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## Decomposing Ethnic Differences in University Academic Achievement in New Zealand

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**AUT**

**School of Economics**

*Working Paper Series*

**Decomposing Ethnic Differences in  
University Academic Achievement in New Zealand**

Zhaoyi Cao and Tim Maloney

2017/02

# **Decomposing Ethnic Differences in University Academic Achievement in New Zealand**

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## **Abstract**

We use individual-level administrative data to examine the extent and potential explanations for the poorer academic performance of three ethnic minority groups in their first year of study at a New Zealand university. Substantial differences in course completion rates and letter grades are found for Māori, Pasifika and Asian students relative to their European counterparts. These large and significant gaps persist in the face of alternative definitions of ethnicity and sample restrictions. We use regression analysis and formal decomposition techniques to test whether differences in other personal characteristics, high school backgrounds and university enrollment patterns might account for these ethnic disparities in early academic achievement. We estimate that no more than one-quarter of the relatively poorer performance of Māori and Pasifika students would be eliminated if they had the same relevant observable factors of European students. These substantial unexplained ethnic differences in early academic performance at university raise concerns about appropriate policies to close ethnic gaps in academic achievement at university.

**Keywords:** Higher Education; University Academic Achievement; Ethnic Differences or Disparities; Decomposition Techniques; New Zealand

## 1. Introduction

Ethnic differences in academic success at university exist in many countries. We know relatively little, however, about the reasons behind these disparities. This study uses rich, individual-level administrative data from a New Zealand university to decompose ethnic differences in early academic success into a number of distinct factors. New Zealand is an opportune place to carry out this kind of analysis. Firstly, there are several relatively large ethnic minority groups in this country. Māori are an indigenous Polynesian people, who settled in New Zealand between 1250 and 1300 (Howe, 2003). Pasifika people emigrated from Polynesia, Melanesia or Micronesia much later than Māori. The most recent large-scale migration comes from Asia.<sup>1</sup> According to the 2013 Population Census, these ethnic minority groups comprised 14.9%, 7.4% and 11.8% of the population, respectively. Europeans are the major ethnic group in New Zealand, representing 74.0% of the population in 2013.<sup>2</sup>

There are widespread concerns about the poor academic achievement at university of Māori and Pasifika students in particular. For example, Marriott and Sim (2014, p.14) cite the growing gaps in the proportions of Māori and Pasifika adults relative to Europeans with a bachelor's degree or higher. One of six priorities for the Tertiary Education Strategy 2014-2019 for the New Zealand Ministry of Education and Ministry of Business, Innovation and Employment is "... boosting achievement of Māori and Pasifika ..." to be "... on par with other students in tertiary education" (2014, p.13). The Tertiary Education Commission in their guidance to universities over the 2015-2017 period (2014, p.1) reported that it "... expects universities to focus on accelerating progress towards parity of participation and achievement for Māori and Pasifika learners." These messages have been duly received by the universities in this country. For instance, the Investment Plan 2015-2017 by Victoria University in Wellington (2014) devotes nine pages out of a 54-page report to recent histories and planned steps to boost the representation and achievement of Māori and Pasifika students at this institution.

These issues parallel concerns about gender and ethnic differences in areas like wage rates. How much of these mean ethnic disparities in university outcomes can be explained by

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<sup>1</sup> The largest eight sources of Asian migrants to New Zealand in 2013 were (in descending order): Chinese, Indian, Korean, Filipino, Japanese, Sri Lankan, Cambodian and Thai. Asians are over-represented in the city of Auckland, where the university used in this study is located.

<sup>2</sup> These percentages total to more than 100% because of multiple self-reported ethnicities in the Census data.

differences in demographic factors, academic histories prior to university, and decisions made at university enrollment about programs and courses of study? How much of these ethnic disparities would remain if we eliminated these differences in other observable factors, and which circumstances in particular would be central to closing these gaps? We use individual-level administrative data, collected at the time of enrollment, to track the success of students during their first year of study in bachelor's degree programs at a university in New Zealand. We use regression analysis and formal decomposition techniques to analyze the pairwise differences in successful course completions and letter grades between the largest single ethnic group of Europeans and the three ethnic minority groups of Māori, Pasifika and Asian students.

This remainder of this paper is organized as follows. Section 2 provides a brief literature review on measuring and scrutinizing ethnic differences in university outcomes. Section 3 describes the data used in our analysis. Sections 4 and 5 present our empirical results. Section 6 concludes and suggests possible future extensions to this study.

## **2. Review of the Relevant Literature**

There is an extensive literature from the US on racial or ethnic differences in academic achievement at university (e.g., see Bowen and Bok 1998, Kao and Thompson 2003, Massey 2006, Fletcher and Tienda 2010). The No Child Left Behind Act of 2001 focused national attention on the low academic achievement of black, Hispanic and native American students. Many of these published studies point to substantial overall differences in the Grade Point Averages (GPAs) of blacks and Hispanics relative to whites. For example, Fletcher and Tienda found in their ten-year samples from four Texas universities that the overall GPAs of black and Hispanic students were 0.40 and 0.23 grade points lower than that of white students.<sup>3</sup> Controlling for pre-university factors reduced, but did not eliminate these racial disparities. Massey used the National Longitudinal Survey of Freshman from 28 prestigious US colleges and found similar first-year GPA differences of 0.37 and 0.24 for black and Hispanic students, respectively, compared to white students. Using a relatively rich set of covariates on self-reported area and school characteristics, including racial segregation,

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<sup>3</sup> Based on a GPA system with four-point maximum.

Massey found that once these factors were held constant these racial differences in first-year GPAs could be reduced by at most one-third.

There is a more extensive literature on racial and ethnic differences in university retention, dropout and graduation rates in the US (e.g., see Murtaugh et al. 1999, Wetzel et al. 1999, Rask 2010, Singell and Waddell 2010) and other countries (e.g., see for Canada: Grayson 1998, Cyrenne and Chan 2012; Italy: Belloc et al. 2010; and United Kingdom: Rodgers 2013). These studies generally report lower retention or graduation rates (or higher dropout rates) for ethnic minorities, with the exception of Singell and Waddell. As with the papers focused on GPA differences, these studies attempted to control for a variety of other determinants of these completion, continuation or termination outcomes at university. For example, Murtaugh et al. found that other factors, including academic progress at university, could account for the higher observed dropout rates for black students. Wetzel et al. found that black students were not as sensitive to ongoing academic progress as other ethnic groups in their retention outcomes at university.

There has been relatively little analysis of ethnic differences in university outcomes in New Zealand. Scott (2005) followed the progress of a cohort of students entering tertiary study in 1998. Of those studying at degree level, he found that Māori and Pasifika were relatively less likely to have gained these qualifications after four years (39% and 37%, respectively) compared to Europeans and Asians (47% and 55%, respectively). These lower degree completion rates persisted for Māori and Pasifika students even after controlling for other factors. Tumen et al. (2008) and Shulruf et al. (2008) used individual-level data on undergraduate students from a metropolitan university to examine the determinants of program completion and first-year achievement at this university. Tumen et al. concluded that “financial obstacles and other commitments” were relatively more important for Māori than other ethnic groups in explaining their decisions to discontinue their programs of study (p.239). Once they held constant current university achievement, the authors found no significant differences in program completion rates across ethnic groups. Shulruf et al. examined how academic achievement at high school could be used to predict the success of first-year students at university. They suggested that alternative summary measures of school achievement could lead to a greater participation of Māori and Pasifika students at university without any deterioration in overall first-year performance at the institution.

Juhong and Maloney (2006) used individual-level data from a university cohort entering Bachelor of Arts or Sciences programs in 2000 to examine ethnic differences in GPAs and dropout rates at the end of the first and second years of study. On the same nine-point grade scale used in the current study, GPAs were 1.06 and 2.15 points lower for Māori and Pasifika students, respectively, relative to European students after three years of study. Controlling for other factors could eliminate at most 33% of the European-Māori and 31% of the European-Pasifika GPA gaps. Jia and Maloney (2015) did not specifically focus on ethnic differences in university outcomes, but used a similar administrative dataset to the one employed in the present study. They used these data to identify students at risk of not successfully completing first-year courses and not returning for their second year of study at university. They found that both Māori and Pasifika students had significantly lower probabilities of successfully completing their first-year courses (by 7.0 and 10.7 percentage points, respectively) compared to European students, controlling for other relevant factors. Only Māori were found to have significantly lower second-year retention rates once these same background factors were held constant.

The present study extends the literature on ethnic differences in university outcomes in several ways. Firstly, we employ more recent data on a wider set of covariates, including high school academic achievement from the current qualification system in New Zealand and decisions made at enrollment over both degree programs and specific course levels of study. Secondly, our data come from a newer, less-established urban university with a higher representation of students from domestic ethnic minority groups.<sup>4</sup> Thirdly, we pay particular attention to the different ways in which ethnicity may be defined for this analysis. Finally, we use modern statistical decomposition techniques to estimate the importance of distinct categories of variables in explaining pairwise differences in academic performance between each ethnic minority group relative to the European majority. This allows us to ask how much of the relatively poorer academic outcomes of each ethnic minority group would be eliminated if these groups had the same observable demographic characteristics, high school backgrounds, and university enrollment patterns as the ethnic majority.

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<sup>4</sup> For example, Juhong and Maloney used data from an older, more-established urban university in New Zealand. Only one in seven students in their study were Māori or Pasifika. The current study includes data on all degree programs, with more than one in four students being Māori or Pasifika.



### 3. Data and Descriptive Statistics

The data used in this study were provided by the Strategy and Planning Department at a large urban university in New Zealand. They were collected as part of the normal enrolment process, and subsequently linked to the first-year performance of students enrolled in bachelor's degree programs at this institution. These anonymized individual records were made available to the researchers for the specific purposes of this study. Unlike survey data, administrative data provide more complete and accurate results on high school and university academic performance. We use first-year outcomes on individual courses taken by these students as our unit of observation. Focusing on first-year student outcomes avoids concerns about attrition bias in examining the course outcomes for students progressing on to later years of study at university.

Table 1 provides definitions of the variables used in our study, and Table 2 displays variable means for the entire sample and five subsamples based on the official ethnic designations of these students. Using data across four annual cohorts (years 2012 through 2015), we have a maximum sample size of 181,277 course outcomes (bottom row of Table 2).

<< Insert Tables 1 and 2 about here >>

Our two dependent variables include a dichotomous indicator on whether or not each course was successfully completed. A value of one indicates the receipt of a passing grade, while zero indicates that the student either received a failing grade or withdrew from this course. A more continuous variable on the letter grade received in this course is our other outcome of interest. Letter grades were converted to numerical equivalents for our regression analysis on the conventional nine-point scale used in New Zealand.<sup>5</sup> In some cases, we had to exclude a course observation from our grade point analysis because a letter grade could not be assigned. These generally occurred when courses were taken as 'pass/fail'. The first outcome of interest was chosen because the New Zealand government places particular emphasis in monitoring course completion outcomes in tertiary institutions. We felt that letter grades added an important additional dimension to this analysis, because letter grades may be more closely

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<sup>5</sup> These letter grades and their numerical equivalents are A+ = 9, A = 8, A- = 7, B+ = 6, B = 5, B- = 4, C+ = 3, C = 2, C- = 1, and D = 0 (or any failing grade). Of course, the GPA from this system can be converted to the four-point US scale by multiplying by four-ninths.

aligned to both human capital acquisition and subsequent returns in the labour market. More than three-quarters (78.7%) of courses were successfully completed. The average grade point was 3.717 in our sample, which equates to slightly less than a B-. We had valid letter grades for 95.5% of the courses in our sample.

