THE IMPACT OF QUESTION FORMAT IN PRINCIPLES OF ECONOMICS CLASSES: EVIDENCE FROM NEW ZEALAND

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Abstract

This study investigates whether question format disadvantages certain types of students. I use assessment data compiled from principles of economics classes at the University of Canterbury from 2002-2008. I combine these with administrative data on student characteristics to create a comprehensive dataset of over 20,000 observations. To control for student ability, I use a battery of measures of student performance in non-economics classes. In the absence of controls for student ability, I find that question format appears to have a significant impact on student performance. These mostly disappear when student ability variables are added. The major exception are student characteristics associated with language: I find that non-native English speakers are relatively disadvantaged by constructed response questions even after controlling for student ability.

JEL Categories: A22

Keywords: Principles of Economics Assessment, Multiple Choice, Constructed Response, Free Response, Essay.

I. Introduction

This study investigates whether question format biases assessment results against certain types of students. Ideally, assessment techniques should test subject knowledge and associated skills such as application, analysis and evaluation. They should be blind to student characteristics such as gender and ethnicity, at least to the extent that these are unrelated to academic achievement. An advantage or disadvantage based on an irrelevant characteristic introduces a bias into the results. A better understanding of how question format impacts the relative performance of different types of students can help to avoid these kinds of biases and lead to more reliable assessment techniques.

Universities typically use a mixture of multiple choice (MC) and constructed response (CR) questions in assessing student knowledge in principles of economics classes. In MC questions, the student must choose between a number of possible answers supplied by the assessment. In CR questions, the student is expected to supply the answer. CR questions include fill-in-the blanks, definitions, and short- and long-essays.

TABLE 1 shows the mix of MC and CR questions employed in introductory economics courses at major universities in New Zealand. Given the higher costs associated with grading CR questions, it is perhaps surprising that CR questions are used as frequently as they are. No university course relies exclusively on MC questions for all their assessments. Some, like the principles of micro- and macroeconomics classes at the University of Auckland, rely entirely on CR questions. Most use a question format that employs a mixture of MC and CR questions. My study intends to shed light on whether certain student groups tend to be relatively disadvantaged by the given mix of MC and CR questions at their university.

A number of studies examine the relationship between performance in university economics classes and student characteristics, with gender

being the most frequently studied characteristic. Anderson, Benjamin and Fuss (1994) find that males outperform females overall in introductory economics courses and this advantage persists under several sets of controls. Ziegert (2000) explains this difference with personality type information and finds the difference disappears when personality type is controlled. Several studies find that males perform better on MC questions while females perform better on CR (e.g., Lumsden and Scott, 1987). Walstad and Robson (1997) find that the difference in MC between males and females can be reduced by eliminating questions with a clear and identifiable bias, though the full difference is not eliminated.

Race (in the U.S. context) has also attracted study, though most of it has been in terms of overall achievement. Walstad and Robson (1997) find that black students score lower on MC compared to non-black students, but this is consistent with overall achievement. In New Zealand, Juhong and Maloney (2006) find that ethnicity is related to achievement and drop-out rates at the university level.

My study uses a unique data set to examine the relationship between question format and assessment results for different types of students in university principles of economics classes. My data consist of over 20,000 assessment results. Further, they include greater detail about student academic ability than previous studies. I find that student academic ability can explain almost all of the apparent discrepancies in relative performances on MC and CR questions. With one exception, the only student characteristics for which significant differences exist are those that are connected to English language ability. The one exception is gender. I find that female students do relatively better on CR questions, but only in macroeconomics classes.

This paper proceeds as follows. Section I introduces the topic and situates this study in the literature. Section II describes the data. Section III presents and analyses the results. Section IV concludes.

II. Data

This study combines assessment data for Principles of Economics courses at the University of Canterbury, New Zealand with demographic data collected by the university. The assessment data covers the period 2002 to 2008 and contains both microeconomics and macroeconomics principles courses. For each student within each course there are two items of assessment – a term test and a final exam. Both assessment items contain MC and CR questions. While the format of the term test and final exam has remained consistent over time, some minor changes in weighting and content have occurred (see Appendix 1). The MC and CR sections for each term test and exam have been scaled to a percentage to allow the two sections to be compared and to allow comparison across different years.

