11-1-2001

Tertiary entrance performance : the role of student background and school factors

Gary Marks
ACER

Julie McMillan
ACER

Kylie Hillman
ACER

Longitudinal Surveys of Australian Youth

Research Report Number 22

TERTIARY ENTRANCE PERFORMANCE: THE ROLE OF STUDENT BACKGROUND AND SCHOOL FACTORS

Gary N. Marks
Julie McMillan
Kylie Hillman

This report forms part of the Longitudinal Surveys of Australian Youth:
a research program that is jointly managed by ACER and the
Commonwealth Department of Education, Training and Youth Affairs (DETYA).

November 2001

ACER

Australian Council for Educational Research

Published 2001 by
Australian Council for Educational Research Ltd
19 Prospect Hill Road, Camberwell, Victoria, 3124, Australia.

ISBN 0 86431 448 5

Contents

Tables

Tables in Appendices

Figures

EXECUTIVE SUMMARY

The report examines the tertiary entrance performance of students in Year 12 in 1998 using data from the Longitudinal Surveys of Australian Youth (LSAY) project to address a variety of issues relating to tertiary entrance performance. The first substantive part of the report examines the relationship between tertiary entrance performance, measured by their Equivalent National Tertiary Entrance Rank (or *ENTER* scores), and a variety of demographic, socioeconomic, educational and psychological factors. These include literacy and numeracy achievement, gender, socioeconomic background, school sector, region, ethnicity and indigenous status. This part of the report also addresses the effects of psychological factors, such as self-concept of ability and educational aspirations. The second substantive part of the report focuses on individual schools, examining the impact of schools on student performance, differences between schools in the impact of prior achievement and socioeconomic background on performance and the influence of the school environment or context. 'School effectiveness' is also addressed in this report by determining which school characteristics lift tertiary entrance performance, taking into account differences in the academic and socioeconomic mix of students across schools and school sector.

Socio-demographic, Educational and Psychological Influences

The major findings from the investigation of the demographic, socioeconomic, educational and psychological influences on tertiary entrance performance are as follows.

Year 9 Achievement in Literacy and Numeracy

- The strongest influence on tertiary entrance performance is literacy and numeracy achievement in Year 9.
- There are differences in the impact of Year 9 achievement on tertiary entrance performance across States.
- Performance in numeracy has a consistently stronger relationship with tertiary entrance performance than literacy.

Socioeconomic Background

- The three major dimensions of socioeconomic background - parental occupational status, parental education and wealth - are all correlated with tertiary entrance performance. Of these dimensions, parental occupational status has the strongest impact.
- Students from professional and, to a lesser extent, managerial occupational backgrounds exhibit higher *ENTER* scores.
- The correlation between socioeconomic background and tertiary entrance performance is moderate (around 0.3), but considerably weaker than that for Year 9 achievement and tertiary entrance performance (around 0.5).
- The impact of socioeconomic background on tertiary entrance performance is substantially reduced, but not removed altogether, after controlling for Year 9 achievement in literacy and numeracy. This indicates that socioeconomic background has effects over and above prior academic performance.

Gender

- The distribution of *ENTER* scores differs between males and females, with males showing a wider distribution.
- On average females achieve slightly higher tertiary entrance scores than males. However, gender differences vary between jurisdictions. For example, in New South Wales females scored substantially higher than males, whereas in other States the differences were smaller and, in some instances, males slightly outperformed females.
- Girls experience greater achievement growth (that is, improvement in academic performance between Year 9 and Year 12) than boys.

School Sector

- School sector has a substantial impact on tertiary entrance performance. On average, students attending independent schools have higher *ENTER* scores than students attending Catholic schools, who in turn have higher mean *ENTER* scores than students attending government schools.
- Differences in *ENTER* scores between students attending independent and government schools are reduced by nearly 50 per cent after controlling for Year 9 achievement and the socioeconomic backgrounds of students.
- Differences in *ENTER* scores between students attending Catholic and government schools are reduced by about 20 per cent after controlling for prior achievement and the socioeconomic backgrounds of students.
- There are differences between school sectors in achievement growth.
- The relationship between students' socioeconomic background and tertiary entrance performance does not differ substantially between school sectors.

Region

- Non-metropolitan students' tertiary entrance performance is marginally lower than that of metropolitan students.
- The correlation between population density of the students' residential area and tertiary entrance performance is weak.
- Regional differences in tertiary entrance performance tend to be slightly higher in Victoria and South Australia than in Queensland and New South Wales.

Ethnicity

- The distribution of *ENTER* scores for students with fathers born in non-English speaking countries is wider than that for students with fathers born in Australia.
- The average *ENTER* score varies across ethnic groups. Some groups perform substantially higher than students with Australian-born fathers and some significantly lower.
- Some ethnic groups are performing at higher levels than would be expected given their prior achievement levels and socioeconomic backgrounds. For example, the high performance of Asian students is not explained by differences in their socioeconomic background or prior achievement.

Indigenous Status

- The small group of Aboriginal and Torres Strait Islander students in this sample who obtained an *ENTER* score had significantly lower scores than non-Indigenous students.

Psychological Factors

- Psychological factors examined in this report – self-concept of ability, parents' aspirations for the student's education and students' aspirations – have an impact on tertiary entrance performance in addition to the impact of the socio-demographic and educational factors summarised above.
- Self-concept of ability has a larger impact on tertiary entrance performance than students' aspirations, which in turn has a larger impact than parents' aspirations.
- These psychological factors do not explain differences in tertiary entrance performance between social groups.

Individual Schools

The major findings from the investigation of the role of individual schools are as follows.

Between-school Variation

- Between-school differences account for approximately 22 per cent of the variation in students' tertiary entrance scores. About half of this between school variation can be accounted for by differences between schools in individual student characteristics.
- About half of this variation can be accounted for by differences in the academic and socioeconomic mix of students and school sector.

Contextual Effects

- The schools' achievement environment effects tertiary entrance performance in addition to the effects of individual-level influences including students' prior achievement.
- The schools' socioeconomic environment does *not* affect tertiary entrance scores in addition to the effects of individual-level influences including students' socioeconomic background.

School Effectiveness

- School-level factors which contributed to lifting tertiary entrance performance, after accounting for the academic and socioeconomic mix of students across schools and school sector, were a higher level of confidence among students in their own ability, a school environment more conducive to learning, and higher parental aspirations for the students' education.

1. INTRODUCTION

For most young people in Australia, their performance in the final year of school is the most important factor influencing their futures. Whether or not a young person goes to university is determined by how well they perform in tertiary entrance subjects in the final year(s) of school. With few exceptions tertiary entrance scores determine entry to university study, and extremely high scores are necessary to be considered for the more prestigious faculties, such as medicine and law. Similarly, the more prestigious an institution is, the higher the tertiary entrance score required. Admission to Technical and Further Education (TAFE) courses may also be based on tertiary entrance scores, especially for courses with high student demand.

Indirectly, tertiary entrance scores influence future labour market outcomes, as university education is a major influence on important economic outcomes such as unemployment, occupation and income. For those students who enter the labour force after completing Year 12, their tertiary entrance score is likely to influence their employment prospects. Job seekers often include their tertiary entrance results in their job applications and some employers use this information when screening applicants.

Given the central importance of tertiary entrance performance in Year 12 (and in some states both Years 11 and 12) to the futures of young people, it is surprising that comparatively little research has been undertaken in this area. There is a range of important issues that careful research could elucidate. For example, while it is generally accepted that a student's socioeconomic background influences their tertiary entrance performance, it is not clear how strong this influence is. Some educational researchers take the view that education is the means by which socioeconomic inequalities are reproduced from generation to generation, while others argue that educational outcomes are largely meritocratic and that the influence of socioeconomic background is quite limited. Another controversial area is the performance of males and females and whether one sex is experiencing disadvantage. Although there is some research in this area, it is usually limited to one or several State jurisdictions and does not take into account some of the correlates of gender (such as attitudes and aspirations) that may provide an improved understanding of gender differences in performance. School sector is also an issue for many of those associated with Australian education systems. It is generally believed that students who attend Catholic and independent schools perform better than students who attend government schools. However, the difference in performance between sectors has not been adequately quantified in a national context. In addition, arguments that school sector differences in student performance are a reflection of the academic and/or the socioeconomic mix of students have not been addressed properly. Other issues on the policy agenda include the performance of students living in rural and remote areas, and students with language backgrounds other than English. Finally, there is the question of the influence of individual schools. An important question for parents and others involved with the education of young people is how important is the school in influencing performance? Do individual schools differ widely in student outcomes and, if so, can these differences be attributed to the schools themselves or do school differences simply reflect differences in the backgrounds of students?

State authorities do undertake research on Year 12 results including tertiary entrance performance but not all of this research is published. Furthermore State authorities do not collect all the relevant data that would allow detailed examination of the issues canvassed above. Background data are usually limited to gender, school sector and region and do not include individual-level measures on the students' socioeconomic background.

There is a limited amount of academic and commissioned research on performance in Year 12, the most recent being by Rowe (1999), Teese (2000) and Collins, Kenway & McLeod. (2000). While each of these three reports contributes to our knowledge about performance in Year 12,

each is limited in its own way. Teese's (2000) report focuses on regional and school sector differences but it is restricted to Victorian students in 1994. The data include only a limited amount of social background information and the analyses do not examine school effects. Rowe's (1999) work is the most statistically sophisticated of the three but is also limited to Victorian students. Collins et al's (2000) report on gender equity includes a limited amount of data on tertiary entrance performance in particular subjects from several States. Its focus is primarily on gender and the analyses are not sophisticated enough to address many of important issues to do with school performance. Importantly, none of these three studies focus on tertiary entrance score, but on performance in specific subjects. Furthermore, the data used in these studies are limited by the data collected by the appropriate education authority. Finally, these studies do not allow comparisons between States (educational jurisdictions) in the importance of particular background factors.

The Current Report

The purpose of this report is to examine the performance of students in Year 12 in 1998 as measured by their *Equivalent National Tertiary Entrance Rank* (or *ENTER* score). Student performance in individual Year 12 subjects or courses is not included in this report for the following reasons. First, even if accurate data could be obtained, it is difficult to construct summary measures that take into account the matching of subjects across jurisdictions and differences in the level of difficulty of similar subjects within jurisdictions. Second, the assessment procedures differ and may or may not involve some form of moderation. Finally, a sample survey such as the one analysed in this report often includes too few students enrolled in particular subjects to be confident about the analyses.

This report uses data from the 1995 Year 9 cohort of Longitudinal Surveys of Australian Youth (LSAY) study. This cohort has been surveyed annually since 1995. In the 1999 telephone survey, respondents who were at school in Year 12 in 1998 were asked to provide their tertiary entrance rank or score. The advantages of the LSAY data over other data sources are threefold. First, the data are national, rather than being limited to a single jurisdiction or a selection of regions or schools within a State. Therefore, the conclusions apply to the national context but also allow comparisons of relationships (not mean scores) between the larger States. Second, the data include variables not usually collected by State authorities such as the socioeconomic background of the students, and their aspirations and attitudes. Third, the data are longitudinal, including information about the students at earlier points in time. Most relevant to tertiary entrance performance is the student's prior achievement level (measured in this report by achievement in literacy and numeracy tests administered in Year 9).

Prior achievement at school is an important concept in the investigation of social equity. If a social group scores substantially less well than expected, given the group's prior performance, then this is evidence of systematic social disadvantage. Therefore, in many of the analyses presented in this report, Year 9 achievement in literacy and numeracy is employed as a control variable to estimate the net influence of a particular factor on performance in the final year of school – that is, after controlling for Year 9 achievement in literacy and numeracy.

Although the LSAY data provide important advantages for the investigation of performance in Year 12, there are some limitations. The most important one is sample size, which although large for sample surveys of school performance, does not compare with the population data held by the State authorities. Most analyses by State authorities use population data, which includes all students in the State who participate in the final year(s) of schooling. When using LSAY data, analyses of small groups (for example, small ethnic communities or regions) are subject to sampling variability thereby reducing the precision of the estimates.

Organisation of the Report

This report comprises 5 chapters.

Chapter 2 outlines the data, measures and statistical procedures used in this report.

Chapter 3 focuses on the influence of social and other characteristics of individual students on tertiary entrance performance. It comprises sections on a range of factors considered to influence tertiary entrance performance: achievement in literacy and numeracy, socioeconomic background, gender, school sector, ethnicity, location and psychological factors.

Chapter 4 focuses on the role of individual schools on tertiary entrance performance. This chapter follows from the recent interest in school effectiveness research, which may have direct policy relevance since it isolates those school factors that more effectively improve student learning. This chapter examines several aspects of the role of schools in student performance in Year12.

A summary of the results and a discussion of their policy implications is provided in Chapter 5.

Demographic, Sociological and Educational Influences

In this section we present a variety of research questions and hypotheses about the influence of demographic, socioeconomic, educational and psychological factors on tertiary entrance performance. These research questions are addressed in detail in Chapters 3 and 4, and reviewed in Chapter 5.

1. **Achievement in Literacy and Numeracy.** To what extent is student tertiary performance a product of this literacy and numeracy levels? Under the assumption that tertiary entrance (*ENTER*) scores are largely a reflection of academic performance, students' achievement in literacy and numeracy should be a strong influence. Is the influence of literacy and numeracy stronger on tertiary entrance performance stronger than that of other influences? If performance in the last year of school is largely meritocratic (that is, based on a combination of ability and motivation) then it is expected that prior school achievement will be a much stronger influence on performance than the demographic and sociological characteristics of the students.

2. **Socioeconomic Background.** What is the influence of socioeconomic background on student performance? This section examines the relationship between socioeconomic background and *ENTER* scores for all students and across jurisdictions. The importance of students' socioeconomic background on performance *vis-a-vis* meritocratic factors is an indication of the degree of socioeconomic inequality in Australia's education system.

3. **Gender.** Are girls outperforming boys for tertiary entrance? Gender differences in tertiary entrance performance are a prominent issue on the educational agenda. In some states girls are outperforming boys across a range of subject areas and therefore attain higher tertiary entrance scores. This situation may not apply to all jurisdictions.

   Gender differences in tertiary entrance performance are put into perspective by comparing the gender differences in performance with other social background factors.

   Another issue investigated is differences in achievement growth between boys and girls. Do the final years of schooling add more value to girls' academic performance compared to the performance of boys? In other words, do the final years of schooling advantage girls relative to boys?

4. **School Sector.** To what extent does tertiary entrance performance differ between school sectors? Differences in performance between students attending government, Catholic and independent schools remain a controversial issue. It is not clear if sector differences are strongest among high performers (as indicated by the results published in newspapers) or apply more generally to all students regardless of ability level or socioeconomic background. The differences in performance between students attending different types of schools have never been quantified adequately. Furthermore, the extent to which school sector differences are accounted for by differences in the academic and socioeconomic mix of students has not been investigated satisfactorily. The analyses presented in this discussion provide a much better understanding of school sector differences in Australia.

5. **Region/Location.** Do students living in rural areas perform worse than metropolitan students? It is often assumed that students living in regional and remote areas suffer educational disadvantage. However in relation to tertiary entrance performance it has not been ascertained whether students living in the remotest areas are the most disadvantaged. Also, it is not clear how regional differences in student performance compare with, or are a reflection of, other influences such as socioeconomic background.

6. **Ethnicity.** Ethnic differences in educational outcomes are another major issue. Generally it is believed that students from Language Backgrounds other than English (LBOTE) face educational disadvantages. On the other hand, students from some ethnic backgrounds figure among the best performers in Year 12. Differences in the average tertiary entrance performance between major ethnic groups have not been established. In addition, there are debates about the extent to which ethnic differences can be attributed to academic and socioeconomic differences.

7. **Psychological Factors.** Psychological factors are important to educational outcomes for three reasons. First, they can be important in their own right. Students who are more confident about their own ability, who have higher educational aspirations and have more positive attitudes to school are more likely to perform better. Second, psychological factors can to some extent explain the relationship between demographic and socioeconomic factors and tertiary entrance performance. For example, girls may perform better than boys because they are more positive about school and education; students with language backgrounds other than English (LBOTE) may perform better because they or their parents have higher educational aspirations for their education; and school sector differences may be, in part, attributable to attitudinal differences. Third, school policies and practices can help shape some of these psychological factors.

The Role of Individual Schools

Chapter 4 focuses on the role of individual schools in individual student tertiary entrance performance including an overview of research into school effects as an introduction to the analyses that follow.

Specifically the aspects of schools examined in this chapter are:

1. **Between-school Variation.** To what extent can student performance be attributed to the differences between schools? The variation between schools in student performance is an indication of the influence of individual schools. If the between-variation in tertiary entrance performance is large then it is important which school a student attends. If on the other hand, the between-school variation is small, then it can be concluded that the school a student attends makes little difference to their performance.

To what extent can between-school differences in tertiary entrance performance be explained by school differences in the socioeconomic and academic mix of students, and school sector?

2. **Between-School Differences in Achievement Growth.** There are two ways in which schools can promote tertiary entrance performance given the prior achievement levels of their students. Relative to other schools, schools can lift the performance of all their students regardless of their prior achievement levels. Alternatively, that can more enhance the effect of prior achievement on tertiary entrance performance. In other words, in some schools the tertiary entrance performance of their higher achieving students compared to their low achieving students is greater than in other schools.

3. **Between-School Differences in the Effect of Socioeconomic Background.** Do schools differ in the way in which socioeconomic background (SES) relates to student performance? In some schools there may be no difference in the performance of students from different socioeconomic backgrounds. Conversely, in other schools tertiary entrance performance may be strongly differentiated by socioeconomic background.

4. **School Culture/Contextual Effects.** Does school 'culture' or the school environment affect student performance? It has been argued that school culture has an important influence on student performance over and above the effect of individual level factors. Are students attending 'academic' schools likely to perform better than they would have otherwise? Similarly, is the schools' socioeconomic environment relevant? For example, do students from a low socioeconomic background perform better in a high SES school than they would have otherwise?

5. **School Effectiveness.** What characteristics of schools add value to student performance? The essence of the school effectiveness literature is to identify those school factors that more effectively improve student performance. In the context of this report, we identify what factors contribute to schools improving performance, net of the academic and socioeconomic mix of students, and school sector?

2. RESEARCH DESIGN, DATA AND METHODS

This chapter is comprised of six sections. In the first section we discuss our research design and analytical strategy. The following sections describe the data, the measure of tertiary entrance performance and other measures employed in the analyses. The final section of this chapter provides an overview of the statistical techniques used in the analytical chapters.

Research Design and Analytical Strategy

Figure 1 presents our general analytical framework for the analysis of tertiary entrance performance. Socioeconomic background, demographics, and prior achievement are all specified as student-level factors that influence *ENTER* score. In addition, school level factors such as the school culture and the socioeconomic status of the school may affect *ENTER* score.

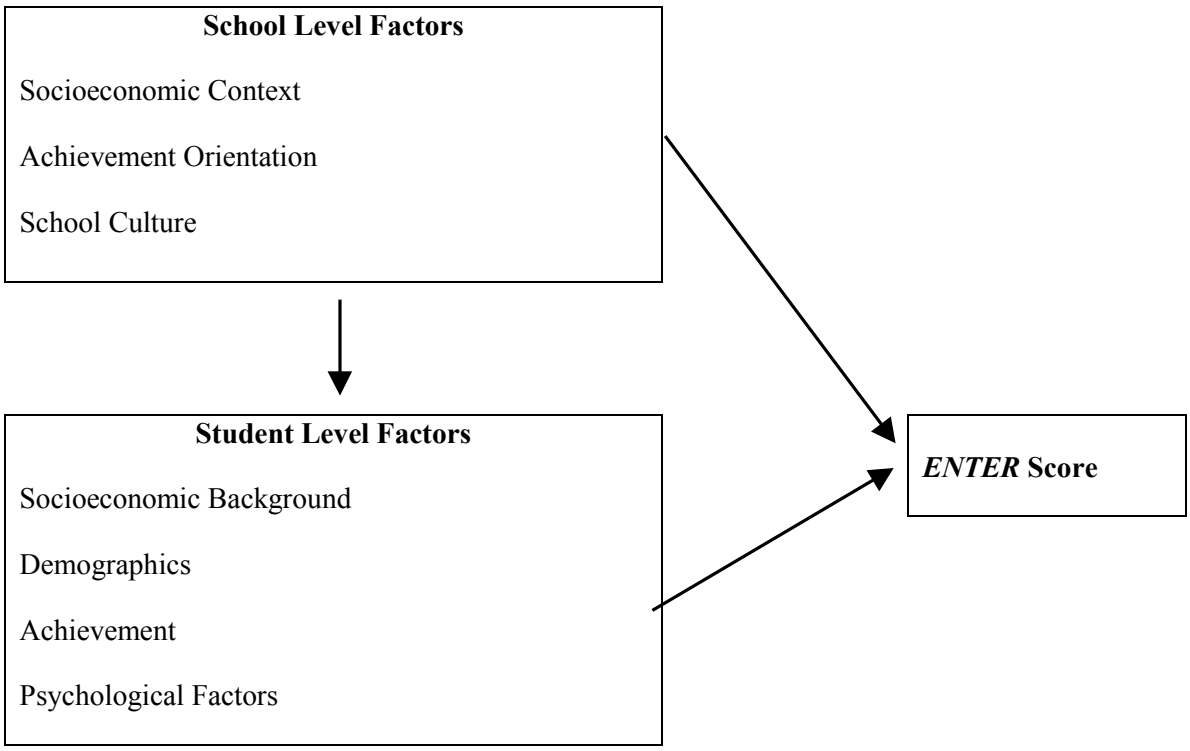

Figure 1 General Theoretical Model showing Student- and School- Level Influences on *ENTER* Score

It is important to recognise that the general model serves as a framework for the investigations of *ENTER* scores. Our analytic strategy is to focus on research questions that can be addressed by the data. These questions come from many sources, such as the academic literature, policy debates and more general debates surrounding student performance in the final years of school. No one specification of predictor variables and *ENTER* score can address all research questions pertaining to tertiary entrance performance.