The independent variables used in our analysis are grouped into eight general categories, with the exception of single indicator variables on students being female or enrolled part-time. A priority system is used to define the official ethnicity of students at this university. Students are allowed to self-report up to three ethnic identities. If they report Māori ethnicity at one their three identities, then they are officially designated as Māori. Non-Māori are officially defined as Pasifika if this is one of their three ethnic identities. The next two prioritized ethnicities are Asian and European, in that order. If students don't report Māori, Pasifika, Asian or European ethnicities, then they end up in the residual category labelled 'Others'.<sup>6</sup> By these official prioritized ethnic designations, course observations come from Māori (10.5%), Pasifika (15.1%), Asian (28.3%), European (38.2%), and Others (7.9%).

Because we have all three self-reported ethnic identities in our dataset, we can ask how many course observations for Māori, for example, include other self-reported ethnicities. These results are shown in italics in the column labelled as Māori for the rows labelled with other alternative ethnicities. Of those officially designated as Māori, other reported ethnicities are Pasifika (18.1%), Asian (2.1%), European (58.2%), and Others (2.2%). Of those officially designated as Pasifika, other reported ethnicities are Asian (18.1%), European (17.7%), and Others (1.5%).<sup>7</sup> Similar multiple ethnicities are shown for those defined as Asian and European. We will use this more detailed information to construct alternative definitions of ethnicity for our subsequent analyses.

We use a series of dummy variables to capture the ages of students when they first enroll in bachelor's degree programs at this university. If these students enrolled directly out of high school, we would generally expect them to be either 18 or 19 years old. These two ages account for 44.5% of the course observations in our sample. We have a series of indicator

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<sup>6</sup> This category also includes unreported ethnicities or non-respondents. We eliminate this residual ethnic group in our subsequent pairwise analyses of the three ethnic minorities relative to Europeans.

<sup>7</sup> Of course, by construction with these prioritized rules, those officially designated as Pasifika cannot also report Māori ethnicity.

variables for single ages running from 20 to 25, and then other dummy variables for four age ranges (under 18, 26 to 29, 30 to 39 and 40 and above).

We know the school decile of the high school last attended prior to enrollment at this university for domestic students. These deciles are used to target funding at disadvantaged schools in New Zealand. Schools are allocated to deciles based on the socio-economic status of the communities from which most of their students are drawn. Decile 1 schools, for example, are among the 10% of schools from the poorest and most disadvantaged areas.<sup>8</sup> We use dummy variables for all of the individual deciles. Even though the institution used in this study is a relatively new, less-established urban university, a relatively large proportion of course observations come from students from upper decile schools. Nearly half of all course observations (49.1%) come from students formerly at schools in the top four deciles, while less than a quarter (24.2%) come from schools in the bottom four deciles. No school deciles were available for 15.1% of our sample, primarily because these international students had completed high school outside of New Zealand.

The National Certificate of Educational Attainment (NCEA) system was introduced in 2002, and is now the main qualification standard for secondary students in New Zealand. The NCEA system is based on internal and external subject-specific assessments during the last three years in high school. External assessments are national subject exams taken at the end of the academic year. Students need to achieve a certain number of credits in required subjects to achieve NCEA Level 1, 2 and 3 qualifications. NCEA Level 3 provides the primary University Entrance standard in this country.<sup>9</sup> A NCEA Rank Score is a weighted summation of the best 80 credits in approved Level 3 subjects. Results are categorized as Excellence, Merit and Achieved, and the associated weights are 4, 3 and 2 points, respectively. Thus, the maximum Rank Score would be 320 (80 credits at 4 points each).

We have data on the NCEA Rank Scores of students for nearly half of course observations (48.3%) in our sample. Missing data exist for all students who completed high school overseas or in New Zealand prior to the NCEA system, or those who did not have NCEA

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<sup>8</sup> For more information on the data used to construct these school deciles see: <http://www.education.govt.nz/school/running-a-school/resourcing/operational-funding/school-decile-ratings/#About>

<sup>9</sup> For more information on the NCEA system see: <http://www.nzqa.govt.nz/qualifications-standards/qualifications/ncea/understanding-ncea>. Other university entrance pathways come from International Baccalaureate and Cambridge International Examination programs.

results recorded in the administrative data. This absence of valid NCEA information may be associated with the different entrance types to this University. For example, for those who were admitted at another university (i.e., an external entrance type), these NCEA results may not be recorded. For those with valid NCEA Rank Scores, the sample mean is 174.5.

We use six dummy variables to capture the different entrance types to this university. The most common entrance type is via NCEA Level 3 (53.2%). The Bursary entrance type is much less common (3.4%), and represents the national high school educational system prior to the introduction of the current NCEA system. External (14.0%) and internal (12.1%) entrance types indicate students previously admitted to degree programs at another university, or progressing on from lower-level pre-degree programs at the current university, respectively. The latter entry type represents ‘second chance opportunities’ for students who had not acquired University Entrance status coming out of high school. The ‘Special Admissions’ entrance type (16.1%) captures individuals who did not achieve University Entrance, but who were allowed to enroll at university once when they had reached their 20<sup>th</sup> birthdays. Finally, all other relatively rare entrance types (1.2%) include the more prestigious International Baccalaureate and Cambridge International Examination programs.

We also have information on the initial degree program enrollments for students. A series of eleven dummy variables capture these individual degree programs.<sup>10</sup> We also use a dummy variable to indicate the relatively rare event where the student enroll in more than a single degree program at a time (i.e., a Double Degree). Since the course outcome is the unit of observation, we also condition on the ‘level’ of each course. Typical first-year courses in a bachelor’s degree programs would be at Level 5. They make up nearly three-quarters of all courses taken by first-year students in our sample (73.5%). Level 4 courses typically would be taken in pre-degree programs, and are relatively rare (0.4%). Level 6 and 7 courses typically would be taken in the second and third years of study in a bachelor degree’s program. They make up 23.9% and 2.1% of the courses in our sample, respectively.

The last five columns of Table 2 show the differences in the sample means of these variables across the officially defined ethnic groups. Consider the independent variables first. Courses

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<sup>10</sup> These bachelor’s degree programs are Arts (BA), Business (BBus), Computer and Information Systems (BCIS), Communication Studies (BCS), Design (BDes), Education (BEdu), Engineering Technology (BEngTech), Health Sciences (BHS), International Hospitality Management (BIHM), Sports and Recreation (BSR), and a residual category of several smaller degree programs (Others). Students must enroll in degree programs in their first year of study at this university.

taken by Māori and Pasifika students are much more likely to come from females, while part-time enrollments are slightly more likely among both Pasifika and Asian students. Older students are more likely to be non-Europeans. European student course-enrollments are much more likely to come from the top four high school deciles (67.5%) compared to the bottom four deciles (10.6%). Māori and Pasifika enrollments are relatively less likely to come from the top four school deciles (41% and 22.1%, respectively), and relatively more likely to come from the bottom four deciles (33.1% and 55.2%, respectively).

For students with valid NCEA Results, the highest mean Rank Scores are in descending order: European (193.7), Māori (174.0), Asian (161.3) and Pasifika (150.1). Europeans are much more likely to enter this university through the ‘standard pathway’ with either NCEA Level 3 or Bursary (67.8%), compared to Māori (60.5%), Pasifika (50.1%) and Asian (47.3%). Europeans are much less likely to enter university through the ‘higher risk pathways’ including External, Internal or Special Admissions (31.2%), compared to Māori (38.5%), Pasifika (48.9%) and Asian (51.1%).

We now focus on the overall ethnic gaps in first-year academic performance at this university. Table 3 reports the pairwise differences in first-year course completion rates between the three ethnic minority groups and Europeans using three different ways of measuring ethnic identity. The first column uses the official, priority-based system of ethnic designation described earlier. European students successfully completed 85.4% of their courses. Course completion rates were relatively lower by 9.95 percentage points for Māori, 21.36 percentage points for Pasifika, and 5.91 percentage points for Asian students. These means are significantly different from each other at better than a 1% level.

<< Insert Table 3 about here >>

Suppose we used all of the self-reported ethnicities of these students. A single course observation could appear in multiple rows in the second column of Table 3. For example, a course observation on a student with Māori, Pasifika and European ethnic identities could appear in all three of these totals. This is why the number of paper observations increases by 16.5% from 181,277 to 211,183 in moving from the first to the second columns. Although these ethnic gaps narrow slightly with this definitional change, all of the means for the minority groups are significantly lower than the European mean.

Standard practice in decomposition analysis is to eliminate observations where there is some overlap across groups. In this case, we report in the third column of Table 3 the descriptive statistics for the subsample of course observations from students who report a single ethnicity. Dropping all students who report multiple ethnicities reduces the original sample size by 20.1% from 181,277 to 144,816. This results in increases in the pairwise ethnic gaps, but especially for the course completion rates of Māori and Pasifika students. These ethnic differences relative Europeans increase from 9.95 to 14.28 percentage points for Māori, and from 21.36 to 25.16 percentage points for Pasifika. These greater gaps by these single-ethnicity definitions are associated with substantial declines in the representation of Māori (from 10.5% to 4.5%) and Pasifika (from 15.1% to 11.3%) course observations in our restricted sample. Many officially defined Māori and Pasifika students self-report multiple ethnicities, and restricting attention to those reporting a single ethnicity widens the ethnic gaps in course completion rates.

Table 4 reports similar pairwise differences in first-year letter grade points between the three ethnic minority groups and Europeans using these same measures of ethnic identity. Using the official, priority-based system, we find that the average grade points were lower, relative to European students by 0.804 for Māori, 1.886 for Pasifika, and 0.984 for Asian students. These means are significantly different from each other at better than a 1% level. This translates into mean course grades of between a C+ and B- for Māori and Asian students, and C and C+ for Pasifika students.

<< Insert Table 4 about here >>

Results similar to those found previously for ethnic differences in course completions are found for grade points when we adopt alternative measures of ethnicity. When we use all reported ethnicities, these ethnic gaps in grades points narrow. When we restrict our analysis to the subsample of students reporting a single ethnicity, these ethnic differences widen. However, in all case, these ethnic differences in grade points are statistically significant.

#### **4. Regression Analysis**

The previous section reported evidence of substantially lower first-year course completion rates and letter grades for ethnic minorities relative to Europeans. We use regression analysis in this section to control for the influence of other personal characteristics, high school

backgrounds, and enrollment patterns at university on these same outcomes of interest. Table 5 reports the results from maximum likelihood probit regressions on individual course completion outcomes. We report the estimated coefficients, standard errors and mean marginal effects for two samples based on alternative definitions of ethnicity.<sup>11</sup> The first three columns display the results using the full sample and official prioritized definitions of ethnicity. The last three columns show the results for the restricted sample of students reporting a single ethnicity.

<< Insert Table 5 about here >>

Being a female student significantly increases the probability of successfully completing a course, while part-time significantly reduces this probability. Cohorts from later years generally had lower probabilities of course completion compared to the omitted 2012 cohort. Students aged between 19 and 22 when they first enrolled in bachelor's degree programs were less likely to complete their courses compared to the omitted group of 18 year olds (i.e., the typical age when students would enter university directly out of high school). Students aged 26 and above were significantly more likely to be complete their courses. Age has an obvious nonlinear effect on course completion rates.

We also see the importance of using individual high school deciles for capturing other nonlinear effects in these regressions. Rather than higher deciles being associated with increasingly higher rates of course completion, the deciles close to the median (6 and 7) have positive and significant effects on course completions relative to the omitted decile 5. The only negative and statistically significant effect is associated with students coming from the lowest school decile.

