evident finding, so the model was adjusted to include only those who had completed more than 2.9 EFTS of degree study. The model was limited to three-year degrees to remove confounding effects of longer programme requirements, which are associated with specific subject areas.

Odds ratios

To aid with the interpretation, results of the logistic regressions are presented in odds ratio form. Odds ratios are not the same as probabilities and to aid in their interpretation a fictional example is set out below.

Suppose that 600 students who are full-time continue in study and 300 do not. The odds of a full-time student continuing in study are 600/300 = 2, or 2 to 1. In other words, the chances of a full-time student continuing in study are reasonably good.

Suppose that 100 part-time students continue in study and 200 do not. The odds of a part-time student continuing in study would be 100/200 = 0.5, or 1 to 2. The chances of their continuing in study are therefore significantly lower than for full-time students.

To calculate the odds ratio of a part-time student continuing in study compared with a full-time student, the odds of a part-time student continuing (0.5) are divided by the odds of a full-time student continuing (2), which equals 0.25.

This result can be interpreted as the odds of a part-time student continuing in study being 25 percent of those of a full-time student. Alternatively, taking the inverse of the odds ratio (2/0.5), the odds of a full-time student continuing in study are four times higher than for a part-time student. Therefore, it is more likely that a full-time student will continue in study than a part-time student.

This is not the same as saying that the probability of a full-time student continuing in study is four times higher than that of a part-time student. Using the data in the above example, the probability of a full-time student continuing in study is equal to the number of full-time students continuing divided by the total number of full-time students, continuing or not. The probability is found using the following calculation 600/(600+300) = 0.67. In other words, the probability that a full-time student continues in study is 67 percent.

For a part-time student, the probability that they continue in study would equal 100/(100+200) = 0.33. In other words, the probability that a part-time student continues in study is 33 percent.

Comparing the two results, the probability that a full-time student continues in study is twice as great as the probability that a part-time student continues (67/33). This compares with the odds ratio that indicated that the odds for a full-time student were four times greater than for a part-time student.

The greater the difference in the probability of the events occurring, the larger is the magnitude of the odds ratio. The large odds ratios that are observed in the results of the logistic regression should therefore not be interpreted as indicating a large difference in probabilities.

Predicted probabilities

Odds ratios are only calculated where a variable is not involved with an interaction. Where odds ratios are not available, predicted probabilities are provided. The predicted probability is calculated by substituting reference values of the variables into the logistic regression equations. Then the actual value of the independent variable of interest is substituted into the regression equation. By doing so, the impact of the selected variable on the predicted probability can be calculated for this reference value set.

It is important to note that these predicted probabilities are for the selected reference value set only. If a different reference value set was chosen, then the values of the predicted probabilities would change. However, the nature of the relationship between the variable and the probability of the outcome would not change if a different reference value set was selected.

1.2 Project-specific data definitions

The following definitions were applied to the data set. These were also used for the descriptive data in chapters 4 and 5 of the main report.

Bachelors degrees

Bachelors degrees are the qualifications coded as ‘Bachelors’ on the Qualification Award Category on the New Zealand Register of Quality Assured Qualifications. Degrees with a total duration of two years’ full-time equivalent or less were excluded. These are generally awarded in addition to a first bachelors degree.

This definition differs from that of bachelors-level qualifications in other Ministry reports, which includes graduate certificates and diplomas, and certificates of proficiency.

Prior activity

Tertiary education providers provide information on the main activity of each student on 31 October in the year prior to their first year of enrolment. For this project, this data has been adjusted, so that if the student was enrolled in school or tertiary study at any time during the year prior to enrolment, that is counted as their prior activity. If not, then their main activity at 31 October as reported on their first-year enrolment record was used.

Provisionally rematched data

The Ministry has created a data set with student records matched over time, going back to 1994. The focus of this matching process has been on identifying the same student across years and in different institutions. The introduction of the national student number in 2002, along with the validation of these numbers against the births and deaths registers in 2003, highlighted an issue with multiple student identification numbers being issued to the same student in the same institution. This was not taken account of in the Ministry's matching process. These additional identification numbers tend to be in use for only one year and therefore have a strong effect on first-year numbers and first-year attrition rates.

For the purposes of this project, a provisional rematch was performed. In this rematch, students in the same institution, with the same year and month of birth, same secondary school, same gender and same ethnicity are treated as the same student. This process has appeared to remove most of the duplicate records.

A proper rematch of the Ministry data has been completed as this report goes to publication.

Māori students

Māori students are identified on the basis of the self-declared ethnicity, as stated to their provider on their enrolment forms. Students can provide up to three ethnicities. The responses they provide may vary from year to year and among institutions.

For this study, Māori students were defined as any students who declared Māori as an ethnicity in at least one year and at least one institution, even if they also declared other ethnicities. This approach was taken to provide a consistent group of students who were represented in each year that they studied, irrespective of whether they declared themselves as Māori in every enrolment.

First-year, first-time students

First-year, first-time students were counted in this study as students who had enrolled for degree study for the first time. It included students who were in tertiary study for the first time and students who had previously studied in tertiary education towards qualifications below degree level. It excluded students who were still completing first-year degree requirements over more than one year (after their first year of enrolment) and students who were starting a second degree.

First year in degree study was been determined using the Ministry of Education's matched data set, going back to 1994. First year in tertiary was been determined from the information provided by the student, checked against the matched data set.

1.3 Areas for further analysis

There are a number of aspects of these models that would bear further attention.

Additional information from students

The most fruitful area for further study would be to combine enrolment record data with additional information collected directly from students by way of a survey. This approach would address the low predictive values of these models and explore factors outside of the enrolment data.

School qualifications

The collection of highest school qualification through the tertiary enrolment data is a fairly rough measure of school achievement and subject to various degrees of error. A preliminary analysis of NCEA results against tertiary enrolments suggests that school qualifications are under-reported.

Further analysis could be undertaken for the school leaver group using actual NCEA results matched to tertiary enrolments. This would not only give more accurate information on school qualifications but also open up a greater range of variables for analysis, such as subject area, levels of attainment for credits (excellence, merit or pass) and attainment of literacy and numeracy standards.

School variables

Only a limited set of school variables was used in this analysis. For more recent years, additional information is available, such as ethnicity by year level and school isolation factor. Information about the distance between school and tertiary study is also available. These factors could be explored in the models for the school leaver group, along with the NCEA results.

Tertiary provider variables

A few size measures relating to tertiary providers were chosen and tested in the models. Most were not statistically significant or had no effect size. A few had intriguing effects within the models. Further exploration of differences among providers could be undertaken.

Extending the time series

It would be worthwhile to rerun these models in the future using additional years of data. In particular, the completion models were based on only a one-year cohort and had relatively small population sizes. A longer time period for completion, such as seven years, would allow four-year degrees to be included in the model. Having a longer time series available would also allow some of the early data, which was subject to poorer quality, to be dropped in favour of higher-quality later data.

2 First-year pass rates for Māori bachelors students aged under 20

Model summary

Response variable	Proportion of first-year courses passed
Response levels	1. <75% passed (N=1,747) 2. 75%-100% passed (N=3,294)
Probability modelled is that the proportion of first-year courses passed is 75% to 100% Predicted probabilities presented below refer to this event	
Number of observations used	5,041
Selection of observations	Māori first-year degree students Enrolling in 2002 to 2005 inclusive Intramural enrolments only
Max-rescaled R^2	0.1531
Percent concordant	70.2
Percent discordant	29.4
Percent tied	0.4
c	0.704

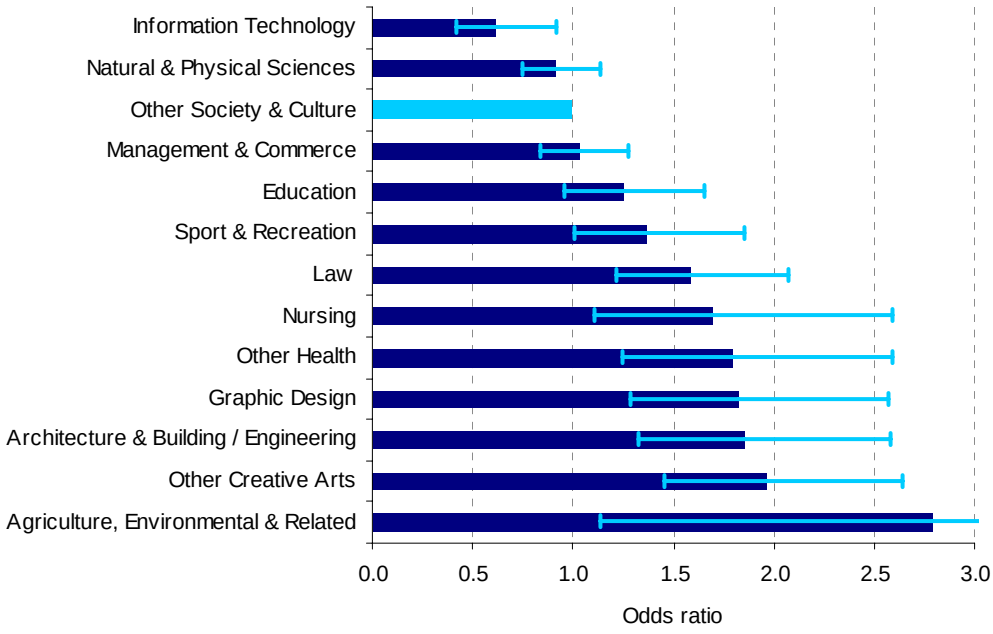
Type 3 analysis of effects

Effect	DF	Wald Chi-square	Pr > Chi-sq	Estimated contribution	Reference value (predicted probabilities)
Subject	12	78.3311	<.0001	22%	Other society and culture
Prior activity	4	45.2026	<.0001	13%	School
Sub-sector	3	44.9555	<.0001	13%	University
EFTS enrolled	1	27.0133	<.0001	8%	0.9
Percent postgraduate EFTS at the provider	1	26.2767	<.0001	7%	12.8%
School decile	1	25.6703	<.0001	7%	4+
Gender	1	15.9	<.0001	5%	Male
Starting year	3	15.5472	0.0014	4%	2005
EFTS enrolled * study type	3	14.825	0.002	4%	
Highest school qualification	2	13.361	0.0013	4%	NCEA Level 2+
Postgraduate EFTS at the provider	1	10.8204	0.001	3%	2,267
School definition	2	9.7069	0.0078	3%	Other schools
Study type	3	9.0794	0.0283	3%	Full-time, full-year
School roll (year 9+)	1	8.7673	0.0031	2%	979
Bachelors EFTS at the provider	1	6.9474	0.0084	2%	10,898

2.1 Subject

Subject has been classified using NZSCED broad and selected narrow fields.

Figure 2.1: Odds ratio by subject (reference = 'Other society and culture')



The lowest pass rates were for students in information technology. Results for sciences, and management and commerce are not statistically different from other society and culture. These three groups represent generic bachelors degrees, such as arts, social science, science and management degrees. Pass rates in more specialised degrees were higher than and significantly different from other society and culture.

2.2 Prior activity

Main activity of the student prior to enrolment in degree programme:

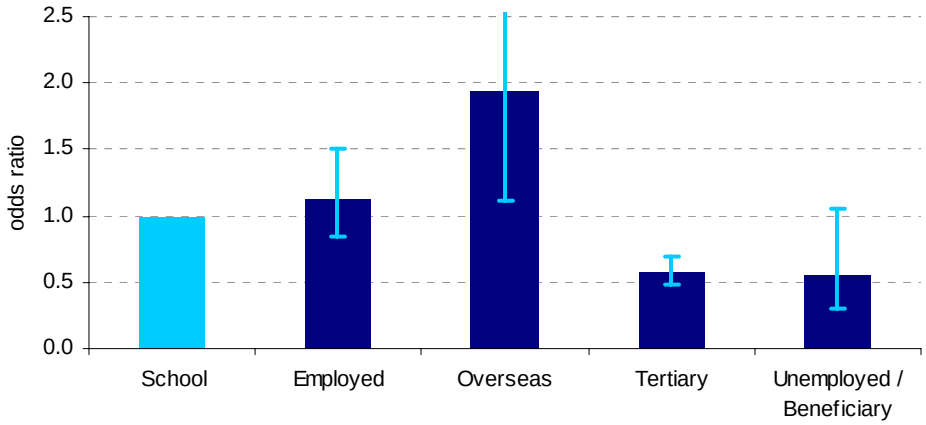
School – if the student's last year at school was a year earlier or the same year as degree enrolment

Tertiary – if the student was enrolled in a sub-degree programme in the year preceding or the same year as degree enrolment

Employed; Unemployed/Beneficiary; Overseas – if the student was in neither school nor tertiary in the year prior to enrolment in degree study then these activities were used, as reported at enrolment.