The demographic data is collected by the university at time of enrolment. Self-declared variables include gender, first language and ethnicity. Students are recorded as international or domestic according to their admission criteria. As is typical of most datasets containing self-declared data, the data is somewhat messy. Appendix 2 contains details of how the data was cleaned to provide usable information.

My study focuses on the following student categories:

1. *GENDER* – either male or female.
2. *ETHNICITY* – this variable has 5 possible categories: European; Maori; Asian; Pacific Island; and Other.
3. *FIRST LANGUAGE* – this variable has 3 possible categories: English; Chinese; and Other.
4. *INTERNATIONAL* – this variable identifies whether the student pays international (as opposed to domestic) fees.

One issue with these categories is that they can be highly correlated, particularly ethnicity, language and whether or not a student is international or domestic. For example, students who declare their first language to be English are most likely to be domestic students. My detailed data will allow me to identify the independent effects of students characteristics once other characteristics are controlled.

I am able to control for a student's overall level of ability by calculating a GPA value for each student in the year that they took their first year economics course(s) but that excludes their first year economics courses. This non-economics GPA variable (NEGPA) provides a measure for general student ability.

One of the problems with this variable is that students may take different sets of non-economics classes, and these may have different grade distributions. Accordingly, I make use of the fact that a large number of economics students take a common set of courses. First-year accounting, management, mathematics, and statistics are courses frequently taken by economics students (see Appendix 3). By comparing grades in these common classes, I am able to get a more detailed measure of student ability than previous studies.

III. Results

I begin by representing a student's performance on the MC and CR portions of assessments as a function of categorical variables:

(1a) $MC = \alpha_0 + \alpha_1$(Individual Categorical Variables) $+ \varepsilon$, and

(1b) $CR = \beta_0 + \beta_1$(Individual Categorical Variables) $+ \varepsilon$.

The categorical variables differ depending on the category I am studying. For example, when studying gender, I include a dummy variable for female (male is the omitted category). When studying ethnicity, I include dummy variables for Maori, Asian, Pacific Island, and Other (European is the omitted category). This allows me to relate the mean score for each portion as a function of the respective categorical variables.

The corresponding mean values for each of the respective categorical values are reported in Table 2. The overall picture is clear: females perform below males; non European ethnicities perform below Europeans; students whose first language is not English perform below students whose first language is English; and international students perform below domestic students. This general picture applies to student performance on both the MC and CR portions of assessments.

Given equations (1a) and (1b), I define the "relative advantage" a student receives from CR questions by

(2) $(CR - MC) = (\alpha_0 - \beta_0) + (\alpha_1 - \beta_1)$(Individual Categorical Variables) $+ \varepsilon$

A positive coefficient indicates that the respective student type is associated with a relative advantage in CR questions. A negative coefficient indicates that the student type experiences a relative disadvantage in CR questions.

To this basic specification, I then add Academic Ability Variables. These include the non-economics GPA variable discussed above, along with a set of dummy variables and interaction terms to capture student performance in first-year accounting, management, mathematics, and statistics courses. These variables allow me to determine whether estimated relative advantages persist after controlling for student ability.

My final specification adds the remaining Categorical Variables. The final specification thus includes dummy variables for Female, Maori ethnicity, Asian ethnicity, Pacific Island ethnicity, Other ethnicity, Chinese language, Other language, and International fee-paying student; along with full set of student ability variables. Results for these three specifications are reported in Table 3.

Gender. The positive coefficient for (CR – MC) in Column (1) indicates a relative advantage in CR for females compared to males. This is consistent with previous studies. When controls for student ability are introduced into the separate category regression (cf. Column 2), the coefficient remains positive but drops below the level of significance (p value = 0.2309). However, when all the student categories are included in the regression (cf. Column 3), the coefficient becomes significant at the 5 percent level again (p = 0.0125).

