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**NCEA Level 3 Economics and Economic Literacy  
in Introductory Economics at University**

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## **Abstract**

In 2003, New Zealand significantly reorganised high school education by moving to a standards-based assessment approach. This paper investigates whether the economics standards are associated with economic understanding using 2008-2011 data from students at the University of Waikato. We find that there is significant association between NCEA economics and economic literacy. However, some standards have a much closer association with economic literacy, in particular *AS90631* and *AS90632*. These standards are the only standards associated with economic literacy for both high aptitude and low aptitude students. An optimal high school course in economics should include these standards as a minimum.

## **JEL Classifications**

A21, A22

## **Keywords**

economic literacy

NCEA

standards-based assessment

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## 1. Introduction

Many studies have investigated the relationship between high school economics education and performance in undergraduate economics at the university level. (See, for example, Becker et al. 1990; Myatt and Waddell, 1990; Brasfield et al. 1993; Anderson et al. 1994). For instance, Cameron and Lim (2011) show that students with prior economics study (usually at high school) have much higher economic literacy in their first-year economics class at the University of Waikato. However, Lopus (1997) showed that the specific type of study (microeconomics or macroeconomics) undertaken at high school makes a difference, with microeconomics study at high school doing better in questions that tested implicit application of concepts. This suggests that specific economics skills taught at high school have different impacts on economic literacy among university students, and that a more nuanced approach than a binary variable should be used to capture prior economics background at high school.

In 2003, New Zealand significantly reorganised high school education, including economics, by moving to a standards-based assessment approach: the National Certificate in Educational Achievement (NCEA). However, the effect of this change to a standards-based approach on economic understanding has not been evaluated. To that end, we investigate the effect that specific subsets of learning, as measured by achievement in different NCEA standards, has on economic literacy among university students. This type of investigation has been conducted for mathematics standards (James et al. 2008), but not for economics. Following Walstad and Rebeck (2001), we define economic literacy as a measure of student economic understanding.

In this paper, we examine the relationship between economics study at high school and economic literacy in the first week of an introductory economics course at university, using data from students at the University of Waikato between 2008 and 2011. We control for student aptitude and other student-specific characteristics, and find significant relationships for only some standards, and only at some levels of achievement. Moreover, different standards have different relationships with economic literacy when different cognitive levels of economic literacy are considered separately. These results may not be altogether surprising given that economic literacy is not an explicit goal of the economics curriculum at high school, which aims to ‘aims to enable students to participate in a changing society as informed, confident, and responsible citizens. Students will achieve this aim by developing knowledge and understandings about human society as they study... people’s allocation and management of resources and people’s participation in economic activities...’ (Ministry of Education 1997, p.8).

## **2. The National Certificate in Educational Achievement (NCEA)**

Until 2002, secondary students in New Zealand were awarded qualifications based on a norms-referenced marking scheme which meant only a certain percentage of students were able to pass the assessment (Shulruf et al. 2008). In addition, any internal assessment marks were scaled to match those of external marks, even if they were assessing different things.

The introduction of the National Certificate in Educational Achievement (NCEA) saw a shift to standards-based assessment. This means New Zealand students are now assessed based on whether and at what level they achieve a particular standard, and each standard only covers a small portion of the overall course content. Instead of the course being evaluated as a whole as it was previously, different areas of skills and knowledge are assessed individually meaning it is easier to see at which levels a student is achieving (or not) for a particular area or topic. The certificate can be gained at three levels – NCEA Levels 1, 2 and 3. These are typically studied during years 11 to 13 (approximately ages 16-18); however the flexibility of the qualification means students can sit subjects earlier (for example some NCEA Level 1 subjects in Year 10) or later (for example pick up a new Level 1 subject in year 12 or 13), depending on their ability level.