Unknown values were added into schools on the basis that results for these students were not significantly different.

Figure 2.2: Odds ratio by prior activity (reference = 'School')



Students who were overseas prior to degree study had better results than students who went straight from school. Those who studied in sub-degree programmes prior to degree study had poorer results. This appears to be the case also for students who were unemployed or were beneficiaries, but the results are not quite as statistically significant. Those who were employed had similar results to those who went straight from school.

This result may reflect a relationship between the ability of the students and the chosen activity, rather than the effect of the activity itself. For example, more able students may be more likely to travel overseas and less able students more likely to enrol for below-degree-level tertiary studies.

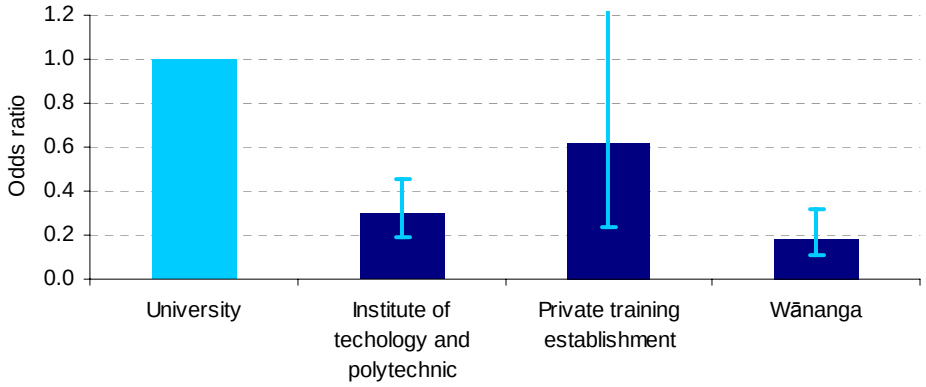
2.3 Sub-sector

Sub-sector groupings of providers, as at time of data collection:

University, institute of technology and polytechnic, wānanga and private training establishments.

Colleges of education have been grouped with universities, to take account of recent mergers. Other tertiary education providers have been grouped with private training establishments.

Figure 2.3: Odds ratio by sub-sector (reference = 'University')

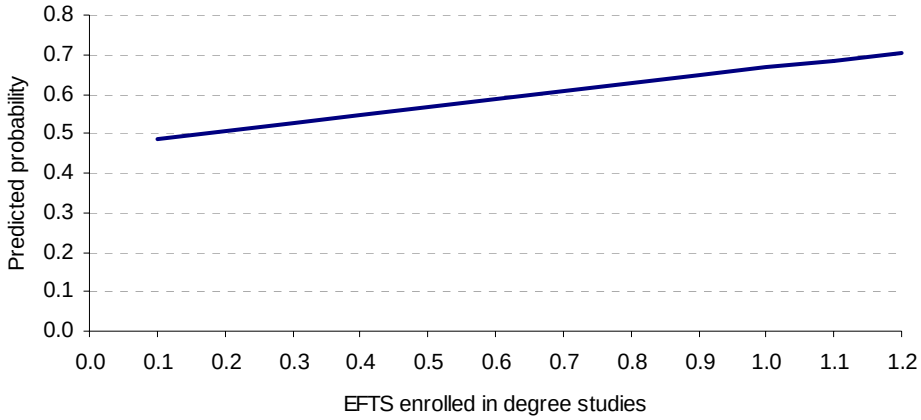


Results for students at PTEs were not statistically significantly different from those at universities. Students at ITPs had lower rates of success than those at universities. Students at wānanga had the lowest rates of success. This result may reflect more open entry criteria in these sub-sectors.

2.4 EFTS enrolled in degree studies

The total EFTS enrolled by the student in courses associated with a bachelors degree (excludes enrolments in other qualifications).

Figure 2.4: Predicted probability by EFTS enrolled in degree studies

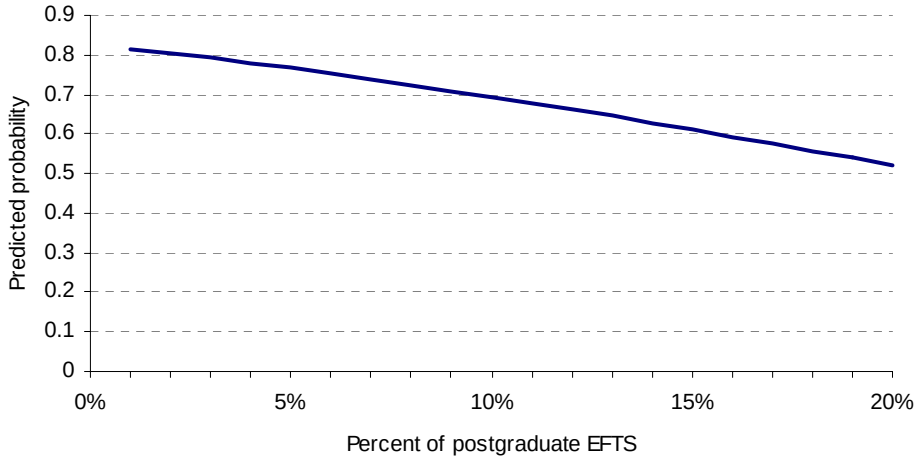


The greater the amount of study a student is enrolled in at degree level, the greater the chance of the student passing 75 percent or more of courses.

2.5 Percent of postgraduate EFTS at the provider

Percentage of EFTS within the provider generated by postgraduate students.

Figure 2.5: Predicted probability by percent of postgraduate EFTS at the provider



Odds ratio = <0.001 (95% interval <0.001-0.010)

When other factors are controlled for, students in providers with a lower proportion of postgraduate EFTS do better than those in providers with a larger proportion of postgraduate EFTS.

2.6 School decile

The decile ranking for purposes of equity funding of the last school attended by the student. Value is at the time of the student's last year at the school. The decile is allocated on a socio-economic deprivation index applied to a sample of families from the school, where 1 is the most deprived and 10 is the least deprived.

Odds ratio: 01-03 vs 04+ = 0.666 (95% interval 0.569-0.779)

Students from low decile schools have poorer results than those from middle and high decile schools, even when controlling for other variables in the model. There is no statistically significant difference in results for students from schools at decile 4 and above.

School decile, for this age group, can be interpreted as a broad proxy for socio-economic background – particularly for students from low decile schools, where there is a high instance of deprivation across the community.

2.7 Gender

Gender of student.

Odds ratio: Female vs Male = 1.314 (95% interval 1.149-1.503)

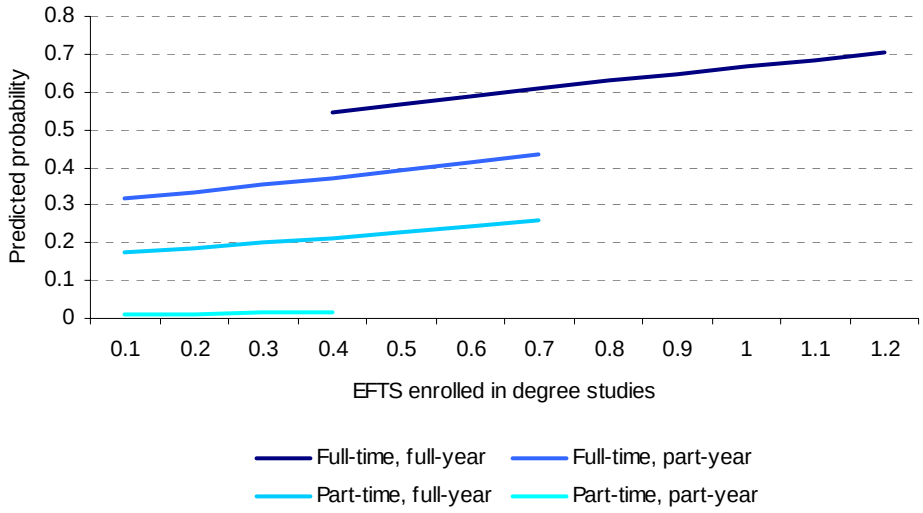
Female students have better results than male students.

2.8 Starting year

The first year of study for each student. It is included in the model as a control variable. This variable is interpreted as controlling for differences in data quality across years.

2.9 EFTS enrolled by study type

Figure 2.6: Predicted probability by study type and EFTS enrolled



Students who are full-time, full-year in tertiary studies have the best chances of passing 75 percent or more of their courses. Within this group, those who are enrolled mostly in degree papers are more successful than those who do a mix of degree-level and lower-level tertiary papers (ie those with a lower amount of EFTS enrolled at degree level).

The next most successful group are part-time, full-year students. These students are likely to be balancing study with work and/or family demands.

Full-time, part-year students are less successful again. This group includes students who studied for one semester and failed most or all of their courses and then withdrew from study.

The least successful are part-time, part-year students. These include students who 'tried out' one or two courses, failed them and then decided not to continue with degree-level studies.

2.10 Highest school qualification

This is the highest school qualification of the student, as reported at the time of enrolment. Changes in the school qualifications system and in the quality of the data collected mean that this variable has been grouped into three broad categories:

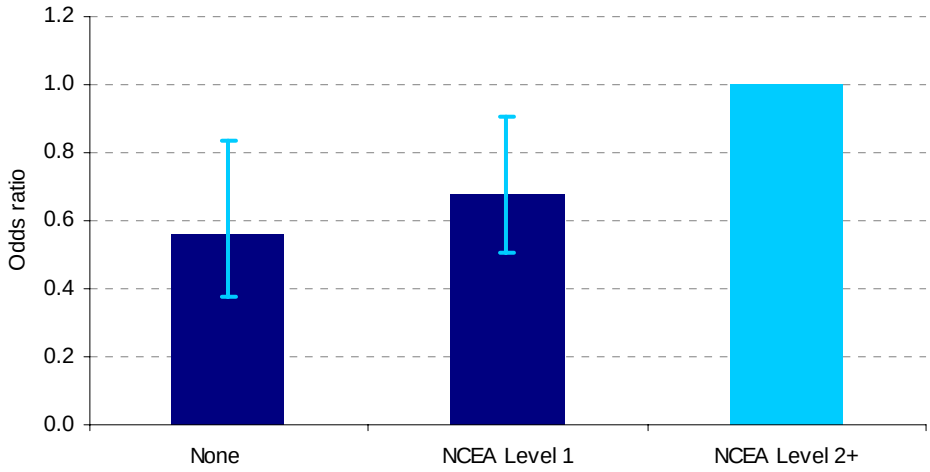
No qualification

NCEA Level 1 or equivalent

NCEA Level 2 or higher or equivalent (including overseas qualifications).

It has not been possible to separate out those who have met the university entrance requirements. Students in this age group with qualifications below university entrance can enter degree study at an ITP, wānanga or PTE. Under certain circumstances they can apply for discretionary or provisional entrance to a university.

Figure 2.7: Odds ratio by highest school qualification (reference = 'NCEA Level 2+')



Students with school qualifications below NCEA Level 2 are less likely to succeed in their first year. Those with no qualifications are less likely to succeed than those with some school qualifications.

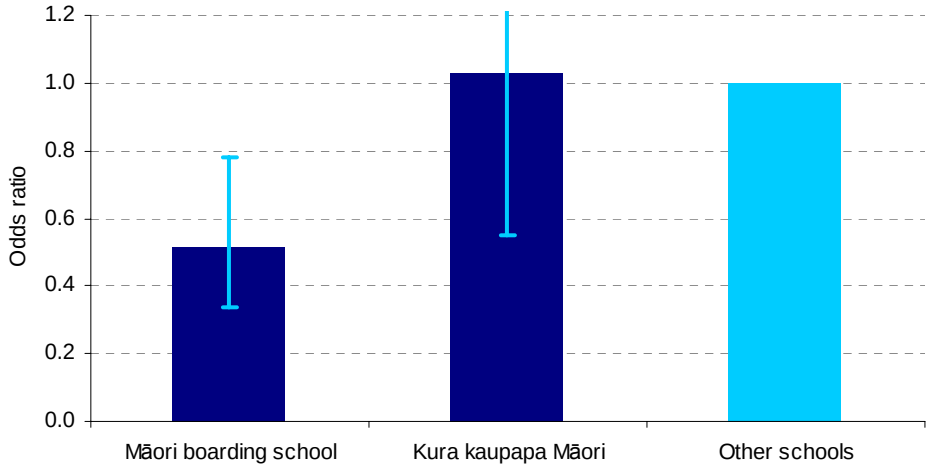
2.11 Postgraduate EFTS at the provider

The total amount of postgraduate EFTS in the provider. It has been included as a control variable and has no effect size (odds ratio = 1.0).