Ethnicity. From Table 3, all ethnic groups have a relative disadvantage compared to Europeans in CR as the coefficients are negative. However, this disadvantage disappears for all but the Asian ethnicity group when controls for student quality are introduced. When all the categories are run together the picture is slightly different with only Maori and Pacific Island showing as significant prior to control for student quality and no groups significant after control. The fact that the coefficient for Asian becomes insignificant when all the categories are run together indicates that rather than an ethnicity issue, this is likely to be a language issue. Not all students who declare Asian as their ethnic group will be second language English speakers. Effectively this is controlled for when all categories are run together and ethnicity becomes irrelevant.

The overall conclusion is that there is no relative disadvantage in CR for Maori, Pacific Island or Other and the use of CR questions does not discriminate against these groups.

The absolute disadvantage that non European groups experience in both MC and CR is therefore partly explained by a much broader struggle with University study. Juhong and Maloney (2006) find a very similar result.

So is assessment form blind to ethnicity? Clearly ethnic groups different to the control group do not perform as well on either MC or CR but the difference is generally not significant when student ability is controlled for. This is a comforting result for instructors who wish to employ both MC and CR questions.

First Language. Students with Chinese as their first language clearly have a relative disadvantage in CR with the coefficient after controlling for student ability negative and strongly significant. This latter result is similar to the ethnicity result which is not surprising given that language and ethnicity are highly collinear. There are 3128 students[1] in the dataset who declare their first language to be Chinese with 3104 in the Asian ethnicity category. Hence the Chinese category for language is almost entirely contained in the ethnicity category of Asian.

There is some weak evidence that Other language speakers also have a relative disadvantage in CR. The coefficient, when controlling for student ability, is significant at the 10 percent level when all categories are run together and is only just outside the same level of significance when language is run separately (p=0.1169).

The implication of these results is that, as would be expected, non English speaking background students do in fact face a relative disadvantage in CR questions.[2] In the case of language, this is probably reasonable. While not the direct focus of what is being assessed, CR questions will test language ability to a much greater extent than MC. The ability to interpret more open ended questions, form ideas and then communicate those ideas is an important skill in economics. In the end, students who graduate from the University of Canterbury do so with a degree from an English speaking university so being able to read, interpret and communicate in English is important. Students for whom English is not their first language and who plan to enter an English speaking university may well find that improving their English ability prior to entry is the single most important thing they can do to improve chances of success.

International. International students appear to have a relative disadvantage in CR in the absence of the other categories. However, this is likely to be picking up the effect of language as when language, gender and ethnicity are included the coefficients in table 3 become insignificant both with and without the control for student ability. Being an international student per se is not likely to result in a relative disadvantage in either MC or CR.

This is not only because most of the effect is captured by language but also because not all international students have English as a second language. Of the 5902 international students, 658 declare English as their first language and 790 declare Other.

Macroeconomics and Microeconomics. Table 4 shows the same results as column (3) of Table 3 but divided into microeconomics and macroeconomics. The macroeconomics results are the same as the overall results in Table 3 but microeconomics differs. Asian ethnicity shows an advantage in CR for microeconomics. One possible explanation is that microeconomics questions have a greater graphical, algebraic and computational element than questions in macroeconomics which require more language skills. This may well play into the hands of

[1] This number is calculated by treating a student who appears in multiple years as a different student in each year since self declared demographic characteristics can change from year to year.

[2] While this result holds over all the data it may not hold at every point in time or in every particular course offering. The main exception is the 2004 year where the relative disadvantage is in MC rather than CR for Chinese language speakers. In 2003 the percentage of Chinese language students climbed to 40 percent of the Microeconomics class as the number of Chinese students entering NZ education rose dramatically. It is possible that, consciously or otherwise, an over compensation was made by the instructor in the following year in response to this increase in either question setting or marking. Another possibility is that the students who arrived in this "bubble" were qualitatively different to the long term average Chinese speaking student. The exact cause is difficult to determine and it may simply be "noise" in the data.

students with a stronger mathematical facility including students of Asian ethnicity. This could be consistent with the observation for females where the advantage that females have in CR disappears for microeconomics. The relative advantage for females possibly arises, at least in part, from the relatively better language performance. The greater premium on symbolic representation and manipulation in microeconomics would then reduce this relative advantage.[3]

IV. Conclusion

This study investigates whether some types of students are unfairly disadvantaged by the question format on assessments in university economics classes. I find that in the absence of controls for student academic ability, question format appears to be biased against many types of students. However, once academic ability is accounted for, most of the estimated effects become statistically insignificant.