Therefore, the model used to analyse the data depends on the particular research question. The investigation of some research questions, such as the extent of gender differences in average *ENTER* score, require a simple bivariate model. Other research questions require slightly more complex specifications. For example, the extent school sector differences in student performance are accounted for by socioeconomic background requires a more complex model, comprising

three variables, socioeconomic background, school sector and *ENTER* score. Some research questions require far more complex specifications. For example, investigating the influence of school culture on performance requires a multivariate multilevel model. The multivariate component is necessary so that the influence of school culture can be disaggregated from individual student characteristics. It is a multilevel analysis since it includes both individual and school level influences.

This is an important point. Since a single specification can only inform on a very limited set of research questions, the tailoring of model specification to the specific research question is the most appropriate approach. It is also the approach used (both implicitly and explicitly) in sociology, economics and other social sciences.

Data and Sample

The data for this report are drawn from the Longitudinal Surveys of Australian Youth (LSAY) project. A number of cohorts of young people have been surveyed as part of the LSAY program. This report focuses on the cohort of students who were in Year 9 in 1995. The initial sample comprised 13,613 students from all States/Territories and school sectors, with approximately equal numbers of males and females. This sample is a representative sample of all Year 9 students at school in Australia in 1995. The students were surveyed in their school in 1995, where they completed a questionnaire about themselves and their families, and undertook reading comprehension and numeracy tests. In the next year the sample was surveyed by a mail questionnaire and in each subsequent year by telephone interviewing. Further details on the LSAY project are provided in Appendix 1.

Data collected up to and including 1999 are analysed. Analysis is restricted to survey respondents who completed Year 12 in 1998 and provided valid information on their academic performance for tertiary study.

Sample Weights

In order to take into account sample design and sample attrition, many of the statistics presented in this report are based upon weighted data.[1] The weights comprise two components. The first component (the stratification weights) accounts for differences in the distribution of respondents by State, school sector and gender in the original Year 9 sample and these distributions for the Year 9 population in 1995 as reported in the ABS publication *Schools Australia*. These weights are necessary to account for the sample design whereby the smaller States and Territories were over-sampled. In addition there are small differences between the sample and 1995 population distributions of school sector by gender within the States and Territories that are corrected by this component. The second component of the weights adjusts for sample attrition. The attrition from the sample is not random, but is associated with Year 9 achievement and gender. Further details on the calculation of weights for this sample are provided in LSAY Technical Paper Number 15 (Marks & Long, 2000).

Defining and Measuring Tertiary Entrance Performance

The focus of this report is on students' scores for admission to tertiary study. Australian States and Territories differ in how they calculate and refer to these scores. A summary of the nomenclature in use in 1998 (when the majority of the 1995 Year 9 cohort were in Year 12) is provided in Table 1. Details about the calculation of scores within each State/Territory are provided in Appendix 2.

Table 1 Tertiary Entrance Measures in use in Australian States and Territories in 1998

State/Territory	Tertiary Entrance Measure
Australian Capital Territory	Universities Admission Index (UAI)
New South Wales	Universities Admission Index (UAI)
Northern Territory	Tertiary Entrance Rank (TER)
Queensland	Overall Position (OP)
South Australia	Tertiary Entrance Rank (TER).
Tasmania	Tertiary Entrance Rank (TER).
Victoria	Equivalent National Tertiary Entrance Rank (ENTER)
Western Australia	Tertiary Entrance Rank (TER).

Tertiary entrance scores in all states except Queensland are now understood as equivalent. The scores were made equivalent by procedures developed by the taskforce on *An Australian Tertiary Admissions System* which developed the Equivalent National Tertiary Entrance Rank (*ENTER*) scores. Before the national *ENTER* scores were developed, it was difficult for institutions to judge the performance of interstate applicants. The calculation of the nationally equivalent *ENTER* scores takes into account the proportion of students who sit the tertiary entrance subjects in any year and also the number of people of Year 12 school leaving age in the total population. Since the tertiary entrance ranks have been adjusted for state differences, in this report they are referred to as scores rather than ranks.

In all States (except Queensland) tertiary entrance measures range from zero to 99.95. For example, an Equivalent National Tertiary Entrance score of 81.0 in Victoria is the equivalent of a University Admission Index of 81.0 in the ACT or New South Wales, and a Tertiary Entrance Rank of 81.0 in South Australia, Northern Territory, Western Australia or Tasmania. Queensland's Overall Position scores can be converted to an equivalent of the other State/Territory scales. The conversion details for 1998 are presented in the Appendix 3.

All scores under 30 are assigned a score of 30. This is because the Equivalent National Tertiary Entrance Rank (ENTER) does not include scores below 30. Therefore the scale ranges from 30.00 to 99.95. Further information on the derivation of this measure, its statistical properties, reliability and validity is provided in Appendix 2.

It needs to be emphasised that the *ENTER* scores cannot be compared between jurisdictions. It cannot be concluded that students in a particular state perform better or worse in Year 12 than students in other states. This is because the proportion of Year 12 students receiving *ENTER* scores differs across jurisdictions.

It could be argued that selection biases are at work in this context because the group of students who obtain an *ENTER* score are not a random selection of all students initially sampled. However, we are not interested in what would be the relationship if all Year 9 students obtained an *ENTER* score. We are interested in the relationships for the students who actually sought university entrance. Furthermore, there are serious statistical problems in trying to take account of 'selection bias' in these data.[2]

Other Measures

The influence of characteristics of students (individual-level factors) is the focus of Chapter 3. Three types of characteristics are examined: socio-demographic factors; educational factors; and psychological factors. The socio-demographic factors include parental occupation, parental education, wealth, gender, region, ethnicity, and Indigenous status. The educational factors include Year 9 achievement in literacy and numeracy, school sector, and jurisdiction (State/Territory). The psychological factors include self-concept of ability, and students' and parents' educational aspirations.

The Year 9 achievement measures are not derived from school or system-wide assessments. They are unrelated to the Year 9 curricula. They are based on the students' performance on ACER designed multiple-choice tests on literacy and numeracy, further details of which can be obtained from ACER. Socioeconomic background (SES) is constructed to maximise its effects. It comprises three components: parental occupational status, parental education and wealth. A detailed description of all the measures is provided in Appendix 4.

In Chapter 4 a range of school-level factors is examined, including the socioeconomic composition of the school, the average achievement level of the school's students, and variety of measures tapping the school environment. A detailed description of each of these school-level measures is provided in Appendix 5.

Statistical Techniques

In this section we explain the variety of statistical procedures used in the report. Space precludes a detailed discussion of the more complex procedures, so readers requiring further information are directed to specialised texts.

Box and Whisker Plots

'Box and whisker' plots are used to graphically illustrate the distributions of *ENTER* scores in the sample, both within and across socio-demographic and educational groups. The horizontal line near the middle of a box represents the median value; that is, 50 per cent of the cases have *ENTER* scores above this value and 50 per cent of the cases have *ENTER* scores below this value. The top of the box represents the 25^{th} percentile; that is, 25 per cent of cases have scores above this value. Similarly, the bottom of the box represents the 75^{th} percentile, above which lie the scores of 75 per cent of students. The distance between the top and the bottom of the box is referred to as the inter-quartile range, which can be used as a summary measure of the 'spread' of *ENTER* scores. The 'whiskers' above and below the box represent the 10^{th} and 90^{th} percentiles: 10 per cent of cases have values above the 10^{th} percentile; and 90 per cent of cases have values above the 90^{th} percentile. It should be noted that the box and whisker plots presented in this report are unweighted distributions.

Means

The mean (or average) *ENTER* scores across categories of the variable of interest (for example, gender, occupational group) are presented, first for all students, and then for each of the four largest jurisdictions (New South Wales, Victoria, Queensland and South Australia). The mean scores are estimates of the respective population means of *ENTER* scores for Year 12 students in 1998. They show the extent to which the average tertiary entrance performance differs between social groups. These mean scores are accompanied by a standard error that indicates the 95 per

cent confidence limits surrounding the mean estimate. Confidence limits and standard errors are discussed in more detail below.

Correlations

Correlations between particular factors and *ENTER* scores are also presented. The correlations provide an indication of the strength of a relationship. Correlations can range from minus 1 to plus 1. A zero correlation indicates no relationship and a correlation of plus (or minus) 1 indicates perfect correspondence. In this report, correlations are used to assess the relative strength of a factor compared to other factors. For example, we compare the relative strength of the correlations between tertiary entrance performance and Year 9 achievement, gender, socioeconomic status, school sector and rurality. This is an important consideration since all too often the relative strength of influences on educational outcomes is not considered, leading to misunderstandings whereby important influences are ignored and the importance of weaker influences exaggerated. It should be noted that correlations may be calculated for ordinal and dichotomous variables (such as gender) but not for categorical (nominal) variables (such as father's occupational group).

Where appropriate, the correlations for all students and for students within the four jurisdictions with sufficient numbers of Year 12 students in the sample are presented.

Regression Analysis

In this report, regression is used to estimate the relationship between *ENTER* score and a factor.

i. Overall Relationship. The overall relationship is examined by bivariate regression. Regression analysis estimates the impact of an independent (or predictor variable) on the dependent variable. For continuous variables, the impact can be interpreted as the change in the dependent variable for a one unit change in the independent variable. It is mathematically equivalent to a correlation. In the case of categorical variable, the impact is the average difference in the dependent variable (in this case *ENTER* score) between individuals belonging to that category compared to the comparison category. It is mathematically equivalent to between-categories differences in mean *ENTER* score.

In the sections on the relationship between *ENTER* score and Year 9 achievement in literacy and numeracy, and parental occupational, the overall relationships are presented graphically. A line of best fit is presented which summarises the relationship between *ENTER* score and the predictor variable. The steepness of the line indicates the strength of the relationship. In some graphs the 95 per cent confidence limits surround the line of best fit.

ii. Net Effects. Multiple regression is used to isolate the net effect of an influence taking into account the influence of other factors. Therefore, multiple regressions can be used to address a variety of important research questions. For example, do school sector differences in tertiary entrance performance reflect, at least in part, differences in the students' socioeconomic backgrounds and prior achievement. Multiple regression can provide estimates of school sector differences in tertiary entrance performance *net* of the effects of socioeconomic background and prior achievement.

iii. Differences in the Effects between Groups. We examine the possibility that the effects of prior achievement or socioeconomic background on *ENTER* scores differ between social groups. For example, achievement growth between Year 9 and Year 12 may be stronger for females than for males. Similarly, the impact of socioeconomic background on tertiary entrance performance

may differ between school sectors. For gender and school sector, between-group differences in the relationships are presented graphically. In the 'by group' analyses for SES, the line of best fit is calculated using linear regression since the relationship is not strong enough to identify stable non-linearities. Sensitivity analysis with cubic regression revealed that the shape of the curvilinear line of best fit changed substantially, depending on the number of cases included in each group. In the case of Year 9 achievement, sensitivity analyses showed that cubic regression produced stable and meaningful non-linearities in the relationships. Therefore the graphs of the relationship between Year 9 achievement and tertiary entrance performance show these non-linearities.

Standard Errors, Confidence Limits and Statistical Significance

The means, correlations and regression coefficients presented in the following chapters are survey estimates (or point estimates) of population parameters. The standard error indicates the likely range of the population parameter according to sampling theory. A large standard error reflects a higher degree of uncertainty of the point estimate, or a wide range within which the population parameter could lie. A small standard error means that the population parameter is likely to be very close to the estimate.

Standard errors are used to estimate confidence limits. When the traditional 95 per cent confidence limits are used, sampling theory states that there is a 95 per cent chance that the estimate of a population parameter lies within plus or minus 1.96 standard errors of the sample estimate. For example, if the mean *ENTER* score in the sample is 72 with a standard error of 1.0 then we can be 95 per cent confident that the mean in the population is between 70.04 (=72-1.96*1.0) and 73.96 (=72+1.96*1.0).

Standard errors can also indicate statistically significant differences between groups. Take, for example, a sample estimate of a mean *ENTER* score for females of 74 with a standard error of 1 and a mean for males of 69 also with a standard error of 1. Because the 95 per cent confidence limits do not overlap, we can be 95 per cent confident that there is a statistically significant difference in mean *ENTER* scores between males and females in the population. (The 95 per cent confidence limits for females are between 72 and 76 compared to between 67 and 71 for males). However, if the standard error for males and females was 3, then the mean estimates of 74 and 69 are not significantly different because there is considerable overlap in the confidence limits. (In this case, the 95 per cent confidence interval for females would be between 68 and 80, and for males would be between 63 and 75).

In this report the standard errors are adjusted for sample design effects. The 1995 Year 9 LSAY sample is a two-stage cluster sample (a sample of schools followed by a sample of classes). Because of the clustering of students within schools, the standard errors are wider than those that would be obtained from a simple random sample of students. The sample also deviates from a simple random sample in that it is stratified by State and school sector. Stratification of a sample tends to reduce the standard error. Taken together, the resulting standard errors are larger than would be the case if the sample were a simple random sample of students.

The following procedures were used within SAS to take into account the two-stage sample design and the stratification of the sample. The means were calculated using the SURVEYMEANS procedure. The correlations were calculated with standardised variables (a mean of zero and a standard deviation of one using bivariate regression within the SAS procedure SURVEYREG.) The variables are standardised for the whole sample, not confined to those cases in a particular analysis.[3] This procedure provides accurate estimates of the standard errors associated with the regression estimates, whereas standard procedures do not. For the multivariate analyses, the SURVEYREG procedure was also employed.

In the tables in the following chapter, means, correlations and regression coefficients are accompanied by standard errors (in parentheses), which are adjusted for sampling effects.

Multilevel Modelling

In chapter 4, multilevel statistical procedures are used to examine between-school variation and the effects of individual schools on individual tertiary entrance performance. Unlike conventional statistical procedures, multilevel analyses allow researchers to distinguish between-school variance from between-student variance. Several recent books provide details in the area (Keft & de Leeuw, 1998; Snijders & Bosker, 1999).

The statistical procedure employed was PROC MIXED in the SAS statistical program, which performs multilevel analyses. For more details see Singer (1998).

3. INDIVIDUAL LEVEL INFLUENCES ON TERTIARY ENTRANCE PERFORMANCE

This chapter examines a variety of individual-level factors that may influence tertiary entrance performance; namely, achievement in literacy and numeracy, socioeconomic background, gender, school sector, region, ethnicity, Indigenous status and psychological factors. Each section briefly reviews previous research and policy concerns before presenting and discussing the results.

Literacy and Numeracy Achievement

Performance at school is often assumed to be largely meritocratic, with ability and motivation being the primary determinants. If this is true, then prior school achievement will be a much stronger influence on tertiary entrance performance than non-meritocratic factors, such as socioeconomic background, gender and ethnicity. Furthermore, this influence should be more or less the same across jurisdictions.

Empirical studies have shown a strong relationship between performance in the final year of school and earlier school achievement. For example, in a study of achievement growth in the final years of high school in New South Wales, Ainley & Sheret (1992:146) report a very high correlation of 0.71 between a composite measure of achievement in Years 9 and 10 and Tertiary Entrance Rank. Similarly, empirical studies have shown a strong relationship between performance in the final year of school and ability measures. For example, in Victoria correlations between the General Achievement Test (GAT) and performance in individual subjects are high, with about three-quarters of the correlations above 0.60 (VBOS, 1997:5; see also Rowe, 1999).

ENTER Scores and Year 9 Achievement

The distribution of *ENTER* scores by the Year 9 achievement quartiles presented in Figure 2 suggests a strong relationship between Year 9 achievement and tertiary entrance performance. The median *ENTER* scores differ substantially from one quartile to the next, with students in the highest Year 9 achievement quartile having the highest median *ENTER* score, and students in the lowest Year 9 achievement quartile having the lowest median *ENTER* score. In the highest Year 9 achievement quartile approximately 75 per cent of students had *ENTER* scores above 75 compared to 50 per cent of students in the second highest quartile, 25 per cent of students in the second lowest quartile, and approximately 15 per cent of students in the lowest achievement quartile.

It is should be noted that the distributions of *ENTER* scores with these quartiles is more limited than the distribution of *ENTER* scores among parental occupational groups (Figure 4). This suggests a closer correspondence between Year 9 achievement and *ENTER* scores than between occupational background and *ENTER* score.

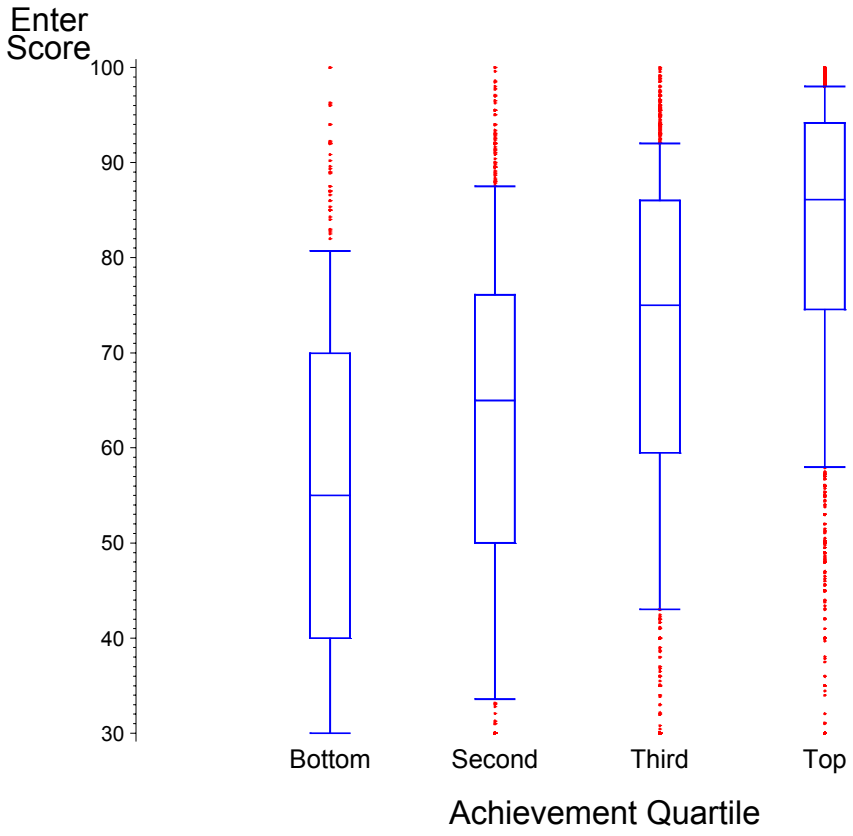

Figure 2 Box and Whisker Plot of the Distribution of *ENTER* Scores in Year 12 (1998) by Year 9 (1995) Achievement Quartiles

Table 2 presents the mean *ENTER* scores (and associated standard errors) for the four Year 9 achievement quartiles. These data confirm the strong association between literacy and numeracy achievement in Year 9 and tertiary entrance performance as shown in Figure 2. Overall, the highest Year 9 achievement quartile has the highest mean *ENTER* score, the second highest Year 9 achievement quartile has the next highest mean *ENTER* score, and so on. The differences are quite large and statistically significant, with a difference in mean *ENTER* score of 26 between the lowest and highest achievement quartiles.[4]

Table 2 Mean *ENTER* Scores in Year 12 (1998) by Achievement in Literacy and Numeracy in Year 9 (1995) - All Students and by Selected Jurisdictions

Achievement in Literacy and Numeracy in Year 9	All	NSW	Vic.	Qld.	SA
Lowest Quartile	54.5 (1.0)	53.9 (1.8)	54.8 (1.5)	49.5 (2.0)	70.8 (3.2)
Second Quartile	62.4 (0.7)	64.9 (1.4)	61.6 (1.1)	56.7 (1.3)	71.1 (1.6)
Third Quartile	69.8 (0.6)	67.6 (1.2)	72.3 (1.0)	64.9 (1.4)	78.4 (1.1)
Highest Quartile	80.4 (0.5)	76.8 (1.1)	83.1 (0.9)	79.3 (1.4)	86.4 (1.0)

Note: Standard errors in parentheses.

Table 2 also allows a comparison across selected jurisdictions (States) of the relationship between Year 9 achievement and tertiary entrance performance. Differences in mean *ENTER* scores between the highest and lowest Year 9 achievement quartiles are largest in Queensland and Victoria, smaller in New South Wales, and smallest in South Australia. Similarly, there is a smaller difference in South Australia between the mean *ENTER* scores of the two highest Year 9 achievement quartiles, and there is no significant difference between the mean *ENTER* scores of the two bottom achievement quartiles. The differences between the States are also reflected in the correlations presented in Table 3. These results suggest that Year 9 achievement in literacy and numeracy has a weaker relationship with *ENTER* scores in South Australia than in the other three States.[5]

Although correlated, literacy and numeracy are separate skills, with differing importance in relation to particular types of courses. Rowe's (1999) results generally confirm the assumption that numeracy is more important in relation to mathematics and the sciences, whereas literacy is more important to performance in English and the humanities.[6] However, it is not immediately obvious whether skills in literacy or numeracy will be more important in regard to *ENTER* score. The next set of analyses addresses this issue.

Table 3 Correlations between *ENTER* Scores and Achievement in Literacy and Numeracy in Year 9 - All Students and by Selected Jurisdictions, 1998

Year 9 Achievement	All	NSW	Vic.	Qld.	SA
Literacy	0.45 (0.02)	0.37 (0.04)	0.50 (0.03)	0.51 (0.05)	0.29 (0.05)
Numeracy	0.47 (0.02)	0.38 (0.04)	0.54 (0.03)	0.54 (0.04)	0.32 (0.04)
Literacy & Numeracy (combined)	0.56 (0.02)	0.47 (0.04)	0.62 (0.03)	0.62 (0.04)	0.38 (0.05)

Note: Standard errors in parentheses.

Table 3 shows the correlations between three measures of Year 9 achievement and *ENTER* scores.[7] The correlation between numeracy and *ENTER* score is stronger than that between literacy and *ENTER* score. This finding is consistent across jurisdictions.