2.12 School definition

This is one of the variables used to classify schools. In this model, the two categories of interest were Māori Boarding Schools and Kura Kaupapa Māori.

Figure 2.8: Odds ratio by school definition (reference = 'Other schools')

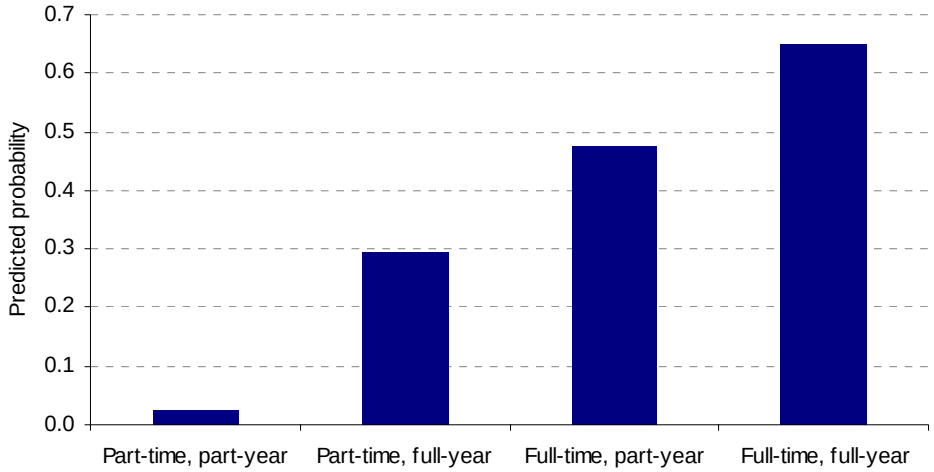


There is no difference between students from kura kaupapa Māori and students from other schools. However, students from Māori boarding schools had statistically significantly poorer performance than other Māori students, after controlling for other factors in the model.

2.13 Study type

Whether full- or part-year and full- or part-time (includes all tertiary enrolments during the year, not just degree studies).

Figure 2.9: Predicted probability by study type



Part-time students do not do as well as full-time students, especially part-time, part-year students. Full-time, part-year students do better than part-time students but not as well as full-time, full-year students.

2.14 School roll (year 9+); Bachelors EFTS at the provider

These variables are the number of students at year 9 and above enrolled in the school that the degree student last attended and the amount of EFTS at the providers at bachelors level (including graduate certificates and diplomas)

They are treated as control variables and have no effect size within the model (odds ratio = 1.0).

3 First-year retention for Māori bachelors students aged under 20

Model summary

Response variable	Continued or left study after one year
Response levels	1. Continued study (N=3,379) 2. Left study (N=520)
Probability modelled is continued in study Predicted probabilities presented below refer to this event	
Number of observations	3,899
Selection of observations	Māori first-year degree students Enrolling in 2002 to 2004 inclusive Returning to study within period to 2005 Intramural enrolments only
Max-rescaled R^2	0.3632
Percent concordant	84.5
Percent discordant	15.0
Percent tied	0.5
c	0.847

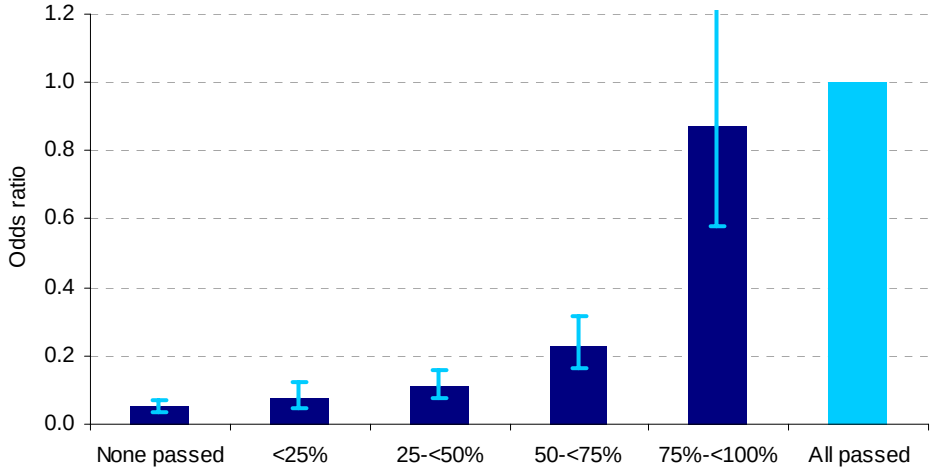
Type 3 analysis of effects

Effect	DF	Wald Chi-square	Pr > Chi-sq	Estimated contribution	Reference value (predicted probabilities)
First-year pass rate	5	385.0773	<.0001	74%	All passed
Study type	3	56.1983	<.0001	11%	Full-time, full-year
Subject	12	31.6491	0.0016	6%	Other society and culture
With(out) iwi affiliation	1	16.3283	<.0001	3%	With iwi affiliation
Gender * highest school qualification	4	12.412	0.0145	2%	
Sub-sector	3	10.2147	0.0168	2%	Institute of technology and polytechnic
Percent of bachelors EFTS at provider	1	6.5568	0.0104	1%	67.6%
Highest school qualification	4	3.7757	0.4372	1%	NCEA Level 3+
Gender	1	0.0131	0.909	0%	Male

3.1 First-year pass rate

Percentage of first-year courses passed.

Figure 3.1: Odds ratio by first-year pass rate (reference = 'All passed')

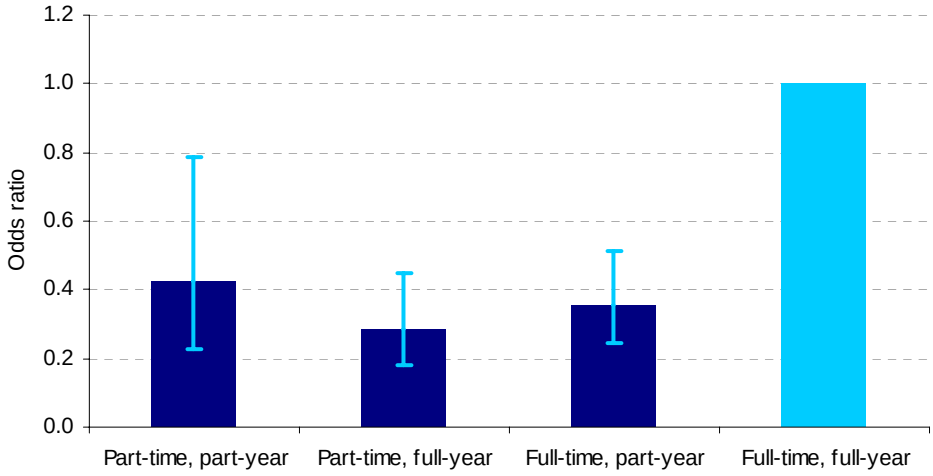


Students who pass less than 75 percent of their courses in the first year are significantly less likely to continue in further study.

3.2 Study type

Whether full- or part-year and full- or part-time (includes all tertiary enrolments during the year, not just degree studies).

Figure 3.2: Odds ratio by study type (reference = 'Full-time, full-year')

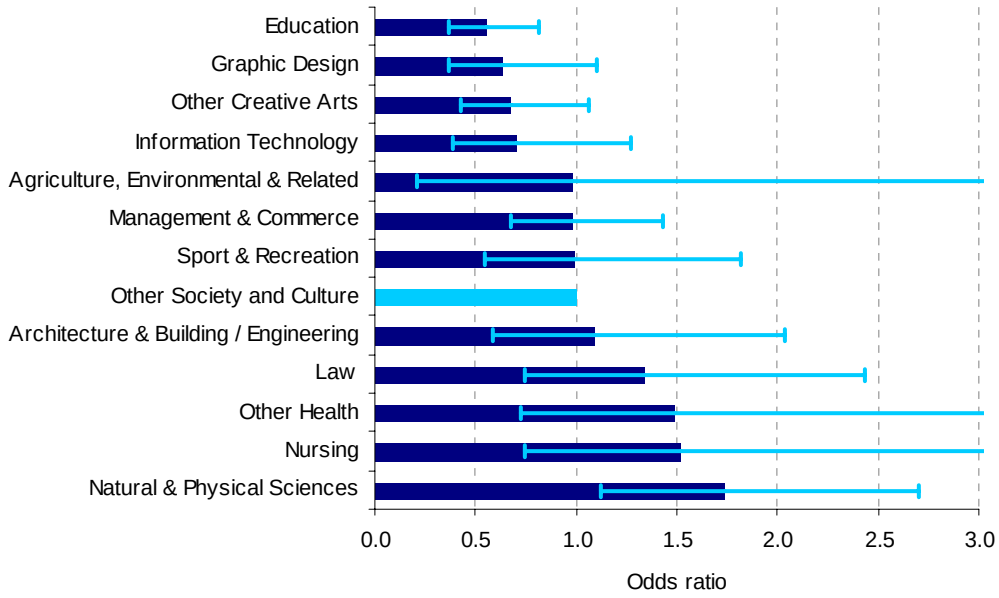


Students who are not full-time, full-year in their first year have a significantly lower chance of continuing in study after one year. There is no statistically significant difference across the three groups.

3.3 Subject

NZSCED broad and selected narrow fields.

Figure 3.3: Odds ratio by subject (reference = 'Other society and culture')



While there appear to be notable differences in the first-year retention among subjects, many of the differences are not statistically significant. Students in sciences have a significantly higher chance of continuing in study than those in other society and culture. There is no significant difference between students in other society and culture and students in the remaining subjects, with the exception of education.

3.4 With(out) iwi affiliation

Whether or not a student declared an iwi affiliation in at least one year, with one provider.

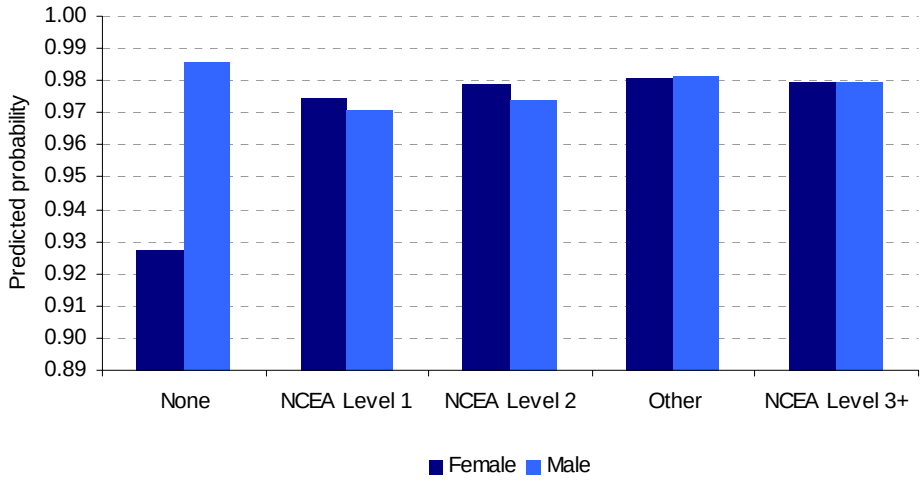
Odds ratio (without vs with) = 0.583 (95% interval 0.448-0.757)

Māori students with an iwi affiliation are more likely to continue in study after one year. This may be the result of stronger cultural and personal identity and/or greater access to social, cultural, educational and financial resources.

However, this can only be a tentative conclusion at this stage, given there was an improvement in the reporting of iwi data over the time period. This means that students who started study when the reporting was introduced and did not continue may be somewhat less likely to have their iwi affiliations recorded than those who started at the same time and continued in study.