NCEA courses are broken into standards of which there are two types. Unit Standards are competency based and are assessed on what is essentially a pass-fail basis (graded as Achieved or Not Achieved), whereas Achievement Standards have four achievement levels. If students have not met the required criteria outlined in the standard they receive a ‘Not Achieved’ grade. The three remaining grades are awarded based on at what level the student meets the criteria, namely, ‘Achieved’ for a satisfactory performance, ‘Merit’ for very good performance, and ‘Excellence’ for outstanding performance. Whereas Unit Standards are assessed entirely internally, Achievement Standards can be either internally or externally assessed, and most courses have a mix of both internal and external assessment. NCEA is standardised across schools and regions. All students studying NCEA Level 3 Economics in the same year sit an identical three-hour exam for external standards, and internal standards are moderated at the national level, although it should be noted that not all students are enrolled in every standard, and some may choose not to sit a particular standard once they get into the exam.

As of 2011, a total of 12 standards in Economics are offered at NCEA Level 3; five Achievement Standards and seven Unit Standards for a total of 60 credits (24 and 36, respectively). Of the Achievement Standards, four are assessed externally, with most students attempting Achievement Standards rather than Unit Standards. The four external standards have remained largely the same since their introduction – all are worth the same number of credits and cover roughly the same topics – however this is likely to change from 2013 onwards with the alignment of the new curriculum. The five most attempted standards are described briefly below.

90629:

*Understand Marginal Analysis and the Behaviour of Firms (5 Credits)*

The main focus of this standard is recognising the different types of markets which might exist (for example perfect competitors or monopolies), and how marginal analysis can be applied in the different market structures to determine factors such as pricing decisions.

90630:

*Describe an Economic Problem, Allocative Efficiency and Market Response to Change (4 Credits)*

This standard looks at the determinants of demand and supply, the shape of the respective curves, and how demand and supply (and the quantities of each) can change. The effect on consumers and producers is studied, as well as the effect of government interventions on efficiency.

90631:

*Describe Market Failure and Government Interventions to Correct for Market Failure (4 Credits)*

Market failures studied in this standard are externalities, merit versus demerit and public versus private goods, natural monopolies and income distribution. Once market failures have been identified, government interventions to correct for market failures are explored and, at Excellence level, evaluated.

90632:

*Describe Aggregate Economic Activity (6 Credits)*

This is the biggest of the economics standards at Level 3, and the only one whose main focus is macro-economics. The aggregate demand and aggregate supply model is studied using New Zealand as an example. Students look at the circular flow model and business cycle, and are required to calculate GDP using a range of methods. They also look at what factors affect aggregate demand and aggregate supply, and policies specific to New Zealand.

90778:

*Collect and Process Information and Carry Out an Economic Analysis (5 Credits)*

In this internally-assessed standard students are required to collect and analyse both primary (raw) and secondary data to test an economic hypothesis. As this is an internal standard, no set assessment is provided to teachers. They can develop their own or adapt one created by others, provided it meets the assessment criteria. At the time of writing, the Ministry of Education resource site Te Kete Ipurangi has two different assessments which would fulfil the criteria for this assessment. The first has students determining ‘whether the economic relationships predicted by economic theory occur in macroeconomic statistics for the New Zealand economy over 10 time periods’ (Ministry of Education, n.d.), whereas the second asks students to analyse ‘the relationship between capital formation through foreign investment and economic growth’ (Ministry of Education, n.d.).

### 3. Data and Methods

The data used in this study comes from 1,232 students who took the introductory economics paper *ECON100: Business Economics and the New Zealand Economy* at the University of Waikato between 2008 and 2011. The sample is restricted to A-Semester students, of which 8.12% were repeating the paper. Administrative data on students' age, gender, domestic/international status, university Grade Point Average (calculated on a nine-point scale from A+ = 9 to Restricted Pass = 1), and NCEA achievement were obtained from University records.

Of the 1,232 students in the sample, 796 students (64.61%) sat at least one NCEA Level 3 standard in any subject, and 369 of those students sat at least one NCEA Level 3 Economics standard. Of the 369 students who sat economics standards, 116 (31.44%) of them achieved at least 24 credits, which is approximately the equivalent of a full course in NCEA Level 3 Economics. As shown in Table 1, the majority of these credits came from the five Achievement Standards noted earlier, while only 125 students achieved any of the Unit Standards.