Where significant effects remain, these can almost always be related to English language ability. Students who do not have English as their first language have a relative disadvantage in constructed response (CR) questions compared to students with English as their first language. While course instructors are not usually aiming to test language directly, language is an important component of academic study. Students need to be able to absorb and interpret information presented in English as well as form their own ideas and express these clearly. Multiple choice (MC) questions do not test such skills to the same extent as constructed response. As such, it can be argued that the relative disadvantage experienced by non-native English speakers on CR questions reflects a valid dimension of student achievement.

The only non-language related student characteristic that remained significant after controlling for student ability was gender. I find that female students do relatively better on CR questions, but only in macroeconomics classes. This result may be of interest to instructors of principles of macroeconomics courses. The use of all-MC tests and exams will disadvantage female students in a discipline where females already perform below males.

This study raises a number of interesting questions. Why do females continue to score less than males in economics when their broader GPA is in fact higher?[4] What classroom strategies might be put in place to overcome this? What kind of language-training can help non-native English speakers to reduce the disadvantage they face on CR questions? These questions remain for future research.

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[3] Confounding this somewhat is that females in the sample who have taken the common first year mathematics paper have a mean GPA of 4.4 compared to the mean for males of 3.5 in the mathematics course. Nevertheless it can still be the case that the lower emphasis on language skills by virtue of the presence of an emphasis on mathematical type skills is sufficient to remove the advantage in CR.

[4] The mean value for NEGPA for females is 3.8 (s.e. = 0.038) but it is only 3.5 (s.e. = 0.033) for males. GPA is measured on a scale of -1 to 9 where a grade of E has a GPA value of -1, D is 0, C- is 1 and so on up to an A+ which has a GPA value of 9.

TABLE 1. How New Zealand Universities Assess Principles of Economics Courses

The following information on invigilated assessment was obtained via an email survey. It was correct at December 2009 but may have subsequently changed.

UNIVERSITY	*PAPER*	*TERM TEST(S) (% MC)*	*FINAL EXAM (% MC)*
Auckland (1)	Microeconomics	0	0
	Macroeconomics	0	0
	General Economics	60	30
	BBIM General Economics	0	0
AUT (2)	Economics	0*	100
Waikato	Business Economics and the NZ Economy	60	60
	Economics and Society	0	0
Massey	Microeconomics	0	100
	Macroeconomics	0	100
Victoria	Microeconomics	100	70
	Macroeconomics	100	70
Lincoln	Introduction to Applied Economics	40/50	30
	Introduction to Economic Theory	50/65	30
Canterbury	Microeconomics	33	30
	Macroeconomics	33	30
Otago	Principles of Economics I	60	67
	Principles of Economics II	50	50

Notes:

(1) University of Auckland
The two general economics paper are not taken by economics majors. Economics majors take ECON 101 Microeconomics and ECON 111 Macroeconomics. The Department of Economics moved away from using MC questions in these two papers because of a university wide requirement that any tests using MC had to be produced in 4 different versions. BBIM stands for Bachelor of Business Information Management.

(2) Auckland University of Technology
AUT operate a different teaching model with smaller classes. They have 4 assessments within the economics section, viz.: an online assignment worth 10 percent; an invigilated test worth 20 percent (all CR); a portfolio worth 30 percent; and an essay worth 40 percent.