3.5 Gender by highest school qualification

Figure 3.4: Predicted probability by gender and highest school qualification



Neither gender nor school qualification was significant on its own in the model. The results of the interaction show that females with no qualifications had a lower chance of continuing in study.

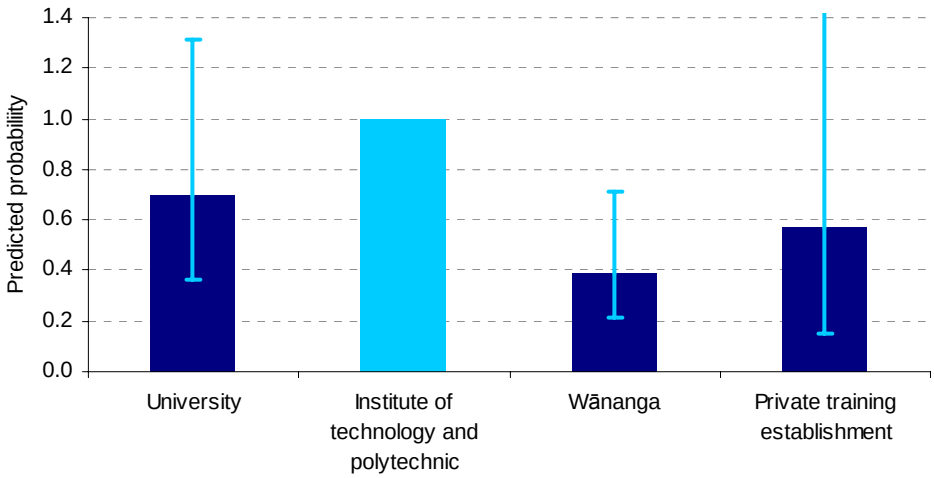
3.6 Sub-sector

Sub-sector groupings of providers, as at time of data collection:

Universities, Institutes of Technology and Polytechnics, Wānanga and Private Training Establishments.

Colleges of Education have been grouped with universities, to take account of recent mergers. Other Tertiary Education Providers have been grouped with Private Training Establishments

Figure 3.5: Odds ratio by sub-sector (reference = 'Institute of technology and polytechnic')

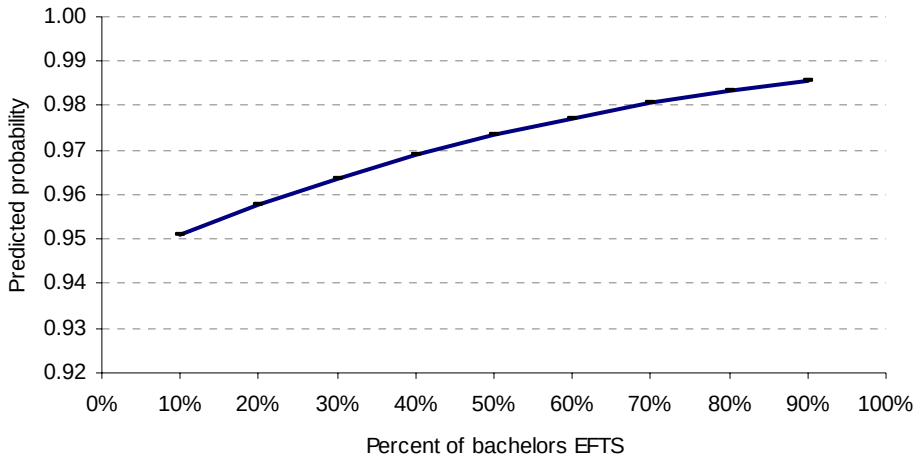


There was no statistically significant differences in first-year retention among universities, ITPs and PTEs. However, students at wānanga had a significantly lower chance of continuing in study after one year. Note that this includes degree study at any tertiary provider, so it does not reflect students starting degree study at a wānanga and then transferring to another institution for higher-level papers.

3.7 Percent of bachelors EFTS at the provider

Percent of EFTS within the provider generated by bachelors-level students (including graduate diplomas and certificates).

Figure 3.6: Predicted probability by percent of bachelors EFTS at the provider



Students at providers with a lower proportion of EFTS at bachelors level are less likely to continue in degree study than those at providers with higher proportions of EFTS. This variable may represent the collective teaching capacity and capability at bachelors level and also a point of critical mass for a strong degree programme.

4 Five-year completion for Māori bachelors students aged under 20

Model summary

Response variable	Whether or not completed a bachelors degree or bachelors with honours within five years of enrolling
Response levels	1. Completed (N=362) 2. Not completed (N=183)
Probability modelled is completed Predicted probabilities presented below refer to this event	
Number of observations	545
Selection of observations	Māori first-year degree students, who enrolled in 2001 and completed more than 2.9 EFTS of degree study in the period to 2005 Three-year degrees only Intramural enrolments only
Max-rescaled R^2	0.4131
Percent concordant	84.2
Percent discordant	15.7
Percent tied	0.3
c	0.843

The model was initially run with students who were enrolled for two or more years of study. This approach showed time in study to be the strongest factor – that is, you need to complete at least 3.0 EFTS to complete a bachelors degree. This was seen to be a self-evident finding, so the model was adjusted to include only students who had completed more than 2.9 EFTS of degree study.

The population was limited to those undertaking three-year degrees only, so as to remove effects due to longer programme requirements.

Type 3 analysis of effects

Effect	DF	Wald Chi-square	Pr > Chi-sq	Estimated contribution	Reference value (predicted probabilities)
Total pass rate	1	96.0933	<.0001	62%	Less than 75%
Bachelors EFTS * Postgraduate EFTS in provider	1	13.2799	0.0003	9%	29,620,027
Percent of postgraduate students in provider	1	12.7323	0.0004	8%	14.6%
EFTS enrolled in first year	1	10.9775	0.0009	7%	0.95
Highest school qualification	2	7.5701	0.0227	5%	NCEA Level 3+
EFTS enrolled in addition to qualification requirement	1	7.22	0.0072	5%	0.79
Full-time, full-year over degree period	1	6.984	0.0082	5%	Full-time, full year

4.1 Total pass rate

The percentage of all degree courses that each student passed.

Odds ratio (more than 75% vs less than 75%) = 15.076 (95% confidence = 8.764-25.935)

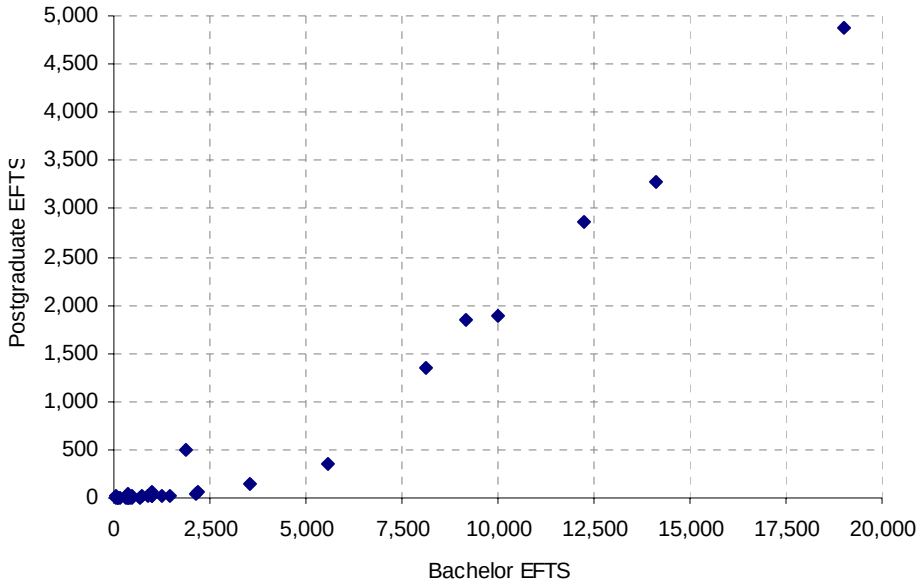
Maintaining a course pass rate of 75 percent or more of courses is the most critical success factor for completion.

4.2 Bachelors EFTS by postgraduate EFTS at the provider

The amount of bachelors-level EFTS at the provider (including graduate certificates and diplomas) multiplied by the amount of postgraduate EFTS at the provider.

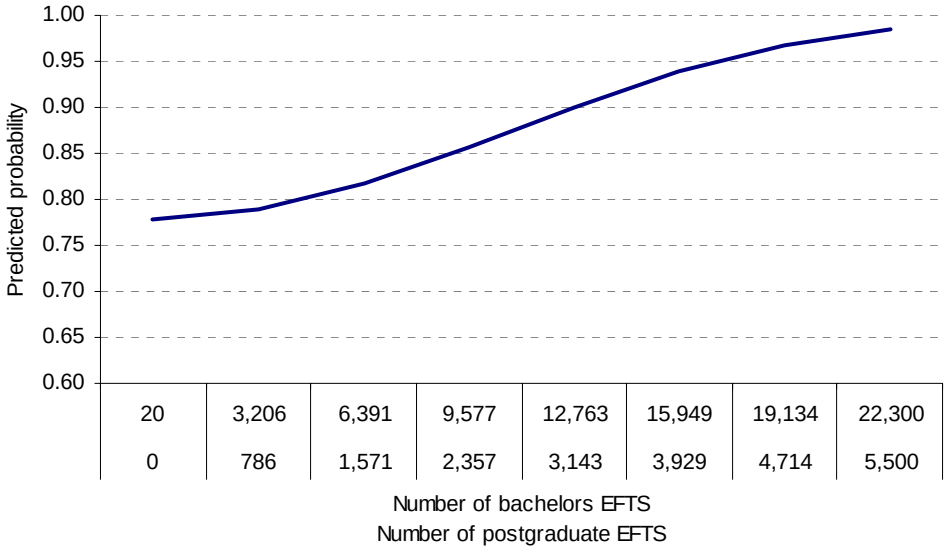
The distribution of the two dimensions is shown in the plot below. This variable provides a measure of the volume of bachelors and postgraduate education undertaken by the provider.

Figure 4.1: Plot of bachelors EFTS against postgraduate EFTS for providers with Māori degree students



This variable reflects sub-sector differences. The universities have the larger amounts of bachelors and postgraduate EFTS. The observations on the diagonal line are all universities. ITPs, wānanga and PTEs have smaller amounts of both and many have no postgraduate students. The observations in the cluster on the left end of the x-axis are all in these last three sub-sectors.

Figure 4.2: Predicted probability by 'bachelors EFTS*postgraduate EFTS' at the provider

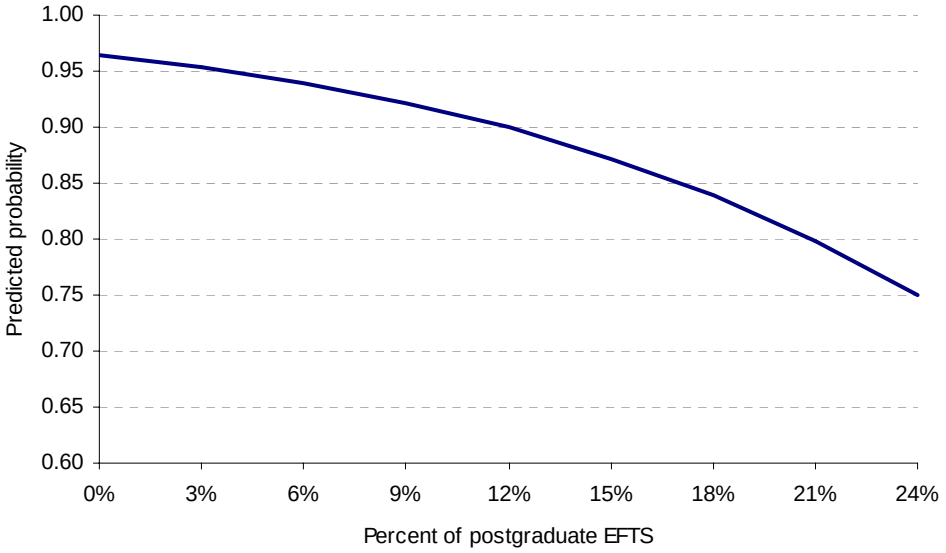


For the graph above, the minimum and maximum values for each variable in the data set have been used, with evenly spaced points for each component value set in between. The analysis shows that chances of success increase with the scale of bachelors and postgraduate provision.