**Table 1: Distribution of Achievement for NCEA Economics Standards**

Standard	Achievement Standards					Unit Standards			
	E	M	A	N	All	Standard	A	N	All
90629	13	45	194	98	350	5863	44	15	59
90630	16	54	146	130	346	5864	76	15	91
90631	14	34	128	162	338	5865	42	20	62
90632	19	59	113	135	326	5866	34	11	45
90633	1	0	4	3	8	5867	63	15	78
90634	0	1	2	2	5	10928	4	5	9
90778	49	64	130	61	304	10931	4	8	12

E = Excellence, M = Merit, A = Achieved, N = Not achieved.

All students who were present in the first week of lectures were invited to complete an economic literacy test, the Test of Economic Literacy, 3<sup>rd</sup> Edition (TEL3) (Walstad and Rebeck 2001). TEL3 is a test designed to measure economics learning at the high school level, and as such lends itself readily for use as a pre-test of the economic literacy for incoming university students. The test contains 40 multiple-choice questions in four content categories: fundamental economic concepts, microeconomic concepts, macroeconomic concepts, and international economics concepts. The questions can be categorized by cognitive character into three levels which correspond to the first three levels of Bloom's (1956) taxonomy: (1) *knowledge* - recognition and recall, remembering information close to the way it was first presented; (2) *comprehension* - understanding the meaning and intent of information; and (3) *application* - applying learning to new situations (Walstad and Rebeck 2001). The test contains six knowledge, twelve comprehension and 22 application questions.

Of the 1,232 students in the sample, 588 students both attempted at least one NCEA Level 3 standard in any subject and completed the economic literacy test. The mean economic literacy score in this sample (measured as the number of questions correct out of 40) was 26.59, with a standard deviation of 6.42. Including the (mostly international and older) students who completed the economic literacy test but had no NCEA Level 3 credits (for a total sample size of 922), has little effect on the results reported in the remainder of this paper, other than age becomes significant (and positive) in some of the models.

Ordinary least squares regression (OLS) was used to analyse the economic literacy score, with student characteristics, year dummy variables, and NCEA economics achievement as explanatory variables. Separate models were estimated with and without student aptitude (proxied by Grade Point Average), and separate models were estimated for NCEA standards as binary variables (achieved/not achieved) and for NCEA standards as ordinal variables (with each level of achievement in each standard as a separate binary variable). Due to the small number of students who completed Unit Standards, Unit Standards were included in the models as a single binary variable, indicating that the student had achieved *any* Unit Standard. In addition, models were estimated for each cognitive level of economic literacy (knowledge, comprehension, and application) as dependent variables. As the dependent variables are count data, Poisson regression models were also estimated, but the results were qualitatively the same as those reported here. Heckman selection models (Heckman, 1979) were also estimated, to account for any selection bias where there may be systematic differences between the 922 students who sat the economic literacy test and the 310 students who did not. Again, the results from those models were qualitatively the same as those reported here, so we choose to report the results from the simplest (OLS) models.

#### **4. Results and Discussion**

The results for economic literacy overall are presented in Table 2. Model I presents results excluding GPA, while Model II includes GPA. In both cases male students and domestic students demonstrate higher economic literacy than female students and international students. Students who are sitting the ECON100 course in 2009 had higher economic literacy than those in 2008, and after student aptitude is controlled for students in 2010 also had higher economic literacy than those in 2008. Each one unit increase in GPA is associated with an additional 0.8 correct answers (out of 40) in the economic literacy test.

Unit Standards appear not to be significantly associated with economic literacy, but all achievement standards are until student aptitude is controlled for. With GPA included as an additional explanatory variable, only four of the achievement standards remain significantly associated with economic literacy: *AS90630* (Describe an economic problem, allocative efficiency, and market response to change), *AS90631* (Describe market failure and government interventions to correct for market failure), *AS90632* (Describe aggregate economic activity), and *ASS90778* (Collect and process information and carry out an

economic analysis). The size of these effects are quite large; in the case of AS90632, the difference between achieving this standard and not is about 10 percent of the mean score in the economic literacy test.