TABLE 2
Summary Statistics by Student Category

Category	*Percent of Sample*	*Term Test MC*	*Final Exam MC*	*Term Test CR*	*Final Exam CR*
Gender					
Female	43.3	65.7	68.2	48.8	54.0
Male	56.7	67.6	70.2	50.1	54.4
Ethnicity					
Asian	39.1	65.1	66.5	46.5	50.9
European	52.8	68.6	72.0	52.5	57.4
Maori	2.5	64.0	68.1	46.8	51.4
Pacific Island	1.6	58.8	61.7	38.4	43.1
Other	4.0	63.3	67.3	45.6	51.3
Language					
Chinese	26.7	65.0	66.5	45.8	50.5
English	65.3	67.8	70.9	51.6	56.2
Other	8.0	64.6	66.1	45.4	50.8
International					
Domestic	71.1	67.5	70.7	51.1	55.9
International	28.9	64.9	66.1	45.8	50.2

NOTE: Term Test and Final Exam Marks range from 0 to 100.

TABLE 3
Estimation of the Relative Advantage Associated with CR Questions for Specific Student Groups

	Individual Categories *(1)*	*Individual Categories + Ability Controls* *(2)*	*All Categories + Ability Controls* *(3)*
Gender			
Female	1.09** (4.68)	0.27 (1.20)	0.57** (2.50)
Ethnicity			
Maori	-1.59** (-2.12)	0.03 (0.04)	-0.03 (-0.05)
Asian	-1.78** (-7.31)	-1.32** (-4.96)	0.54 (1.30)
Pacific Island	-4.14** (-4.45)	0.21 (0.23)	0.33 (0.37)
Other	-1.54** (-2.58)	0.17 (0.30)	0.59 (1.00)
First Language			
Chinese	-2.13** (-8.05)	-2.43** (-8.17)	-2.66** (-5.54)
Other	-1.78** (-4.11)	-0.65 (-1.57)	-0.88 (-1.77)
International			
International	-1.85** (-7.24)	-1.62** (-5.85)	-0.44 (-1.16)
Observations	20,446	20,254	20,254

TABLE 4
Estimation of the Relative Advantage Associated with CR Questions for Specific Student Groups: Macro and Micro

	All Categories +Ability Controls	
	Macroeconomics	***Microeconomics***
Gender		
Female	1.16** (3.42)	0.30 (0.99)
Ethnicity		
Maori Ethnicity	-0.49 (-0.47)	0.24 (0.25)
Asian Ethnicity	-0.92 (-1.47)	1.65** (2.96)
Pacific Island	-1.75 (-1.26)	1.83 (1.56)
Other Ethnicity	-0.49 (-0.54)	1.38 (1.78)
First Language		
Chinese language	-1.64** (-2.26)	-3.39** (-5.31)
Other language	0.61 (0.81)	-1.97** (-2.98)
International		
International	0.34 (0.59)	-1.11** (-2.19)
Observations	8904	11350

APPENDIX 1 How the test and exam have changed over time.

2002 and 2003, semester 1: Assignment 10%, term test 40%, final exam 50%. Final exam: 3 constructed response questions worth 70 in total and 30 multiple choice. Term test: 25 MC worth 50/100, CR worth 50/100

2003 semester 2 and 2004: Assignment 10%, term test 40%, final exam 50% Final exam: 2 constructed response questions worth 70 in total and 30 multiple choice. Term test: 25 MC worth 50/100, CR worth 50/100

2005 and 2006: Assignment 10%, online MC 10%, term test 35%, final exam 45%. Final exam: 2 constructed response questions worth 70 in total and 30 multiple choice. Term test: 25 MC worth 25/75, CR worth 50/75

2007 onwards: Assignment 10%, online MC 10%, term test 20%, final exam 60%. Final exam: 2 constructed response questions worth 70 in total and 30 multiple choice. Term test: 25 MC worth 25/75, CR worth 50/75

Note that from 2007 onwards students needed to pass the final exam or get 39/80 in the test and exam combined to get a full pass. The final exam became comprehensive and included a greater coverage of term 1 material than before.

The second semester offering of microeconomics was introduced in 2003. The first semester offering of macroeconomics was introduced in 2006.

APPENDIX 2 Details About the Construction of the Demographic Variables

The student management system at the University of Canterbury collects data on a range of student characteristics. Students self-report their characteristics for each year they are enrolled. Some characteristics are not compulsory to complete and so may have missing values, e.g. ethnicity. Despite this, the database provides a rich source of information with which to classify students.