4.3 Percent of postgraduate students at the provider

The percent of all students at the provider who are at postgraduate levels.

Figure 4.3: Predicted probability by percent of postgraduate EFTS at the provider



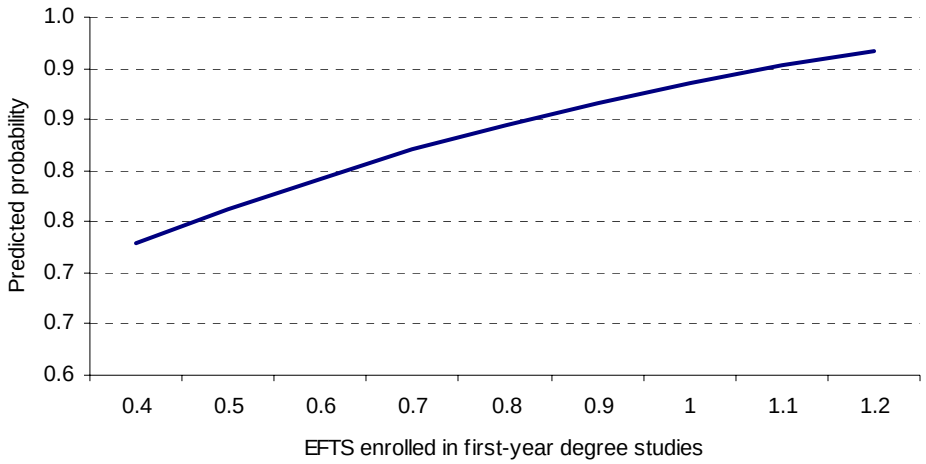
Given the same level of provision at bachelors and postgraduate level (as expressed in the previous variable), increases in the proportion of postgraduate provision are associated with

decreasing chances of success at bachelors level. This suggests that a greater concentration of postgraduate study may take the focus away from support of bachelors students.

4.4 EFTS enrolled in first year

EFTS value of course enrolled in by the student in their first year of study

Figure 4.4: Predicted probability by EFTS enrolled in first year



Odds ratio = 5.824 (95% confidence = 2.054-16.513)

The amount of study undertaken in the first year has a significant effect on the probability of completing within five years, even when students have continued in study for the equivalent of three full-time years.

4.5 Highest school qualification

Highest school qualification of the student, as reported at the time of enrolment. Changes in the school qualification system and in the quality of the data collected mean that this variable has been grouped into three categories:

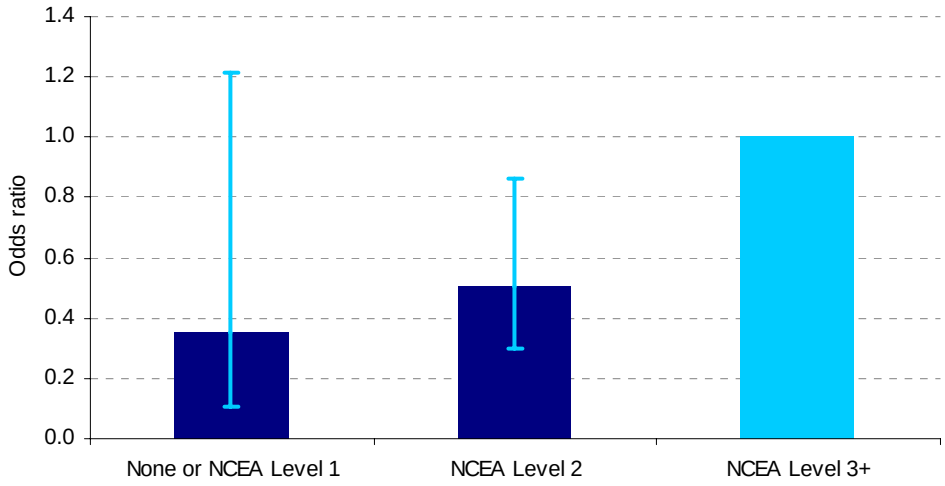
No qualification or NCEA Level 1 or equivalent

NCEA Level 2 or equivalent

NCEA Level 3 or higher or equivalent and other qualifications (including overseas).

It has not been possible to separate out those who have met the university entrance requirements. Students in this age group with qualifications below university entrance can enter degree study at an ITP, wānanga or PTE. Under certain circumstances they can apply for discretionary or provisional entrance to a university.

Figure 4.5: Odds ratio by highest school qualification (reference = 'NCEA Level 3+')

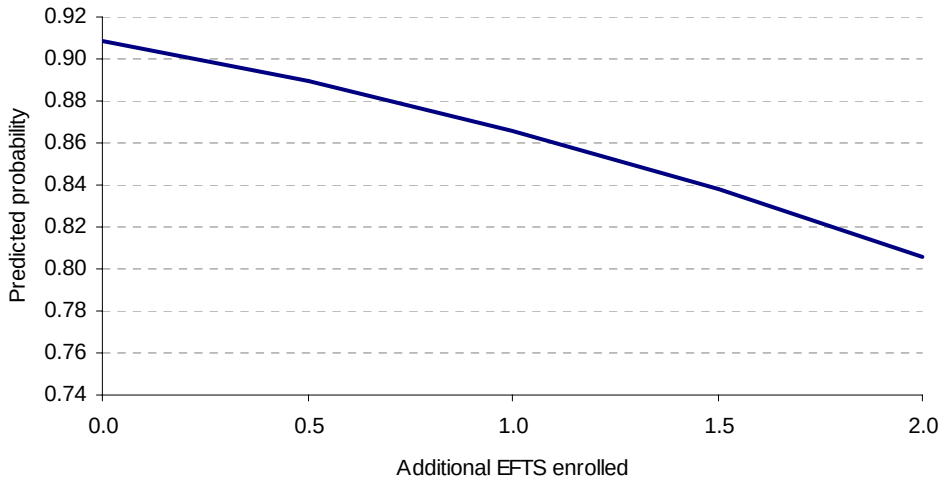


Students with school qualifications below NCEA Level 3 have a lower chance of completing within five years. The result is statistically significant for students with NCEA Level 2, but not for students with qualifications below that (due to sample size). This means that even if students with NCEA Level 2 or below are passing most of their courses and remain in study for at least 2.9 EFTS, they are still less likely to complete than counterparts with higher school qualifications.

4.6 EFTS enrolled in addition to qualification requirement

The difference between the total EFTS enrolled in degree studies and the EFTS year value of the qualification enrolled in. This represents additional courses undertaken over and above the expected requirements.

Figure 4.6: Predicted probability by additional EFTS enrolled



Odds ratio = 0.644 (95% confidence = 0.467-0.888)

Taking additional time (in EFTS terms) towards a degree is associated with reduced chances of completing within five years. Students who undertake additional study include those with double majors, those who failed some courses and those who change their major subject.

4.7 Full-time, full-year over degree period

This variable represents students who were enrolled full-time, full-year over the full period of their degree studies. This has been determined as having an average annual EFTS enrolment of 0.9 or higher.

Odds ratio (Other vs Full-time / full-year) = 0.491 (95% confidence = 0.290-0.832)

Being part-time or part-year reduces the chances of completing a degree, even when students have completed the required amount of EFTS during the five-year period.

5 First-year pass rates for Māori first-time bachelors students aged 25 to 39

Model summary

Response variable	Proportion of first-year courses passed
Response levels	1. <75% passed (N=2,491) 2. 75%-100% passed (N=2,333)
Probability modelled is that the proportion of first-year courses passed is 75% to 100% Predicted probabilities presented below refer to this event	
Number of observations	4,824
Selection of observations	Māori first-year degree students Enrolling in 2002 to 2005 inclusive
Max-rescaled R^2	0.2314
Percent concordant	74.0
Percent discordant	25.7
Percent tied	0.2
c	0.742

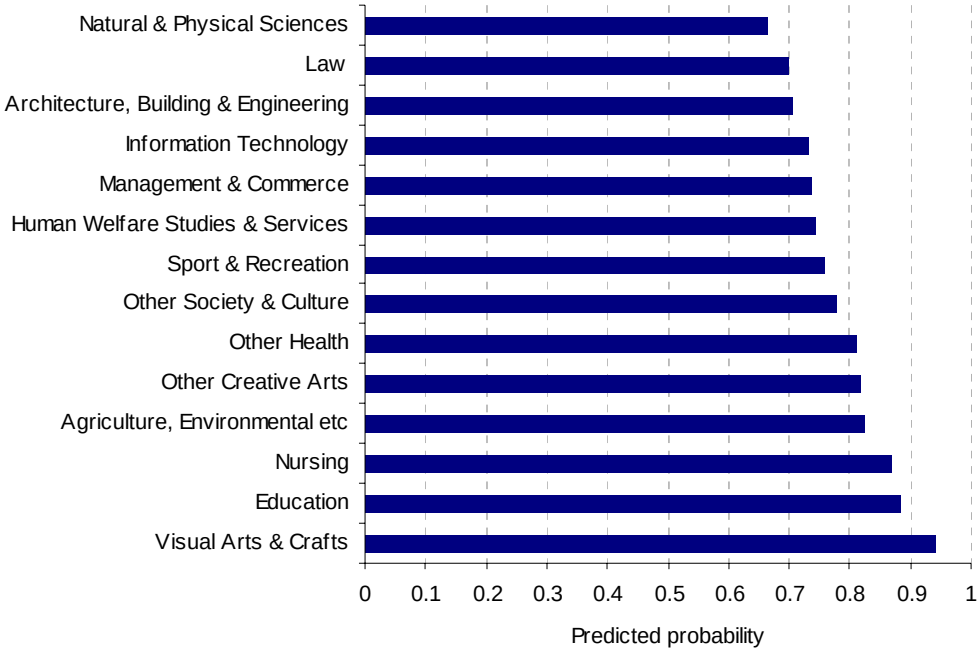
Type 3 analysis of effects

Effect	DF	Wald Chi-square	Pr > Chi-sq	Estimated contribution	Reference value (predicted probabilities)
Subject	13	93.0711	<.0001	18%	Other society and culture
Highest school qualification	4	77.2171	<.0001	15%	NCEA Level 3+
Sub-sector	3	71.4088	<.0001	14%	University
Prior activity	3	53.0469	<.0001	10%	Employed
Sub-sector*subject	26	41.1247	0.0301	8%	
Number of Māori students at provider	1	40.43	<.0001	8%	3,803
EFTS enrolled*study type	3	35.3952	<.0001	7%	
Number of students at provider	1	29.6669	<.0001	6%	22,450
EFTS enrolled	1	17.3255	<.0001	3%	0.62
Highest school qualification * Extra-/intra-mural	4	13.5904	0.0087	3%	
Study type	3	13.3247	0.004	3%	Full-time, full-year
Sub-sector * Extra-/intra-mural	3	9.9176	0.0193	2%	
Age	1	6.7304	0.0095	1%	31.5
School decile	1	6.5616	0.0104	1%	4+
Extra-/intra-mural	1	1.3842	0.2394	0%	Intramural

5.1 Subject

Subject has been classified using NZSCED broad and selected narrow fields.

Figure 5.1: Predicted probability by subject



The graph above shows probability of passing courses for the reference group, who are students at university. It needs to be read alongside the graph for subject by sub-sector, below, which shows the variation across sub-sectors.

The main conclusion from this graph is that there is notable variation in the probability of passing 75 percent or more of courses by subject area. These differences are not differentiated by generic and specialist qualifications as they were for the under-20-year-old age group. The highest success was in nursing, education and visual arts.

5.2 Highest school qualification

Highest school qualification of the student is as reported at the time of enrolment. Changes in the school qualification system and in the quality of the data collected mean that this variable has been grouped into five categories:

No qualification

NCEA Level 1 or equivalent

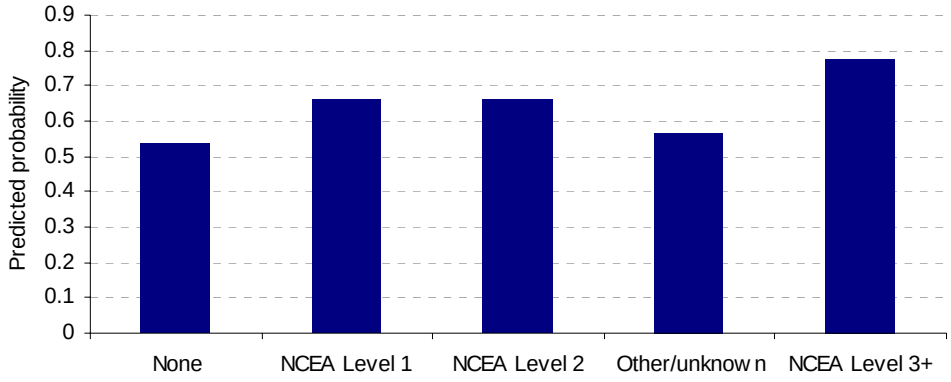
NCEA Level 2 or equivalent

NCEA Level 3 or higher or equivalent

Other qualifications (including overseas).