The inter-correlation between achievement in literacy and achievement in numeracy is high – around 0.65. Furthermore, the combined measure has a substantially stronger relationship with *ENTER* score than either of the individual components (see Table 3). For these reasons it was decided to use the combined measure in subsequent analyses which incorporate Year 9 achievement as a control variable.[8]

Socioeconomic Background

The influence of socioeconomic background on education has important implications for social mobility in society; that is, whether inequalities are reproduced from one generation to the next. Consequently, the influence of socioeconomic background on student performance has long been of major concern for educationalists and educational researchers. The importance of students' socioeconomic background on performance *vis-a-vis* meritocratic factors (such as prior achievement in literacy and numeracy) is an indicator of the degree of socioeconomic inequality in Australia's education systems.

In a recent report, Collins et al. (2000:71-74) presented evidence of socioeconomic differences in performance in several Year 12 subjects in Victoria and Queensland. Students belonging to low socioeconomic groups are underrepresented among the top 20 per cent of students and over-

represented among the bottom 20 per cent. The authors concluded that socioeconomic differences in tertiary entrance performance are stronger than gender differences.

Socioeconomic Background and ENTER Scores

In order to include most aspects of socioeconomic background, six measures are used. These comprise categorical measures of parental occupation and education, and continuous measures of parental occupational status, parental education, and wealth. Finally, a composite measure of parental socioeconomic status (SES) was constructed by combining parental occupation, education and wealth (Appendix 4). This multi-faceted approach provides a more comprehensive understanding than relying on a single indicator of socioeconomic background.

The measures of socioeconomic background are not readily apparent and require some introduction. Parental occupation is based on father's occupation but in cases where that information was missing mother's occupation was used. The categorical measure of parental occupation comprises five categories: professional (including para-professionals); managers and administrators; sales, clerical and service occupations; trade and skilled manual workers, semi-skilled manual workers (including drivers and operatives); and unskilled manual workers. The continuous measure of occupational status is the ANU3 scale that assigns status scores (based on the average income and educational levels) to some 300 occupational groups (Jones, 1989). Parent's education was based on mother's education and if information on mother's education was missing, father's education was substituted. For the categorical measures of education, students whose mothers had gained a post-secondary education were contrasted with students whose mothers had not received a post-secondary education. The continuous measure of education comprises five categories ranging from no secondary education to a degree or diploma. Wealth is measured by information on the numbers of particular household possessions in the student's home.

The distribution of *ENTER* scores by parental occupation group is presented in Figure 3. The median *ENTER* score is highest among students with professional backgrounds, followed by students from managerial backgrounds and sales, clerical, and service backgrounds. These students from non-manual backgrounds have higher median *ENTER* scores than students from manual backgrounds. Interestingly, among students with a manual background, the relationship with *ENTER* score does not correspond with skill-level. Students whose parents (usually fathers) work in unskilled or labouring jobs show a higher median *ENTER* score than students with fathers who work in more skilled manual occupations.

The distribution or spread of scores within occupational groups indicates that greater occupational group differences occur at the lower end of the distribution. At the higher end of the distribution there is little difference across occupational backgrounds in the *ENTER* score (92-96) at which the 10th percentile cuts in. This finding indicates that there are similar proportions of very high scoring students from each occupational background. At the 25^{th} percentile the occupational gradient is steeper, cutting in at about an *ENTER* score of 93 for the professional group and 85 for the three manual groups. The occupational gradient is steeper again for the median (or 50^{th} percentile). For the 90^{th} and 75^{th} percentiles there are large occupational group differences, with substantially less students from professional and managerial backgrounds with low *ENTER* scores.

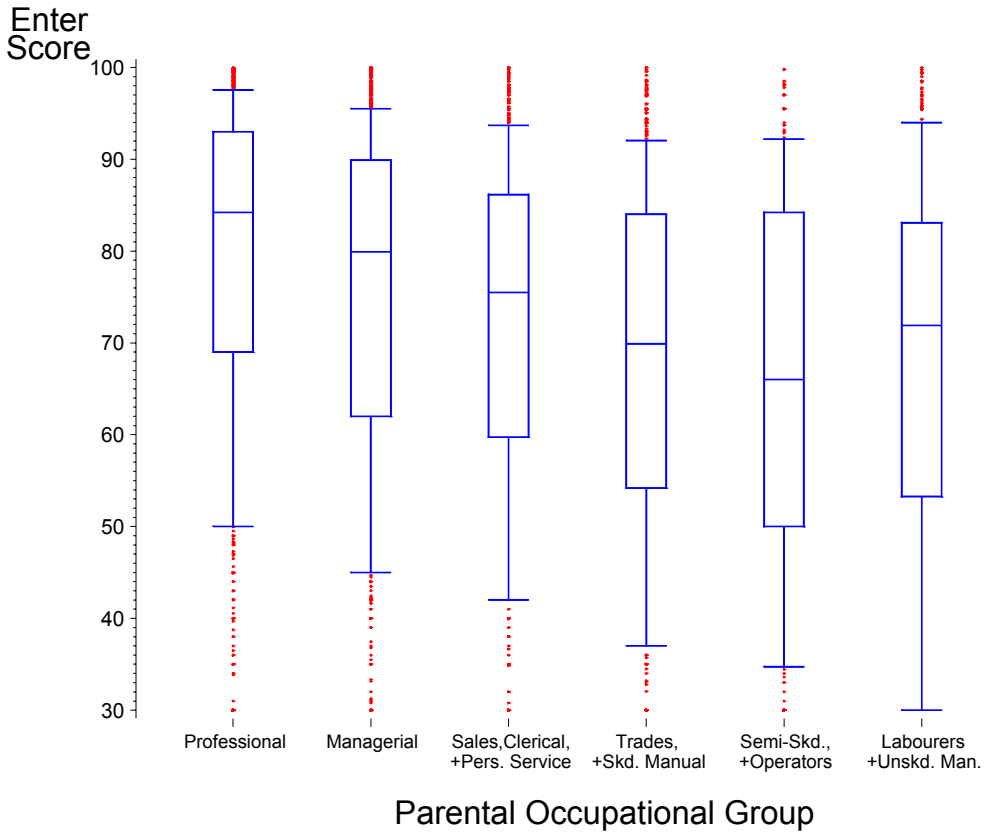

Figure 3 Box and Whisker Plot of the Distribution of *ENTER* Scores by Parental Occupational Group, 1998

Table 4 presents mean *ENTER* scores by parental occupational group. The mean scores confirm that a socioeconomic gradient exists, with students from higher status backgrounds (especially those from professional backgrounds) tending to receive higher *ENTER* scores than students from other occupational backgrounds. Focusing on all students (the first column), students from professional backgrounds score higher on average than students from managerial backgrounds who in turn score higher than students from sales, service and clerical backgrounds. As a group, students from white-collar backgrounds score higher than students from blue-collar backgrounds. There are no statistically significant differences between the *ENTER* scores of students from the three manual groups.

Differences in *ENTER* scores by occupational group are largest in Victoria and to a lesser extent Queensland and New South Wales. In contrast, occupational group differences are smallest among South Australian students. A similar result was found for Year 9 achievement where the relationship between *ENTER* score and achievement was weaker in South Australia than in other states. This is probably due to a selection effect, since a lower proportion of South Australian Year 12 students take tertiary entrance subjects compared to their peers in other states.

An examination of the relationship between parental education group and *ENTER* scores produces similar findings to those for parental occupational group. Students from more highly educated families perform better than other students. Overall, students whose mothers received a post-secondary education score about 10 points higher than other students, and these differences are statistically significant. This compares with a difference of 12 to 13 points in the mean *ENTER* scores of students from professional and unskilled manual backgrounds (Table 4) and a difference in mean *ENTER* score of 25 points between the highest and lowest achievement quartiles (Table 2).

Table 4 Mean *ENTER* score by Parental Occupational and Educational Group - All Students and by Selected Jurisdictions, 1998

	All	NSW	Vic.	Qld.	SA
Parent's Occupational Group					
Professional	76.9 (0.7)	75.6 (1.3)	78.8 (1.2)	70.7 (1.9)	83.4 (1.4)
Managerial	72.5 (0.8)	70.9 (1.4)	72.1 (1.6)	68.4 (1.7)	82.5 (1.2)
Sales, Clerical, Service	69.0 (0.9)	67.9 (1.5)	69.7 (1.8)	64.3 (2.3)	75.7 (1.9)
Trades, Skilled Manual	65.3 (0.9)	63.3 (1.5)	66.7 (1.3)	62.1 (2.2)	71.9 (2.0)
Semi-Skilled Manual, Operatives	63.6 (1.4)	62.1 (2.4)	64.7 (2.0)	60.8 (2.9)	77.2 (3.4)
Labourers, Unskilled Manual	64.9 (1.2)	64.6 (2.4)	64.7 (1.7)	59.4 (2.6)	80.0 (2.0)
Parent's Education					
Post-Secondary	78.3 (0.7)	75.7 (1.4)	80.1 (1.2)	75.4 (1.6)	84.7 (1.3)
Not Post-Secondary	68.4 (0.6)	68.1 (1.1)	65.5 (0.8)	63.3 (1.4)	78.4 (1.0)

Note: Standard errors in parentheses.

Differences according to mother's education are greatest in Victoria and Queensland. Parent's education had the weakest impact on *ENTER* scores in South Australia, as was the case for parental occupation and Year 9 achievement. This result is further evidence that selection effects are responsible for the lower correlations.

A relationship between socioeconomic background and *ENTER* score is also revealed when continuous measures of socioeconomic background are examined. Table 5 presents the correlations between *ENTER* score and parental occupational status, parental education, family wealth and the composite SES measure. Each of the socioeconomic measures is related to *ENTER* scores, although the strength of the correlations varies. Overall and within each State, the strongest correlations are with the composite SES measure. Parental occupational status is moderately correlated with *ENTER* scores. In most jurisdictions, the correlation between parental education and *ENTER* score is weaker than that between occupational status and *ENTER* score, and the wealth index displays even weaker correlations. As before, the correlations are weakest among South Australian students.

The composite SES measure is used in subsequent analyses because it encompasses the three main aspects of socioeconomic background and its relationship with *ENTER* scores is substantially stronger than that for the separate indicators (Table 5).

Table 5 Correlations between *ENTER* Scores and Aspects of Socioeconomic Background - All Students and by Selected Jurisdictions, 1998

	All	NSW	Vic	Qld	SA
Parental Occupational Statu	0.24 (0.02)	0.23 (0.03)	0.26 (0.03)	0.21 (0.04)	0.19 (0.04)
Parental Education	0.22 (0.02)	0.19 (0.04)	0.28 (0.03)	0.16 (0.04)	0.14 (0.03)
Family Wealth	0.16 (0.02)	0.17 (0.04)	0.16 (0.04)	0.17 (0.04)	0.13 (0.04)
Socioeconomic background (Composite SES)	0.29 (0.02)	0.28 (0.04)	0.32 (0.03)	0.25 (0.05)	0.23 (0.04)

Note: Standard errors in parentheses.

Socioeconomic Background, Year 9 Achievement and ENTER Scores

We next assess the extent socioeconomic differences in tertiary entrance performance can be attributed to earlier school performance. If the final years of schooling were completely fair, socioeconomically speaking, there should be no effects of socioeconomic background on *ENTER* score when controlling for Year 9 achievement.

Table 6 presents the results of this regression analysis of *ENTER* scores, with SES and Year 9 achievement in literacy and achievement. Both of the predictor variables have been standardised to a mean of zero and a standard deviation of one. Model 1 includes only SES, whereas, model 2 includes both SES and Year 9 achievement. With the addition of the achievement measure, the difference in average *ENTER* score for a one standard deviation difference in SES declined from 5.7 to 3.7 *ENTER* score points, a decline of over 30 per cent. While small, the impact of SES on student performance during the final years of school remains statistically significant even after controlling for prior achievement.[9]

This analysis also shows the effect of SES is substantially weaker than the effect of Year 9 achievement. A one standard deviation increase in Year 9 achievement results in an increase of 10 *ENTER* score points compared to an increase of 3.7 points for a one standard deviation increase in SES. The variation in *ENTER* score explained by the composite measure of socioeconomic background is around 8 per cent, but substantially increases to 25 per cent with the addition of Year 9 achievement. The means and correlations presented earlier in this chapter also support the conclusion that Year 9 literacy and numeracy achievement has a stronger effect on *ENTER* score than socioeconomic background.

Table 6 Regression of *ENTER* Scores on Socioeconomic Background and Year 9 Achievement

	Model 1	Model 2
Intercept	71.7 (0.5) ***	67.6 (0.5) ***
SES (Standardised)	5.7 (0.4) ***	3.7 (0.4) ***
Year 9. Achievement (Standardised)		10.0 (0.5) ***
R Square	0.08	0.25

Note: Standard errors in parentheses. * 0.05>P>0.01; ** 0.01>P>0.001; *** P<0.001

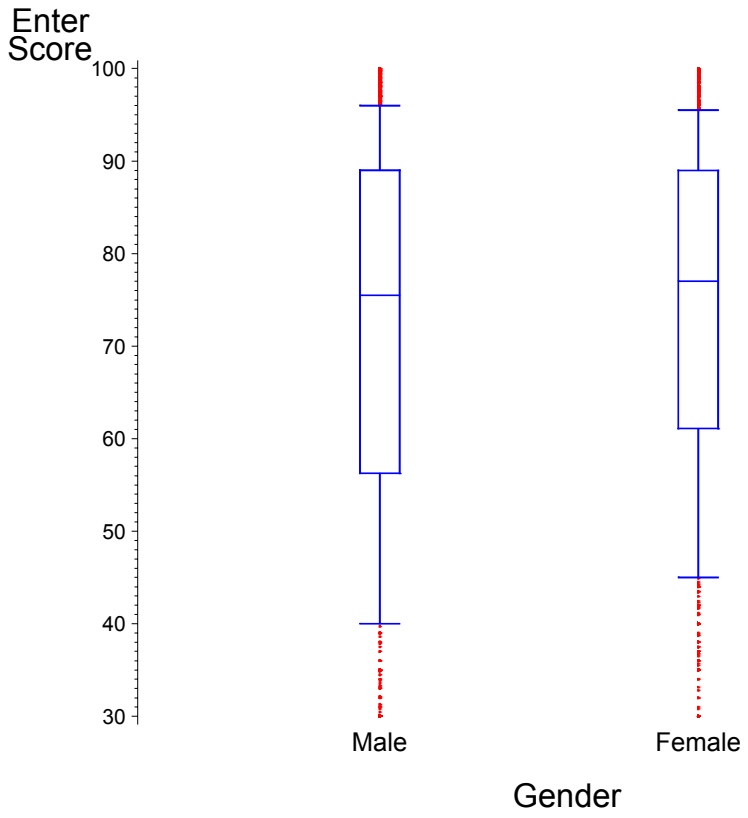

Figure 4 Box and Whisker Plot of the Distribution of *ENTER* Scores by Gender, 1998

Gender

Studies of student performance in Year 12 have (arguably) focused more on gender than on the other social and educational factors examined in this report.[10] In Australia, as in other industrialised countries, there is continuing debate about the educational outcomes of males compared to females. Recently, the debate has focused on the extent to which boys lag behind and whether policies should be implemented to improve the educational outcomes of boys.

In New South Wales, females are more frequently found in the top percentiles for university admission (NSW UAC, 1998:10). In the great majority of Year 12 courses in New South Wales, females outperform males and the gap appears to have increased throughout the 1990s (Collins et al., 2000:50,57-60; MacCann, 1995). The Victorian Tertiary Admission Centre (1998-99:107) reports higher percentages of females in the top percentile bands, with males more common in the lower bands. Collins et al. (2000: 54) also report that females outperform males in the majority of subjects in Victoria. This was also the case for Western Australia (Collins, 2000:55). In the Queensland Cores Skills Test (QCS), there were proportionally more males in the very top band, more females in the following high and middle achieving bands, but more males in the lower bands (Collins et al., 2000:55). The trend towards females outperforming males is not limited to the Australian context. In the United Kingdom there is also evidence of a widening gender gap favouring females (Cassidy, 1992).

Table 7 *ENTER* scores and Gender - All Students and by Selected Jurisdictions, 1998

	All	NSW	Vic	Qld.	SA
Means					
Male	68.7 (0.8)	66.4 (1.6)	71.1 (1.5)	63.4 (1.8)	80.3 (1.5)
Female	71.4 (0.6)	71.2 (1.2)	70.8 (1.0)	66.2 (1.6)	79.6 (1.4)
Correlations					
Gender (Female=1 vs. Male=0)	0.07 (0.03)	0.11 (0.05)	-0.01 (0.05)	0.07 (0.06)	-0.02 (0.05)

Note: Standard errors in parentheses.

Gender and ENTER Scores

The distribution of *ENTER* scores is presented in Figure 4. The median *ENTER* score for females is higher than that for males. The distribution of *ENTER* scores for males is more dispersed than for females; that is, males are more likely to be found at both the top and bottom of the distribution. The 10th percentile for males is at a slightly higher score than that for females; the 25th percentile is much the same value; and the *ENTER* scores at 75th and 90th percentiles are substantially lower for males than females.

Overall, female students showed slightly higher mean *ENTER* scores: on average female students scored two to three *ENTER* score points higher than male students, and this small difference is statistically significant (Table 7). By jurisdiction, female students scored higher than male students in New South Wales and Queensland, but these differences were statistically significant only in New South Wales. In the other States, the gender differences in mean *ENTER* scores were not statistically significant. In other words, the differences observed are probably due to sampling error.

The correlations between gender and *ENTER* score presented in Table 7 convey a similar message.[11] Overall and in New South Wales, gender has a low but statistically significant correlation with *ENTER* score. The correlations in Victoria, South Australia and Queensland are not statistically significant. The correlations are considerably lower than those observed for socioeconomic background and Year 9 achievement.

Gender Differences in Achievement Growth

The test for gender differences in achievement growth used Year 9 scores in literacy and numeracy as the measure of prior achievement. The gender difference increased from 2.7 to 4.0 *ENTER* score units after controlling for Year 9 achievement (Table 8). This finding indicates that achievement growth during the final years of secondary school is greater for females than for males. This result may be interpreted as evidence that, on average, females relative to males are advantaged (possibly through the assessment procedures) during the final years of secondary school. Alternatively, the result may be interpreted as boys not being as motivated or engaged in learning as girls, or boys not choosing courses as appropriately as girls.

Table 8 Regression of *ENTER* Scores on Gender and Year 9 Achievement

	Model 1	Model 2
Intercept	71.4 (0.6) ***	68.04 (0.5) ***
Gender (Male=1, Female=0)	-2.7 (1.0) ***	-4.0 (0.8) ***
Lit. & Num. Achievement in Year 9 (Standardised)	–	11.1 (0.4)
R Square	0.004	0.23

Note: Standard errors in parentheses. * 0.05>P>0.01; ** 0.01>P>0.001; *** P<0.001

Further analyses revealed differences between jurisdictions in the achievement growth of boys and girls. The overall finding only holds in New South Wales and Queensland. In New South Wales the gender difference in *ENTER* scores increased from 4.8 to 6.1 after controlling for Year 9 achievement. In Queensland the gap increased from 2.8 to 4.5. In contrast, controlling for Year 9 achievement did not increase the gender difference in *ENTER* scores for Victorian and South Australian students (not shown).

The relationship between *ENTER* score and achievement is slightly stronger for females (Table 9). This difference appears to be related to achievement in literacy rather than in numeracy. Therefore, there are indications that Year 9 achievement is a slightly stronger correlate of tertiary entrance performance for girls than for boys. This finding may be the result of high achieving boys (relative to high achieving girls) not performing as well as expected given their Year 9 achievement levels. The alternative explanation is that low achieving boys (relative to low achieving girls) are performing better than expected given their Year 9 achievement levels. The following analysis provides evidence for the first rather than the second explanation.

Figure 5 presents the results of the regression analyses of *ENTER* score and Year 9 achievement by gender. Cubic regression was used to allow for non-linearities in these relationships.[12] This figure shows clearly why correlations between Year 9 achievement and *ENTER* score tend to be higher among female students. The curve is steeper for girls than for boys.

The gender gap is larger at the higher levels of Year 9 achievement (Figure 5). With increasing Year 9 achievement scores, the difference in achievement growth between males and females increases. Therefore, the explanation for the higher correlation between Year 9 achievement and *ENTER* score among girls is that middle to high achieving boys are not performing as well as expected, relative to girls, given their Year 9 achievement levels.[13]

Table 9 Correlations between *ENTER* Scores and Year 9 Achievement – Males and Females

Year 9 Achievement in …	Males	Females
Literacy & numeracy (combined)	0.55 (0.03)	0.58 (0.02)
Literacy	0.43 (0.03)	0.46 (0.03)
Numeracy	0.50 (0.03)	0.50 (0.02)

Note: Standard errors in parentheses.