**Table 2: Regression Results for Economic Literacy Overall**

Variable	Model I	Model II
Gender (1 = male)	3.1775*** (0.4248)	3.8308*** (0.4015)
Student origin (1=domestic)	5.2157*** (1.0750)	5.2203*** (0.9893)
Student age	0.1750 (0.2002)	0.2425 (0.1701)
Year 2009	1.2932** (0.6014)	1.6738*** (0.5649)
Year 2010	0.5633 (0.5890)	0.9825* (0.5483)
Year 2011	0.4284 (0.6265)	0.3123 (0.5718)
First enrolment	0.3618 (1.0371)	-1.0214 (1.0700)
Grade Point Average		0.8135*** (0.1030)
AS90629	1.44867** (0.6328)	0.9783 (0.7092)
AS90630	2.0505*** (0.5805)	1.5532** (0.6199)
AS90631	2.4124*** (0.5190)	1.7207*** (0.5560)
AS90632	2.3556** (0.5075)	2.4321** (0.5570)
AS90778	1.1297** (0.5092)	0.9148* (0.5331)
Any Unit Standard	0.4038 (0.5054)	0.6375 (0.5070)
Constant	12.9998*** (4.2774)	9.5218** (3.7097)
R <sup>2</sup>	0.4394	0.5053

N=588; \*\*\* significant at the 1% level; \*\* significant at the 5% level; \* significant at the 10% level; robust standard errors are reported in parentheses below the coefficients.

Results including level of achievement are presented in Table 3. In Model I, most levels of achievement are significantly associated with higher economic literacy (when compared with no achievement in that standard), and the coefficients are mostly as expected with the higher levels of achievement (excellence, merit) associated with even greater economic literacy. The exceptions to this are AS90629, AS90632 and AS90778, where *ceteris paribus* achievement at the merit level is associated with lower economic literacy than achievement at the achieved level. In the case of AS90629, students with merit achievement *ceteris paribus* have insignificantly different economic literacy than students with no achievement at all in

that standard, while for AS90778 this is true of achievement at both the merit and excellence levels. This may go some way towards explaining why these standards were less significant or insignificant in the previous analysis in Table 2.

**Table 3: Regression Results for Economic Literacy Overall with Level of Achievement**

Variable <sup>†</sup>	Model I	Model II
Gender (1 = male)	3.2259*** (0.4375)	3.8018*** (0.4119)
Student origin (1=domestic)	5.4800*** (1.0223)	5.4382*** (0.9582)
Student age	0.1960 (0.2027)	0.2496 (0.1706)
First enrolment	0.3387 (1.0402)	-1.0644 (1.0815)
Grade Point Average		0.8368*** (0.1071)
AS90629 Excellence	2.9852** (1.5029)	2.6064 (1.5880)
AS90629 Merit	0.4876 (0.9354)	-0.0387 (0.9963)
AS90629 Achieved	1.4872** (0.6573)	1.1697 (0.7119)
AS90630 Excellence	4.1382*** (1.5061)	2.4848 (1.5385)
AS90630 Merit	2.2341*** (0.8203)	1.3056 (0.8629)
AS90630 Achieved	2.0062*** (0.5877)	1.5607** (0.6275)
AS90631 Excellence	3.3595*** (1.0858)	2.9747*** (1.0573)
AS90631 Merit	2.8479*** (0.7534)	2.1339*** (0.7956)
AS90631 Achieved	2.1603*** (0.5358)	1.7671*** (0.5792)
AS90632 Excellence	2.7917*** (1.0844)	2.1648** (1.0503)
AS90632 Merit	2.0913*** (0.7157)	2.0264*** (0.7277)
AS90632 Achieved	2.2663*** (0.5413)	2.6167*** (0.5975)
AS90778 Excellence	1.2582 (0.8133)	0.0565 (0.8471)
AS90778 Merit	0.7068 (0.7589)	0.2103 (0.7237)
AS90778 Achieved	1.1666** (0.5464)	1.2024** (0.5821)
Any Unit Standard	0.4228 (0.5089)	0.6983 (0.5148)
R <sup>2</sup>	0.4468	0.5118

N=588; \*\*\* significant at the 1% level; \*\* significant at the 5% level; \* significant at the 10% level; robust standard errors are reported in parentheses below the coefficients; <sup>†</sup> year dummy variables and constant term are omitted from the table for brevity.