It has not been possible to separate out those who have met the university entrance requirements.

Figure 5.2: Predicted probability by highest school qualification



Students with no school qualification are less likely to pass 75 percent or more of their courses than other students. Students with NCEA Level 1 or 2 do not do as well as those with NCEA Level 3.

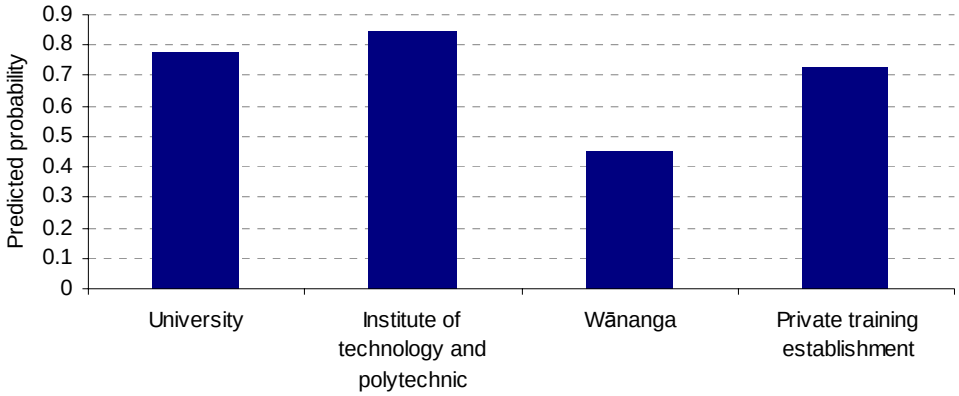
5.3 Sub-sector

Sub-sector groupings of providers, as at time of data collection:

Universities, Institutes of Technology and Polytechnics (ITPs), Wānanga and Private Training Establishments (PTEs).

Colleges of Education have been grouped with universities, to take account of recent mergers. Other Tertiary Education Providers have been grouped with Private Training Establishments.

Figure 5.3: Predicted probability by sub-sector



Students at universities and PTEs have fairly similar results. Students at ITPs do slightly better. However, results for students at wānanga are notably poorer.

5.4 Prior activity

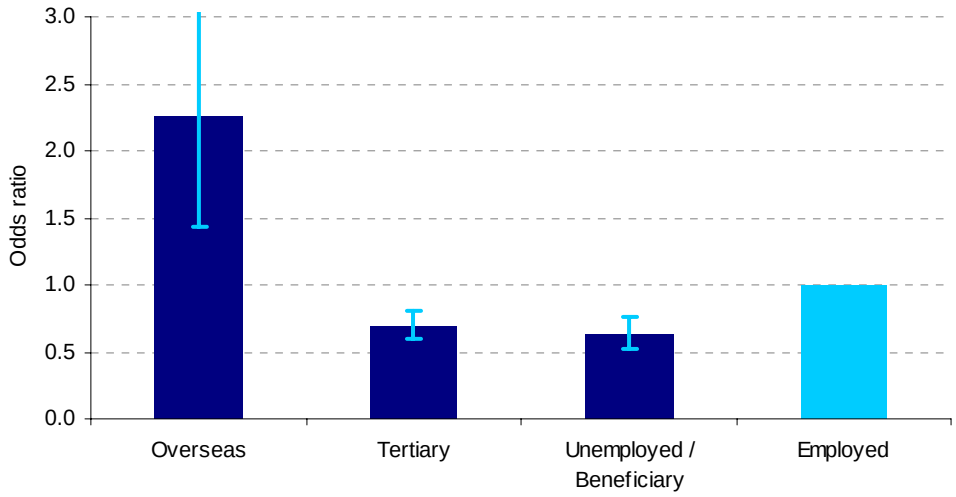
Main activity of the student prior to enrolment in degree programme:

Tertiary – if the student was enrolled in a sub-degree programme in the year preceding or same year as degree enrolment

Employed; Unemployed/Beneficiary; Overseas – if the student was in neither school nor tertiary in the year prior to enrolment in degree study then used these activities as reported at enrolment

Unknown values were added into Employed on the basis that results for these students were not significantly different.

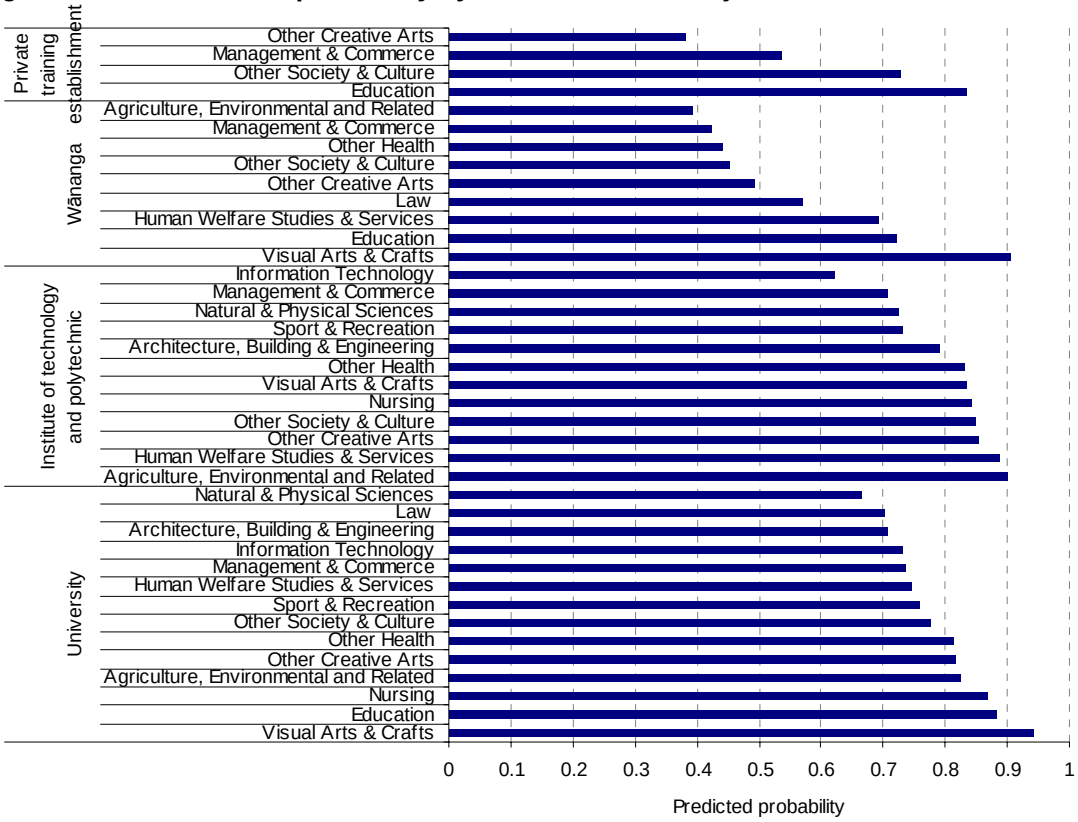
Figure 5.4: Odds ratio by prior activity (reference= 'Employed')



Students whose prior activity is tertiary study (below degree level) or unemployed have a lower chance of success in their first year than those who are in employment. Students returning from overseas have a much higher chance of success. However, their numbers are quite small.

5.5 Sub-sector by subject

Figure 5.5: Predicted probability by sub-sector and subject



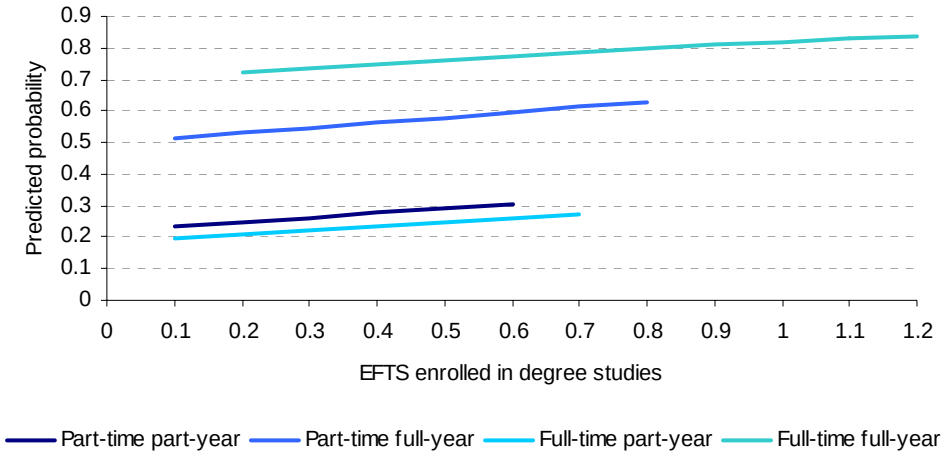
Success in subjects varies considerably by sub-sector. In universities, success was highest in nursing, education and visual arts and crafts. In ITPs, success was highest in agriculture, environmental and related studies, and human welfare studies and services. In wānanga, success was highest in visual arts and education. In PTEs, success was highest in education.

5.6 Number of Māori students at the provider

The number of Māori students enrolled at the provider (at all levels). It was added as a control variable. It has no effect size in the model (odds ratio = 1.0).

5.7 EFTS enrolled by study type

Figure 5.6: Predicted probability by EFTS enrolled and study type



Students who are enrolled full-time, full-year in degree studies are more likely to be successful than students enrolled part-time and/or part-year. The next most successful group are those who enrol part-time, full-year. The least successful are students who enrolled only part-year. These groups will include students who started study towards a degree and failed their first semester courses and then pulled out of study.

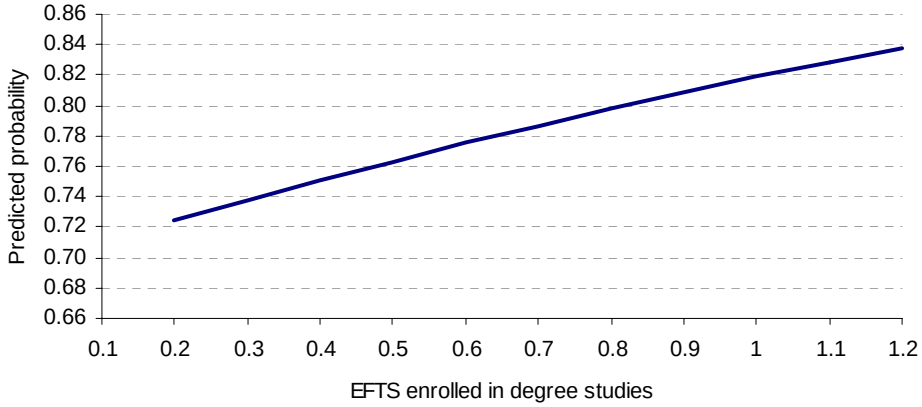
5.8 Number of students at the provider

The total number of students enrolled at the provider (at any level). It was added as a control variable. It has no effect size in the model (odds ratio = 1.0).

5.9 EFTS enrolled

EFTS enrolled: the total EFTS enrolled in courses associated with a bachelors degree (excludes enrolments in other qualifications).