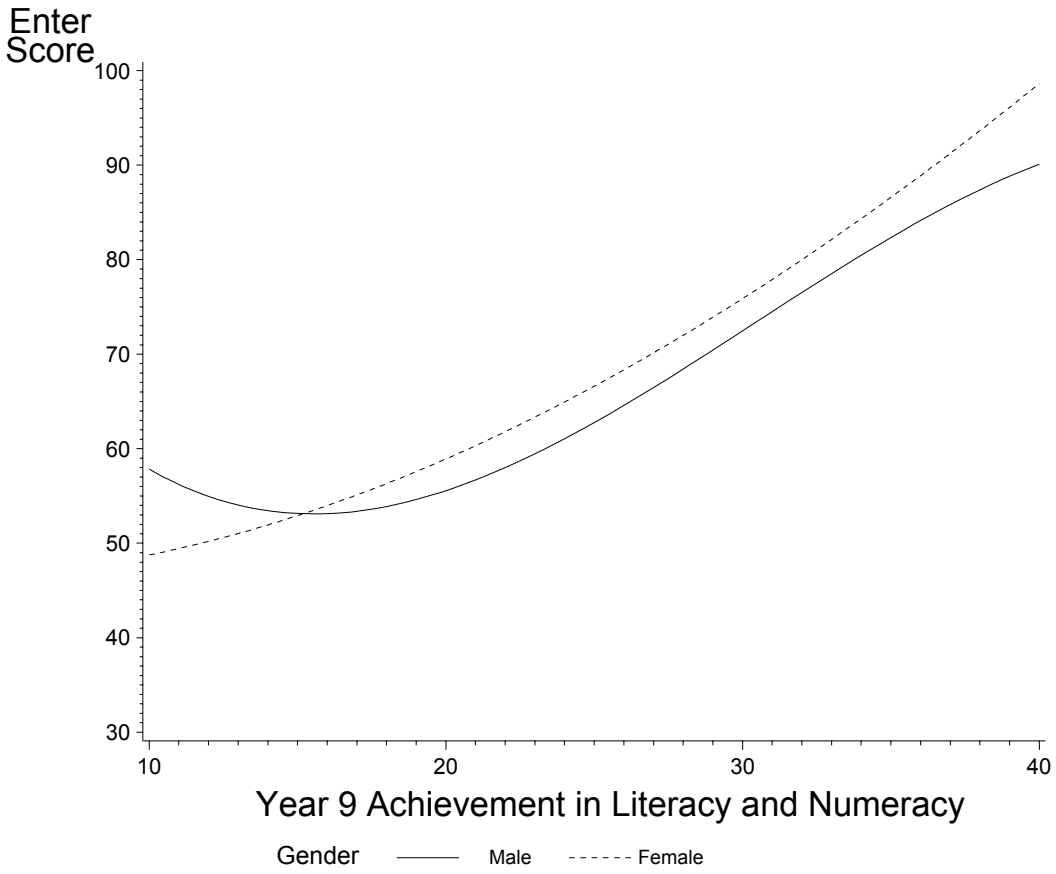

Figure 5 Regression of *ENTER* Scores on Year 9 Achievement in Literacy and Numeracy – Males and Females

Gender Differences in the Impact of Socioeconomic Background

It has been argued that the influence of socioeconomic background on school performance is weaker among females. For example, the findings presented by Collins et al. (2000:71-78) suggest that in most subject areas, socioeconomic background effects are stronger among males. A recent analysis of the LSAY Year 9 achievement data also suggested that socioeconomic background effects are stronger for males than females (Marks & McMillan, 2000).

Figure 6 shows the regression lines of best fit of parental occupational status on *ENTER* scores for boys and girls. Although the intercept is higher for girls there is no difference in effect of SES; i.e., there is no difference in the slopes of the two regression lines.[14] If the impact of socioeconomic background were stronger for one sex compared to the other, then one of the regression lines would be substantially steeper. Therefore, gender differences in *ENTER* score are much the same across the range of occupational backgrounds.

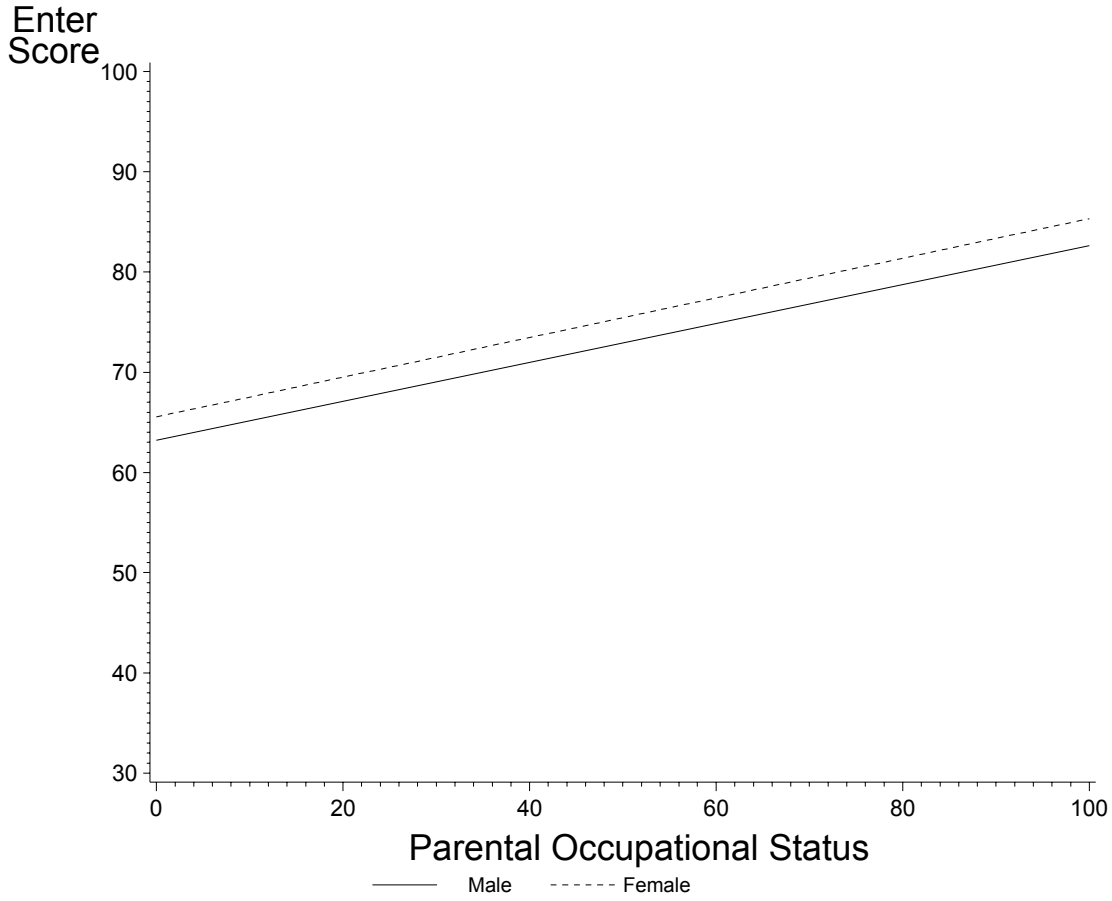

Figure 6 Linear Regression of *ENTER* Score on Parental Occupational Status – Males and Females, 1998

School Sector

An important aspect of the Australian education system is school sector. It is generally believed that students attending non-government (Catholic and independent) schools perform better than their counterparts in government schools. In some States, major newspapers publish data on the top students and schools in their State. A very high proportion of the schools that are named are non-government schools. Apart from newspaper publications on the best performing students and schools, there is very little literature on school sector differences in tertiary entrance performance.

For New South Wales, Gannicott (1998:27) reported the mean tertiary entrance scores for New South Wales school sectors in 1994 and 1996. In both years the average score for students at government schools was around 45 compared with 51 to 52 for Catholic schools and 70 for independent schools. The author added that school sector differentials had not changed since 1991. Gannicott (1997:55-56) also reports the results from a multivariate analysis, which control for a number of school characteristics, including school fees.[15] Gannicott estimated the odds of schools achieving at least two students in the top 1000 in the State in 1992. He reports higher odds for selective government schools (with odds of 5.57), followed by independent schools (2.24), Catholic schools (1.0), and state comprehensive schools (0.18).

A number of reports have examined school sector differences in tertiary entrance performance in Victoria. Gannicott (1997:56-57) found that in 1996, non-government schools were over-

represented among the top performing Victorian schools. (The performance of schools was measured by their performance over and above what was expected by the General Ability Test scores of their students). Of the 100 top performing schools, 53 were Independent, 25 were Catholic, and 22 were government. Of the top 25 performing schools, 20 were independent schools. Using data on Year 12 results in 1994, Teese (2000) concluded that there are strong sector differences in failure rates for English. However, using more recent (1998) data, Rowe (1999) found weaker differences. For the 20 largest VCE subjects the students from independent schools scored about 0.22 standard deviations higher than students attending government schools, net of performance in the *General Achievement Test*.[16] Rowe's (1999) work also indicates that school sector differences between Victorian independent and government schools are declining.[17] Similarly, the differences in VCE performance between Catholic school and government students also declined, although the initial difference was substantially smaller.[18]

A host of reasons may explain why school sector is associated with student performance. Coleman argued that the social capital (or the social networks of students) influences their performance at school. He speculated that higher levels of social capital are found in Catholic schools than in (American) public schools, which explain differences in performance (Coleman, Hoffer, & Kilgore, 1982). Another possible explanation is that non-government schools maintain a school culture that is more conducive to learning and academic performance. Material factors may also play a role. The more expensive non-government schools are able to pay teachers higher salaries and provide more up-to-date facilities.

However, the idea that non-government schools provide students with higher *ENTER* scores than they would otherwise obtain can be challenged on a number of grounds. First, some of the students in the top percentiles in their State whose names (and schools) appear in newspapers may have been recruited from government schools through the extensive scholarship system that independent schools offer. Generally, these scholarships go to exceptionally high achieving students, who conceivably would have performed just as well at a government school. Second, the data published in newspapers is limited to the very top performers and does not show how well students not in the top percentiles perform. Obviously the vast majority of students at non-government schools do not perform at these levels. Third, students attending independent schools tend to come from families with higher socioeconomic status. The benefits of attending a non-government school for tertiary entrance may be a reflection, at least in part, of the influence of family socioeconomic status.

Differences in performance between students attending government, Catholic and independent schools remain a controversial issue. It is not clear if sector differences are strongest among high performers or whether they are more general, applying to all students regardless of ability level and socioeconomic background. The scores of exceptional students may unduly influence the high mean tertiary entrance scores of students attending independent schools. The differences in *ENTER* scores between students attending different types of schools has been never been quantified adequately, and the extent to which school sector differences are confounded by differences in the academic ability and socioeconomic background of students has not been investigated satisfactorily.

A related issue is achievement growth between school sectors. It is conceivable that achievement growth during the final years of secondary school is greater among students attending independent schools than students attending Catholic or government schools. Since a major attraction of independent schools is higher tertiary entrance scores, independent schools are likely to devote greater resources to the teaching of students during the final years of secondary school. For Catholic schools this argument is unlikely to apply, although it remains an empirical question whether achievement growth is greater among students attending Catholic schools compared to those at government schools.

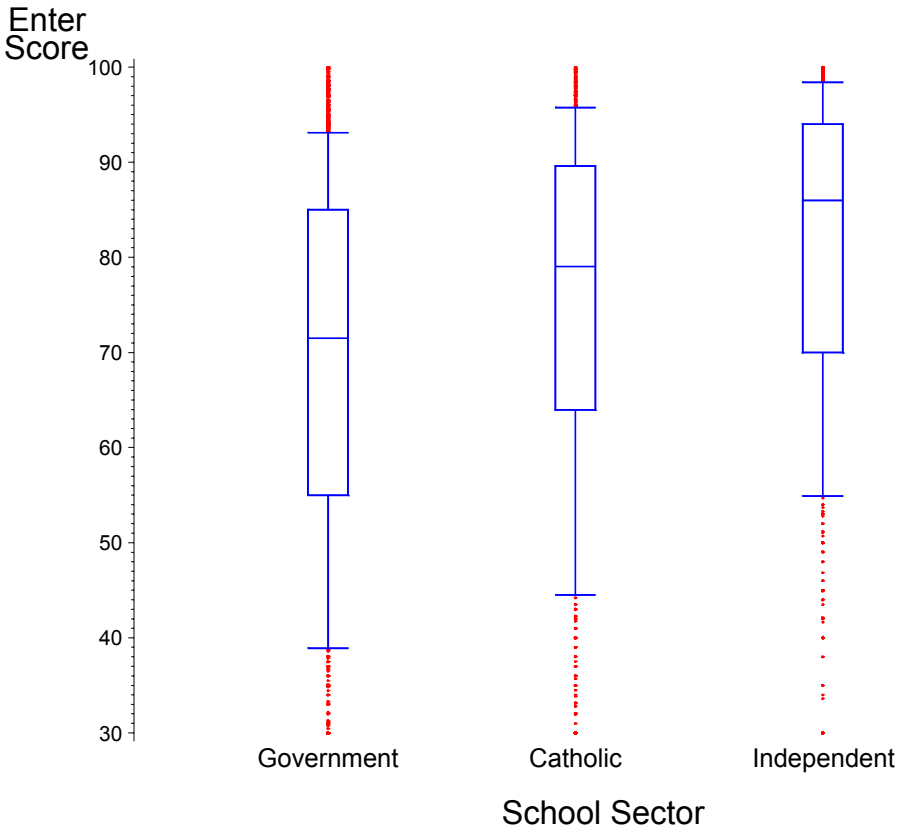

Figure 7 Box and Whisker Plot of Distribution of *ENTER* Scores by School Sector

School Sector and Achievement Scores

The distribution of *ENTER* scores by school sector is presented in Figure 7. While it is clear that there are some very high achieving students in each school sector, the distributions also show that higher proportions of students attending Catholic and independent schools gain high *ENTER* scores compared to students at government schools. The 10th percentile is highest among students attending independent schools followed by students attending Catholic schools. Twenty-five per cent of students at independent schools attained *ENTER* scores of 93 or above. For Catholic and government school students, the 25th percentile cuts in at *ENTER* scores of 88 and 84, respectively. Similarly, the median *ENTER* score for independent school students is higher than the median *ENTER* score for Catholic school students, which in turn is higher than the median *ENTER* score for students attending government schools. At the other end of the distribution, sector differences are even more apparent. For independent school students the 75th percentile cuts in at an *ENTER* score of 69, compared to 55 for government school students. These differences in the distributions within school sectors do not support the argument that sector differences in performance can be attributed only to the top performing students.

Table 10 shows the mean *ENTER* scores for the three school sectors. For all students, the difference in mean *ENTER* scores between students attending independent and government schools was around 12 *ENTER* score points. For a sense of the size of this difference, a difference of 12 *ENTER* score points was also found in the mean scores of students from professional and manual occupational backgrounds (Table 4). It should be noted that the non-government school categories in this sample include both high-fee and low-fee schools. Students attending Catholic schools scored, on average, 6 *ENTER* score points higher than government school students. School sector differences in *ENTER* score are quite similar in New South Wales, Victoria, Queensland and South Australia.

Table 10 *ENTER* scores and School Sector - All Students and by Selected Jurisdictions, 1998

	All	NSW	Vic.	Qld.	SA
Mean					
Independent	78.2 (1.2)	76.7 (2.0)	80.0 (2.4)	71.8 (2.4)	87.7 (1.4)
Catholic	72.8 (1.1)	71.4 (2.0)	72.0 (2.0)	69.1 (3.2)	80.8 (1.9)
Government	66.7 (0.7)	66.7 (1.4)	67.3 (0.9)	60.9 (1.3)	75.5 (1.1)
Correlation					
School Sector (1=Gov, 2=Catholic & 3= Independent)	0.22 (0.02)	0.19 (0.05)	0.23 (0.04)	0.22 (0.05)	0.23 (0.04)

Note: Standard errors in parentheses.

The correlations presented in Table 10 provide an analogous picture, with sector differences being very similar across jurisdictions. The overall correlation of 0.22 is similar to that for parental occupational status but weaker than that for the composite measure of socioeconomic background.

School Sector, Year 9 Achievement and Socioeconomic Background

Although these school sector differences are substantial, they may be largely a reflection of academic and socioeconomic differences in the students who attend these schools.[19] Therefore, the next step is to estimate the size of school sector differences, net of the academic and socioeconomic mix of the schools' students. The results from these analyses are presented in Table 11. In Model 1 the unadjusted differences are the same as those presented in Table 10. Students attending independent schools score, on average, 11.5 *ENTER* score points higher than government school students. Students in the Catholic school sector score about 6 *ENTER* score points higher. Controlling for the academic mix of students with Year 9 achievement (Model 2) reduces the difference between independent and government school students by about a quarter to 8.5 *ENTER* score points. Differences between Catholic and government school students remain unchanged. The addition of SES (Model 3) reduces the difference in *ENTER* scores between independent and government schools to 6 *ENTER* score points. For Catholic schools, the difference declines marginally to 5 *ENTER* score points.[20] Note that in the presence of school sector, the impact of SES has declined from 3.7 (see Table 6) to 3.0.

Therefore, it can be concluded that school sector differences between independent and government schools, can to some extent, be attributed to differences in the socioeconomic and academic mix of students. Approximately 50 per cent of the difference between independent and government school students in tertiary entrance performance can be attributed to differences in Year 9 achievement and socioeconomic background. Therefore, substantial differences still remain.

Table 11 Regression of ENTER Scores on School Sector, Year 9 Achievement and Socioeconomic Background, 1998

	Model 1	Model 2	Model 3
Intercept	66.6 (0.7) ***	63.4 (0.5) ***	65.4 (0.6) ***
School Sector			
Government (Reference Category)	-	-	-
Independent Schools	11.5 (1.3) ***	8.5 (1.1) ***	5.9 (1.1) ***
Catholic Schools	6.2 (1.3) ***	6.2 (0.9) ***	5.0 (1.0) ***
Achievement in Year 9 (Standardised)	–	10.5 (0.5) ***	9.9 (0.5) ***
SES (Standardised)	–	–	3.0 (0.4) ***
R Square	0.05	0.25	0.27

Note: Standard errors in parentheses. * 0.05>P>0.01; ** 0.01>P>0.001; *** P<0.001

The question remains as to what factors are associated with school sector differences in tertiary entrance performance. One explanation is that psychological factors play a role. Students attending independent schools have more confidence in their ability to do well at school and have higher educational aspirations. Analyses presented later in this chapter do not support this explanation. Analyses that included measures of self-concept of ability, and both student and parent aspirations did not further reduce substantially school sector differences in *ENTER* score (see Table 20 and accompanying text). School sector differences actually increased when self-concept of ability was introduced to the analysis.

Another explanation is that the school culture of independent and perhaps Catholic schools is more conducive to learning. The analysis in the next chapter on contextual effects (Table 24) tests a number of aspects of the school environment: the academic environment of the school; the socioeconomic context; the level of student engagement with the school; classroom climate; and satisfaction with school. These measures of the school environment tended to reduce the gap between independent and government school students to 3.4 *ENTER* score points. The academic environment of the school has the largest impact. This result makes sense since the selective government schools that produce many high-performing students tend to have a more academic environment.

Differences in tertiary entrance performance between Catholic and government schools appear to relate more to classroom climate than academic environment (Table 24).

School Sector Differences in Achievement Growth

The correlation between Year 9 achievement and *ENTER* scores is higher within Catholic schools. Among students attending Catholic schools (in Year 12), the correlation between the combined literacy and numeracy achievement measure and *ENTER* score was 0.62, compared to 0.50 and 0.53 for students attending government and independent schools respectively (Table 12). A similar pattern was found for the separate measures of literacy and numeracy.

Table 12 Correlations between Entry Scores and Achievement in Literacy and Numeracy in Year 9 –Government, Catholic and Independent Schools, 1998

Achievement Measure	Government	Catholic	Independent
Literacy and Numeracy (combined)	0.50 (0.02)	0.62 (0.04)	0.53 (0.04)
Literacy	0.40 (0.02)	0.52 (0.04)	0.40 (0.04)
Numeracy	0.44 (0.02)	0.51 (0.04)	0.43 (0.02)

Note: Standard errors in parentheses.

A relatively high correlation may be interpreted either positively or negatively. It may mean that the relative ranking of student performance is much the same for tertiary entrance performance as it was for Year 9 achievement. In other words, there was no relative improvement in the performance of students who were low Year 9 achievers. Conversely, a relatively low correlation may indicate that the school sector has improved the performance of its lower achieving students but not its higher achieving students.

These issues were further investigated by using Year 9 achievement quartiles to identify the achievement levels where the sectoral differences were occurring. The results presented in Table 13 suggest that within Catholic schools the correlation is higher because of the strong tertiary entrance performance of the top quartile of Year 9 achievers. In the independent sector the correlation is lower because of a smaller gap in *ENTER* scores between the bottom two achievement quartiles. As in the Catholic sector, the top quartile of Year 9 achievers in independent schools performed well in Year 12.

These findings suggest that the correlation between Year 9 achievement and tertiary entrance performance in Catholic Schools is higher than in government schools because of the strong performance (in Catholic schools) of students in the top achievement quartile. The correlation is stronger in Catholic schools compared to independent schools because of the stronger tertiary entrance performance of students in the bottom achievement quartile attending independent schools.

Table 13 Mean *ENTER* Scores by Achievement in Literacy and Numeracy in Year 9 and School Sector

Literacy and Numeracy Achievement in Year 9	Government	Catholic	Independent
Lowest Quartile	52.5 (1.2)	56.1 (2.1)	64.1 (2.8)
Second Quartile	60.3 (0.9)	64.4 (1.4)	68.2 (1.6)
Third Quartile	67.1 (0.8)	72.7 (1.1)	74.3 (1.4)
Highest Quartile	76.2 (1.2)	84.8 (0.9)	85.6 (0.9)

Note: Standard errors in parentheses.