Two variables capture the effects of the NCEA results on the probability of a course completion. The first is a dummy variable for the availability of these NCEA results, and the second is the NCEA Level 3 Rank Score.<sup>12</sup> A ten-point increase in this Rank Score increases the probability of a course completion by an average of slightly more than one percentage

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<sup>11</sup> Because the estimated coefficients have no directly interpretable meaning in this nonlinear estimation, we report these mean marginal effects. For a dummy independent variable like gender, this is the mean of the estimated marginal effects for this sample as this variable goes from zero to one, holding all other individual covariates in this regression constant.

<sup>12</sup> The actual Rank Score is divided by ten to make the estimated effects easier to interpret.

point. These estimated marginal effects are statistically significant at better than a 1% level.<sup>13</sup> Relative to the omitted university entrance type of NCEA Level 3, enrolling for a bachelor's degree program through Internal, Bursary or Other Entrance Types have generally positive and significant effects on the probability of course completion. Only enrolling at university with Special Admissions status has negative and significant effects on the probability of course completion. Because Special Admissions status is also associated with an absence of NCEA results and entering the university in the vulnerable age group range of 20 to 22, these are obviously students at high-risk of course non-completion.

There are substantial differences in the estimated marginal effects of course completion from enrolling in the various degree programs. The Bachelor of Business is the omitted reference group. Three of these ten estimated marginal effects are greater than ten percentage-points in magnitude. For example, an otherwise observationally equivalent student in the Bachelor of Education has a probability of completing a first-year course that is more than sixteen percentage-points higher than a student in the Bachelor of Business. Students enrolling in a Double Degree or in Level 6 or 7 courses have substantially higher estimated probabilities of completing their first-year courses. Our interpretation is that these positive estimated effects are the result of selection on unobservables into double degree programs or courses normally taken during the second and third years of study at university.

We conclude this discussion of these regression results by considering the estimated marginal effects on the dummy variables for ethnic minorities. The omitted group is Europeans. We saw previously that the overall gaps in course completion rates between European and Māori students were 9.95 and 14.28 percentage points using the official and single-reported ethnicity designations, respectively. We can compare these ethnic gaps to the estimated marginal effects on this Māori dummy in these two regressions. Once other factors are held constant, these differences decline in magnitude to 7.39 and 10.16 percentage points, respectively. This suggests that holding constant other personal attributes, high school

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<sup>13</sup> To estimate the marginal effect on this probability of course completion from having NCEA results available, we would have to plug the Rank Score into the following equation:

$$\frac{\partial Prob}{\partial NCEA Results} = -0.1669 + 0.0116 \times Rank Score/10$$

At the sample mean Rank Score of 174.5, this marginal effect would increase the probability of course completion by 3.552 percentage points. This marginal effect would be negative for any Rank Scores below 143.8 (i.e., the breakeven point)



backgrounds and university enrollment patterns can eliminate between 26% and 29% of these overall mean differences between European and Māori students in course completion rates.

We saw previously that the overall gaps in course completion rates between Pasifika and European students were 21.36 and 25.16 percentage points using the official and single-reported ethnicity designations, respectively. Once other factors are held constant, these differences decline in magnitude to 12.99 and 15.57 percentage points, respectively. This suggests that holding constant personal characteristics, school experiences and university enrolment patterns can eliminate between 38% and 39% of the overall differences between Pasifika and European students.

The overall gaps in course completion rates between Asian and European students were 5.91 and 5.93 percentage points using the official and single-reported ethnicity designations, respectively. Once other factors are held constant, these differences decline in magnitude to 2.88 and 3.05 percentage points, respectively. This suggests that holding these various covariates constant can eliminate between 49% and 51% of the overall differences between Asian and European students. As with the other minority groups, what remains are statistically significant differences in course completion rates between otherwise observationally equivalent Asian and European students.

Table 6 reports the estimated coefficients and standard errors from ordinary least-squares regressions on individual course grade points for the two samples based on alternative definitions of ethnicity. The first two columns display the results using the full sample and the official prioritized definitions of ethnicity, while the last two columns show the results for the restricted sample of students reporting a single ethnicity.

<< Insert Table 6 about here >>

The qualitative findings on most of the covariates are similar to what we had found earlier on course completion outcomes. However, a few findings from these regressions are worth highlighting. Age of enrolment above 18 has something close to a positive, linear relationship with respect to course grades. Although students aged 19 to 22 are particularly vulnerable to not completing their courses relative to 18 year-olds, this is not true when we would look at the full range of grades received from these courses. This suggests that 19 to 22 year-olds are more likely to dropout or withdraw from these courses, rather than to complete them with a failing grade. High school deciles of students appear to have similar

impacts on both course completion and letter grade outcomes. Courses are significantly less likely to be completed and have significantly lower grade points if they're taken by students from decile 1 schools. The positive effects on course completion rates for students from decile 6 and 7 schools are also reflected in the higher letter grades.

Higher NCEA Rank Scores significantly increase both the probability of course completion rates and letter grades. Courses taken by students entering this university through Special Admissions are particularly vulnerable to both course non-completions and lower letter grades. Internal entrance types (i.e., progressing on to bachelor's degree programs after completing a pre-degree qualification), are more likely to complete their courses, but tend to receive lower letter grades compared to the typical NCEA Level 3 entrance type. Courses taken by students in all degree programs are found to have higher grades compared to the Bachelor of Business reference group. Higher grades are received for courses at levels other than the omitted category of Level 5. Although completion rates were not measurably higher for Level 4 courses, we find that letter grades are significantly higher for these same courses.

We saw previously that the overall gaps in letter grades between European and Māori students were 0.804 and 1.009 grade points using the official and single-reported ethnicity designations, respectively. Once other factors are held constant, these differences decline in magnitude to 0.596 and 0.791 grade points, respectively. This suggests that holding constant other personal factors, high school backgrounds and university enrolment patterns can eliminate between 22% and 26% of these mean differences in grades between European and Māori students.

The overall gaps in letter grades between European and Pasifika students were 1.886 and 2.15 grade points using these same two ethnicity designations. Once other factors are held constant, these differences decline in magnitude to 1.355 and 1.685 grade points, respectively. Holding these other covariates constant can eliminate between 22% and 29% of these mean differences in grades between European and Pasifika students.

The overall gaps in letter grades between European and Asian students were 0.984 and 0.996 grade points using these same two ethnicity designations. Once other factors are held constant, these differences decline in magnitude to 0.624 and 0.658 grade points, respectively. Holding these various covariates constant can eliminate between 34% and 37% of the overall differences between European and Asian students. As with the other minority

groups, what remains are statistically significant differences in letter grades between otherwise observationally equivalent Asian and European students.

## 5. Decomposition Analysis

Although regression analysis can indicate the potential for other measured factors to account for the observed ethnic gaps in academic performance at university, formal decomposition techniques provide much more insight in this area.

Consider separate ordinary least-squares regressions on the grade points for courses taken by European and Māori students. Because the means of the residuals must be equal to zero, we can write the overall mean grades of European ( $\bar{G}^E$ ) and Māori ( $\bar{G}^M$ ) students as products of the vectors of group mean covariates ( $\bar{X}^E$  and  $\bar{X}^M$ ) and estimated coefficients ( $\mathbf{b}^E$  and  $\mathbf{b}^M$ ).

$$\bar{G}^E = \bar{X}^E \mathbf{b}^E \quad (1)$$

$$\bar{G}^M = \bar{X}^M \mathbf{b}^M \quad (2)$$

By adding and subtracting cross-products of these covariates and estimated coefficients, we can express the overall European-Māori gap in letter grades in two ways:

$$\bar{G}^E - \bar{G}^M = \mathbf{b}^M (\bar{X}^E - \bar{X}^M) + \bar{X}^E (\mathbf{b}^E - \mathbf{b}^M) \quad (3)$$

$$\bar{G}^E - \bar{G}^M = \mathbf{b}^E (\bar{X}^E - \bar{X}^M) + \bar{X}^M (\mathbf{b}^E - \mathbf{b}^M) \quad (4)$$

The ethnic differences in average course grades stemming from the covariates (i.e., the first terms on the right-hand sides of equations 3 and 4) can be ‘weighted’ by either the estimated Māori or European coefficients. In this Blinder-Oaxaca decomposition technique for linear regression models, these are the ‘explained’ components of the overall ethnic gap (Blinder 1973, Oaxaca 1973). The ethnic differences in course grades coming from differences in the estimated coefficients (i.e., the second terms on the right-hand side of these expressions) are the ‘unexplained’ components, and can be weighted by mean covariates of either group.

There is a long-standing issue in the use of this decomposition technique over which expression (3 or 4) should be used in practice. These alternative equations can produce different results if the estimated coefficients vary considerably between the two groups. The estimated coefficients from the majority ethnic group are sometimes used (i.e., equation 4), because of the argument that any narrowing of ethnic differences in outcomes would most

likely imply that minority coefficients would converge to majority coefficients. Of course, these two expressions yield the same decomposition results if these coefficient vectors are identical (i. e.,  $\mathbf{b}^E = \mathbf{b}^M$ ).

We adopt a third alternative that weights the first term in this decomposition by the estimated coefficients from a pooled regression of the two ethnic groups (see Neumark 1988, and Oaxaca and Ransom 1994 for other examples of this approach). Furthermore, to understand the importance of these various covariates in explaining the ethnic gaps in letter grades, we report these results by the categories of variables already established in our previous tables (female, part-time enrolment, years enrolled, ages, school deciles, NCEA results, entrance types, degree programs, and course levels). This allows us to say how much of these ethnic differences in average course grades would be eliminated if a minority group had the same mean covariates of Europeans (either in total or in specific categories).

The appropriateness of the Blinder-Oaxaca decomposition technique for non-linear regressions has been questioned in the literature, because estimated coefficients from probit and logit estimation cannot be used in the same way as they are in linear decompositions.<sup>14</sup> Fairlie (2003) developed the following non-linear counterparts of the Blinder-Oaxaca decompositions.

$$\bar{C}^E - \bar{C}^M = \left[ \sum_{i=1}^{n^E} \frac{\Phi(X^E \mathbf{b}^E)}{n^E} - \sum_{i=1}^{n^M} \frac{\Phi(X^M \mathbf{b}^E)}{n^M} \right] + \left[ \sum_{i=1}^{n^M} \frac{\Phi(X^M \mathbf{b}^E)}{n^M} - \sum_{i=1}^{n^M} \frac{\Phi(X^M \mathbf{b}^M)}{n^M} \right] \quad (5)$$

$$\bar{C}^E - \bar{C}^M = \left[ \sum_{i=1}^{n^E} \frac{\Phi(X^E \mathbf{b}^M)}{n^E} - \sum_{i=1}^{n^M} \frac{\Phi(X^M \mathbf{b}^M)}{n^M} \right] + \left[ \sum_{i=1}^{n^E} \frac{\Phi(X^E \mathbf{b}^E)}{n^E} - \sum_{i=1}^{n^E} \frac{\Phi(X^E \mathbf{b}^M)}{n^E} \right] \quad (6)$$

The outcomes of interest in our study are the mean probabilities of successful course completions for European ( $\bar{C}^E$ ) and Māori ( $\bar{C}^M$ ) students. The sample sizes for Europeans and Māori are  $n^E$  and  $n^M$ , and  $\Phi(\cdot)$  is the cumulative density function of the standard normal. Again, there are essentially three choices in how to weight the ‘explainable’ components of these non-linear decompositions (i.e., the first terms in brackets on the right-hand sides of equations 5 and 6). These can be done with the estimated coefficients from either ethnic group, or from a pooled regression. We choose to use the results from pooled regressions for both our linear and non-linear decompositions.