However, once student aptitude (grade point average) is controlled for, the size of the effect of every standard at almost every level reduces, and many become insignificant. Of the achievement standards, only *AS90631* and *AS90632* retain significance at all levels of achievement. However, only *AS90631* performs as expected, with excellence being associated with greater economic literacy than merit, which is in turn associated with greater economic literacy than achieved. Interestingly, for the standards *AS90630* and *AS90778*, *ceteris paribus* only students at the achieved level have significantly higher economic literacy than students without the standard, while students at the merit and excellence level are no more economically literate than a similarly endowed student without the standard. This suggests that *AS90631* and *AS90632* may be the only standards that provide economic literacy gains for all students, regardless of their innate ability, and that *AS90631* is the only standard that provides monotonically increasing gains with level of achievement.

To further explore this, we first separated the sample from the previous regression into two groups – a high aptitude group comprised of those above the median grade point average of 4.5 (n=290), and a low aptitude group comprised of those equal to or below the median (n=298). As expected, students in the high aptitude group had, on average, significantly higher economic literacy with a mean test score of 28.94 compared to the mean score of the low aptitude group of 24.31 ( $p < 0.001$ ). We then re-estimated the regression results separately for each group. The results for both groups, controlling for aptitude, are reported in Table 4.

The results for the low aptitude group have to be interpreted in the context of their level of achievement. Only four students in this group gained excellence in any standard; in three cases this was *AS90778*, and the other one was *AS90632*. Only small proportions of students gained merit. However, *ceteris paribus* it appears that all standards, including unit standards, are associated with higher economic literacy for low aptitude students. The results are quite different for high aptitude students, with only *AS90631* and *AS90632* significant at all levels of achievement (with *AS90778* only significant at the merit level). These results provide additional context for the earlier results – all students gain from *AS90631* and *AS90632*, but low aptitude students gain from all standards.

As noted earlier, the TEL3 economic literacy test can be broken down into three cognitive levels: knowledge, comprehension, and application (Walstad and Rebeck 2001). Knowledge questions test recognition and recall, essentially the ability to remember facts. Comprehension questions test the ability of the student to interpret information. Application questions test the ability of students to use information and to apply learning to new situations. We extended the previous analysis to separately consider the knowledge, comprehension and application components of students' economic literacy. The results for all three components, controlling for student aptitude and other variables, are shown in Table 5. The coefficients are not directly comparable between the different cognitive levels, due to the differing number of questions at each cognitive level.

**Table 4: Regression Results for Economic Literacy Overall  
with Level of Achievement Separated by Student Aptitude**

Variable <sup>†</sup>	Low Aptitude Group	High Aptitude Group
Student origin (1=domestic)	6.7769 <sup>***</sup> (1.1421)	2.8121 <sup>***</sup> (0.9924)
Grade Point Average	0.4665 <sup>*</sup> (0.2552)	1.1172 <sup>***</sup> (0.2588)
AS90629 Excellence		2.7152 (1.7073)
AS90629 Merit	0.6533 (1.8181)	-0.0295 (1.3207)
AS90629 Achieved	2.0311 <sup>*</sup> (1.1030)	0.7588 (1.0593)
AS90630 Excellence		1.7323 (1.5262)
AS90630 Merit	3.8761 <sup>***</sup> (1.1814)	1.3267 (1.0725)
AS90630 Achieved	2.6048 <sup>***</sup> (0.9694)	1.0227 (0.8761)
AS90631 Excellence		2.7964 <sup>***</sup> (1.0197)
AS90631 Merit	1.3144 (2.0811)	1.6171 <sup>*</sup> (0.8571)
AS90631 Achieved	2.5278 <sup>***</sup> (0.9404)	1.3253 <sup>*</sup> (0.7021)
AS90632 Excellence	-4.2780 <sup>**</sup> (2.1123)	1.9216 <sup>*</sup> (1.0676)
AS90632 Merit	0.1231 (1.2363)	1.9358 <sup>**</sup> (0.8252)
AS90632 Achieved	2.9722 <sup>***</sup> (1.0544)	1.8725 <sup>***</sup> (0.6909)
AS90778 Excellence	-0.0376 (1.6270)	0.3464 (1.0146)
AS90778 Merit	-2.1788 (1.9092)	1.3634 <sup>*</sup> (0.8193)
AS90778 Achieved	1.4146 <sup>*</sup> (0.8258)	0.9415 (0.8067)
Any Unit Standard	1.8985 <sup>**</sup> (0.8972)	0.1091 (0.5449)
N	298	290
R <sup>2</sup>	0.4675	0.4876