These differences are also illustrated by regression analyses of the relationship between Year 9 achievement and *ENTER* scores for each school sector (see Figure 8). As in earlier graphs, cubic regression was used to detect any non-linear aspects of the relationship. Independent schools seemed to markedly improve the performance of students who performed poorly in Year 9. For other students at independent schools, higher levels of Year 9 achievement translate to higher *ENTER* scores at much the same rate as among students at government schools. That is, the increment in *ENTER* scores from attendance at an independent compared to a government school is quite constant for students with average and above average Year 9 achievement levels. The stronger relationship between Year 9 achievement and *ENTER* score among students attending Catholic schools is clearly discernible in Figure 8. The *ENTER* scores of lower achievers in Catholic schools are similar to those of low achievers in the government sector, but the *ENTER* scores of high (Year 9) achievers are similar to those of students attending independent schools.[21]

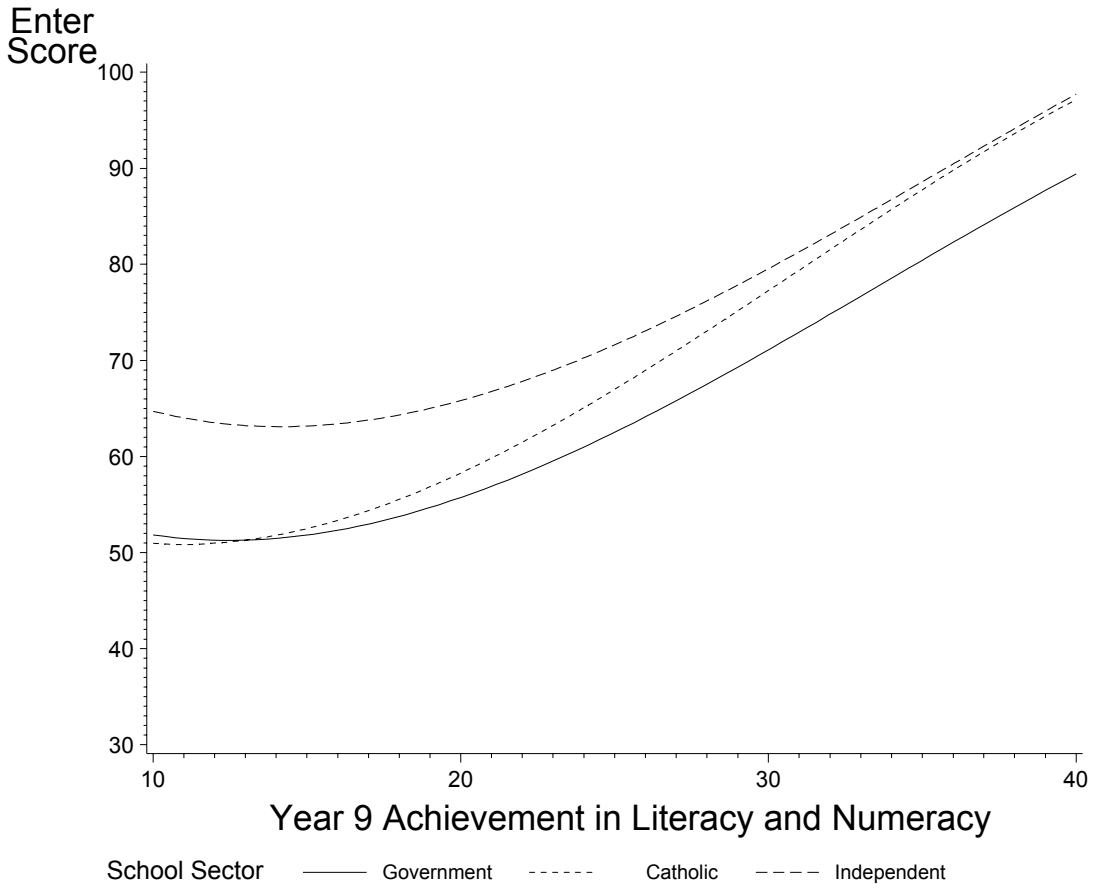

Figure 8 Impact of Year 9 Achievement on *ENTER* Scores by School Sector

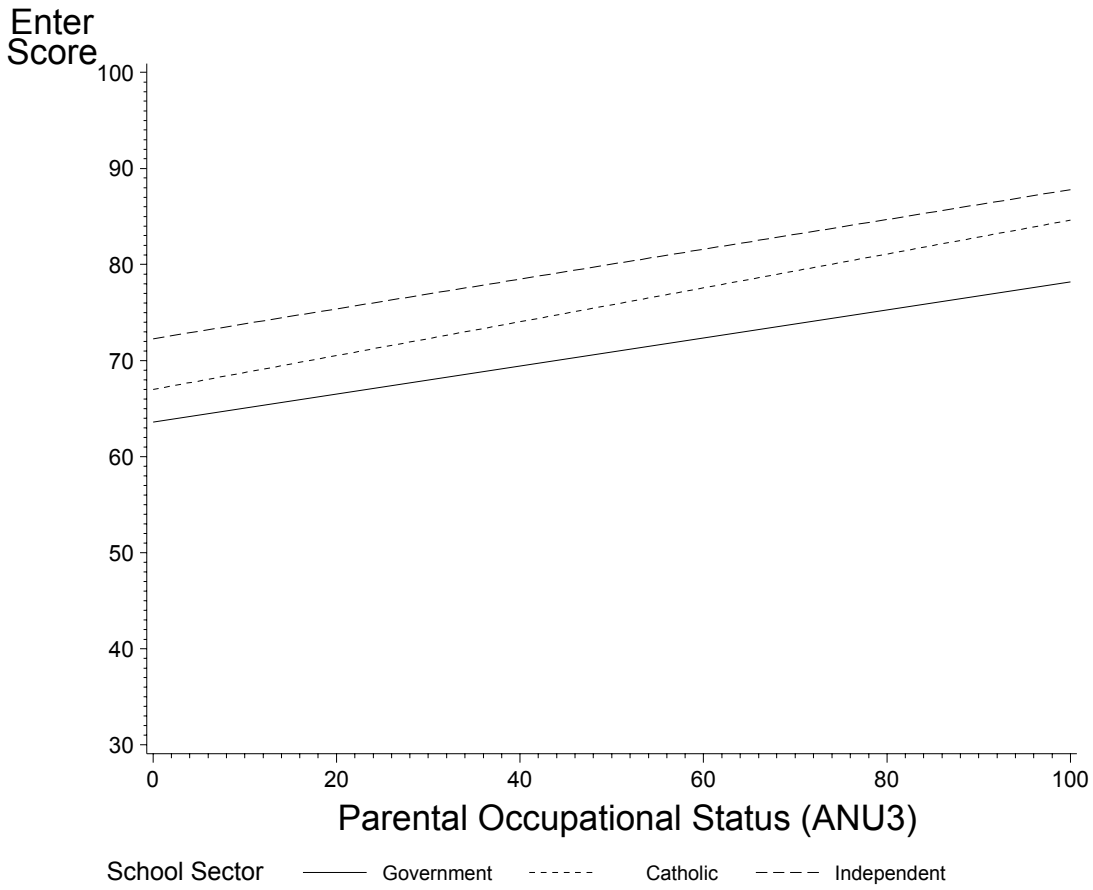

Figure 9 Impact of Parental Occupational Status on *ENTER* Scores by School Sector

School Sector and the Influence of Socioeconomic Background

The influence of socioeconomic background on *ENTER* score may differ between school sectors. A celebrated finding from the American research literature was that the impact of socioeconomic background was weaker in Catholic schools than state high schools (Coleman, Hoffer & Kilgore, 1982). Figure 9 shows the linear regression lines for the relationship between *ENTER* scores on socioeconomic background by school sector.[22] This graph shows that while the relationship between socioeconomic background and achievement is much the same across school sectors, the impact of socioeconomic background is very marginally stronger in the Catholic school system.

Region

The issue of regional differences in schooling outcomes has re-emerged recently. It has been argued that students living in rural and remote areas are disadvantaged, and several reasons have been offered to explain this disadvantage. First, disadvantage may result from distance to major centres. Students living in rural and remote areas may not have the same access as metropolitan students to educational resources and services such as libraries. Second, disadvantage may result from differences in school resources. For example, non-metropolitan schools may have more trouble attracting suitable teachers and other personnel. Third, disadvantage may result from cultural factors, such as if relatively less emphasis is placed on academic performance in rural areas.

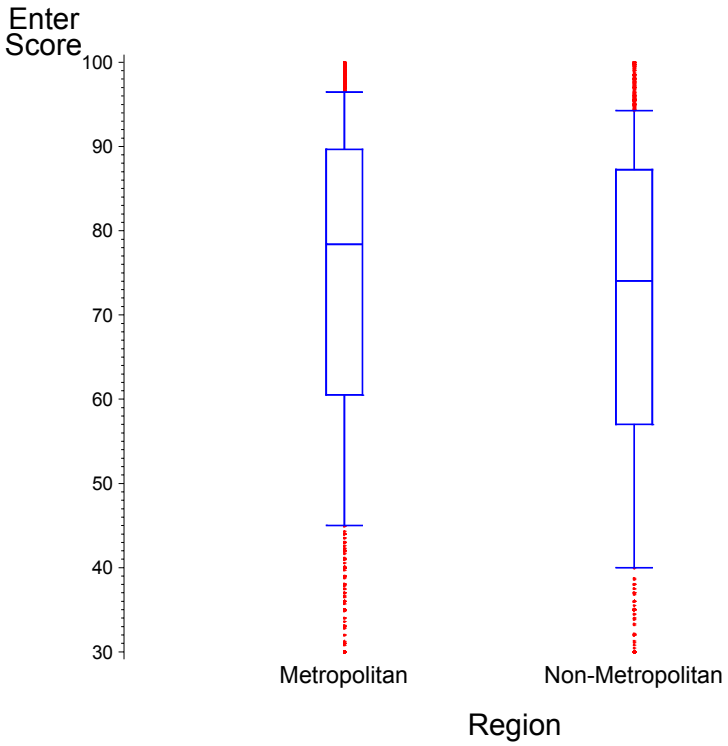

Figure 10 Box and Whisker Plot of Distribution of *ENTER* Scores by Metropolitan/Non-Metropolitan Region

However, past research suggests that there is little evidence that the academic performance of non-metropolitan students is considerably worse than that of their metropolitan counterparts. In an analysis of the academic achievement of Western Australian Year 3, 7 and 10 students, Young (1994) concluded that there is little difference in overall performance. Although statistically significant differences were found in bivariate analyses of school location and performance, these differences disappeared after controlling for the socioeconomic status of the school and other factors. An analysis by ACER of rural/urban differences in Year 9 achievement found only small differences, and that these differences were declining over time (Marks, 1999).

Region and ENTER Scores

The distribution of *ENTER* scores by region is presented in Figure 10. In this report, region is defined by place of residence in Year 9.[23] The median *ENTER* score is lower among students living in non-metropolitan areas, as are the 90th, 75th, 25th and especially the 10th percentiles. However, these differences are not as large as the differences between parental occupational groups or school sectors.

Table 14 shows the mean *ENTER* scores for two measures of region. The first measure, used also in Figure 13, distinguishes between students living in metropolitan and non-metropolitan areas. The second is a quartile measure based on the population density of the census collection district of the students' home address. These measures suggest that although regional differences in *ENTER* scores are in the expected direction — with non-metropolitan students performing less well — the differences are quite small. Overall, students living in non-metropolitan areas score on average 3 to 4 *ENTER* score points lower than students attending school in metropolitan areas. Similarly, the relationship between *ENTER* score and population density (as demonstrated by the means and correlations reported in Table 14) is relatively weak in comparison to other influences. There is no evidence that students living in the remotest areas (as indexed by the least dense quartile) perform substantially worse than students living in other areas.

Table 14 *ENTER* scores by Measures of Region- All Students and by Selected Jurisdictions, 1998

	All	NSW	Vic.	Qld.	SA
Means					
Region					
Non-Metropolitan	68.1 (0.7)	66.6 (1.5)	68.3 (1.2)	65.5 (1.3)	77.4 (1.1)
Metropolitan	71.5 (0.6)	70.6 (1.4)	72.2 (1.0)	64.2 (1.4)	81.3 (1.2)
Population Density Quartiles					
Least Dense Quartile	68.4 (0.9)	65.5 (1.9)	71.5 (1.4)	64.4 (1.8)	77.3 (1.2)
Second Quartile	68.5 (0.9)	68.5 (2.0)	67.9 (1.2)	65.2 (1.9)	78.5 (1.7)
Third Quartile	70.4 (0.8)	71.1 (1.8)	68.4 (1.2)	65.3 (1.9)	80.1 (1.9)
Most Dense Quartile	72.6 (0.9)	70.4 (1.5)	75.1 (1.6)	64.4 (2.7)	82.9 (1.3)
Correlations					
ENTER Score and Population Density	0.07 (0.02)	0.05 (0.03)	0.14 (0.02)	0.02 (0.07)	0.13 (0.04)

Note: Standard errors in parentheses.

Regional differences do vary across state jurisdictions. In Victoria and South Australia, regional differences are stronger than in New South Wales and Queensland. Regional differences are especially weak in Queensland, which may reflect Queensland being more decentralised than the other states.

Region, Socioeconomic Background and Year 9 Achievement

Generally, students living in rural and remote areas come from lower socioeconomic backgrounds. The small regional differences observed in tertiary entrance performance may, to a large extent, simply reflect socioeconomic differences between regions. Conversely, regional differences will remain significant after controlling for the socioeconomic backgrounds of students if rural disadvantage is unrelated to socioeconomic status.

A second explanation for urban-rural differences in tertiary entrance performance is that for a variety of reasons, non-metropolitan students are lower achievers than their metropolitan counterparts, and their tertiary entrance performance is simply a reflection of this. However, if the tertiary entrance performance of students living in non-metropolitan areas was considerably lower than that expected given their Year 9 achievement levels, this would be evidence of rural disadvantage in the final years of secondary school.

These questions were addressed by a series of multivariate regression models (Table 15). Model 1 includes only population density. According to this model, a standard deviation increase in population density is associated with a difference of 1.4 *ENTER* score points. This effect is statistically significant but very small. After controlling for the students' SES, the difference decreases to 1.0 *ENTER* score points (Model 2). Together these results show that (the small) regional differences in tertiary entrance performance can be explained only partially by differences in socioeconomic background.

Similarly, the performance of non-metropolitan students in Year 12 is not simply a reflection of their Year 9 achievement levels. On the contrary, regional differences are larger after controlling for Year 9 achievement. Model 3, which includes Year 9 achievement, shows a slightly larger effect for population density. However, this effect remains small.

Table 15 *ENTER* Scores Regressed on Region, Socioeconomic Background and Year 9 Achievement, 1998

	Model 1	Model 2	Model 3
Intercept	70.0 (0.5)***	71.6 (0.5)***	66.0 (0.4)***
Population Density (Standardised)	1.4 (0.4)**	1.0 (0.4)*	1.7 (0.4)**
SES (Standardised)	–	5.5 (0.4)***	–
Lit. & Num. Achievement in Year 9 (Standardised)	–	–	11.0 (0.4)***
R Square	0.01	0.09	0.23

Note: Standard errors in parentheses; * 0.05>P>0.01; ** 0.01>P>0.001; *** P<0.001

Finally, there may be differences in achievement growth between regions. Since schools in rural and remote areas may not have access to the same material and human resources, students attending these schools may not improve their performance in the last years of schooling as much as students attending metropolitan schools. This hypothesis was tested using various models and different measures of region.[24] It is concluded that although achievement growth is larger among metropolitan students, the differences are small and not statistically significant.

Ethnicity

Ethnicity is a prominent issue on the educational agenda because of its association with social inequality and disadvantage. It is generally believed that students from language backgrounds other than English (LBOTE) experience educational disadvantage. Although over the last two decades all systems have made substantial efforts to cater for students from a diverse range of backgrounds, the curriculum is still delivered in English and, arguably, is at least implicitly biased towards mainstream culture. Furthermore, the parents of students from some ethnic backgrounds may find it more difficult to assist their children's schooling than other parents.

However, recent empirical evidence does not support the contention that all students with language backgrounds other than English (LBOTE) perform less well than other students (see Marks & McMillan, 2000; Ainley et al., 2000). It needs to be acknowledged that the educational outcomes of LBOTE students are quite diverse. For example, an analysis of the LSAY data revealed that achievement in literacy and numeracy in Year 9 varies widely among LBOTE students. When ethnic background was measured by nine categories relating to father's country of birth, some ethnic groups showed higher Year 9 achievement levels than those students with fathers born in Australia, while students from some LBOTE groups showed lower Year 9 achievement levels (Marks & McMillan, 2000).

Ethnicity and ENTER Scores

The distribution of *ENTER* scores by ethnic group is presented in Figure 11. The median *ENTER* score is higher among LBOTE students than for students whose fathers were born in Australia or another English-speaking country. The 90th, 75th, 25th and especially the 10th percentiles are also all higher among LBOTE students. Consistent with previous research, these results indicate that as a group, LBOTE students perform better than other students.

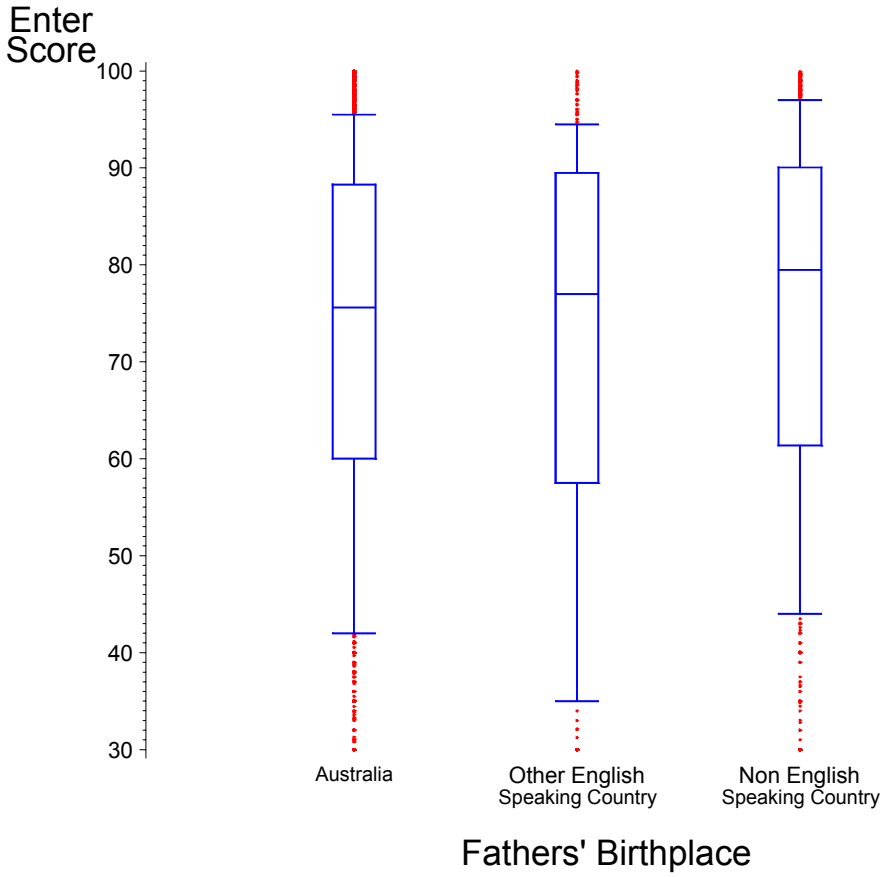

Figure 11 Box and Whisker Plot of Distribution of *ENTER* Scores by Father's Country of Birth

However, it may be the case that particular ethnic groups do not perform as well as students with English language backgrounds. Mean *ENTER* scores and the associated standard errors for the ten ethnic groupings are presented in Table 16. Students classified as 'Asian' perform substantially better than students whose fathers were born in Australia. On the other hand, students with Southern European and Pacific Islander ancestries show substantially lower mean *ENTER* scores.[25] The mean scores of the five other groups of students do not differ substantially from the mean scores of the group of students with Australian-born fathers.

Across the States the pattern was similar. Students from Asian backgrounds perform better than students whose fathers were born in Australia, although the difference was less pronounced in South Australia. The lower mean performance of Southern European students occurred in the three largest jurisdictions. However, the estimate for Queensland was associated with a large standard error. There were too few respondents in the other ethnic groups to report a breakdown by State.

Table 16 Mean *ENTER* scores by Parents' Country of Birth - All Students and by Selected Jurisdictions, 1998

Parents' Country of Birth	All	NSW	Vic.	Qld.	SA
Australia	69.9 (0.6)	67.5 (1.3)	71.8 (0.9)	65.3 (1.4)	80.4 (1.1)
English Speaking	68.8 (1.1)	68.4 (1.9)	69.3 (2.4)	62.2 (2.3)	74.3 (2.9)
Non-English Speaking (total)	71.5 (1.1)	70.9 (2.0)	70.3 (1.5)	66.0 (3.0)	79.8 (1.4)
Southern Europe	65.7 (1.5)	63.6 (3.2)	64.7 (1.6)	54.8 (6.5)	81.2 (3.7)
Other Europe	72.3 (2.0)	70.6 (4.0)	72.0 (3.5)	68.8 (4.7)	79.3 (2.8)
Asia	78.9 (1.5)	77.9 (2.6)	79.3 (2.6)	73.0 (4.8)	82.9 (2.5)
Middle East & North Africa	67.2 (1.8)	69.6 (2.4)	62.0 (3.0)	§	§
Other Africa	69.2 (6.0)	§	§	§	§
Central and South America	68.4 (5.4)	§	§	§	§
Pacific Islands	65.4 (4.3)	§	§	§	§

Note: Standard errors in parentheses; § Number of cases less than 30.

Ethnicity, Socioeconomic Background and Year 9 Achievement

It was important to investigate whether ethnic differences in tertiary entrance performance can be attributed to socioeconomic background or earlier school achievement. The results of these analyses are presented in Table 17. The column labelled 'Model 1' presents the estimates from a regression model based on the detailed ethnicity measure.[26] The category comprising students with fathers born in Australia is the reference group. Statistically significant differences (between the group mean and the mean for the reference category) were found for only two groups. The 'Southern Europe' group tended to receive lower *ENTER* scores and the 'Asia' group tended to receive higher *ENTER* scores than students with Australian-born fathers. Due to the small sample size of the Pacific Islander group, their mean *ENTER* score is not significantly different from the comparison group.

The addition of Year 9 achievement produces several noteworthy changes (Model 2). First, the lower *ENTER* scores of the Southern European group do not remain statistically significant after controlling for Year 9 achievement. This suggests that differences in the *ENTER* scores between students classified as 'Southern Europe' and students with Australian-born fathers reflect differences in achievement in Year 9. Second, the tertiary entrance performance of students with Middle Eastern ancestries is considerably better than expected given their Year 9 achievement scores. This suggests that this group experienced high levels of achievement growth during the final years of secondary school. Third, the difference in mean *ENTER* score for Asian students compared to students with Australian-born fathers also increased with the addition of the Year 9 achievement measure to the model. That is, Year 9 achievement cannot explain the high performance of Asian students in Year 12. Their tertiary entrance performance is well above what was expected given their Year 9 achievement scores.

Model 3 examines the contribution that socioeconomic background makes to ethnic group differences in tertiary entrance performance. Differences in *ENTER* scores between the Southern European and reference groups did not remain statistically significant after controlling for SES. This result suggests that the lower level of tertiary entrance performance by the South European group can be attributed to the lower average socioeconomic background of this group. For the 'Asia' group, socioeconomic differences only very partially explain their higher performance. The inclusion of SES marginally reduced the difference in mean *ENTER* score between this group and the Australian-born group.