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<sup>14</sup> See Fairlie (1999) for this original discussion in developing an alternative non-linear decomposition technique in explaining black-white differences in the US in self-employment incidence.

### *5.1 Non-Linear Decompositions of Successful Course Completion Outcomes*

We first report the results from our non-linear decompositions of the pairwise differences in successful course completion outcomes between the three minority ethnic groups and Europeans. This analysis required separate pooled regression estimates for each of these comparisons (i.e., European-Māori, European-Pasifika, and European-Asian). These regression results are not reported in this paper, but are available from the authors by request.

Table 7 summarises the results from these non-linear decompositions using the prioritised official ethnic designations.<sup>15</sup> Consider the results for Māori in the first column. As shown previously, the average course completion rate for Māori students is 9.95 percentage points lower than that of Europeans. Using the results from a pooled regression on these two ethnic groups, the differences in all measureable factors can account for 2.23 percentage points of this overall gap. This result is statistically different from zero at better than a 1% level. This suggests that if Māori were given the same personal characteristics, high school backgrounds and university enrolment patterns of Europeans, 22% of this ethnic gap in course completion rates would be eliminated.

<< Insert Table 7 about here >>

We also list in the first column of Table 7 the contributions of specific categories of variables in explaining the average European-Māori difference in course completion rates. Not all of these factors widen this ethnic gap in course completion probabilities. For example, Māori students are relatively more likely to be female, and courses taken by female students are more likely to be successfully completed. Thus, if Māori had the same proportion female as Europeans, this ethnic gap would widen by 0.14 percentage points. This result is statistically different from zero at better than a 1% level. Similar qualitative results would occur if Māori had the same age distribution as Europeans (Māori tend to come to university at a later age, and older students have higher course completion rates), or course level distribution as Europeans (Māori are slightly more likely to take level 7 courses, and these courses have higher completion rates). Eliminating the ethnic differences in these three factors combined

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<sup>15</sup> Because sample sizes of the two comparison groups are generally different, Fairlie (2003) explains why different random samples must be drawn from the majority ethnic group and matched to the ethnic minority sample for this decomposition technique. The reported results in our analysis are based on 100 replications of this procedure. All estimates come from the Fairlie non-linear decomposition routine available in Stata software package.

would *increase* this European-Māori gap in course completion rates by 0.27 percentage points.

Eliminating the ethnic differences in the remaining six variable categories would *reduce* this European-Māori gap in course completion rates by 2.5 percentage points. Each of these six variable categories has a positive estimated effect that is statistically different from zero at better than a 1% level. The most important factors for closing this European-Māori gap in course completion rates are in descending order: NCEA results (1.19 percentage points); school deciles (0.57 percentage points); entrance types (0.38 percentage points); degree programs (0.25 percentage points); part-time enrollment (0.08 percentage points); and years enrolled (0.03 percentage points).

A similar pairwise decomposition in successful course completion outcomes between European and Pasifika students is reported in the second column of Table 7. As shown previously, the average course completion rate for Pasifika students is 21.36 percentage points lower than that of European students. Using the results from a separate pooled regression on these two ethnic groups, we find that differences in all measureable factors can account for 5.75 percentage points of this overall gap. This result is statistically different from zero at better than a 1% level. This suggests that if Pasifika were given the same measured covariates of Europeans, 27% of this ethnic gap in course completion rates would be eliminated.

Similar to Māori, if Pasifika students had the same female representation of European students, this ethnic gap in course completion rates would widen (by 0.11 percentage points). If Pasifika students had the same course level distribution of Europeans, this ethnic gap would also widen (by 0.05 percentage points). Eliminating ethnic differences in these two factors would *increase* this European-Pasifika gap in course completion rates by a combined 0.16 percentage points.

Eliminating ethnic differences in the remaining seven variable categories would *reduce* this European-Pasifika gap in course completion rates by 5.9 percentage points. Where the age distribution of Māori tended to narrow their ethnic gap, it widens the ethnic gap for Pasifika. The most important factors for closing this European-Pasifika gap in course completion rates are in descending order: NCEA results (1.97 percentage points); school deciles (1.82 percentage points); degree programs (1.51 percentage points); entrance types (0.28

percentage points); part-time enrollment (0.16 percentage points); ages (0.13 percentage points); and years enrolled (0.03 percentage points).

A similar approach in decomposing course completion outcomes between European and Asian students is reported in the last column of Table 7. The average course completion rate for Asian students is 5.91 percentage points lower than that of Europeans. We find that differences in all measureable factors can account for 2.89 percentage points of this overall gap. This result is statistically different from zero at better than a 1% level. This suggests that if Asian students were given the same measured covariates of Europeans, 49% of this ethnic gap in course completion rates would be eliminated.

Unlike the other two ethnic minorities, if Asian students had the same school deciles of European students, this would widen the ethnic gap (by 0.74 percentage points). This result is statistically different from zero at better than a 1% level. If Asian students had the same entrance types and course levels of Europeans, this ethnic gap would also widen (by 0.37 and 0.15 percentage points, respectively). Eliminating ethnic differences in these three factors would *increase* this European-Asian gap in course completion rates by 1.27 percentage points.

Eliminating the ethnic differences in the remaining six variable categories would *reduce* this European-Asian gap in course completion rates by 4.16 percentage points. Unlike the other two ethnic minorities, if Asian students had the same female representation of European students, this ethnic gap would narrow (by 0.61 percentage points in this case). The most important factors for closing this European-Asian gap in course completion rates are in descending order: NCEA results (1.75 percentage points); degree programs (1.31 percentage points); female representation (0.61 percentage points); ages (0.40 percentage points); part-time enrolment (0.07 percentage points); and years enrolled (0.02 percentage points).

Table 8 repeats this Fairlie decomposition technique on course completion outcomes for the subsample of students who report a single ethnicity. The qualitative results are not greatly affected for Asian students. However, the explained components for the other two ethnic minorities decline in relative size when we restrict attention to courses taken by students reporting a single ethnicity. If officially designated Māori students were given the same personal attributes, high school backgrounds and university enrollment patterns of European students, we estimate that this would eliminate 22% of this ethnic gap in course completion

rates. This explained component would decline to 19% if we restricted the sample to individuals reporting a single ethnicity. If officially designated Pasifika students were given the same measured covariates of European students, this would eliminate 27% of this ethnic difference in course completion rates. This explained component would decline to 22% if we restricted the sample to individuals reporting a single ethnicity.

<< Insert Table 8 about here >>

The importance of the variable categories in explaining the ethnic differences in course completion rates between Māori and Pasifika students relative to European students also change with ethnic definitions and associated sample restrictions. For both ethnic minorities, sample restrictions related to single ethnicities, lead to reductions in the importance of NCEA results and increases in the importance of school deciles, entrance types and degree programs in accounting for these ethnic gaps in course completion rates.

### *5.2 Linear Decompositions of Course Letter Grades*

We now report the results from linear decompositions of the pairwise differences in course letter grades between the three minority ethnic groups and Europeans. This analysis also required separate pooled OLS regressions for each of these comparisons (i.e., European-Māori, European-Pasifika, and European-Asian). These regression results are not reported in this paper, but are available from the authors by request. Table 9 summarizes the results from these linear decompositions of the grade points using the official prioritized ethnic designations. Consider the results for Māori in the first column. We showed previously that the average course grade for Māori students was 0.804 points lower than that of European students. Using the results from a pooled regression on these two ethnic groups, the Blinder-Oaxaca procedure shows that the differences in all measurable factors can account for 0.182 grade points of this overall gap. This result is statistically different from zero at better than a 1% level. This suggests that if Māori students had the same personal characteristics, high school backgrounds and university enrolment patterns of European students, 23% of this ethnic difference in letter grades would be eliminated.

<< Insert Table 9 about here >>

The first column of table 9 also lists the contributions of specific categories of variables in explaining the average European-Māori difference in course grades. Four factors tend to



narrow this ethnic gap (female representation, years enrolled, ages and course levels). Eliminating the ethnic differences in these four factors combined would *increase* this European-Māori grade differences by 0.068 points.

Eliminating the ethnic differences in the remaining five variable categories would *reduce* this European-Māori gap in course grades by 0.25 points. The most important factors for closing this ethnic grade differences are in descending order: school deciles (0.139 points); entrance types (0.048 points); degree programs (0.046 points); NCEA results (0.015 points) and part-time enrolment (0.002 points). We estimate that if Māori students had the same distributions of all of these covariates as European students, 23% of this ethnic gap in letter grades would be eliminated.

A similar pairwise decomposition in course letter grades between European and Pasifika students is reported in the second column of Table 9. Recall that Pasifika students, on average, have grades that are 1.886 points lower than those of European students. We find that differences in all measureable factors can account for 0.49 points of this overall gap. This suggests that if Pasifika students had the same measured covariates of European students, 26% of this ethnic grade difference would be eliminated.

Similar to Māori, four factors tend to narrow this ethnic gap in letter grades (female representation, years enrolled, ages and course levels). Removing ethnic differences in these four factors combined would *increase* this European-Pasifika gap in course grades by 0.074 points.

Eliminating the ethnic differences in the remaining five variable categories would *reduce* this European-Pasifika gap in course letter grades by 0.564 points. The most important factors for closing this European-Pasifika gap in course grades are: school deciles (0.287 points); degree programs (0.119 points); NCEA results (0.086 points); entrance types (0.064 points); and part-time enrolment (0.008 points). We estimate that if Pasifika students had the same distributions of all of these covariates as European students, 26% of this ethnic grade difference would be eliminated.

We report the decomposition of letter grade differences between European and Asian students in the last column of Table 9. The average course grades for Asian students is 0.984 points lower than that of Europeans. Differences in the covariates can account for 0.355 points of this overall gap. This suggests that if Asian students were given the same covariates

of European students, this ethnic grade difference would shrink by 36%. Where similar decompositions can explain around one-quarter of the differences in letter grades between Māori and Pasifika students relative to European students, the explained component is larger in relative terms for Asian students.

Three factors tend to narrow this ethnic gap in letter grades (years enrolled, NCEA results and course levels). Removing ethnic differences in these three factors would *increase* this European-Asian gap in course grades by 0.063 points.

Eliminating ethnic differences in the remaining six variable categories would *reduce* this European-Asian gap in course letter grades by 0.417 points. The most important factors for closing this European-Asian grade gap are in descending order: school deciles (0.209 points); degree programs (0.147 points); female representation (0.048 points); entrance types (0.006); part-time enrollment (0.004 points); and ages (0.003 points). We estimate that if Asian students had the same distributions of all of these covariates as European students, 36% of this ethnic grade difference would be eliminated.

Table 10 repeats this linear decomposition technique in grade points for the subsample of students who report a single ethnicity. This definitional change does not greatly alter the qualitative results for Asian students. However, the explained components for the other two ethnic minorities decline in relative size when we restrict attention to courses taken by students reporting a single ethnicity. If officially designated Māori students were given the same personal characteristics, high school backgrounds and university enrolment patterns of European students, we estimate that this would eliminate 23% of this ethnic grade difference. This overall explained component declines to 17% if we restricted the sample to individuals reporting a single ethnicity. If officially designated Pasifika students were given the same measured covariates of European students, this would eliminate 26% of this ethnic difference in letter grades. This overall explained component would decline to 18% if we restricted the sample to individuals reporting a single ethnicity.