A complication arises because some students take their introductory economics courses over multiple years. Reasons for this include the fact that students may choose to spread out their study, or because they fail a course. In these cases, the student management system contains multiple records, one for each year the student was enrolled in an introductory economics course. Because of the self-declared nature of the data and the fact that some fields legitimately change over time (e.g., a student may gain NZ citizenship while studying), the same student may look different from one year to the next. A "best judgment" was used to determine the most appropriate classifications for these students. If this could not be done with reasonable certitude, the student was dropped from the sample.

Citizenship. There are three values for citizenship in the student database: (i) New Zealand, (ii) Permanent Resident, and (iii) Overseas. Permanent residents are students who do not have citizenship but are entitled to reside in New Zealand on an ongoing basis.

Ethnicity. The student database contains a primary ethnicity field that supplies the following choices: (i) European, (ii) Maori, (iii) Pacific Islander, (iv) Asian, (v) Indian, and (vi) Other. Most students self-report one of these categories. However, students have the opportunity to supply their own ethnic identification. In addition, they can select multiple ethnicities. The upshot is that the student management system assigns a value of "Unknown" for many students' ethnicities. Nevertheless, most students were able to be assigned to an ethnicity category using other information such as citizenship type and country of citizenship.

"Indian" was eliminated as a separate ethnicity category. This category accounted for less than 50 students in the full sample. In some of the subsamples used in the empirical analyses, there were no students in this category. As a result, Indian was included in Other.

The table below summarizes how student were assigned to the ethnic categories used in this study.

Assigned Ethnic Category	*Ethnicity Reported in Student Records*
European	-NZ European/European/Pakeha -NZ European/Pakeha -Australian -"Unknown" and country of citizenship is any of New Zealand, United Kingdom, France, United States, Netherlands, Latvia, Russia, Ukraine, Australia, Norway, Canada or Germany.
Asian	-Chinese -Filipino -Other Asian -"Unknown" and country of citizenship is any of China, South Korea, Malaysia, Thailand, Japan, Philippines, Indonesia, Pakistan, Sri Lanka or Singapore.
Maori	-New Zealand Maori
Pacific Islander	-Fijian -Samoan -Tongan
Other	-"Unknown" and country of citizenship is any of Nigeria, Zimbabwe, South Africa, Kenya, Tanzania, Sudan, Maldives Islands, Ethiopia, Egypt, Saudi Arabia or Chile.

Language. The "First Language" field in the student information file supplies the following categories: (i) English; (ii) Mandarin, (iii) Other Chinese Dialect, (iv) Other Asian, (v) Maori, (vi) Other, and (vii) Not Specified. As would be expected with self-reported data of this sort, the data is noisy. For example, a student from Hong Kong declared his language as Other Chinese Dialect in one year, but later identified English as his first language. Similarly, a student from Taiwan originally declared Mandarin as his first language, but reported Not Specified in a later year. In many cases, these ambiguities are legitimate as many students are highly fluent in more than one language, so that there is little basis for choosing one language as "first language" over another. Finally, Maori was included with English because there were only three students in the sample who declared Maori as their first language. All of these would be fluent in English. The table below summarizes the language categorization system used for this study.

Assigned Language Category	*"First Language" Reported in Student Records*
Chinese	- Mandarin - Other Chinese Dialect - (i) Language reported as "Not Specified", "Other" or "Other Asian;" and (ii) Citizenship = "Overseas" and Country= "China"
English	- English - Maori - (i) Language reported as "Not Specified", "Other" or "Other Asian;" and (ii) Citizenship="New Zealand" and Ethnicity="European," OR Citizenship="New Zealand" and Ethnicity= "Maori," OR Citizenship="New Zealand" or "United Kingdom" or "United States" or "Canada"
Other	- (i) Language reported as "Not Specified", "Other" or "Other Asian;" and (ii) does not meet any of the conditions above

APPENDIX 3

Simple counts of commonly taken courses and combinations of those courses.