Table 17 *ENTER* Scores Regressed on Ethnic Background, Year 9 Achievement and Socioeconomic Status, 1998

	Model 1	Model 2	Model 3	Model 4
Intercept	70.0 (0.6)***	64.7 (0.5)***	71.2 (0.5)***	66.3 (0.6)***
Fathers' country of birth				
Australia	-	-	-	-
English Speaking Country	-0.3 (1.0)	-0.6 (0.9)	-2.0 (1.2)	-1.7 (1.1)
Southern Europe	-4.2 (1.6)**	1.5 (1.2)	-0.2 (2.8)	3.2 (1.5)*
Other Europe	1.7 (1.8)	2.3 (1.4)	1.7 (2.4)	2.0 (1.7)
Asia	8.9 (1.4)***	11.6 (1.1)***	7.5 (1.4)***	9.1 (1.3)***
Middle East & North Africa	-3.0 (1.8)	6.3 (1.5)***	2.1 (1.9)	8.8 (2.0)***
Other Africa	0.3 (4.9)	-0.6 (4.7)	1.3 (8.3)	0.1 (7.5)
Central and South America	-5.1 (4.7)	1.0 (3.9)	-0.1 (5.9)	3.8 (4.6)
Pacific Islands	-5.5 (4.8)	5.2 (4.4)	-3.8 (6.2)	6.4 (5.8)
Year 9 Achievement	-	11.5 (0.4)***	-	10.4 (0.4)***
SES (Standardized)	-	-	5.7 (0.4)***	3.8 (0.4)***
R Square	0.02	0.25	0.10	0.27

Note: Standard errors in parentheses; * 0.05>P>0.01; ** 0.01>P>0.001; *** P<0.001

Model 4 includes both Year 9 achievement and SES. This model suggests that students with Middle Eastern and North African ancestries performed considerably better than expected given their socioeconomic background and Year 9 achievement scores. Similarly, the tertiary entrance performance of the 'Asia' group cannot be attributed to socioeconomic background or prior school achievement.

Indigenous Status

In this section we report on the tertiary entrance performance of Year 12 students from Australia's Indigenous population, Aboriginal and Torres Strait Islanders.

In 1995, the *National Review of the Aboriginal Education Policy* stated that Indigenous peoples were the most educationally disadvantaged group in Australia. This continues to be the case. A summary of statistics on educational outcomes for Indigenous students in the *National Report on Schooling in Australia 1997* (MCEETYA, 1997) noted that, while there had been some improvement in educational outcomes for Indigenous students, there was still a significant gap between the achievement of Indigenous students and non-indigenous students. In the *National School English Literacy Survey* (NSELS), a special Indigenous sample, drawn mainly from schools in rural and remote areas, had substantially lower levels of English literacy achievement than other students (Masters & Forster, 1997).

Aboriginal and Torres Strait islander students in this sample performed considerably worse in the Year 9 tests in literacy and numeracy than did non-indigenous students. The mean reading achievement score for Indigenous students was 37 compared to 64 for non-indigenous students. The respective figures for numeracy were 44 and 66 (Marks & Ainley, 1997:9,16). These differences are large. However, it could be expected that Indigenous/non-indigenous differences in *ENTER* scores will be smaller because only those Aboriginal and Torres Strait students intending to undertake tertiary study will obtain an *ENTER* score.

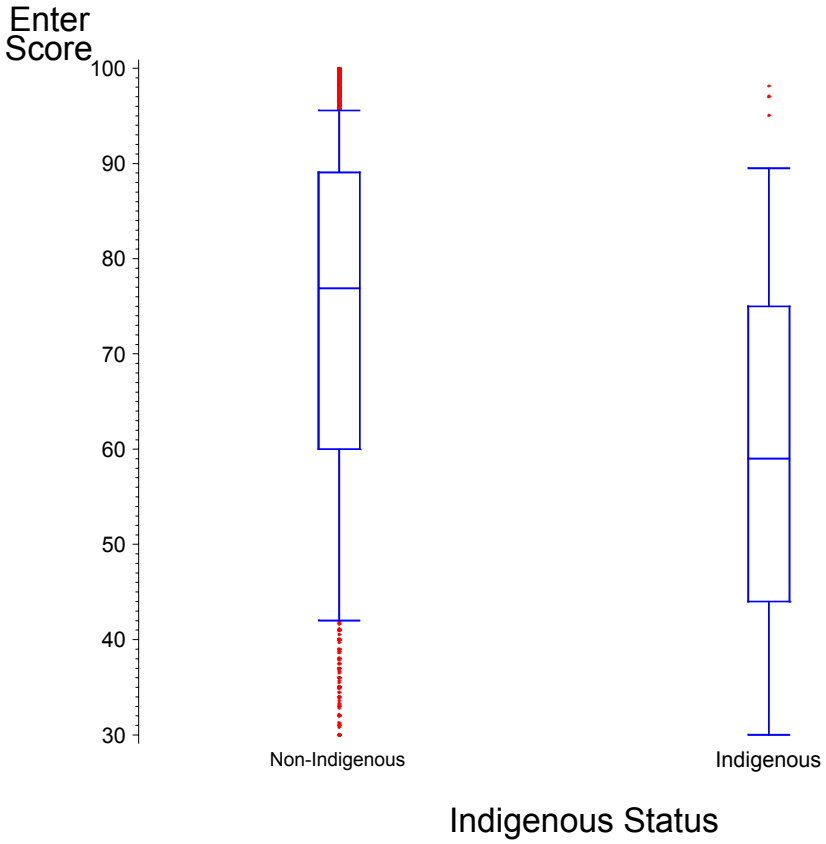

Figure 12 Box and Whisker Plot of Distribution of *ENTER* Scores by Indigenous Status, 1998

Of the 385 Aboriginal and Torres Strait Islander students in the original Year 9 sample, only 45 (or about 12 per cent) obtained useable *ENTER* scores. This compares with between 60 to 70 per cent of the original sample of non-indigenous students obtaining *ENTER* scores.

With weighting, the sample of Indigenous students increases marginally to 48. According to sampling theory this group is representative of Aboriginal and Torres Strait Islander students who were in Year 9 in 1995 and obtained a tertiary entrance score in 1998. Therefore, the estimates obtained will be the best estimates of the respective population parameters. However, the precision of the estimates is undermined by the small sample size producing large standard errors. Therefore the results presented in this section are suggestive rather than conclusive.

Indigenous Status and ENTER Scores

The distribution of *ENTER* scores for Indigenous and non-indigenous students is presented in Figure 12. The median *ENTER* score for Indigenous students is substantially lower than that for non-indigenous students. Similarly, the 90th, 75th, 25th and especially the 10th percentiles are considerably lower among Indigenous students than non-indigenous students.

Table 18 presents the mean *ENTER* scores for Indigenous and non-indigenous students for all students and for New South Wales and Queensland students. (The number of Indigenous students in other states is too small to report). Students who identified themselves as Aboriginal or Torres Strait Islander (in Year 9) displayed substantially lower mean *ENTER* scores than other students. The mean *ENTER* score of Indigenous students was lower in Queensland than in New South Wales, but this result should be treated with caution, as the estimates are associated with large standard errors.

Table 18 Mean *ENTER* scores by Indigenous Status - All Students and by Selected Jurisdictions, 1998

Indigenous Status	All	NSW	Qld.
Indigenous	59.0 (3.5)	63.5 (8.4)	54.6 (5.0)
Non-Indigenous	70.5 (0.5)	69.3 (1.1)	65.3 (1.2)

Note: Standard errors in parentheses.

Indigenous Status, Year 9 Achievement and Socioeconomic Background

Can differences in tertiary entrance performance between Indigenous and non-indigenous students be explained by differences in Year 9 achievement and socioeconomic background? Year 9 achievement does to some extent explain differences in *ENTER* scores between Indigenous and non-indigenous students (Table 19). With the addition of the achievement measure (Model 2), the difference in mean *ENTER* score between Indigenous and non-indigenous students declines from 11.6 to 7.0 *ENTER* score points. In contrast, controlling for SES only (Model 3) marginally reduces the difference (from 11.6 to 11.1).

Table 19 *ENTER* Scores Regressed on Indigenous Status, Year 9 Achievement and Socioeconomic Background, 1998

	Model 1	Model 2	Model 3	Model 4
Intercept	70.5 (0.5)***	66.3 (0.5)***	70.5 (0.5)***	67.7 (0.5)***
Indigenous status	-11.6 (3.3)***	-7.0 (2.6)**	-11.1 (3.6)**	-7.8 (3.0)**
Year 9 Achievement	-	11.2 (0.4)***		9.9 (0.5)***
Socioeconomic Background	-		5.6 (0.4)***	3.6 (0.4)***
R Square	0.02	0.22	0.09	0.25

Note: Standard errors in parentheses; * 0.05>P>0.01; ** 0.01>P>0.001; *** P<0.001

Therefore, the weaker tertiary entrance of Indigenous students cannot be attributed to socioeconomic differences. The difference in performance between Indigenous and non-indigenous students can only be partially explained by differences in Year 9 achievement. The tertiary entrance performance of Indigenous students is less than expected given their Year 9 achievement levels.

Psychological Factors

Psychological factors are associated with educational performance. Students who have more positive attitudes about school, school work and their own abilities tend to perform better than other students. There are three general explanations for the association between school performance and psychological factors.

The first is that much of the association between psychological factors and performance is due to psychological factors themselves, independent of other factors such as students' socioeconomic backgrounds (see left panel of Figure 13). In this case, the impact of psychological factors on an educational outcome will not change substantially with the addition of socioeconomic factors to the analysis.

A second explanation is that the association between psychological factors and school performance is simply a reflection of sociological factors. For example, students with a more positive self-concept of their ability may perform better because they have higher socioeconomic backgrounds (see middle panel of Figure 13). In this case, the impact of the psychological factors becomes negligible with the addition of socioeconomic factors.

A third explanation is that psychological factors mediate the effects of other influences such as socioeconomic background. For example, the superior performance of students from higher compared to lower socioeconomic groups may, at least in part, be due to greater confidence in their own ability or higher educational aspirations (see right panel of Figure 13). In this case, the impact of socioeconomic background will be substantially reduced with the addition of psychological factors.

A recent analysis of participation in Year 12 and higher education based upon the LSAY data provided support for the first hypothesis that psychological factors exert an influence over and beyond that of demographic and socioeconomic factors, although there are instances where psychological factors partially mediate the influence of demographic and socioeconomic factors (see Marks, Fleming, Long & McMillan, 2000).

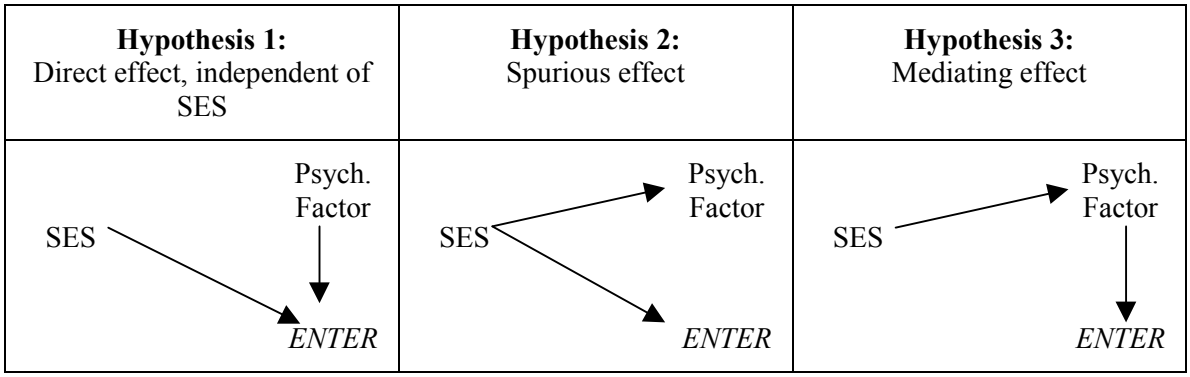

Figure 13 Illustration of the Three General Explanations for the Relationship between Psychological Factors and *ENTER* Score

In this section we examine the role of selected psychological factors on tertiary entrance performance. The data from which the psychological measures were constructed were collected in Years 9 and 10. We present the results for three measures: self-concept of ability; parents' educational aspirations for the student (as reported by the student); and the student's educational aspirations. The analysis was based upon a core model, with the psychological measures added in various combinations.

The core model (Model 1) comprises all the factors discussed in the previous sections: Year 9 achievement in literacy and numeracy; socioeconomic background (a composite measure of parental occupation, education and wealth); gender; school sector; region; and ethnic group. The core model builds on the previous analyses. As expected, the estimates from the core model in Table 20 are very close to the estimates from the previous analyses. The core model comprising demographic, socioeconomic and educational factors explains about 30 per cent of the variance in *ENTER* scores.

Table 20 Core Model and Extended Psychological Regression Models, 1998

Description	Model 1 Core Model	Model 2 Core+ Self-Concept of Ability	Model 3 Core+ Parental Aspirations	Model 4 Core+ Student Aspirations	Model 5 Core+ Self-Concept & Student Aspirations
Intercept	66.8 (0.8)***	65.7 (0.8)***	66.1 (0.8)***	64.3 (0.9)***	64.0 (0.9)***
Year 9 achievement (Std.)	10.5 (0.4)***	9.0 (0.4)***	10.4 (0.4)***	10.2 (0.4)***	8.9 (0.4)***
SES (Std.)	3.0 (0.4)***	2.9 (0.4)***	3.0 (0.4)***	3.0 (0.4)***	2.9 (0.4)***
Gender					
Female	-	-	-	-	-
Male	-4.5 (0.7)***	-5.0 (0.7)***	-4.5 (0.7)***	-4.1 (0.7)***	-4.6 (0.7)***
School sector					
Government	-	-	-	-	-
Independent	5.9 (1.0)***	6.9 (1.0)***	5.8 (1.0)***	5.7 (1.0)***	6.8 (1.0)***
Catholic	4.4 (1.0)***	4.8 (0.9)***	4.3 (1.0)***	4.2 (1.0)***	4.6 (1.0)***
Region					
Metropolitan	-	-	-	-	-
Non-Metropolitan	-1.6 (0.8)*	-1.2 (0.8)	-1.7 (0.8)*	-1.5 (0.8)	-1.2 (0.8)
Fathers' country of birth					
Australia	-	-	-	-	-
English Speaking Country	-1.8 (1.0)*	-1.8 (1.0)*	-1.8 (1.0)*	-2.1 (1.0)*	-2.0 (1.0)*
Southern Europe	1.8 (1.5)	1.2 (1.5)	1.3 (1.5)	1.3 (1.5)	1.0 (1.5)
Other Europe	1.4 (1.7)	0.7 (1.6)	1.3 (1.6)	1.3 (1.6)	0.7 (1.6)
Asia	8.5 (1.2)***	8.3 (1.3)***	7.9 (1.2)***	7.9 (1.3)***	7.9 (1.3)***
Middle East & Nth Africa	7.7 (2.2)***	6.0 (2.0)***	7.1 (2.3)***	7.5 (2.3)***	5.9 (2.1)***
Other Africa	-0.9 (7.0)	1.4 (6.5)	-1.2 (6.8)	-0.4 (6.6)	1.7 (6.2)
Central and South America	-1.1 (4.3)	1.6 (4.8)	0.6 (4.3)	-0.2 (4.3)	0.7 (4.8)
Pacific Islands	7.0 (6.5)	5.0 (5.8)	6.1 (6.5)	6.2 (6.6)	4.5 (5.9)
Psychological Factors					
Self-Concept of Ability		4.6 (0.4)***	-	-	4.4 (0.4)***
Parents' Aspirations			2.3 (0.7)**	-	-
Student's Aspirations				4.0 (0.7)***	2.7 (0.7)***
R Square	0.30	0.35	0.31	0.31	0.36

Note: Standard errors in parentheses; * 0.05>P>0.01; ** 0.01>P>0.001; *** P<0.001 Std=Standardized

Model 2: Self-Concept of Ability

Self-concept of ability is measured by asking students in Year 9 how well they think they are doing at school compared to others in their level at their school. Self-concept of ability in Year 9 has an impact on *ENTER* score in addition to that of the factors in the base model. A one standard deviation increase in self-concept of ability is associated with an increase of nearly 5 *ENTER* score points (Table 20). This effect is net of Year 9 achievement (which, arguably, is to a substantial extent a measure of actual ability), socioeconomic background, school sector and

other factors in the model. The addition of this measure raises the variance explained by 6 percentage points to 35 per cent. An earlier LSAY report demonstrated that self-concept of ability also influenced participation in Year 12, net of the effects of demographic, socioeconomic and educational factors (Marks et al., 2000).

The estimates for demographic and socioeconomic factors reported in Model 1 vary little with the addition of self-concept of ability in Model 2. This suggests that differences in self-concept of ability do not account for the differences in performance according to gender, socioeconomic background, or ethnic group.[27] The estimates for the educational factors do change with the addition of the self-concept of ability measure. The effect of Year 9 achievement is reduced because there is a positive correlation between achievement and the subjective assessment of ability. In contrast, the difference between the independent and government schools increases with the addition of the self-concept of ability measure. This result can be interpreted as students at independent schools have relatively lower self-concepts of ability (for equivalent *ENTER* scores) than students at government schools. This result is not unexpected given that there are a higher proportion of more academically inclined students attending independent schools.

Model 3: Parental Aspirations

Model 3 comprises the core model and parental aspirations. For this analysis, the measure of parental aspirations is based upon students' perceptions of their parents' aspirations. It is a dichotomous measure; contrasting parents who wanted the student to undertake study full-time after completing school and parents who did not. Parents' expectations for full-time study were associated with an average increase of 2.3 *ENTER* score points, independent of the influence of other factors. Higher parental expectations (or aspirations) were not associated with gender, socioeconomic background or school sector. There is some indication that ethnic differences in tertiary entrance performance are in a small way associated with higher parental expectations. The coefficients for the 'Asia', and 'Middle Eastern' groups are lower with the addition of the parental aspiration measure. However, the effects (in model 3 compared to model 1) are only marginally smaller.

Model 4: Students' Aspirations

Model 4 comprises the core model plus students' aspirations. Students were asked in Year 9 what they planned to do in the year after leaving school. Those students who indicated they planned to undertake full-time study were contrasted with other students. Students' aspirations in Model 4 had a stronger effect than parental aspirations in Model 3. Students who planned to study full-time after leaving school obtained *ENTER* scores about four *ENTER* score points higher than other students, net of the effects of the other factors in the model. Like self-concept of ability, students' aspirations have an additional impact on tertiary entrance performance.

The addition of students' aspirations did not change the estimates for the other factors in the model substantially. This suggests that students' aspirations do not mediate the effects of socioeconomic background, school sector or ethnicity. There is some evidence that the gender difference in *ENTER* scores is partially associated with the higher educational aspirations of females compared to males. However, the contribution of aspirations to the gender gap in tertiary entrance performance is small.

Model 5: Self concept of ability and students' aspirations

Model 5 comprises the core model, self-concept of ability and students' aspirations.[28] As was the case when only self-concept was added, the variance explained increases substantially to 36 per cent. The effect of self-concept of ability marginally declines but the effect of students' aspirations is substantially smaller. This suggests that self-concept of ability is a stronger psychological influence than students' aspirations. The coefficients for the other statistically significant variables in the model are very similar to those when only self-concept of ability was added to the core model (Model 2 compared with Model 5).

These analyses show that psychological factors influence tertiary entrance performance over and above the influence of demographic, socioeconomic and educational factors in accordance with the first explanation. Self-concept of ability has a stronger influence than students' aspirations, which in turn have a stronger influence than the expectations of parents. These psychological factors only partially, if at all, mediate the effects of demographic, socioeconomic and educational factors.

4. THE ROLE OF INDIVIDUAL SCHOOLS

In this chapter we focus on the role of individual schools on students' tertiary entrance performance and achievement growth. This approach has direct policy relevance since it aims at isolating those factors that make schools more effective in terms of student learning. Such factors may be school resources, school organisation, school culture or milieu, and teaching practices.

Early literature on school effects concluded that schools had little effect on student outcomes (Coleman, 1969; Jencks et al., 1972). Coleman et al. (1982:xxvi) claimed that variations in schools were considerably less important than social background. They note that schools account for between 10 and 25 per cent of the variation in achievement compared to 20 per cent or more due to family background.[29] To policy-makers at the time this was a disappointing finding since schools were (and often still are) viewed as important mediators of education and indeed social inequalities. In contrast to socioeconomic background and most other sources of inequality, school inequalities can be addressed more directly by government initiatives.

From the mid-1970s there has been a resurgence in research on the role of individual schools in student outcomes. This area of research has had a further impetus from the mid-1980s with the application of multi-level models that enable separation of school-level effects from individual-level effects, and allow the estimation of effects within schools even when the sample sizes are too small for standard multivariate analyses. In contrast to the work of Coleman and Jencks, more recent school effectiveness research concludes that schools can and often do have substantial effects on students' academic performance (Goldstein, 1996).

Key Concepts

Before discussing the literature it is worth clarifying the concepts used in school effects research. The between-school variance is the average performance of the students within a school compared to the average for all students in all schools. An individual school effect is this difference for students in that school. A positive effect means that the school is associated with higher performance of its students and a negative effect means that the school is associated with lower performance. The variation of school effects may be large indicating that there are large differences between schools in student performance. Conversely, if the between-school variation in student performance is small then there is little difference between schools in the average level of student performance.

When there are no individual-level predictor variables involved, such as student background or prior achievement, these school effects are 'gross' effects. In the presence of predictor variables these effects are 'net' effects. Almost invariably, net school effects are smaller than gross effects.

The between-school variance is often compared to the total variance of student performance, that is, the variation of individual students' performance around the average student performance. The intra-class correlation is the quotient of these two variances, that is, the proportion of between-school variance of the total variance.