<< Insert Table 10 about here >>

The importance of the variable categories in explaining the ethnic differences in letter grades between Māori and Pasifika students relative to European students also change with ethnic definitions and associated sample restrictions. For both ethnic minorities, sample restrictions related to single ethnicities, lead to reductions in the importance of NCEA results and

increases in the importance of school deciles, entrance types and degree programs in accounting for these ethnic gaps in course completions.

## **6. Conclusions**

Concerns have been raised in many countries over the relatively poor academic achievement in higher education among ethnic minority groups. New Zealand, in particular, has made the closing of ethnic gaps in course completion rates and letter grades at university a public policy priority. This study used individual-level administrative data from a large urban university in this country to measure the extent of these ethnic differences in first-year outcomes. We found that Māori, Pasifika and Asian students had substantially lower course completion rates and grades compared to European students.

We also asked how these ethnic differences in academic performance might be influenced by the way in which ethnicity was defined. An official prioritized system gives precedence to Māori and Pasifika ethnicities. Using up to three self-reported ethnic identities, we tested whether or not our results were sensitive to alternative ways of measuring ethnicity. Although ethnic gaps in university performance were larger for students reporting a single ethnicity, these minority-group differences were substantial in magnitude and statistical significance under any measure.

Regression analysis and modern decomposition techniques were used to ascertain whether other measurable other factors might explain these ethnic differences in university outcomes. We concluded that eliminating differences between the high school backgrounds of Māori and Pasifika minorities relative to their European counterparts (reflected in school deciles, high school achievement results, and university entrance types) would significantly close the ethnic gaps in first-year performance at university. However, eliminating ethnic differences in all measurable factors could explain no more than one-quarter of the observed gaps in course completion rates and letter grades between Māori and Pasifika students and European students. This suggests that three-quarters or more of these current ethnic gaps would persist even if these minority groups had the same personal characteristics, high school backgrounds and university enrollment patterns of the European majority. The European-Asian gaps in university outcomes are more readily explainable. Eliminating differences in other observable factors could remove about one-half of gap in course completion rates and one-third of the gap in course letter grades.

These large unexplained differences in the poorer academic outcomes for Māori and Pasifika students at university may pose particular concerns for public policymakers and university officials intent on eliminating these ethnic gaps. We estimate that giving Māori and Pasifika students the same high school backgrounds and other factors as European students would still leave them with substantially lower course completion rates and letter grades. This suggests that additional interventions will be required to lift the academic performance of these minority students.

There are several caveats to this current analysis, and these suggest possible directions for future research in this area. We lack data on potentially important personal and family background histories for the students in our sample. For example, we have no information on parental education, household income and living standards during childhood. More extensive and detailed data on academic achievement and other school experiences also might be predictive of early university performance. Adding these additional covariates to our analysis may allow us to explain greater proportions of the ethnic differences in university academic performance. Although such data are not available for this current study, they do exist in the Integrated Data Infrastructure (IDI) in New Zealand and could potentially be linked to these internal administrative data from this university.<sup>16</sup> This could also provide a valuable new platform to address these critical policy issues on ethnic differences in academic performance at university.

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<sup>16</sup> The IDI provides national linked administrative data from a variety of sources on individuals in New Zealand to facilitate basic research to improve social outcomes in this country. For more information on this relatively new data source see [http://www.stats.govt.nz/browse\\_for\\_stats/snapshots-of-nz/integrated-data-infrastructure.aspx](http://www.stats.govt.nz/browse_for_stats/snapshots-of-nz/integrated-data-infrastructure.aspx)

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**Table 1**  
**Variables Used in this Analysis**

<b>Variable Names</b>	<b>Definitions</b>
<b>Dependent Variables</b>	
Successful Completion	Equals 1 if student successfully completed a course; 0 otherwise
Grade Point	Converted to numerical equivalents (0=D (failed grade), 1=C-, 2=C, ..., 9=A+)
<b>Independent Variables</b>	
Female	Equals 1 if student female; zero male
Part-Time Enrollment	Equals 1 if student enrolled part-time ( $\leq 4$ courses annually); zero full-time
<b>Years Enrolled</b>	
2012	Equals 1 if student enrolled in 2012; 0 otherwise
2013	Equals 1 if student enrolled in 2013; 0 otherwise
2014	Equals 1 if student enrolled in 2014; 0 otherwise
2015	Equals 1 if student enrolled in 2015; 0 otherwise
<b>Ethnicities<sup>1</sup></b>	
Maori	Equals 1 if student self-reported as Maori; 0 otherwise
Pasifika	Equals 1 if student self-reported as Pasifika; 0 otherwise
Asian	Equals 1 if student self-reported as Asian; 0 otherwise
European	Equals 1 if student self-reported as European; 0 otherwise
Others	Equals 1 if student self-reported none of the above ethnicities; 0 otherwise
<b>Ages</b>	
Age Under 18	Equals 1 if student under age 18; 0 otherwise
Age 18	Equals 1 if student age 18; 0 otherwise
Age 19	Equals 1 if student age 19; 0 otherwise
Age 20	Equals 1 if student age 20; 0 otherwise
Age 21	Equals 1 if student age 21; 0 otherwise
Age 22	Equals 1 if student age 22; 0 otherwise
Age 23	Equals 1 if student age 23; 0 otherwise
Age 24	Equals 1 if student age 24; 0 otherwise
Age 25	Equals 1 if student age 25; 0 otherwise
Age 26 to 29	Equals 1 if student age 26 to 29; 0 otherwise
Age 30 to 39	Equals 1 if student age 30 to 39; 0 otherwise
Age 40 or Above	Equals 1 if student age 40 or above; 0 otherwise
<b>School Deciles<sup>2</sup></b>	
Decile 1	Equals 1 if student last enrolled in decile 1 high school (bottom 10%); 0 otherwise
Decile 2	Equals 1 if student last enrolled in decile 2 high school; 0 otherwise
Decile 3	Equals 1 if student last enrolled in decile 3 high school; 0 otherwise
Decile 4	Equals 1 if student last enrolled in decile 4 high school; 0 otherwise
Decile 5	Equals 1 if student last enrolled in decile 5 high school ; 0 otherwise
Decile 6	Equals 1 if student last enrolled in decile 6 high school ; 0 otherwise
Decile 7	Equals 1 if student last enrolled in decile 7 high school; 0 otherwise
Decile 8	Equals 1 if student last enrolled in decile 8 high school; 0 otherwise
Decile 9	Equals 1 if student last enrolled in decile 9 high school; 0 otherwise
Decile 10	Equals 1 if student last enrolled in decile 10 high school (top 10%); 0 otherwise
Decile Unknown	Equals 1 if high school decile unknown or unavailable; 0 otherwise

Table 1 Continued

<b>NCEA Results</b>	
Valid NCEA Results	Equals 1 if student completed NCEA level 3; 0 otherwise
NCEA Rank Score	NCEA level 3 rank score (if reported); 0 otherwise
<b>Entrance Types</b>	
External	Equals 1 if previously enrolled in another New Zealand university; 0 otherwise
Internal	Equals 1 if previously completed pre-degree in current university; 0 otherwise
Bursary	Equals 1 if student entered with University Bursary qualification; 0 otherwise
NCEA Level 3	Equals 1 if student entered with NCEA Level 3 qualification; 0 otherwise
Special Admission <sup>3</sup>	Equals 1 if student entered with Special Admission status; 0 otherwise
Other Entrance Types	Equals 1 if student entered with any other entrance type; 0 otherwise
<b>Degree Programs<sup>4</sup></b>	
BA	Equals 1 if enrolled in Bachelor of Arts; 0 otherwise
BBus	Equals 1 if enrolled in Bachelor of Business; 0 otherwise
BCIS	Equals 1 if enrolled in Bachelor of Computer Information Science; 0 otherwise
BCS	Equals 1 if enrolled in Bachelor of Communication Studies; 0 otherwise
BDes	Equals 1 if enrolled in Bachelor of Design; 0 otherwise
BEdu	Equals 1 if enrolled in Bachelor of Education; 0 otherwise
BEngTech	Equals 1 if enrolled in Bachelor of Engineering Technology; 0 otherwise
BHS	Equals 1 if enrolled in Bachelor of Health Science; 0 otherwise
BIHM	Equals 1 if enrolled in Bachelor of International Hospitality Mgmt; 0 otherwise
BSR	Equals 1 if enrolled in Bachelor of Sports and Recreation; 0 otherwise
Others	Equals 1 if enrolled in any other bachelor's degree program; 0 otherwise
Double Degree	Equals 1 if enrolled in double degree; 0 otherwise
<b>Course Levels</b>	
Level 4	Equals 1 if course at level 4 (normally in a pre-degree program)
Level 5	Equals 1 if course at level 5 (normally in first year of a bachelor's degree)
Level 6	Equals 1 if course at level 6 (normally in second year of a bachelor's degree)
Level 7	Equals 1 if course at level 7 (normally in third year of a bachelor's degree)

Notes: <sup>1</sup> Ethnicity designations are prioritized. Students are allowed to self-report up to three ethnicities. Anyone reporting to be Maori is officially 'Maori'. Non-Maori respondents are 'Pasifika' if they report being Polynesian (e.g., from Samoa, Tonga, Niue, Cook Islands), Melanesian (e.g., from Papua New Guinea, Fiji, Caledonia, Vanuatu), Micronesian (e.g., from Kiribati, Nauru, Guam, Marshall Islands). Non-Maori, non-Pasifika students are then allocated across the remaining Asian, European and Other (or residual) ethnicity groups.

<sup>2</sup> Schools are allocated to a decile group based on recent Census data from geographic areas in which their students are drawn. These five measures included in these decile designations are the proportions of (i) households with adjusted income in the bottom 20% nationally; (ii) employed parents in low or unskilled occupations; (iii) households in overcrowded housing; (iv) parents with no formal qualifications; and (v) parents receiving social welfare benefits.

<sup>3</sup> Students entering university with Special Admission status are not required to have University Entrance (e.g., NCEA Level 3 qualifications). This entry status is conferred on New Zealand and Australian citizens or permanent residents who are 20 years old or over.

<sup>4</sup> These are initial degree programs in which first-year students were enrolled. These are not mutually exclusive. Students can enroll in more than a single degree program at a time through a 'double degree'.