\*\*\* significant at the 1% level; \*\* significant at the 5% level; \* significant at the 10% level; robust standard errors are reported in parentheses below the coefficients; <sup>†</sup> constant term and some control variables are omitted from the table for brevity.

**Table 5: Regression Results for Economic Literacy Components**

Variable <sup>†</sup>	Knowledge		Comprehension		Application	
	Model I	Model II	Model I	Model II	Model I	Model II
AS90629	0.3494 (0.2130)		0.3254 (0.2273)		0.3035 (0.4117)	
AS90629 Excellence		0.6944 (0.4870)		0.8137* (0.4585)		1.0983 (0.8845)
AS90629 Merit		0.2694 (0.2611)		0.1307 (0.3491)		-0.4388 (0.6467)
AS90629 Achieved		0.3994* (0.2136)		0.3755* (0.2266)		0.3948 (0.4167)
AS90630	0.2942* (0.1625)		0.5018** (0.2128)		0.7572* (0.3893)	
AS90630 Excellence		0.2318 (0.3763)		0.4044 (0.4465)		1.8486* (1.0090)
AS90630 Merit		0.1444 (0.2203)		0.5614* (0.3205)		0.5998 (0.5309)
AS90630 Achieved		0.2991* (0.1685)		0.5353** (0.2124)		0.7263* (0.3959)
AS90631	0.3433** (0.1503)		0.4450** (0.1921)		0.9323*** (0.3503)	
AS90631 Excellence		0.7301*** (0.2063)		0.3918 (0.3716)		1.8527** (0.8155)
AS90631 Merit		0.4248* (0.2249)		0.1814 (0.2986)		1.5277*** (0.4833)
AS90631 Achieved		0.3585** (0.1579)		0.5537*** (0.2025)		0.8549** (0.3655)
AS90632	0.5085*** (0.1589)		0.4705** (0.1851)		1.4531*** (0.3419)	
AS90632 Excellence		0.4055* (0.2401)		0.6690 (0.4146)		1.0903 (0.8105)
AS90632 Merit		0.4663** (0.1948)		0.2577 (0.2760)		1.3023*** (0.4462)
AS90632 Achieved		0.5451*** (0.1658)		0.5470*** (0.2011)		1.5246*** (0.3682)
AS90778	0.1238 (0.1465)		0.3049 (0.1874)		0.4860 (0.3050)	
AS90778 Excellence		-0.1514 (0.2211)		0.0617 (0.3101)		0.1462 (0.4905)
AS90778 Merit		-0.0405 (0.1961)		0.0704 (0.2629)		0.1803 (0.4361)
AS90778 Achieved		0.1967 (0.1601)		0.4006** (0.2014)		0.6051* (0.3402)
Any Unit Standard	0.0982 (0.1335)	0.1299 (0.1411)	0.4870*** (0.1743)	0.4959*** (0.1767)	0.0523 (0.3178)	0.0725 (0.3268)
R <sup>2</sup>	0.3979	0.4020	0.3325	0.3394	0.4450	0.4539

N=588; \*\*\* significant at the 1% level; \*\* significant at the 5% level; \* significant at the 10% level; robust standard errors are reported in parentheses below the coefficients; † control variables and constant term are omitted from the table for brevity.