In a meta-analysis of school effects reported for a large number of studies in several countries, Scheerens and Bosker (1997:77) found that although the intra-class correlations ranged considerably, the average between-school variation was around 19 per cent of the total variation in achievement. The between-school variance was greater for secondary schools compared to primary schools, and higher in composite measures (such as *ENTER* score) compared to measures of performance in a single subject. After adjusting for initial differences, such as prior school performance and social background, the (average) between-school variance declined to 8 per cent. These net differences were again greater for composite measures.

Generally, there is a reasonably high degree of consistency in the magnitude of school effects. That is, the patterns of schools that show positive and negative school effects are consistent over time. Several studies report year-to-year correlations for unadjusted school effects of around 0.60. The correlations are higher for adjacent years (Scheerens & Bosker 1997:83-95). However, there is substantially less consistency in school effects across subjects and grades. These findings and other evidence led Scheerens and Bosker (1997:96) to conclude that teacher effects are greater than school effects.

The 'gross school effects' model is equivalent to the intra-class correlation; the between-school variation in student performance as a proportion of the total variation. In this model there are no predictor variables and the estimate of the between-school variance is at a maximum. In contrast, 'net' effects can be obtained from a variety of model specifications. Hill and Rowe (1996) and Scheerens and Bosker (1997:54) distinguish three types of 'net effects' models. The first, the 'unpredicted' gain model, controls for individual-level social background factors. The 'learning gain' controls for prior achievement and the third, 'net progress', controls for both background factors and prior achievement. The proportion of variation attributed to schools declines in each case, particularly in the 'learning gain' and 'net progress' models. Hill and Rowe (1996) point out that the 'learning gain' and 'net gain' models may underestimate school effects, since they are confounded with prior achievement. This is because schools also influence prior achievement.

A related area focuses on the contextual influences of the student body rather than school organisation. The argument here is that individual students are influenced by the social and academic context of the school. For example, students from disadvantaged backgrounds may perform better in schools where the students have more privileged backgrounds. In contrast, students from high socioeconomic backgrounds may perform worse in schools whose students are largely from disadvantaged backgrounds. In the United States, several studies have found that the socioeconomic status of the student body has an independent effect on achievement beyond individual socioeconomic status (Lee & Bryk, 1989; Bryk & Raudenbush, 1989). Similarly, the academic context of schools may raise or lower the performance of individual students.

The ultimate aim of research into the role of individual schools in educational outcomes is to discover what factors make for more effective schools, that is, they substantially reduce the between-school variance. After reviewing the international literature, Kreft (1993) concludes that more effective schools have: a higher level of parental involvement with the school; higher levels of expectations among students; frequent monitoring of student performance; greater involvement by parents and teachers; an orderly school atmosphere; and strict discipline. In a review of the US research on unusually effective schools, Levine (1992) identified a large number of correlates including mastery of central learning skills, students having a sense of efficacy, school resources and support for teachers. A more recent review of the literature concluded that research on effective schools identifies five factors: 1. strong educational leadership; 2. emphasis on acquiring basic skills; 3. an orderly and secure environment; 4. high expectations of pupil attainment; and 5. frequent assessment of pupil progress (Scheerens & Bosker, 1997:146). However, after performing meta-anlayses on factors often understood as important to school effectiveness, the same authors (1997:237-238) conclude that the most powerful factors operate at the classroom level, such as corrective feedback and reinforcement.

The foregoing paragraph may suggest that there is a high degree of consensus on what factors contribute to more effective schools but, at the level of specific rather than general factors, there is little consensus. It is difficult to conclude which particular factors (and therefore policy initiatives) make for effective schools. There is a wide range of factors canvassed as important influences and many are inter-correlated. Different factors appear to be important depending on the particular context and the outcome being investigated. Conclusions are further undermined by important differences between studies in the ways factors were measured and estimates derived.

Between and Within School Variance

A first step in the examination of the effect of individual schools on student tertiary entrance performance is the analysis of the between-school variation. It should be noted that these analyses are confined to those students who did not change schools between Year 9 and Year 12.

About 22 per cent of the total variance in *ENTER* scores is attributed to differences between schools (see Table 21). This means that there is some clustering of *ENTER* scores within schools. However, there is considerably more variation of *ENTER* scores (78 per cent) between students within schools.[30] This percentage of variance (or intra-class correlation) is only slightly higher than the international average reported by Scheerens and Bosker (1997:77). However, they report that the between-school variance is higher for composite scores and higher in secondary schools. Therefore, the 22 per cent between-school variance observed here, is likely to be slightly lower than that for comparable outcomes in other countries.

It is worth noting that the between-school variance of achievement scores in literacy and numeracy when these students were in Year 9 is also about 22 per cent.

The figure of 22 per cent for the between-school variance can be understood as the maximum possible amount of between-school variation. The next step is to investigate how much of this variation can be attributed to other factors. Following Hill and Rowe (1996) we distinguish three 'net gain' models. The first comprises Year 9 achievement and SES. The second model adds school sector based on the findings from our analyses of school sector reported in the preceding chapter. The final net gain model comprises all variables in the core model (Table 20). The purpose of these analyses is to quantify how much of the between-school variation in *ENTER* scores remains after controlling for individual-level influences.

The results of these analyses are presented in Table 21. A small proportion of the between-school variation can be attributed to SES differences between students. The between-school variation declines from 22 to 18 per cent (Unpredicted Gain in Table 21). Slightly more between-school variation is accounted for by student-level differences in Year 9 achievement (Learning Gain). Together SES and achievement reduced the percentage of between-school variance to around 15 per cent (Net Gain 1). In other words, over a third of the between-school variation in *ENTER* scores is attributable to differences in the socioeconomic and academic mix of the students across schools. The addition of school sector to the analysis further reduces the between-school variance to around 13 per cent (Net Gain 2).

Overall, about half the between-school variation can be accounted for by the influences included in the core model. The between-school variation declines from 22 per cent in the gross effects model to around 11 per cent (Net Gain 3). Therefore, about 11 per cent of the variation in *ENTER* scores between students can be attributed to differences between-schools other than those captured by the measures in the core model. This figure compares to the international average of 8 per cent reported by Scheerens and Bosker (1997:77).

Table 21 The Relationship between Schools and *ENTER* Scores: Between-school Variance and Percentage of Schools with Significant School Effects

Model	Controls	Percent Between-school Variance	Percentage of Schools with Significant Effects on *ENTER* Score
Gross Effects	No Controls	22	34
Unpredicted Gain	Socioeconomic Background	18	21
Learning Gain	Achievement	17	29
Net Gain (1)	Socioeconomic background and Achievement	15	17
Net Gain (2)	Socioeconomic background, Achievement and School Sector	13	13
Net Gain (3)	Core Model (Socioeconomic background, Achievement , School Sector, Rurality, Ethnicity)	11	9

The final column of Table 21 reports the percentage of schools that show statistically significant effects on *ENTER* scores under the various models. In the gross effects model, which includes no predictor variables, 34 per cent of the 221 schools show significant effects on tertiary entrance performance. In other words, in about two-thirds of schools, the school makes no significant difference to its students' *ENTER* scores.[31]

Controlling for SES, the percentage of schools with significant effects on *ENTER* score declines to 21 per cent (Unpredicted Gain in Table 21). Therefore, in 79 per cent of schools there are either no differences in the average tertiary entrance performance of students or the differences can be attributed to differences in the socioeconomic mix of the students. In the remaining 21 per cent of schools, schools do make a contribution to tertiary entrance performance, over and above differences in the socioeconomic mix of students.

With the inclusion of Year 9 achievement the decline is less substantial, with 29 per cent of schools showing significant school effects (Learning Gain). The interpretation of this result corresponds to that for the 'Unpredicted Gain' model. In approximately 30 per cent of schools, schools make a difference to tertiary entrance performance, net of differences across schools in the academic mix of students. In 70 per cent of schools, the individual school does not contribute significantly to tertiary entrance performance beyond school differences in the academic mix of students.

With the 'Net Gain' model a further decline was observed. Together SES and achievement account for almost half of the significant between-school differences. The percentage of schools with significant effects declined to 17 per cent. Therefore, less than 20 per cent of schools make a difference to student performance net of differences in the socioeconomic background and the Year 9 achievement levels of their students.[32]

Inclusion of school sector reduces the percentage even further. Therefore, only 13 per cent of schools have a significant impact (either positive or negative) on the performance of their students, after taking into account differences in the socioeconomic and academic mix of students.

Learning Gain -Year 9 Achievement and School Effects

In this section we focus on the learning gain model in order to examine the effects of schools on tertiary entrance performance given the achievement levels of their students in Year 9. It is an important focus since schools may differentially improve student performance. In some schools the improvement in student performance over a period of time may be much greater than in other schools. Such schools can be understood as more 'effective' schools because they improve student learning more substantially.

There are two ways in which schools can promote tertiary entrance performance relative to Year 9 achievement in literacy and numeracy. Schools can lift the performance of all their students regardless of their prior achievement levels. This situation is illustrated in Figure 14 where students' tertiary entrance performance is higher in School B compared to School A regardless of Year 9 achievement levels. A second possibility is that the effect of prior achievement on tertiary entrance performance differs between schools. This possibility is illustrated in Figure 15 where students' learning gain is greater in School C than in School A as student achievement level increases. School C is especially beneficial for high achievers but of much less benefit for students with low literacy and numeracy scores. The relationship between prior achievement and tertiary entrance performance is greater in School C.

These two scenarios are both examples of school effects. However, the nature of the school effect is quite different. One type of school effect is manifested by differences in the intercepts and the other indicates differences in the slopes. On average, school B would show a higher mean *ENTER* score. There is no difference between schools B and C in the tertiary entrance performance of high achieving students, but this was achieved in different ways.

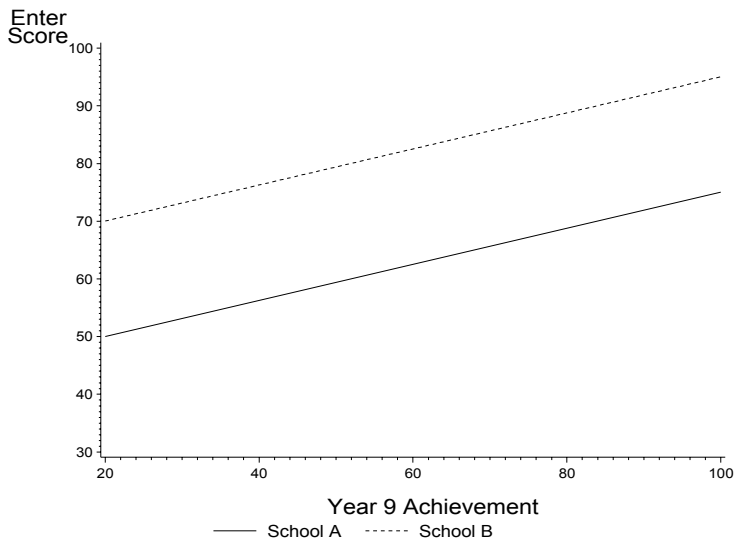

Figure 14 Example of Achievement Growth where a School lifts the Performance of all its students

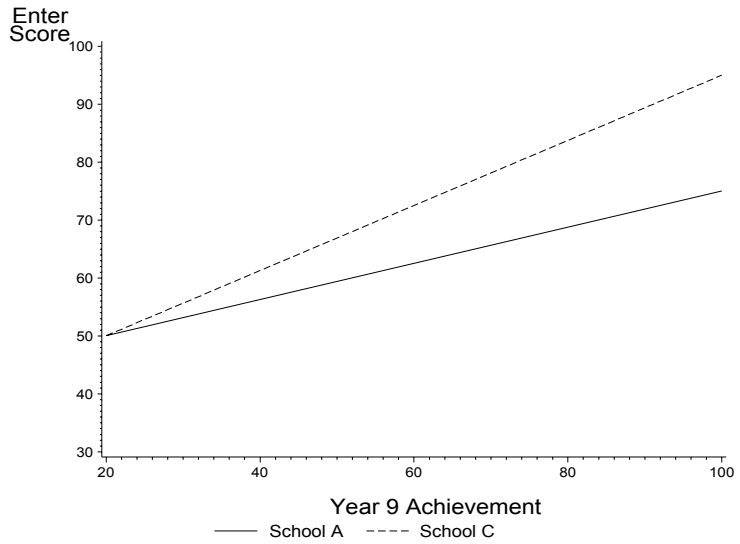

Figure 15 Example of Achievement Growth where a School Increases the Effect of Prior Achievement

The reader may have noted that a stronger relationship between prior achievement and tertiary entrance performance in one school compared to another does not necessarily mean that students in the first school obtain higher scores. This is true only when the lowest achieving students in the first school perform, as well as, or better than students in the second school.

These examples are ideal types. Of course, the situation in the real world may be more complex with school differences in both the intercepts and the slopes. However, it is important to identify where between-school differences in achievement growth are occurring -predominantly in lifting the performance of all students (the intercepts) or lifting the performance of high achievers relative to lower achieving students (the slopes).

Figure 16 graphs the relationship between Year 9 achievement and tertiary entrance performance by individual schools. The lines are regression lines of best fit for points representing students' scores in Year 9 and Year 12. The lengths of the regression lines indicate the range of achievement and performance levels within a particular school. From Figure 16, it is immediately apparent that the slopes of the regression lines for most schools are much the same. There are few schools where the slopes are noticeably steeper or shallower. This means that the relationship between Year 9 achievement and *ENTER* scores within schools is generally similar.

By far the most striking difference is in the school intercepts. This finding indicates that schools differ markedly in their ability to lift the performance of all their students, regardless of their prior achievement levels. Later in this chapter, we identify some of the school factors that explain why some schools are able to lift student performance more than other schools.

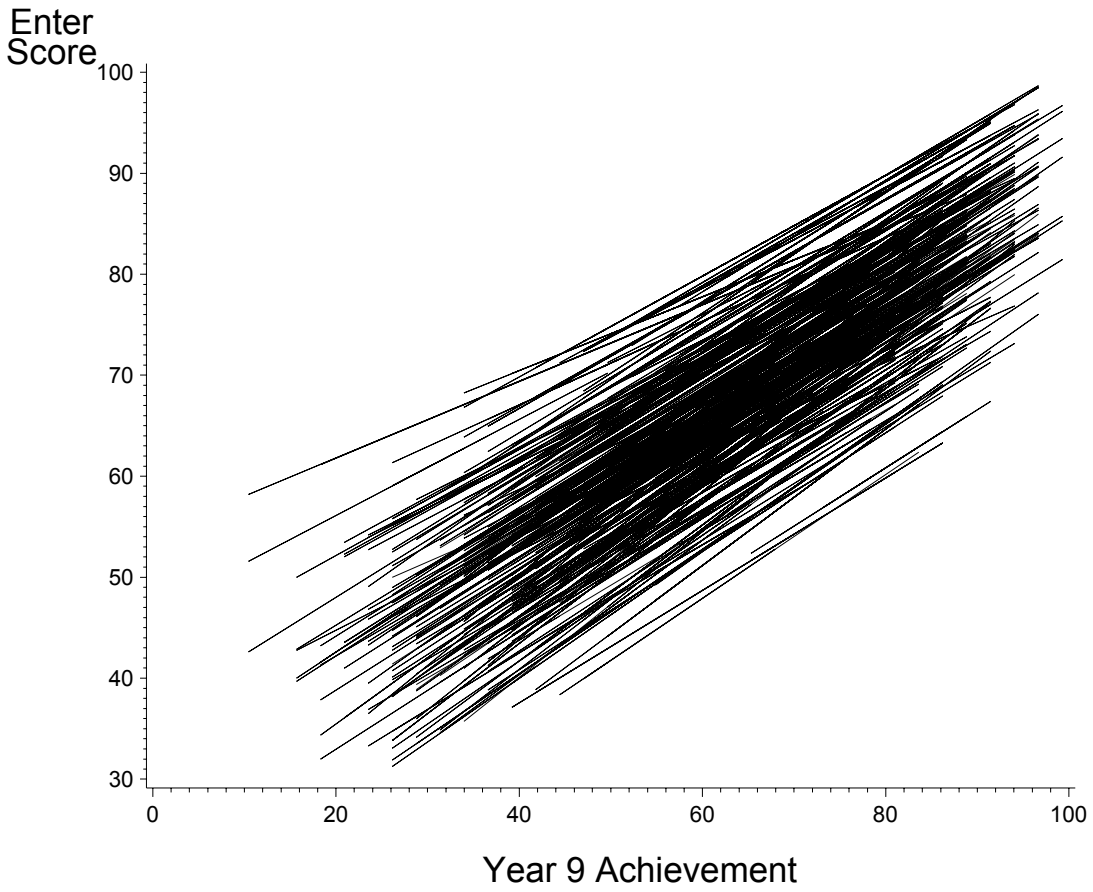

Figure 16 Effects of Year 9 Achievement on *ENTER* Scores by Individual School

A variety of statistical tests can be performed on these slopes. These tests are used to examine whether there are significant differences (i) between the intercepts, (ii) between the slopes and, (iii) the interaction between the intercepts and the slopes. It is clear from visual inspection that there are substantial differences in the intercepts. However, it is not clear if there are significant differences in the slopes. In the previous chapter, we identified school sector differences in the relationship between Year 9 achievement and *ENTER* score. The relationship was stronger among students attending Catholic schools compared to students attending independent and government schools.

We test for an interaction between the slopes and the intercepts for two reasons. It is possible that some schools, relative to other schools, that are able to lift the performance of all their students are also more effective at improving tertiary entrance performance among high achievers. Alternatively, such schools may be less effective at improving the performance of high achievers, since their efforts have been directed at lifting the performance of all students. The third possibility is that there is no relationship between the ability of schools to lift the tertiary entrance performance of all their students (the intercepts) and differentially improve (or worsen) the performance of their high achievers relative to their low achievers (the slopes).

The results of these tests are presented in Table 22. It shows that there is large variation in the intercepts, which is readily apparent from inspection of Figure 16. The intercept variance is 17 per cent of the total variance (54.7/(54.7+260.4)). The variation in slopes is much smaller but it is statistically significant (P=0.008).

Table 22 Tests of between-school differences in the relationship between Year 9 Achievement and *ENTER* Score

Description	Parameter Estimate	Standard Error	T Ratio	Probability
Intercept Variance	54.7	7.1	7.8	<0.0001
Covariance between Intercepts and Slopes	-0.69	1.6879	-1.1	0.26
Slope Variance	0.158	0.1130	2.3	0.008
Residual	260.4	6.3	41.5	<0.0001

The small but significant between-school differences in the slopes confirm the findings from the previous chapter that showed the slopes for government and independent schools were much the same.

There is no significant covariation between the intercepts and slopes. In other words, achievement growth between Years 9 and 12 bears no relation to the schools' mean level of achievement in Year 9.

Therefore, most of the between-school difference in tertiary entrance performance is attributable to school differences in their ability to improve the student performance of all their students, regardless of literacy and numeracy achievement levels (i.e. the intercepts). There is a much smaller variation between schools in the relationship between Year 9 achievement and tertiary entrance performance. The schools with stronger relationships tend to belong to the Catholic school sector.

Unpredicted Gain -Socioeconomic Background and School Effects

One question that is often addressed in school effectiveness research is whether the effect of SES differs between schools.

The SES slopes for individual schools are presented in Table 23. The school regression lines are lines of best fit for points representing each student's socioeconomic status and their Year 12 *ENTER* score within each school. Several points emerge from this graph. First, the slopes are substantially less steep than the previous graph of Year 9 achievement and tertiary entrance performance. This result is consistent with other analyses presented in this report that show that Year 9 achievement is a much stronger influence of Year 12 *ENTER* score than socioeconomic background. Second, as in the case of achievement, there are large differences in the school intercepts but not the slopes. In other words, the relative differences in socioeconomic status are translated into differences in tertiary entrance performance at much the same rate across schools. However, the school intercepts vary considerably across schools, so that in absolute terms the relationship between a given socioeconomic status and tertiary entrance performance differs considerably between schools.

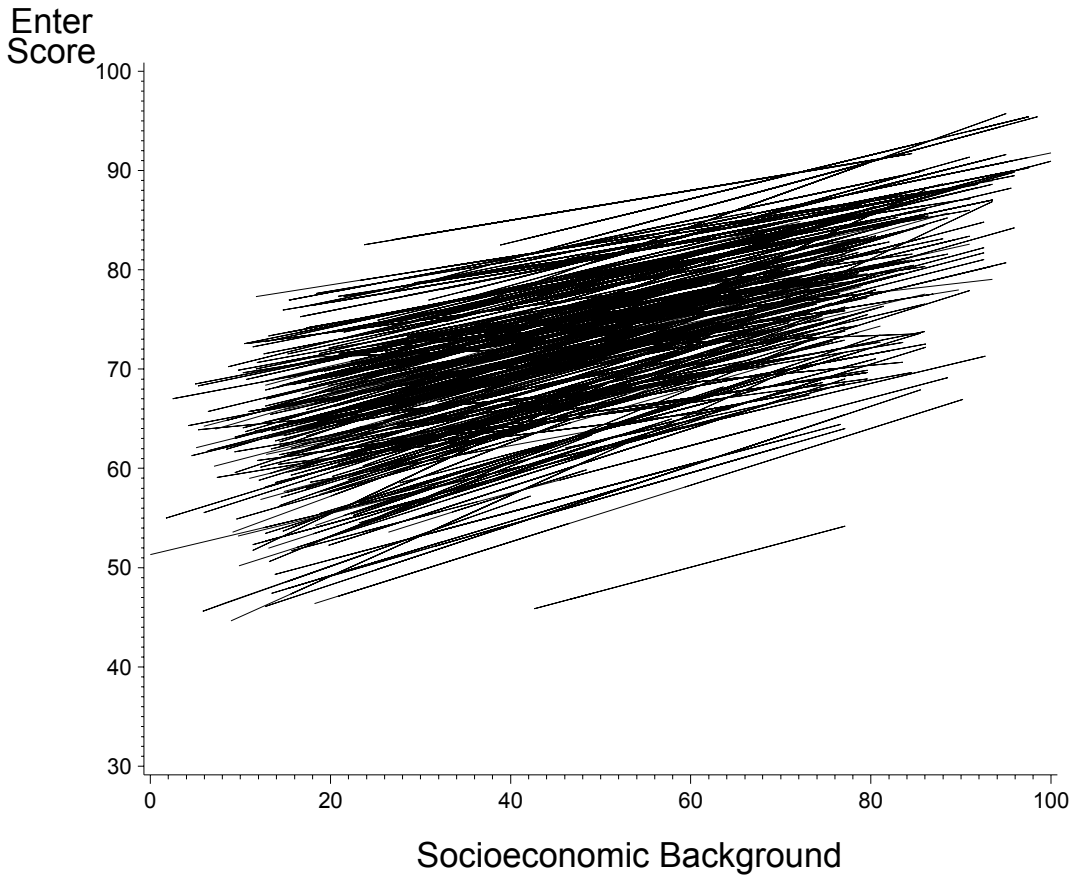

Figure 17 Effects of Socioeconomic Background on *ENTER* Scores within Schools, No Controls

The results of the statistical tests on the variations in intercepts and slopes and the covariance between the intercepts and slopes are presented in Table 23. The statistical tests confirm the visual interpretation of Figure 17. The extent of between-school variation in the SES intercepts is large and statistically significant at the 0.001 level. In contrast, the estimates for the variation in slopes and the covariance between the intercepts and slopes are much smaller and significant at a less demanding level of statistical significance ($0.01<P<0.05$). Therefore, the relationship between SES and tertiary entrance performance is much the same across schools.