**Table 2**  
**Variable Means and Sample Sizes for Course Observations**

Variables	All Ethnicities	Maori	Pasifika	Asian	European	Others
<b>Dependent Variables</b>						
Successful Competition	0.7870	0.7545	0.6404	0.7949	0.8540	0.7572
Grade Points <sup>1</sup>	3.717	3.659	2.577	3.479	4.463	3.230
<b>Independent Variables</b>						
Female	0.5964	0.6816	0.6638	0.5042	0.6234	0.5547
Part-Time Enrollment	0.0849	0.0812	0.0990	0.0916	0.0742	0.0910
<b>Years Enrolled</b>						
2012	0.2233	0.2184	0.1983	0.2187	0.2314	0.2550
2013	0.2527	0.2402	0.2456	0.2529	0.2545	0.2736
2014	0.2662	0.2656	0.2778	0.2668	0.2646	0.2506
2015	0.2578	0.2758	0.2783	0.2616	0.2495	0.2208
<b>Ethnicities<sup>2</sup></b>						
Maori	0.1047	---	0.0000	0.0000	0.0000	0.0000
Pasifika	0.1509	0.1811	---	0.0000	0.0000	0.0000
Asian	0.2833	0.0208	0.1807	---	0.0146	0.0059
European	0.3818	0.5822	0.1770	0.0391	---	0.1190
Others	0.0793	0.0219	0.0148	0.0220	0.0097	---
<b>Ages</b>						
Age Under 18	0.0048	0.0038	0.0016	0.0065	0.0052	0.0036
Age 18	0.2269	0.2805	0.1804	0.1632	0.2969	0.1352
Age 19	0.2180	0.2189	0.2203	0.2103	0.2296	0.1849
Age 20	0.1478	0.1226	0.1692	0.1701	0.1266	0.1629
Age 21	0.1039	0.0757	0.1089	0.1340	0.0827	0.1262
Age 22	0.0674	0.0519	0.0738	0.0862	0.0523	0.0814
Age 23	0.0479	0.0396	0.0481	0.0633	0.0368	0.0562
Age 24	0.0334	0.0300	0.0325	0.0419	0.0254	0.0478
Age 25	0.0240	0.0229	0.0240	0.0278	0.0191	0.0360
Age 26 to 29	0.0544	0.0588	0.0592	0.0530	0.0480	0.0759
Age 30 to 39	0.0487	0.0629	0.0598	0.0338	0.0479	0.0656
Age 40 or Above	0.0228	0.0325	0.0222	0.0100	0.0295	0.0243
<b>School Deciles</b>						
Decile 1	0.0395	0.0588	0.1781	0.0125	0.0042	0.0161
Decile 2	0.0399	0.0917	0.1014	0.0254	0.0159	0.0214
Decile 3	0.0651	0.0752	0.1439	0.0774	0.0236	0.0578
Decile 4	0.0970	0.1050	0.1290	0.1155	0.0621	0.1279
Decile 5	0.0554	0.1051	0.0658	0.0321	0.0591	0.0355
Decile 6	0.0614	0.0816	0.0406	0.0401	0.0827	0.0473
Decile 7	0.0853	0.0834	0.0680	0.0835	0.0958	0.0764
Decile 8	0.0814	0.0766	0.0473	0.0646	0.1113	0.0689
Decile 9	0.1224	0.1226	0.0567	0.0952	0.1721	0.1048
Decile 10	0.2018	0.1270	0.0485	0.1909	0.2957	0.1794
Decile Unknown	0.1508	0.0731	0.1207	0.2627	0.0774	0.2645

Table 2 Continued

<b>NCEA Results</b>						
Valid NCEA Results	0.4825	0.5284	0.4913	0.4109	0.5395	0.3867
NCEA Rank Score <sup>3</sup>	174.5	174.0	150.1	161.3	193.7	156.4
<b>Entrance Types</b>						
External	0.1398	0.0958	0.1142	0.2276	0.0897	0.1738
Internal	0.1205	0.0764	0.1724	0.1758	0.0631	0.1584
Bursary	0.0342	0.0286	0.0102	0.0352	0.0492	0.0116
NCEA Level 3	0.5320	0.5768	0.4905	0.4375	0.6284	0.4259
Special Admissions	0.1612	0.2132	0.2019	0.1076	0.1590	0.2180
Other Entrance Types	0.0123	0.0091	0.0109	0.0160	0.0106	0.0123
<b>Degree Programs</b>						
BA	0.1162	0.1661	0.1695	0.0763	0.1115	0.1141
BBus	0.2247	0.1889	0.2230	0.2950	0.1821	0.2284
BCIS	0.0708	0.0242	0.0621	0.1227	0.0498	0.0651
BCS	0.0619	0.0795	0.0372	0.0214	0.1028	0.0341
BDes	0.0497	0.0395	0.0265	0.0551	0.0627	0.0260
BEdu	0.0442	0.0486	0.0251	0.0173	0.0709	0.0426
BEngTech	0.0538	0.0244	0.0424	0.0853	0.0292	0.1204
BHS	0.1946	0.2206	0.1780	0.1352	0.2365	0.2031
BIHM	0.0367	0.0199	0.0261	0.0684	0.0249	0.0231
BSR	0.0632	0.0965	0.0686	0.0192	0.0890	0.0414
Others	0.0982	0.1047	0.1452	0.1106	0.0665	0.1082
Double Degree	0.0144	0.0131	0.0038	0.0071	0.0259	0.0065
<b>Course Levels</b>						
Level 4	0.0038	0.0023	0.0029	0.0055	0.0026	0.0068
Level 5	0.7354	0.7467	0.7452	0.7189	0.7483	0.6988
Level 6	0.2394	0.2307	0.2323	0.2483	0.2324	0.2666
Level 7	0.0214	0.0202	0.0196	0.0272	0.0167	0.0278
<i>n</i>	181,277	18,979	27,356	51,352	69,211	14,379
Sample Proportions	1.0000	0.1047	0.1509	0.2833	0.3818	0.0793

Notes: <sup>1</sup> The number of grade point observations were missing for some of the course observations in this sample (e.g., enrollments in pass/fail courses). There were 173,079 course observations with valid grades (95.48% of the sample). Means were conditionally computed for only course observations with valid grade points (ranging from a zero for a failing grade of D to a nine for an A+).

<sup>2</sup> Values in *italics* in this section indicate the proportions who report multiple ethnicities. For example, 10.47% of course observations came from students officially designated as Māori (first column). For this subsample of Māori (second column), some of these course observations came from individuals who also identified as Pasifika (18.11%), Asian (2.08%), European (58.22%) and Others (2.19%). Because of the prioritized ethnicity status, no course observation for the Pasifika subsample can come from students who identify as Māori, and no course observation for the Asian, European and Others subsamples can come from students who also identify as either Māori or Pasifika.

<sup>3</sup> The number of course observations from students with valid NCEA Rank Scores was 87,465 (48.25% of the sample). Means were conditionally computed for course observations only from students with valid NCEA scores.

**Table 3**  
**Ethnic Differences in Successful Course Completion Rates**  
**Three Different Measures of Ethnic Identification**

Ethnicities	Official Ethnic Designations <sup>1</sup>	All Self- Reported Ethnicities <sup>2</sup>	Students Reporting Single Ethnicities <sup>3</sup>
<b>Maori</b>	0.7545 <i>n</i> = 18,979 (10.47%)	0.7545 <i>n</i> = 18,979 (8.99%)	0.7110 <i>n</i> = 6,574 (4.54%)
<b>Pasifika</b>	0.6404 <i>n</i> = 27,356 (15.09%)	0.6480 <i>n</i> = 30,609 (14.49%)	0.6022 <i>n</i> = 16,297 (11.25%)
<b>Asian</b>	0.7949 <i>n</i> = 51,352 (28.33%)	0.7875 <i>n</i> = 57,495 (27.23%)	0.7945 <i>n</i> = 46,733 (32.27%)
<b>European</b>	0.8540 <i>n</i> = 69,211 (38.18%)	0.8390 <i>n</i> = 87,335 (41.36%)	0.8538 <i>n</i> = 62,419 (43.10%)
<b>Others</b>	0.7572 <i>n</i> = 14,379 (7.93%)	0.7569 <i>n</i> = 16,765 (7.94%)	0.7450 <i>n</i> = 12,793 (8.83%)
<b>Total</b>	0.7870 <i>n</i> = 181,277 (100.00%)	0.7832 <i>n</i> = 211,183 (100.00%)	0.7903 <i>n</i> = 144,816 (100.00%)
<b>Pairwise Ethnic Differences</b>			
<b>European – Maori</b>	0.0995 <sup>***</sup>	0.0845 <sup>***</sup>	0.1428 <sup>***</sup>
<b>European – Pasifika</b>	0.2136 <sup>***</sup>	0.1910 <sup>***</sup>	0.2516 <sup>***</sup>
<b>European – Asian</b>	0.0591 <sup>***</sup>	0.0515 <sup>***</sup>	0.0593 <sup>***</sup>

Notes: <sup>1</sup> Figures in parentheses ('()') indicate the percentages of each sample of course observations for students with a particular ethnicity under each definition.

<sup>2</sup> Each paper observation can appear in multiple rows if students report multiple ethnicities. A maximum of three ethnicities can be reported per individual student.

<sup>3</sup> All paper observations from students reporting multiple ethnicities were excluded from these descriptive statistics.

\*\*\* Means significantly different from one another at 1% level using a two-tailed *t* test.

\*\* Means significantly different from one another at 5% level using a two-tailed *t* test.

\* Means significantly different from one another at 10% level using a two-tailed *t* test.

**Table 4**  
**Ethnic Differences in Course Grade Points**  
**Three Different Measures of Ethnic Identification**

Ethnicities	Official Ethnic Designations <sup>1</sup>	All Self- Reported Ethnicities <sup>2</sup>	Students Reporting Single Ethnicities <sup>3</sup>
<b>Maori</b>	3.659 <i>n</i> = 17,832 (10.30%)	3.659 <i>n</i> = 17,832 (8.85%)	3.447 <i>n</i> = 6,124 (4.42%)
<b>Pasifika</b>	2.577 <i>n</i> = 25,819 (14.92%)	2.639 <i>n</i> = 28,893 (14.34%)	2.306 <i>n</i> = 15,344 (11.08%)
<b>Asian</b>	3.479 <i>n</i> = 49,821 (28.79%)	3.437 <i>n</i> = 55,737 (27.67%)	3.460 <i>n</i> = 45,364 (32.77%)
<b>European</b>	4.463 <i>n</i> = 65,805 (38.02%)	4.324 <i>n</i> = 82,940 (41.17%)	4.456 <i>n</i> = 59,320 (42.85%)
<b>Others</b>	3.230 <i>n</i> = 13,802 (7.97%)	3.259 <i>n</i> = 16,057 (7.97%)	3.091 <i>n</i> = 12,294 (8.88%)
<b>Total</b>	3.717 <i>n</i> = 173,079 (100.00%)	3.6931 <i>n</i> = 201,459 (100.00%)	3.726 <i>n</i> = 138,446 (100.00%)
<b>Pairwise Ethnic Differences</b>			
<b>European – Maori</b>	0.804***	0.665***	1.009***
<b>European – Pasifika</b>	1.886***	1.685***	2.150***
<b>European – Asian</b>	0.984***	0.887***	0.996***

Notes: <sup>1</sup> Figures in parentheses ('()') indicate the percentages of each sample of course observations for students with a particular ethnicity under each definition.

<sup>2</sup> Each paper observation can appear in multiple rows if students report multiple ethnicities. A maximum of three ethnicities can be reported per individual student.

<sup>3</sup> All paper observations from students reporting multiple ethnicities were excluded from these descriptive statistics.

\*\*\* Means significantly different from one another at 1% level using a two-tailed *t*-test.

\*\* Means significantly different from one another at 5% level using a two-tailed *t*-test.

\* Means significantly different from one another at 10% level using a two-tailed *t*-test.