The standard *AS90629* appears to be only associated with significantly higher levels of economic literacy at the knowledge and comprehension cognitive levels, but only for students at the achieved level (but not merit level, and not overall). Similarly, *AS90778* is only associated with higher economic literacy in the comprehension and application cognitive levels, and then only for students at the achieved level. *AS90630* is associated with higher levels of economic literacy at all cognitive levels, but the size of the effect is small, and when broken down by cognitive level it is only significant for knowledge at the achieved level, comprehension at the achieved and merit levels, and for application at the excellence and achieved levels. *AS90631* and *AS90632* again perform best, being associated overall with higher economic literacy at all cognitive levels. However, in both cases for the comprehension cognitive level, only the achieved level is significant (but not merit or excellence). For *AS90631*, it is clear that the monotonic increase in economic literacy across achievement levels is driven by this effect in the knowledge and application cognitive levels, but not comprehension. However, *AS90632* is also associated with larger effect sizes in all three cognitive levels than any of the other standards. Finally, unit standards appear to be associated with higher levels of comprehension, but not knowledge or application.

Overall, the results seem to confirm the experience of secondary school teachers in New Zealand. The standards *AS90631* and *AS90632* are more contextual and create greater interest from the students. *AS90632* lends itself to discussions of Reserve Bank and government policy and issues in the global economy that students encounter regularly and can identify with, while *AS90631* involves issues such as pollution that students are familiar with. That is, these standards may provide a greater opportunity for experiential learning (Kolb and Fry 1975), which in turn leads to greater understanding and retention of knowledge. This also explains why these standards were highly significant at the application cognitive level. However, experiential learning cannot be the only important factor as the results for *AS90778*, where students are generally asked to work with real-world data and where experiential learning might readily occur, are much less significant.

Finally, some limitations of the analysis in this paper should be noted. First, the sample was composed of university students enrolled in first-year economics at the University of Waikato. While we have no *a priori* reason to believe that the choice of institution will make a difference, it is possible that more able students may choose programmes of study such as law, medicine or engineering, which do not require a first year economics course. Some of these students may take economics as an elective course, but many will not. Similarly, some students who study economics at high school may not proceed to university study at all. However, to some extent this limitation is overcome by controlling for student aptitude.

Secondly, as the economic literacy test was optional for students, there is a possibility that students who choose not to complete the test introduce bias into the results. However, as noted earlier Heckman (1979) selection models result in qualitatively similar results to those presented in this paper. Third, the content in the TEL3 economic literacy test appears to

match most closely with all the standards except *AS90629*. This may explain why that standard was generally insignificant in the results once student aptitude was controlled for. Finally, we are unable to fully attribute causality from NCEA economics standards to economic literacy. In order to do so would require randomisation of a group of students into different NCEA standards – a situation that is unlikely to present itself to researchers! However, notwithstanding the inability to fully attribute causality, these results do provide guidance as to the association between NCEA standards and economic literacy among entry-level university students in economics.

## **5. Conclusions**

These results show that there is significant association between NCEA economics and economic literacy for students as they start university study. In and of itself, this result is unsurprising and simply confirms earlier findings such as those by Cameron and Lim (2011). However, it is clear from the results that some standards have a much closer association with economic literacy, in particular *AS90631* (Describe market failure and government interventions to correct for market failure) and *AS90632* (Describe aggregate economic activity). Those two standards appear to provide for increases in economic literacy for students that are robust to their level of aptitude, and the association holds for all levels of achievement in the standard. For low aptitude students, all standards are associated with higher economic literacy.

This difference between the effects for high aptitude and low aptitude students suggests that more targeted course design in NCEA Level 3 is appropriate for high achieving students, if economic literacy is the goal. Where a general course in economics for all students is required, the optimal economics course would likely include both *AS90631* and *AS90632* as a minimum starting point, along with *AS90630* which is likely a pre-requisite for understanding the other standards. Such a course would remain within the aims of the economics curriculum (see Ministry of Education 1997), while providing significant gains for high achieving economics students at secondary school.

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