Course Combinations	**Number**	**Percent**
Individual Courses		
Accounting	3226	51
Mathematics	2298	36
Statistics	4184	66
Management	3798	60
Combinations of two courses		
Accountancy and Mathematics	1364	22
Accountancy and Statistics	2746	43
Accountancy and Management	2366	37
Mathematics and Statistics	1810	29
Mathematics and Management	1187	19
Statistics and Management	3008	48
Combinations of three courses		
Accountancy, Mathematics and Statistics	1249	20
Accountancy, Mathematics and Management	869	14
Accountancy, Statistics and Management	2108	33
Mathematics, Statistics and Management	1078	17
All four courses	823	13
Taken none of the four courses	792	13
Total number of individual students	6313	100

APPENDIX 4 Coefficients for CR and MC separately

Gender

	CR		MC	
	No controls	*With controls*	*No controls*	*With controls*
Constant	52.3**	33.37**	68.9**	58.0**
	(266.0)	(85.02)	(484.39)	(184.17)
Female	-0.84**	-2.68**	-1.93**	-2.94**
	(-2.80)	-(11.95)	(-8.92)	(-16.39)
Non Econ GPA		4.79**		2.91**
		(67.63)		(51.17)
Accy.		-1.34**		-1.54**
		(-3.90)		(-5.59)
Accy GPA		0.70**		0.47**
		(11.98)		(10.12)
Math.		2.63**		1.38**
		(7.74)		(5.05)
Math GPA		-0.03		0.06
		(-0.43)		(1.07)
Stat.		-0.01		1.13**
		(-0.02)		(3.93)
Stat GPA		0.44**		-0.03
		(7.35)		(-0.72)
Mgmt.		-3.44**		-3.96**
		(-9.91)		(-14.23)
Mgmt GPA		0.66**		0.77**
		(10.11)		(14.68)
Observations	20446	20254	20446	20254
R^2	0.0004	0.4590	0.0039	0.3376

Ethnicity

	CR		MC	
	No controls	*With controls*	*No controls*	*With controls*
Constant	54.99**	33.73**	70.30**	57.92**
	(273.62)	(85.03)	(482.2)	(181.16)
Maori Ethnicity	-5.87**	-1.58**	-4.28**	-1.61**
	(-6.20)	(-2.22)	(-6.23)	(-2.81)
Asian Ethnicity	-6.28**	-3.93**	-4.50**	-2.61**
	(-20.39)	(-14.75)	(-20.14)	(-12.14)
Pacific Island	-14.20**	-2.71**	-10.06**	-2.92**
	(-12.06)	(-3.04)	(-11.77)	(-4.06)
Other Ethnicity	-6.53**	-2.04**	-5.00**	-2.21**
	(-8.65)	(-3.61)	(-9.12)	(-4.86)
Non Econ GPA		4.63**		2.80**
		(64.75)		(48.54)
Accy.		-0.90**		-1.31**
		(-2.61)		(-4.73)
Accy GPA		0.69**		0.46**
		(11.87)		(9.89)
Math.		3.54**		2.10**
		(10.39)		(7.65)
Math GPA		0.06		0.09*
		(0.90)		(1.71)
Stat.		0.19		1.30**
		(0.53)		(4.50)
Stat GPA		0.51**		0.00
		(8.53)		(0.04)
Mgmt.		-3.50**		-4.08**
		(-10.11)		(-14.60)
Mgmt GPA		0.55**		0.69**
		(8.31)		(12.95)
Observations	20446	20254	20446	20254
R^2	0.0260	0.4610	0.0256	0.3341