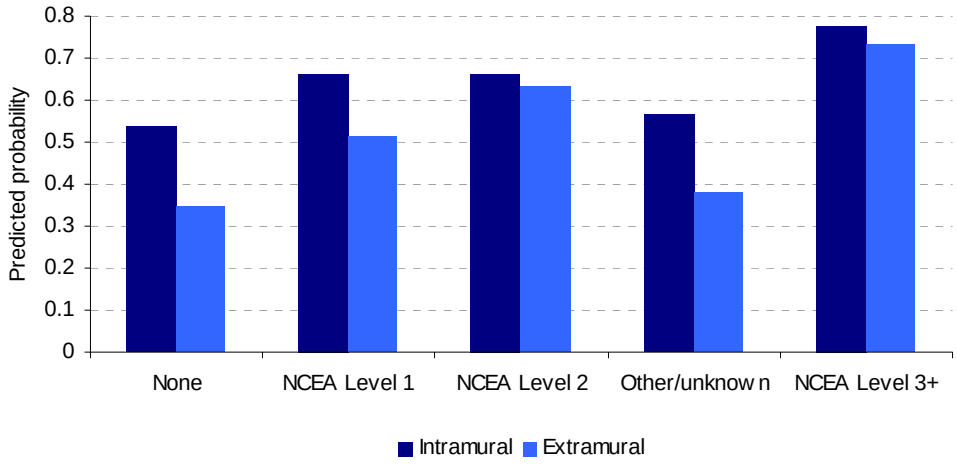
Figure 5.7: Predicted probability by EFTS enrolled



Students who study larger amounts of EFTS at degree level during the year are more likely to pass their degree courses.

5.10 Highest school qualification by extra-/intra-mural

Figure 5.8: Predicted probability by highest school qualification and extra-/intra-mural

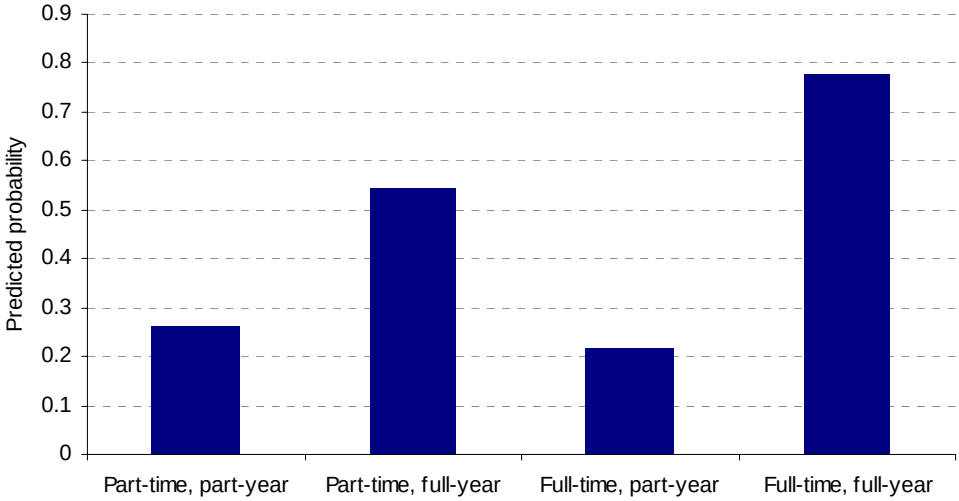


Overall, extramural students have a lower chance of success than intramural students. However, the difference is not very great for students with NCEA Level 2 and NCEA Level 3. Students with no qualifications or NCEA Level 1 have notably poorer performance in extramural studies.

5.11 Study type

Whether full or part year and full or part time (includes all tertiary enrolments during the year, not just degree studies).

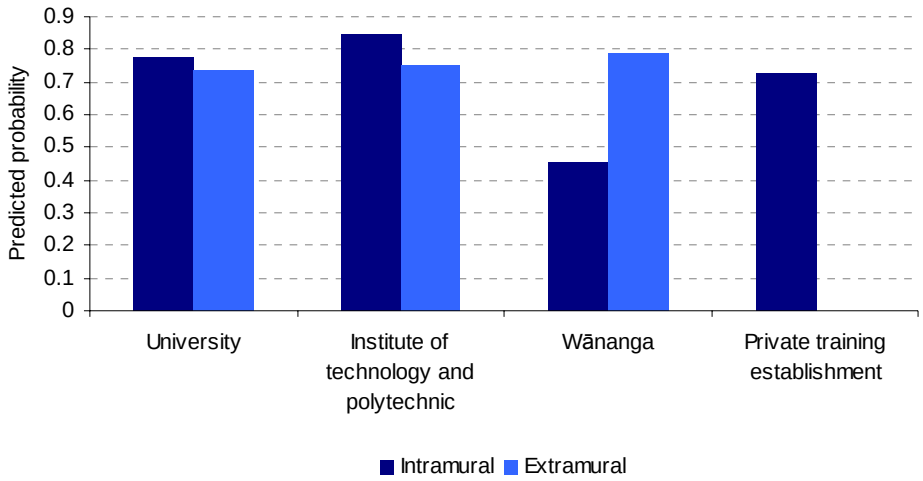
Figure 5.9: Predicted probability by study type



Full-year students are notably more successful in their first year than part-year students. However, part-time, full-year students are not as successful as full-time, full-year students. There is little difference between part-time and full-time for part-year students. Part-year students include students who stopped study after failing all of their first-semester courses.

5.12 Sub-sector by extra-/intra-mural

Figure 5.10: Predicted probability by sub-sector and extra-/intra-mural

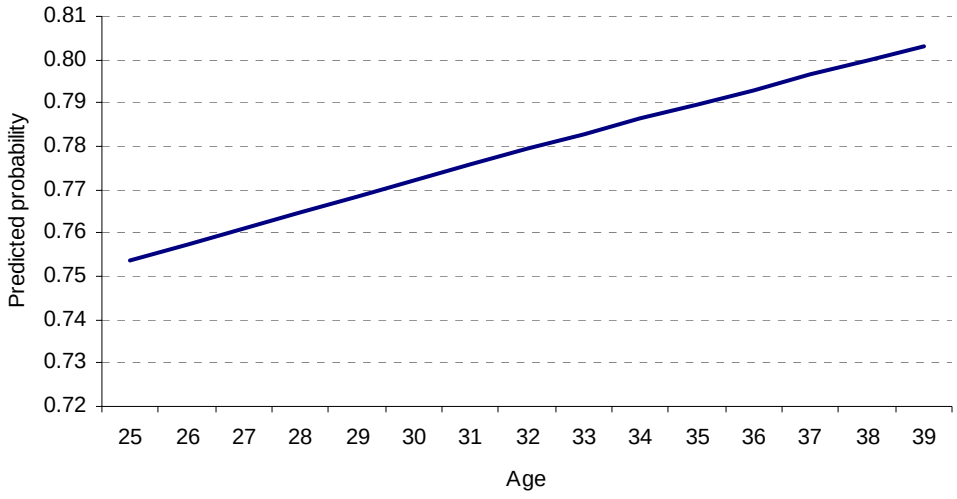


Extramural students at universities and ITPs have similar chances of success. Their chances of success are only slightly lower than those of their intramural colleagues, when other factors are controlled for. There were only a few extramural students at wānanga who had considerably higher success than their intramural colleagues. There were no extramural students at PTEs.

5.13 Age

Age of the student in the first year of degree study.

Figure 5.11: Predicted probability by age



Odds ratio = 1.021 (95% confidence = 1.005-1.037)

The chances of success increase with age, with the probability of passing 75 percent or more of courses increasing by about one percentage point for every three additional years of age.

5.14 School decile

The decile ranking for purposes of TFEA funding of the last school attended by the student. Value is at the time of the student's last year at the school. The decile is allocated on a socio-economic deprivation index applied to a sample of families from the school, where 1 is the most deprived and 10 is the least deprived.

Decile was grouped into 1-3 and 4+ on the basis of testing statistical significance among individual deciles.

Odds ratio (01-03 vs 04+) = 0.846 (95% confidence = 0.744-0.961)

Students from low decile schools have a lower chance of success than those from medium and high decile schools – even when returning to study as adult students. The difference, however, is less than for students entering tertiary education directly from school.

6 First-year retention for Māori first-time bachelors students aged 25 to 39

Model summary

Response variable	Continued or left study after one year
Response levels	1. Continued study (N=2,439) 2. Left study (N=1,418)
Probability modelled is continued in study Predicted probabilities presented below refer to this event	
Number of observations	3,857
Selection of observations	Māori first-year degree students Enrolling in 2002 to 2004 inclusive Returning to study within period to 2005
Max-rescaled R^2	0.3308
Percent concordant	80.1
Percent discordant	19.7
Percent tied	0.2
c	0.802

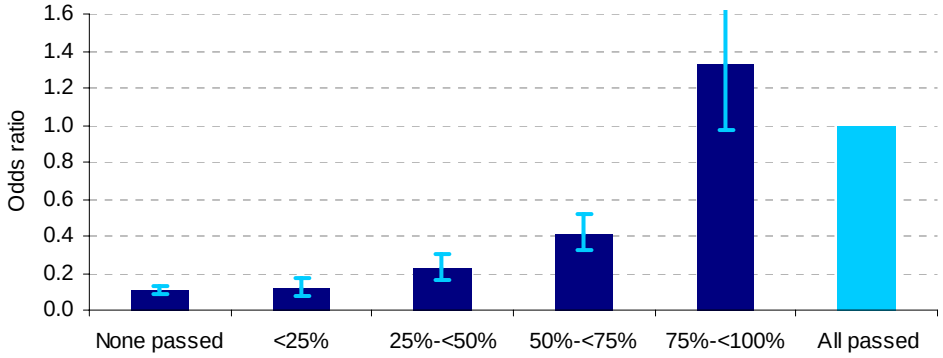
Type 3 analysis of effects

Effect	DF	Wald Chi-square	Pr > ChiSq	Estimated contribution	Reference value (predicted probabilities)
First-year pass rate	5	563.5222	<.0001	76%	All passed
Subject	13	51.9213	<.0001	7%	Other society and culture
EFTS enrolled	1	38.1791	<.0001	5%	0.63
Extra-/intra-mural	1	28.8395	<.0001	4%	Intramural
Sub-sector*extra-/intra-mural	3	16.9175	0.0007	2%	
Starting year	2	15.0514	0.0005	2%	2004
Age	1	9.9551	0.0016	1%	31.5
Study type	3	8.6787	0.0339	1%	Full-time, full-year
Sub-sector	3	7.5304	0.0568	1%	University
Iwi	1	5.5463	0.0185	1%	With iwi affiliation

6.1 First-year pass rate

The percentage of first-year courses that each student passed.

Figure 6.1: Odds ratio by first-year pass rate (reference = 'All passed')

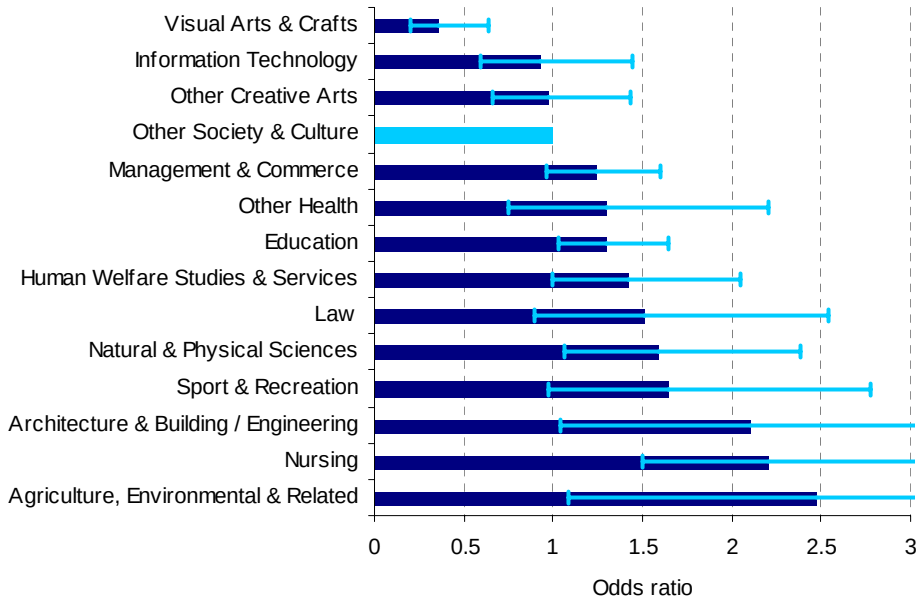


Students who pass 75 percent or more of their first-year courses are much more likely to continue in study. However, students who pass all of their courses may be less likely to continue than those who pass more than 75 percent but less than 100 percent. This may be because the former category includes students who only studied for the course(s) and did not intend to complete the qualification.

6.2 Subject

Subject has been classified using NZSCED broad and selected narrow fields.