**Table 5**  
**Maximum Likelihood Probit Regression Results on Successful Paper Completions**

Variables <sup>1</sup>	All Students Official Ethnic Designations			Restricted to Students Reporting Single Ethnicities		
	Estimated Coefficient	Standard Error	Marginal Effect	Estimated Coefficient	Standard Error	Marginal Effect
Constant	0.6952***	0.0223	---	0.6734***	0.0254	---
Female	0.1257***	0.0079	0.0335***	0.1517***	0.0089	0.0399***
Part-Time Enrollment	-0.1624***	0.0119	-0.0433***	-0.1589***	0.0133	-0.0418***
<b>Years Enrolled</b>						
2013	-0.0284***	0.0103	-0.0076***	-0.0302***	0.0115	-0.0079***
2014	-0.0472***	0.0105	-0.0126***	-0.0414***	0.0118	-0.0109***
2015	-0.0229**	0.0110	-0.0061**	-0.0147	0.0123	-0.0039
<b>Ethnicities</b>						
Maori	-0.2774***	0.0122	-0.0739***	-0.3865***	0.0104	-0.1016***
Pasifika	-0.4874***	0.0113	-0.1299***	-0.5924***	0.0185	-0.1557***
Asian	-0.1081***	0.0097	-0.0288***	-0.1159***	0.0140	-0.0305***
Others	-0.2305***	0.0136	-0.0614***	-0.2621***	0.0144	-0.0689***
<b>Ages</b>						
Age Under 18	0.2014***	0.0580	0.0537***	0.2653***	0.0646	0.0697***
Age 19	-0.0270***	0.0113	-0.0072***	-0.0155	0.0129	-0.0041
Age 20	-0.0592***	0.0132	-0.0158***	-0.0602***	0.0150	-0.0158***
Age 21	-0.0771***	0.0155	-0.0206***	-0.0669***	0.0173	-0.0176***
Age 22	-0.0664***	0.0181	-0.0177***	-0.0545***	0.0203	-0.0143***
Age 23	-0.0076	0.0204	-0.0020	-0.0033	0.0227	-0.0009
Age 24	0.0181	0.0229	0.0048	0.0138	0.0255	0.0036
Age 25	0.0198	0.0255	0.0053	0.0048	0.0282	0.0013
Age 26 to 29	0.0761***	0.0203	0.0203***	0.0870***	0.0228	0.0229***
Age 30 to 39	0.1276***	0.0217	0.0340***	0.1536***	0.0240	0.0404***
Age 40 or Above	0.0831***	0.0276	0.0222***	0.0567*	0.0304	0.0149*
<b>School Deciles</b>						
Decile 1	-0.2786***	0.0215	-0.0743***	-0.1968***	0.0252	-0.0517***
Decile 2	-0.0413*	0.0217	-0.0110*	0.0006	0.0261	0.0002
Decile 3	-0.0073	0.0195	-0.0020	0.0254	0.0230	0.0067
Decile 4	0.0106	0.0181	0.0028	0.0172	0.0210	0.0045
Decile 6	0.1056***	0.0205	0.0281***	0.1075***	0.0238	0.0282***
Decile 7	0.0691***	0.0189	0.0184***	0.0865***	0.0219	0.0227***
Decile 8	-0.0199	0.0190	-0.0053	-0.0324	0.0219	-0.0085
Decile 9	0.0335*	0.0178	0.0089*	0.0290	0.0206	0.0076
Decile 10	0.0208	0.0168	0.0055	0.0314	0.0195	0.0082
Decile Unknown	0.2054***	0.0181	0.0547***	0.2347***	0.0207	0.0617***
<b>NCEA Results</b>						
Valid NCEA Results	-0.6263***	0.0167	-0.1669***	-0.5998***	0.0189	-0.1576***
NCEA Rank Score/10 <sup>2</sup>	0.0434***	0.0010	0.0116***	0.0412***	0.0011	0.0108***

Table 5 Continued

<b>Entrance Types</b>						
External	0.0071	0.0132	0.0019	0.0054	0.0147	0.0014
Internal	0.0565***	0.0121	0.0151***	0.0227*	0.0136	0.0060*
Bursary	0.2978***	0.0233	0.0794***	0.2823***	0.0262	0.0742***
Special Admissions	-0.2035***	0.0127	-0.0542***	-0.2303***	0.0143	0.0605***
Other Entrance Types	0.0739**	0.0337	0.0197**	0.0136	0.0370	0.0036
<b>Degree Programs</b>						
BA	0.0735***	0.0123	0.0196***	0.0851***	0.0141	0.0224***
BCIS	0.0811***	0.0143	0.0216***	0.0882***	0.0156	0.0232***
BCS	0.4577***	0.0198	0.1220***	0.4588***	0.0231	0.1206***
BDes	0.4441***	0.0203	0.1184***	0.4494***	0.0230	0.1181***
BEdu	0.6064***	0.0211	0.1616***	0.6093***	0.0240	0.1601***
BEngTech	0.0265	0.0162	0.0071	0.0401**	0.0176	0.0105**
BHS	0.2731***	0.0113	0.0728***	0.2701***	0.0128	0.0710***
BIHM	0.3410***	0.0205	0.0909***	0.3654***	0.0228	0.0960***
BSR	0.0119	0.0154	0.0032	0.0217	0.0176	0.0057
Others	0.1045***	0.0128	0.0279***	0.1035***	0.0143	0.0272***
Double Degree	0.5613***	0.0432	0.1496***	0.5315***	0.0467	0.1397***
<b>Course Levels</b>						
Level 4	-0.0514	0.0528	-0.0137	-0.0470	0.0570	-0.0123
Level 6	0.1442***	0.0085	0.0384***	0.1541***	0.0096	0.0405***
Level 7	0.3102***	0.0254	0.0827***	0.3239***	0.0282	0.0851***
<i>n</i>		181,277			144,816	
Likelihood Function		-93,893.31			-74,375.64	
Pseudo- $R^2$ Statistic		0.0807			0.0851	

Notes: Estimated standard errors were adjusted for clustering with multiple course observations for individual students.

<sup>1</sup> Omitted categories for the multiple dummy variables are: '2012' for Years Enrolled; 'European' for Ethnicities; '18' for Ages; '5' for School Deciles; 'NCEA Level 3' for Entrance Types; 'BBus' for Degree Programs; and 'Level 5' for Course Levels.

<sup>2</sup> NCEA Rank Scores were divided by 10 to ease the interpretation of the parameter estimates.

\*\*\* Estimated parameter statistically different from zero at better than a 1% level using a two-tailed *t*-test.

\*\* Estimated parameter statistically different from zero at better than a 5% level using a two-tailed *t*-test.

\* Estimated parameter statistically different from zero at better than a 10% level using a two-tailed *t*-test.

**Table 6**  
**Ordinary Least-Squares Regression Results on Course Grade Points**

Variables <sup>1</sup>	All Students Official Ethnic Designations		Restricted to Students Reporting Single Ethnicities	
	Estimated Coefficient	Standard Error	Estimated Coefficient	Standard Error
Constant	3.1935***	0.0381	3.1786***	0.0431
Female	0.3003***	0.0136	0.3365***	0.0152
Part-Time Enrollment	-0.2115***	0.0218	-0.2004***	0.0240
<b>Years Enrolled</b>				
2013	-0.0542***	0.0175	-0.0302***	0.0115
2014	0.0193	0.0178	-0.0414***	0.0118
2015	0.1229***	0.0184	-0.0147	0.0123
<b>Ethnicities</b>				
Maori	-0.5959***	0.0212	-0.7914***	0.0335
Pasifika	-1.3551***	0.0203	-1.6846***	0.0257
Asian	-0.6238***	0.0161	-0.6581***	0.0172
Others	-0.9138***	0.0236	-1.0413***	0.0252
<b>Ages</b>				
Age Under 18	0.3013***	0.0867	0.3046***	0.0935
Age 19	0.0134	0.0184	0.0100	0.0208
Age 20	0.0279	0.0224	0.0237	0.0250
Age 21	0.0646**	0.0266	0.0781***	0.0294
Age 22	0.1444***	0.0315	0.1436***	0.0347
Age 23	0.3370***	0.0352	0.3129***	0.0387
Age 24	0.4716***	0.0398	0.4365***	0.0439
Age 25	0.5868***	0.0446	0.5529***	0.0489
Age 26 to 29	0.7578***	0.0346	0.8263***	0.0382
Age 30 to 39	1.0314***	0.0364	1.0555***	0.0397
Age 40 or Above	1.0163***	0.0469	0.9786***	0.0515
<b>School Deciles</b>				
Decile 1	-0.6752***	0.0401	-0.4299***	0.0466
Decile 2	-0.0776**	0.0389	0.0623	0.0464
Decile 3	-0.0343	0.0343	0.0525	0.0400
Decile 4	0.0106	0.0315	0.0193	0.0362
Decile 6	0.2436***	0.0345	0.2392***	0.0396
Decile 7	0.0844***	0.0322	0.1009***	0.0369
Decile 8	0.0073	0.0326	-0.0161	0.0372
Decile 9	-0.0056	0.0303	0.0002	0.0347
Decile 10	-0.0380	0.0287	-0.0219	0.0328
Decile Unknown	0.2659***	0.0312	0.3191***	0.0354
<b>NCEA Results</b>				
Valid NCEA Results	-1.8946***	0.0290	-1.8469***	0.0324
NCEA Rank Score/10 <sup>2</sup>	0.1174***	0.0015	0.1130***	0.0017

Table 6 Continued

<b>Entrance Types</b>				
External	0.0753***	0.0231	0.0569**	0.0255
Internal	-0.1055***	0.0215	-0.1298***	0.0239
Bursary	0.7981***	0.0363	0.7593***	0.0404
Special Admissions	-0.4481***	0.0227	-0.4890***	0.0254
Other Entrance Type	0.3113***	0.0568	0.2373***	0.0622
<b>Degree Programs</b>				
BA	0.7217***	0.0223	0.7419***	0.0253
BCIS	0.5153***	0.0260	0.5312***	0.0281
BCS	0.1820***	0.0284	0.1243***	0.0325
BDes	0.9938***	0.0299	0.9496***	0.0334
BEdu	1.7842***	0.0325	1.7485***	0.0362
BEngTech	0.2176***	0.0293	0.2347***	0.0316
BHS	0.9696***	0.0194	0.9541***	0.0216
BIHM	0.8033***	0.0332	0.7842***	0.0362
BSR	0.1735***	0.0276	0.1602***	0.0311
Others	0.6066***	0.0227	0.5902***	0.0253
Double Degree	1.2874***	0.0503	1.2524***	0.0551
<b>Course Levels</b>				
Level 4	0.3826***	0.0974	0.3856***	0.1044
Level 6	0.1246***	0.0144	0.1258***	0.0159
Level 7	0.2744***	0.0408	0.2694***	0.0447
<i>n</i>	173,079		138,446	
<i>R</i> <sup>2</sup> Statistic	0.1670		0.1740	

Notes: Estimated standard errors were adjusted for clustering with multiple course observations for individual students.

<sup>1</sup> Omitted categories for the multiple dummy variables are: '2012' for Years Enrolled; 'European' for Ethnicities; '18' for Ages; '5' for School Deciles; 'NCEA Level 3' for Entrance Types; 'BBus' for Degree Programs; and 'Level 5' for Course Levels.

<sup>2</sup> NCEA Rank Scores were divided by 10 to ease the interpretation of the parameter estimates.

\*\*\* Estimated parameter statistically different from zero at better than a 1% level using a two-tailed *t*-test.

\*\* Estimated parameter statistically different from zero at better than a 5% level using a two-tailed *t*-test.

\* Estimated parameter statistically different from zero at better than a 10% level using a two-tailed *t*-test.