Language

	CR		MC	
	No controls	*With controls*	*No controls*	*With controls*
Constant	53.90**	33.09**	69.37**	57.29**
	(296.86)	(85.38)	(525.74)	(182.95)
Chinese language	-5.75**	-4.54**	-3.62**	-2.11**
	(-17.07)	(-15.26)	(-14.78)	(-8.77)
Other language	-5.84**	-2.15**	-4.06**	-1.49**
	(-10.61)	(-5.17)	(-10.15)	(-4.45)
Non Econ GPA		4.66**		2.84**
		(65.43)		(49.46)
Accy.		-0.72**		-1.34**
		(-2.10)		(-4.82)
Accy GPA		0.68**		0.45**
		(11.65)		(9.71)
Math.		3.56**		2.04**
		(10.47)		(7.41)
Math GPA		0.11*		0.09*
		(1.66)		(1.69)
Stat.		0.28		1.31**
		(0.77)		(4.55)
Stat GPA		0.50**		-0.02
		(8.42)		(-0.37)
Mgmt.		-3.39**		-4.04**
		(-9.79)		(-14.43)
Mgmt GPA		0.53**		0.70**
		(8.02)		(13.16)
Observations	20446	20254	20446	20254
R^2	0.0169	0.4614	0.0134	0.3315

International vs. Domestic Students

	CR		MC	
	No controls	*With controls*	*No controls*	*With controls*
Constant	53.48**	33.02**	69.13**	57.26**
	(306.94)	(85.49)	(546.30)	(183.75)
International	-5.50**	-3.64**	-3.65**	-2.02**
	(16.96)	(-13.16)	(-15.51)	(-9.06)
Non Econ GPA		4.70**		2.86**
		(66.06)		(49.83)
Accy.		-0.96**		-1.41**
		(-2.78)		(-5.08)
Accy GPA		0.66**		0.45**
		(11.45)		(9.57)
Math.		3.40**		2.00**
		(10.00)		(7.30)
Math GPA		0.09		0.09*
		(1.36)		(1.79)
Stat.		0.20		1.29**
		(0.57)		(4.48)
Stat GPA		0.46**		-0.03
		(7.78)		(-0.68)
Mgmt.		-3.46**		-4.05**
		(-9.97)		(-14.48)
Mgmt GPA		0.55**		0.70**
		(8.35)		(13.21)
Observations	20446	20254	20446	20254
R^2	0.0139	0.4598	0.0116	0.3315

All Demographic Variables

	CR		MC	
Constant	55.1**	34.33**	70.90**	58.80**
	(238.04)	(85.18)	(422.54)	(181.36)
Female	-0.07	-2.14**	-1.47**	-2.70**
	(-0.25)	(-9.46)	(-6.79)	(-14.87)
Maori Ethnicity	-5.93**	-1.48**	-4.24**	-1.45**
	(-6.26)	(-2.09)	-(6.17)	(-2.55)
Asian Ethnicity	-3.47**	-1.67**	-3.59**	-2.21**
	(-6.26)	(-4.01)	(-8.94)	(-6.61)
Pacific Island	-13.55**	-2.13**	-9.63**	-2.46**
	(-11.46)	(-2.38)	(-11.22)	(-3.42)
Other Ethnicity	-5.24**	-1.38**	-4.34**	-1.97**
	(-6.66)	(-2.34)	(-7.59)	(-4.16)
Chinese language	-2.02**	-2.10**	0.16	0.56
	(-3.20)	(-4.39)	(0.35)	(1.45)
Other language	-2.43**	-0.52	-0.90*	0.36
	(-3.64)	(-1.04)	(-1.85)	(0.91)
International	-1.68**	-1.07**	-1.11**	-0.63**
	(-3.34)	(-2.82)	(-3.05)	(-2.06)
Non Econ GPA		4.63**		-2.81**
		(64.92)		(49.03)
Accy.		-0.61*		-1.22**
		(-1.77)		(-4.40)
Accy GPA		0.69**		0.47**
		(11.86)		(10.12)
Math.		3.29**		1.69**
		(9.63)		(6.13)
Math GPA		0.15**		0.13**
		(2.27)		(2.45)
Stat.		0.19		1.20**
		(0.52)		(4.18)
Stat GPA		0.52**		0.01
		(8.84)		(0.28)
Mgmt.		-3.31**		-3.94**
		(-9.59)		(-14.18)
Mgmt GPA		0.53**		0.71**
		(8.07)		(13.40)
Observations	20446	20254	20446	20254
R^2	0.0280	0.4650	0.0285	0.3415