Figure 6.2: Odds ratios by subject (reference = 'Other society and culture')



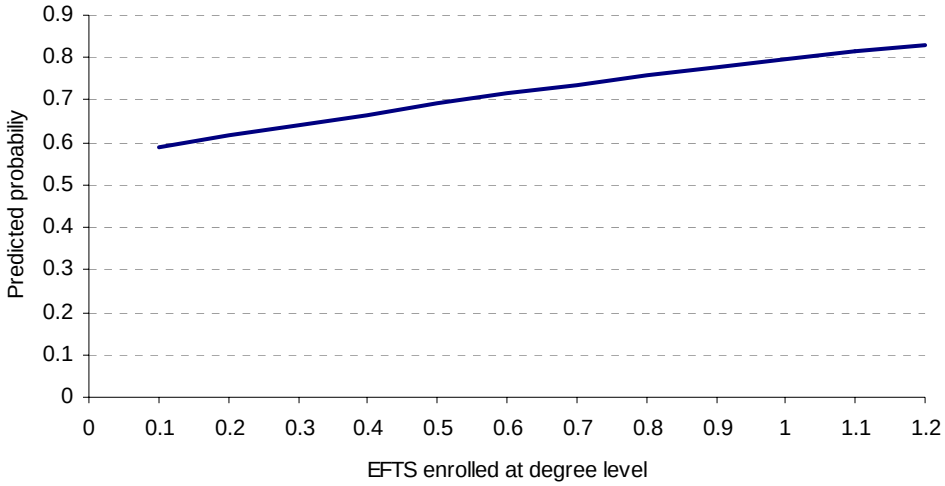
There are some differences in probability of continuing in study across subjects. For most subjects, the probabilities are not statistically significantly different from the reference subject ('other society and culture'). The probability of continuing in study is significantly lower for visual

arts and crafts. This may be due to people studying to achieve courses rather than a qualification in this area. The probability is statistically significantly higher in education, sciences, architecture, building and engineering, nursing and agriculture, and environmental and related studies.

6.3 EFTS enrolled

EFTS enrolled by the student in courses associated to bachelors degree (excludes enrolments in other qualifications).

Figure 6.3: Predicted probability by EFTS enrolled

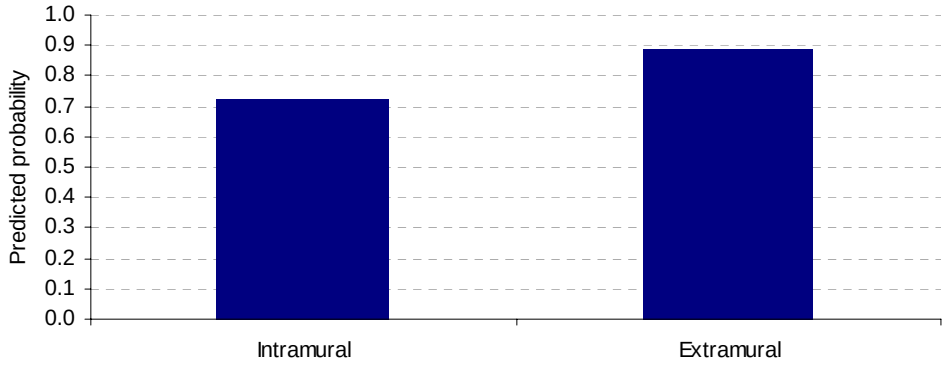


Students who undertake a greater amount of study at degree level, as measured in terms of EFTS, are more likely to continue in degree-level study the following year.

6.4 Extra-/intra-mural

Whether the student is enrolled extramurally (distance learning and/or block courses) or intramurally (all classes on campus).

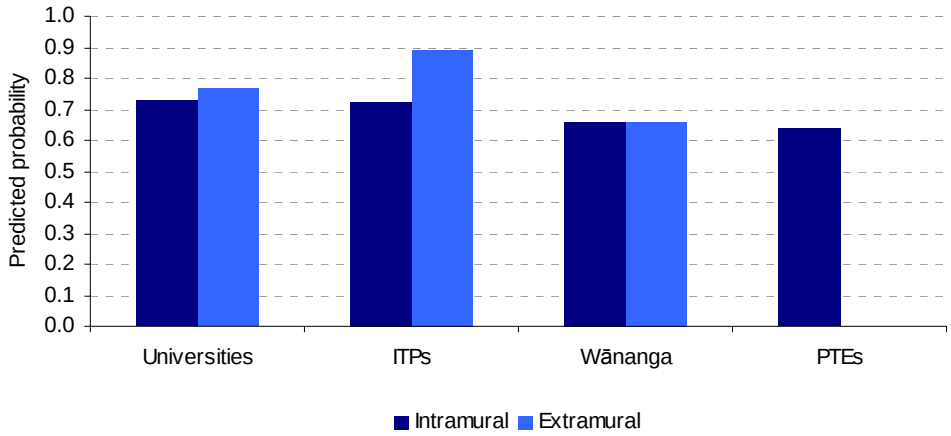
Figure 6.4: Predicted probability by extra-/intra-mural



Looking at this variable on its own, extramural students are more likely to continue in study than intramural students.

6.5 Sub-sector by extra-/intra-mural

Figure 6.5: Predicted probability by sub-sector and extra-/intra-mural



Looking at extramural and intramural students by sub-sector reveals that extramural students at ITPs have a higher chance of continuing in study than their intramural colleagues. The difference is much less for students at universities and there is no difference for students at wānanga.

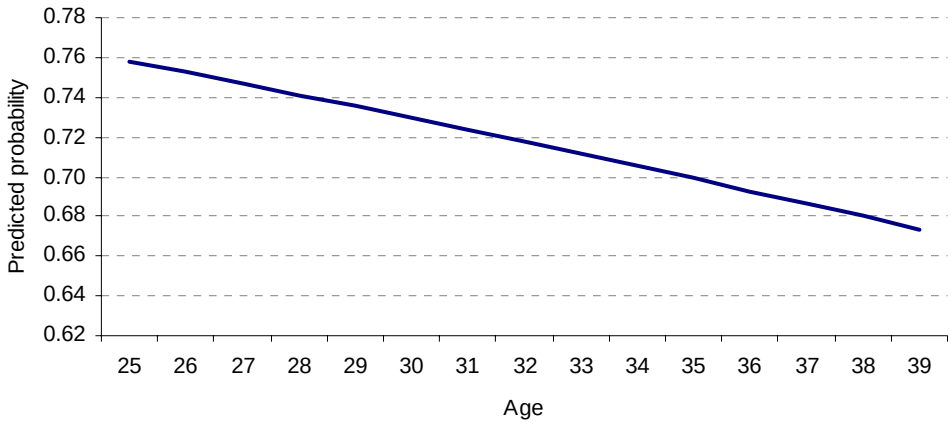
6.6 Starting year

This is first year of study for each student. It is included in the model as a control variable. This variable is interpreted as controlling for differences in data quality across years, particularly with regard to course pass rates.

6.7 Age

Age of the student in the first year of degree study.

Figure 6.6: Predicted probability by age



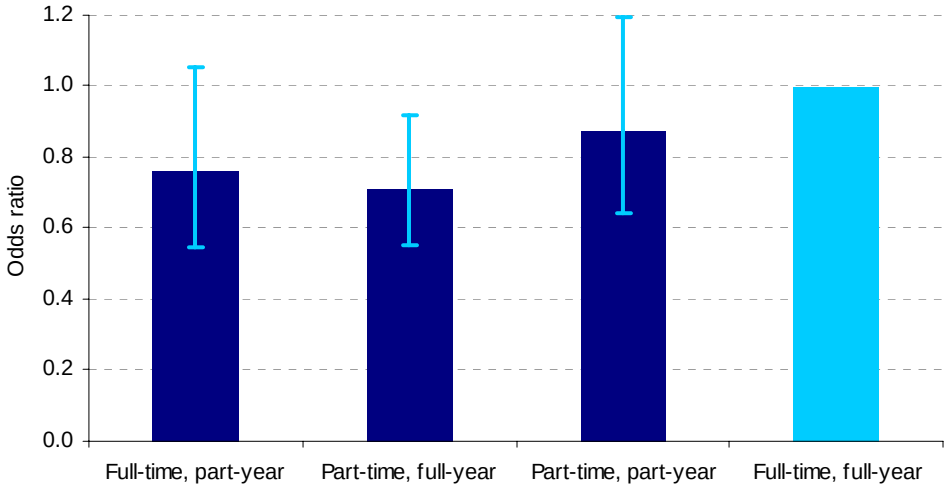
Odds ratio = 0.971 (95% confidence = 0.953-0.989)

The probability of continuing in study reduces slightly with the age of the student. There is approximately a 1 percent decrease in probability for every two additional years of age.

6.8 Study type

Whether full- or part-year and full- or part-time (includes all enrolments during the year).

Figure 6.7: Odds ratio by study type (reference = 'Full-time, full-year')



Students who are not full-time, full-year in their first year are less likely to continue in study in the following year. However, this result is only statistically significant for part-time, full-year students.

6.9 With(out) iwi affiliation

Whether or not a student declared an iwi affiliation in at least one year, with one provider.

Odds ratio (without vs with) = 0.755 (95% confidence = 0.597-0.954)

Students with an iwi affiliation may have a small advantage in terms of staying in study. However, this may also reflect improvements in data quality for this variable over time.

7 Five-year completion for Māori first-time bachelors students aged 25 to 39

Model summary

Response variable	Whether or not completed a bachelors degree or bachelors with honours within five years of enrolling
Response levels	1. Completed (N=254) 2. Not completed (N=108)
Probability modelled is completed Predicted probabilities presented below refer to this event	
Number of observations	362
Selection of observations	Māori first-year degree students who enrolled in 2001 and completed more than 2.9 EFTS of degree study in the period to 2005 Three-year degrees only
Max-rescaled R^2	0.4832
Percent concordant	60.5
Percent discordant	1.5
Percent tied	38.1
c	0.795

The model was initially run with students who were enrolled for two or more years of study. This approach showed time in study to be the strongest factor – that is, you need to complete at least 3.0 EFTS to complete a bachelors degree. This was seen to be a self-evident finding, so the model was adjusted to include only students who had completed more than 2.9 EFTS of degree study.

The population was limited to three-year degrees only, so as to remove effects due to longer programme requirements.

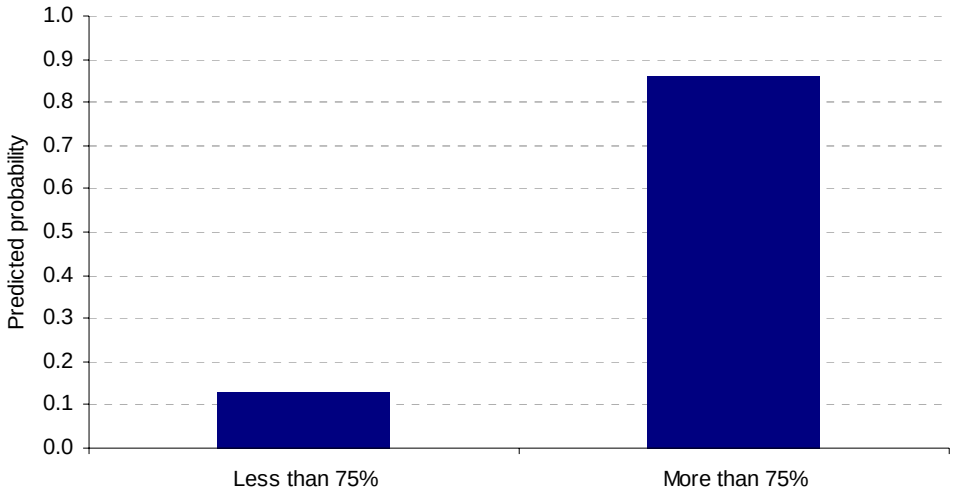
Type 3 analysis of effects

Effect	DF	Wald Chi-square	Pr > ChiSq	Estimated contribution	Reference value (predicted probabilities)
Total pass rate	1	96.4983	<.0001	100%	Less than 75%

7.1 Total pass rate

The percentage of all degree courses that each student passed.

Figure 7.1: Predicted probability by total pass rate



Odds ratio (more than 75% vs less than 75%) = 41.477 (95% confidence = 19.725-87.217)

This model provides a single conclusion for this age group, namely that, for people in three-year degrees who have completed more than 2.9 EFTS of study, the main factor for completing the qualification is passing 75 percent or more of all of their courses.

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