**Table 7**  
**Decomposition of Pairwise Ethnic Differences in Successful Course Completions**  
**All Students Using Official Ethnic Designations**

	European – Maori	European – Pasifika	European – Asian
Overall Ethnic Differences	0.0995	0.2136	0.0591
Explained Ethnic Differences <sup>1</sup>			
Female	-0.0014*** (0.0001) [-1.41%]	-0.0011*** (0.0001) [-0.51%]	0.0061*** (0.0004) [10.32%]
Part Time Enrollment	0.0008*** (0.0001) [0.80%]	0.0016*** (0.0001) [0.75%]	0.0007*** (0.0001) [1.18%]
<b>Years Enrolled</b>	0.0003*** (0.0001) [0.30%]	0.0003** (0.0001) [0.14%]	0.0002*** (0.0001) [0.34%]
<b>Ages</b>	-0.0005*** (0.0001) [-0.50%]	0.0013*** (0.0003) [0.61%]	0.0040*** (0.0003) [6.77%]
<b>School Deciles</b>	0.0057*** (0.0011) [5.73%]	0.0182*** (0.0018) [8.52%]	-0.0074*** (0.0007) [-12.52%]
<b>NCEA Results</b>	0.0119*** (0.0004) [11.96%]	0.0197*** (0.0006) [9.22%]	0.0175*** (0.0006) [29.61%]
<b>Entrance Types</b>	0.0038*** (0.0003) [3.82%]	0.0028*** (0.0006) [1.31%]	-0.0037*** (0.0006) [-6.26%]
<b>Degree Programs</b>	0.0025*** (0.0004) [2.51%]	0.0151*** (0.0005) [7.07%]	0.0131*** (0.0008) [22.17%]
<b>Course Levels</b>	-0.0008*** (0.0001) [-0.80%]	-0.0005*** (0.0000) [-0.23%]	-0.0016*** (0.0001) [-2.71%]
<b>Total Explained Differences</b>	0.0223*** (0.0012) [22.41%]	0.0575*** (0.0021) [26.92%]	0.0289*** (0.0012) [48.90%]
<i>n</i>	88,190	96,567	120,563

Notes: All decompositions used pooled coefficient estimates from separate pairwise regressions using relevant subsamples (European and Maori, European and Pasifika, and European and Asian). These maximum likelihood probit regressions included a single dummy variable for the relevant minority group, and all other covariates shown in Table 5. The unbolded names in the first column refer to single variables, while the bolded names refer to multiple variables under these headings (see previous tables for these individual variables). These regression results are not included in this paper, but are available from the authors by request. These reported decompositions are based on a total of 100 replications.

<sup>1</sup>. Standard errors associated with these individual or groups of variables are listed in parentheses ('(·)') below these estimated effects. Percentage changes in overall ethnic differences associated with these individual or groups of variables are shown in square brackets ('[·]').

\*\*\* Estimated effect statistically different from zero at better than a 1% level using a two-tailed *t*-test.

\*\* Estimated effect statistically different from zero at better than a 5% level using a two-tailed *t*-test.

\* Estimated effect statistically different from zero at better than a 10% level using a two-tailed *t*-test.

**Table 8**  
**Decomposition of Pairwise Ethnic Differences in Successful Course Completions**  
**Restricted to Students Reporting Single Ethnicities**

	European – Maori	European – Pasifika	European – Asian
Overall Ethnic Differences	0.1428	0.2516	0.0593
Explained Ethnic Differences <sup>1</sup>			
Female	-0.0014*** (0.0001) [-0.98%]	-0.0028*** (0.0002) [-1.09%]	0.0064*** (0.0004) [10.79%]
Part Time Enrollment	0.0012*** (0.0001) [0.84%]	0.0018*** (0.0002) [0.70%]	0.0007*** (0.0001) [1.18%]
<b>Years Enrolled</b>	0.0005*** (0.0001) [0.35%]	0.0003** (0.0002) [0.12%]	0.0001* (0.0001) [0.17%]
<b>Ages</b>	-0.0021*** (0.0003) [-1.47%]	0.0003 (0.0004) [0.12%]	0.0041*** (0.0005) [6.91%]
<b>School Deciles</b>	0.0144*** (0.0005) [10.08%]	0.0208*** (0.0008) [8.28%]	0.0184*** (0.0007) [31.03%]
<b>NCEA Results</b>	0.0023 (0.0017) [1.61%]	0.0136*** (0.0024) [5.41%]	-0.0086*** (0.0008) [-14.50%]
<b>Entrance Types</b>	0.0064*** (0.0005) [4.48%]	0.0044*** (0.0007) [1.75%]	-0.0035*** (0.0007) [-5.90%]
<b>Degree Programs</b>	0.0067*** (0.0006) [4.69%]	0.0176*** (0.0007) [6.98%]	0.0130*** (0.0009) [21.92%]
<b>Course Levels</b>	-0.0013*** (0.0001) [-0.91%]	-0.0004*** (0.0001) [-0.16%]	-0.0018*** (0.0001) [-3.04%]
<b>Total Explained Differences</b>	0.0268*** (0.0019) [18.77%]	0.0556*** (0.0028) [22.10%]	0.0288*** (0.0014) [48.57%]
<i>n</i>	68,993	78,716	109,152

Notes: All decompositions used pooled coefficient estimates from separate pairwise regressions using relevant subsamples (European and Maori, European and Pasifika, and European and Asian). These maximum likelihood probit regressions included a single dummy variable for the relevant minority group, and all other covariates shown in Table 5. The unbolded names in the first column refer to single variables, while the bolded names refer to multiple variables under these headings (see previous tables for these individual variables). These regression results are not included in this paper, but are available from the authors by request. These reported decompositions are based on a total of 100 replications.

<sup>1</sup>. Standard errors associated with these individual or group estimates are listed in parentheses ('(·)') below these estimated effects. Percentage changes in overall ethnic differences associated with these individual or groups of variables are shown in square brackets ('[·]').

\*\*\* Estimated effect statistically different from zero at better than a 1% level using a two-tailed *t*-test.

\*\* Estimated effect statistically different from zero at better than a 5% level using a two-tailed *t*-test.

\* Estimated effect statistically different from zero at better than a 10% level using a two-tailed *t*-test.

**Table 9**  
**Decomposition of Pairwise Ethnic Differences in Course Grade Points**  
**All Students Using Official Ethnic Designations**

	European – Maori	European – Pasifika	European – Asian
Overall Ethnic Differences	0.804	1.886	0.984
Explained Ethnic Differences <sup>1</sup>			
Female	-0.0235*** (0.0020) [-2.92%]	-0.0142*** (0.0014) [-0.75%]	0.0482*** (0.0023) [4.90%]
Part Time Enrollment	0.0018*** (0.0007) [0.22%]	0.0079*** (0.0011) [0.42%]	0.0037*** (0.0006) [0.38%]
<b>Years Enrolled</b>	-0.0034*** (0.0008) [-0.42%]	-0.0026*** (0.0010) [-0.14%]	-0.0023*** (0.0006) [-0.23%]
<b>Ages</b>	-0.0399*** (0.0041) [-4.96%]	-0.0564*** (0.0048) [-2.99%]	0.0031 (0.0046) [0.32%]
<b>School Deciles</b>	0.1392*** (0.0055) [17.31%]	0.2871*** (0.0062) [15.23%]	0.2094*** (0.0058) [21.29%]
<b>NCEA Results</b>	0.0149* (0.0077) [1.85%]	0.0857*** (0.0121) [4.55%]	-0.0571*** (0.0062) [-5.80%]
<b>Entrance Types</b>	0.0480*** (0.0031) [5.97%]	0.0644*** (0.0047) [3.42%]	0.0059 (0.0056) [0.60%]
<b>Degree Programs</b>	0.0460*** (0.0045) [5.72%]	0.1187*** (0.0051) [6.30%]	0.1468*** (0.0067) [14.92%]
<b>Course Levels</b>	-0.0012** (0.0006) [-0.15%]	-0.0010* (0.0005) [-0.05%]	-0.0032*** (0.0008) [-0.33%]
<b>Total Explained Differences</b>	0.1820*** (0.0113) [22.64%]	0.4896*** (0.0146) [25.96%]	0.3546*** (0.0101) [36.04%]
<i>n</i>	83,637	91,624	115,626

Notes: All decompositions used pooled coefficient estimates from separate pairwise regressions using relevant subsamples (European and Maori, European and Pasifika, and European and Asian). These ordinary least-squares regressions included a single dummy variable for the relevant minority group, and all other covariates shown in Table 6. The unbolded names in the first column refer to single variables, while the bolded names refer to multiple variables under these headings (see previous tables for these individual variables). These regression results are not included in this paper, but are available from the authors by request. These reported decompositions are based on a total of 100 replications.

<sup>1</sup>. Standard errors associated with these individual or group estimates are listed in parentheses ('(·)') below these estimated effects. Percentage changes in overall ethnic differences associated with these individual or groups of variables are shown in square brackets ('[·]').

\*\*\* Estimated effect statistically different from zero at better than a 1% level using a two-tailed *t*-test.

\*\* Estimated effect statistically different from zero at better than a 5% level using a two-tailed *t*-test.

\* Estimated effect statistically different from zero at better than a 10% level using a two-tailed *t*-test.

**Table 10**  
**Decomposition of Pairwise Ethnic Differences in Course Grade Points**  
**Restricted to Students Reporting Single Ethnicities**

	European – Maori	European – Pasifika	European – Asian
Overall Ethnic Differences	1.009	2.150	0.996
Explained Ethnic Differences <sup>1</sup>			
Female	-0.0203*** (0.0028) [-2.01%]	-0.0312*** (0.0023) [-1.45%]	0.0500*** (0.0025) [5.02%]
Part Time Enrollment	0.0045*** (0.0012) [0.45%]	0.0087*** (0.0013) [0.40%]	0.0039*** (0.0007) [0.39%]
<b>Years Enrolled</b>	-0.0021* (0.0012) [-0.21%]	-0.0030*** (0.0011) [-0.14%]	-0.0022*** (0.0006) [-0.22%]
<b>Ages</b>	-0.1060*** (0.0080) [-10.51%]	-0.1047*** (0.0070) [-4.87%]	0.0031 (0.0052) [0.31%]
<b>School Deciles</b>	0.2052*** (0.0084) [20.34%]	0.3104*** (0.0079) [14.44%]	0.2177*** (0.0064) [21.86%]
<b>NCEA Results</b>	-0.0283** (0.0126) [-2.80%]	0.0034 (0.0163) [0.16%]	-0.0660*** (0.0069) [-6.63%]
<b>Entrance Types</b>	0.0736*** (0.0054) [7.29%]	0.0769*** (0.0062) [3.58%]	0.0077 (0.0062) [0.77%]
<b>Degree Programs</b>	0.0513*** (0.0070) [5.08%]	0.1227*** (0.0063) [5.71%]	0.1455*** (0.0073) [14.61%]
<b>Course Levels</b>	-0.0041*** (0.0012) [-0.41%]	-0.0012** (0.0006) [-0.06%]	-0.0036*** (0.0009) [-0.36%]
<b>Total Explained Differences</b>	0.1739*** (0.0184) [17.23%]	0.3819*** (0.0193) [17.76%]	0.3562*** (0.0110) [35.76%]
<i>n</i>	65,444	74,664	104,684

Notes: All decompositions used pooled coefficient estimates from separate pairwise regressions using relevant subsamples (European and Maori, European and Pasifika, and European and Asian). These ordinary least-squares regressions included a single dummy variable for the relevant minority group, and all other covariates shown in Table 6. The unbolded names in the first column refer to single variables, while the bolded names refer to multiple variables under these headings (see previous tables for these individual variables). These regression results are not included in this paper, but are available from the authors by request. These reported decompositions are based on a total of 100 replications.

<sup>1</sup>. Standard errors associated with these individual or group estimates are listed in parentheses ('(·)') below these estimated effects. Percentage changes in overall ethnic differences associated with these individual or groups of variables are shown in square brackets ('[·]').

\*\*\* Estimated effect statistically different from zero at better than a 1% level using a two-tailed *t*-test.

\*\* Estimated effect statistically different from zero at better than a 5% level using a two-tailed *t*-test.

\* Estimated effect statistically different from zero at better than a 10% level using a two-tailed *t*-test.