Table 23 Tests of between-school differences in the relationship between Socioeconomic background and *ENTER* Score

Description	Parameter Estimate	Standard Error	T Ratio	Probability
Intercept Variance	120.55	30.1562	4.00	<.0001
Covariance between Intercepts and Slopes	-3.7222	1.6879	-2.21	0.0274
Slope Variance	0.2248	0.1130	1.99	0.0233
Residual	277.44	8.1126	34.2	<.0001

It is important to note that the preceding discussion of SES slopes across schools does not apply when controlling for the Year 9 achievement levels of students. This is because the addition of Year 9 achievement produces more accurate estimates of the students' *ENTER* scores, and so the plots of predicted *ENTER* scores by SES by school are no longer linear and do not provide the clear picture presented in Figure 17. This finding undermines the usefulness of the currently popular research practice of plotting and analysing the SES slopes of individual schools.

Contextual Effects

In this section we examine contextual effects. Contextual effects are intuitively attractive; it is plausible that students are influenced by the social milieu of the school, over and above the influence of their individual characteristics. The performance of students from lower socioeconomic backgrounds is likely to be better if they attend a school in a wealthy area. Equally, a student's performance may be lower if attending a school in a less privileged area than otherwise would be the case. The contextual argument is even stronger in regard to academic achievement. Students' academic achievement is likely to be higher if they attend schools with high levels of performance, rather than schools with relatively lower levels. Similarly, student performance may benefit from schools where the classroom climate is more conducive to learning or where the students express greater satisfaction with their school.

In this section we examine four specific contextual effects: the academic and socioeconomic milieu of the school; classroom climate; and satisfaction with school. Details on the measurement of these school level variables are presented in Appendix 5. The logic of these analyses is that for a contextual effect to be established, significant contextual effects must be identified net of individual-level factors that influence student performance. If individual level factors are not controlled for, then spurious contextual effects may be found. Therefore, the following analyses are based on the core model (Table 20).

The analyses indicate that the only substantial contextual effect is academic environment of the school as measured by the mean Year 9 achievement levels (Table 24). The socioeconomic context of the school has no effect in the presence of controls for individual-level factors. The school level measure of classroom climate does affect student performance. Its effect is substantial, but considerably smaller than that for academic context. However, it has no significant effect when including all four contextual factors in the analysis. Similarly, the level of students' general satisfaction with school (in Year 11) has a significant influence on student performance, net of individual-level factors in the model. Again the effect of satisfaction with school was not significant in the full contextual model (model 6). However, the effects of both classroom climate and satisfaction just failed to reach statistical significance.

The lack of significant effects in the full contextual model for school climate and general satisfaction with school were further examined. Satisfaction with school, and classroom climate are moderately correlated at the individual-level. At the school-level this correlation will be substantially higher, so that when they are both included in the same model each fails to reach statistical significance. In further analyses of contextual models without one of these measures, the other becomes statistically significant. Therefore, they are both indicators of some underlying contextual variable that has a significant effect on student performance. The satisfaction with school measure includes several items that also may indicate classroom climate. Items about the work being interesting, enjoying what is done in class, finding learning fun and getting excited about school-work could be argued as pertaining to classroom climate. Therefore we can conclude that classroom context does influence student performance. However, it should be kept in mind that academic context (indexed by school achievement levels in Year 9) is the most powerful contextual effect.

Table 24 Models of School Context Effects on *ENTER* Scores, 1998

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Description	Core Model	+School Achievm't	+School SES	+Engage-ment	Classroom Climate	+Satisfaction with School	+All
Individual-Level Factors							
Intercept	70.7 (0.9)***	71.1 (0.9)***	71.0 (0.9)***	70.8 (0.9)***	70.9 (0.9)***	70.6 (0.9)***	71.2 (0.9)***
Year 9 Achievement	8.8 (0.4)***	8.5 (0.4)***	8.8 (0.4)***	8.8 (0.4)***	8.8 (0.4)***	8.8 (0.4)***	8.4 (0.4)***
Male vs Female	-4.5 (0.7)***	-4.5 (0.7)***	-4.5 (0.7)***	-4.4 (0.7)***	-4.2 (0.7)***	-4.3 (0.7)***	-4.1 (0.7)***
Socioeconomic Background	3.1 (0.4)***	3.0 (0.4)***	2.9 (0.4)***	3.1 (0.4)***	3.0 (0.4)***	3.2 (0.4)***	3.0 (0.4)***
Independent School vs Gov	6.0 (1.4)***	4.1 (1.4)**	4.5 (1.4)**	5.1 (1.5)**	4.6 (1.4)**	5.8 (1.3)***	3.4 (1.4)*
Catholic School vs Gov	3.9 (1.1)***	3.5 (1.1)***	3.2 (1.3)*	3.5 (1.3)*	3.0 (1.2)*	3.8 (1.2)*	2.9 (1.3)**
Non-Metropolitan vs Metro	-1.9 (0.9)*	-1.9 (0.9)*	-1.5 (0.9)*	-1.8 (0.9)*	-1.7 (0.9)*	-1.9 (0.9)*	-1.9 (0.9)*
Contextual Factors							
Mean School Achievement		0.78 (0.19)***	-	-	-	-	0.80 (0.21)**
Mean School SES			0.38 (0.22)	-	-	-	-0.02 (0.22)
Engagement				0.58 (0.43)	-	-	-
Classroom Climate					2.40 (0.8)**	-	1.5 (0.8)
General Satisfaction with School						0.31 (0.15)*	0.29 (0.16)
Between-school Variance	11	11	10	10	10	10	9

Note: Standard errors in parentheses. * 0.05>P>0.01; ** 0.01>P>0.001; *** P<0.001

School Effectiveness

What are the characteristics of schools that contribute to better student outcomes? This is one of the most important questions asked by educational policymakers and is the basis for 'school effectiveness' research. In this examination of school effectiveness we are fortunate that the data includes a wide range of measures of individual student characteristics. Many studies of school effectiveness do not have an adequate range of individual student characteristics so that it is difficult to distinguish between-school effects with the (within-school) sum of the individual characteristics of the students.

The between-school differences are the focus of the analyses. The aim of the analysis is to discover what school-level factors explain the variation in school intercepts. The school-level factors examined are measured by aggregating student-level characteristics, such as students' self-concept of their own ability, satisfaction with school and teachers, aspirations, engagement with school and classroom climate. Details of these measures can be found in Appendix 5.

The intercepts are the values of the intercepts obtained with a model that comprises Year 9 achievement, socioeconomic background and school sector. School-level factors which account for the variation in the average level of tertiary entrance performance (that is, the intercepts) after controlling for relevant individual level characteristics are direct indicators of school effectiveness. It is the schools with larger intercepts that more effectively lift the performance of all students.

Table 25 Correlations between School characteristics and Average School *ENTER* Score, 1998

School Level Factor (Derived from Student-level Data)	Correlation with Adjusted School Intercepts
Year 9 Achievement in Literacy and Numeracy (in Year 9)	0.20**
Socioeconomic Background (from data collected in Year 9)	0.14*
Self-Concept of Ability (in Year 9)	0.34***
Aspirations for Post-School Study (in Year 9)	0.25***
Parents' Aspirations for Post-School Study (in Year 9)	0.30***
General Satisfaction with School (in Year 9)	0.25***
Attitudes to Teachers (in Year 9)	0.16***
Relevance of School Work (in Year 9)	0.20**
Sense of Achievement (in Year 9)	0.26***
Classroom Climate (in Year 10)	0.29***
Teacher Performance (in Year 10)	0.28***
Engagement (in Year 10)	0.14
School Climate (in Year 10)	0.31***
General Satisfaction with School (in Year 11)	0.22***

* 0.05>P>0.01; ** 0.01>P>0.001; *** P<0.001

Table 25 presents the correlations between the school-level factors and between-school differences in the intercepts. It shows that a range of factors is associated with between-school differences in tertiary entrance performance. Although some variables (such as self-concept of ability) have larger correlations and others (such as engagement) have weak correlations, most have moderate correlations between 0.20 and 0.30. Since most of the correlations are of a similar magnitude and many of these variables are intercorrelated, it is difficult to conclude which school-level factors are important. However, multivariate analysis (presented below), which takes into account the intercorrelations between influences, does allow conclusions to be drawn on which factors best explain the variation between-school performance.

The finding that a large number of school level factors are moderately correlated with school differences in *ENTER* scores has an important implication. It suggests that research hypothesising a single or a small number of school level variables as important contributors to school performance will almost invariably confirm their hypotheses. This is because so many of the factors are inter-correlated. Therefore, a range of factors need to be considered before confirming that particular school characteristics are important contributors to school performance.

The next step is to unravel the contributors to between-school differences in the intercepts. The aim is to identify which factors are the most important contributors to school-level variation. The method chosen was multiple regression with backward elimination. Backward elimination deletes variables (one at a time) from the analysis, which have no significant impact on the dependent variable. It is used here as these variables are inter-correlated and none has theoretical or temporal precedence over the others.

Table 26 Effects of School characteristics on (adjusted) School Differences in tertiary entrance performance

School-level Factor	Effect	Standardised Effect
Intercept	-31.22***	-
Self-concept of Ability	5.02***	0.28
School Climate	1.31***	0.24
Parents' Aspirations for Post-School Study	4.31*	0.14
R Square	*0.20*	

* 0.05>P>0.01; ** 0.01>P>0.001; *** P<0.001

The results are presented in Table 26. The school-level variables with significant effects are self-concept of ability, school climate and parental aspirations. Self-concept of ability is measured by asking students how well they judge themselves to be doing compared to other students in the same level at school. Schools with students that on average are more confident about their own ability show higher aggregate *ENTER* scores, other factors being equal. School climate was measured by student ratings on their teachers' interest in students, effective discipline, and student learning. Therefore, more effective schools are rated highly by their students on these criteria. Finally, schools in which the students' parents have higher educational aspirations for their children are able to lift the performance of all students, regardless of school sector, and the students' prior achievement and SES.

The most effective schools are those schools that give students confidence in their own abilities and provide an environment conducive to leaning, and in which the students are likely to experience high expectations for educational success.

5. DISCUSSION

Policy makers in the field of education are often faced with a plethora of opinions, views and even hypotheses on what the important correlates of educational outcomes may be. At the same time, there is a lack of systematic evidence on which factors are and are not important. This report has contributed to a better understanding of the way in which social background, schools and other factors influence tertiary entrance performance. Our approach has been to address specific research questions that surround tertiary entrance performance. It is the most broad ranging and thorough investigation of tertiary entrance performance conducted in Australia.

Achievement in Literacy and Numeracy

Of the possible influences considered here, it is clear that Year 9 achievement in literacy and numeracy has the strongest effect on tertiary entrance performance. Its effect is considerably stronger than socioeconomic background.

A common response to the finding that Year 9 achievement in literacy and numeracy has a strong impact, is that literacy and numeracy is just a reflection of socioeconomic background. This is not the case. The relationship between achievement and socioeconomic background can only be described as moderate.[33] This moderate relationship has also been observed in other studies.[34]

Before further discussing other influences, it is important to consider what the strong achievement effect means. One interpretation is that tertiary entrance performance in Australia is to a substantial extent meritocratic, that is, based on a combination of academic ability and motivation. This is not to say that there are no effects of socioeconomic background and other factors on tertiary entrance performance, but that their importance is often overstated.

Another significant finding from these analyses is that the numeracy component of achievement has a stronger influence on the *ENTER* scores than the literacy component. This finding was consistent across jurisdictions. It may reflect the greater weight applied to performance in the maths and sciences in the calculation of tertiary entrance scores. Alternatively, it may be because numeracy skills are a better indicator of general analytical skills, which are important across a wide range of subject areas. One way to adjudicate between these two explanations would be to examine the relationship between these two components of achievement among students who did not take any maths or sciences courses.

State Differences in the Relationship between Achievement and Tertiary Entrance Performance

The impact of Year 9 achievement on tertiary entrance performance varies between jurisdictions. It is stronger in Victoria and Queensland and weaker in South Australia. The most likely explanation for these differences is in the proportion of the cohort gaining a tertiary entrance score. In South Australia this proportion is lower than in other states, so the effects of most influences will be weaker. However, if State differences in the relationship between Year 9 achievement and tertiary entrance performance are not due to differences in the proportions gaining *ENTER* scores, then several important issues are raised. Differences between States suggest that state tertiary entrance scores are capturing different aspects of performance, which then raises the question of how comparable *ENTER* scores are between States. Only further work in this area will establish why there are state differences in strength of influences on tertiary entrance performance.

Socioeconomic Background

This report found that students from professional and, to a lesser extent, managerial occupational backgrounds exhibited higher *ENTER* scores than did students from other occupational backgrounds. About 12 *ENTER* score points separate the average *ENTER* scores of students from professional backgrounds and those from manual backgrounds. Similarly students whose mothers have had tertiary education score, on average, about 10 to 12 *ENTER* score points higher than students with mothers who did not have a tertiary education. These differences compare to a difference of 25 *ENTER* score point between students in the top and bottom achievement quartiles. These results suggest that socioeconomic background has only a moderate relationship with tertiary entrance performance. This finding is contrary to the view that educational systems are simply a mechanism that strongly reproduces socioeconomic inequality between generations.

Although socioeconomic background has only a moderate effect on tertiary entrance performance its effect is by no means negligible. The impact of socioeconomic background on tertiary entrance performance is substantially reduced, but not eliminated, after controlling for Year 9 achievement in literacy and numeracy. This indicates that socioeconomic background still has effects net of prior academic performance. From a sociological perspective, the final years of schooling could be said to be fair if there is no impact of a student's socioeconomic background during the final years of schooling. From a policy perspective, a reduction in its impact could be a first step in reducing socioeconomic inequalities in education. Such a goal is certainly achievable.

Gender

Overall, gender differences in tertiary performance are small compared to differences according to socioeconomic background, school sector and especially literacy and numeracy achievement. On average, females showed slightly higher tertiary entrance scores than males. However, gender differences in tertiary entrance performance varied in both strength and direction between jurisdictions. For example, while female students in New South Wales scored significantly higher than males, in other States the differences were smaller and not statistically significant. The distributions of *ENTER* scores do differ between the sexes. Male students showed a wider distribution of *ENTER* scores than did females.

This report found that females experienced greater achievement growth than males in their final years of schooling. Females consistently performed at a higher level in Year 12 (compared to males) than would have been predicted by their achievement in both numeracy and literacy in Year 9. This finding suggests that female students in the Australian education system are gaining more from the final years of schooling than are male students. The reasons for differences in achievement growth require further investigation.

School Sector

This report found that school sector (independent, Catholic or government) had an impact on tertiary entrance performance. On average, independent school students received about 12 *ENTER* score points more than government school students. Catholic schools students scored, on average, about 6 *ENTER* score points higher than government school students. Therefore, sector differences were comparable to socioeconomic differences.

About half of the difference in tertiary entrance performance between government and independent school students can be attributed to differences in the academic and socioeconomic mix of students. When controlling for prior achievement and the socioeconomic background of the students the difference declined to around 6 *ENTER* score points.

In contrast, socioeconomic background and prior achievement do not explain differences between Catholic and government school students. Differences in *ENTER* scores between students attending Catholic and government schools were reduced by only 20 per cent after controlling for the Year 9 achievement and SES.

Achievement growth between Years 9 and 12 differed between school sectors. Achievement growth among students who in Year 9 showed low to middle achievement levels, was greater among independent school students than comparable students in the Catholic and government sectors. For students with average to high levels of achievement in Year 9, achievement growth was greater among Catholic and independent school students than among government school students.

Although these findings appear to be bad news for government schools, there are indications that school sector differences are declining. Rowe's work suggests that school sector differences in student performance in individual studies (subjects) in Victoria are declining over time. Similarly, the school sector differences in New South Wales presented in this report are smaller than those reported by other studies for earlier years.

The question remains as to why a difference between sectors in tertiary entrance performance remains even after accounting for differences in the academic and socioeconomic mix of students.

One argument is that school sector differences can be attributed to the attitudes of students. For example, students who attend non-government schools may have higher aspirations, and so may be more motivated to perform well. However, our analyses of psychological factors showed that although higher educational aspirations (of either the students or the students' parents) are related to student performance, higher aspirations do not explain school sector differences in tertiary entrance performance.

Other explanations focus on the school environment (or school culture). The school culture in some school sectors may value academic pursuits more highly or have a more competitive or cooperative ethos. While the research literature does not reach consistent conclusions on the importance of school culture, analyses presented in this report show that academic context does, to some extent, explain differences between students attending government and independent schools.

There are a variety of other explanations for school sector differences but none are entirely satisfactory. Greater funding for school resources is often put forward as one explanation. However, in general the international literature does not find school resources are an important factor (see Scheerens & Bosker, 1997:216). Another focus is on teaching. It can be argued that the quality of teaching differs between school sectors. Independent schools are able to pay higher salaries, and recruit more experienced teachers. Although there is little evidence for strong effects of either teacher salaries or experience (Scheerens and Bosker, 1997:216-217), this explanation cannot be discounted. There is some evidence that the overall effects of teachers and teaching are stronger than school effects (Rowe, 1996; Scheerens & Bosker, 1997:84-85; 218). A focus on school sector differences in teachers and teaching practices may be a fruitful line of inquiry for the investigation of school sector (and indeed school) differences.

Region

Although, students from metropolitan areas had marginally higher *ENTER* scores than students from non-metropolitan areas, this difference was not large, and varied between jurisdictions, with slightly larger differences in Victoria and South Australia. The differences in *ENTER* scores between metropolitan and non-metropolitan students could not be accounted for by either prior academic achievement or socioeconomic background.

Other reports in the LSAY series have found that non-metropolitan students are less likely to complete school and participate in higher education (Marks et al., 2000). On the other hand, differences between metropolitan and non-metropolitan students in Year 9 achievement and *ENTER* scores are considerably smaller. Therefore, the reasons for the lower participation rates of non-metropolitan students are to do with factors other than performance.

Ethnicity

The *ENTER* scores of LBOTE students were higher than those of other students. Asian students showed higher *ENTER* scores than did students whose fathers were Australian-born. The tertiary entrance scores of students belonging to other ethnic groups were not significantly different from students whose fathers were born in Australia. These findings indicate that ethnic minorities are not suffering systematic disadvantage during the final years of schooling.

The higher average *ENTER* scores of Asian students could not be accounted for by differences in prior achievement, socioeconomic background or parental aspirations. Therefore, cultural factors, not investigated here, are likely to be at work. The finding that parental aspirations did not explain the better performance of Asian students does not mean that parents are not involved. Parents may contribute to their higher performance in a variety of ways, such as setting higher expectations, different parenting styles and possibly placing a higher priority on schoolwork. The behaviour of parents that contribute to the success of Asian students probably began many years earlier than the time frame investigated here.

Indigenous Students

The performance of Indigenous students was found to be substantially lower than that of non-indigenous students. The difference is larger than for the other group differences reported here. It is important to monitor differences in school performance between Indigenous and non-indigenous students, preferably with larger numbers of Indigenous students than this one, to identify trends and ascertain the impact of various policy initiatives.

What is also of concern is that controlling for Year 9 achievement and socioeconomic background did not substantially reduce the difference in *ENTER* scores between Indigenous and non-indigenous students. Although improving the literacy and numeracy of Indigenous students is and should be a policy priority, it will only partially improve the performance of Indigenous students in the final years of school. Although the sample sizes in this study are too small to draw definitive conclusions, the fact that the performance of Indigenous students varies across jurisdictions may be a useful starting point. Comparisons of the performance of Indigenous students between jurisdictions and schools may suggest those policies and practices that are most useful in lifting the educational performance of Indigenous students.

Psychological Factors

The psychological factors examined here - namely, students' self-concept of ability, parents' aspirations for the student's education, and students' aspirations - contributed to students' tertiary entrance performance largely independent of the influences discussed above.

Students' self-concept of ability had a larger impact on their performance than did their aspirations for post-school study, which in turn had a larger impact on their performance than did the aspirations for them held by their parents.

A major finding of this study is that differences between the performance of students from different demographic and socioeconomic groups cannot be attributed to differences in these psychological factors. The other major finding is that psychological factors have a surprisingly

strong relationship with *ENTER* scores. Thus while psychological factors are important to the performance of individual students, they do not account for social group differences.

Effects of Individual Schools

These analyses of the effects of individual schools on tertiary entrance performance in Australia are consistent with the international literature. Between-school differences account for approximately 22 per cent of the variation in individual performance compared to an international average of around 19 per cent. About half of this variation can be accounted for by differences in the academic and socioeconomic mix of students and school sector, which again is broadly consistent with the international literature (Shreenens & Bosker, 1997:237).

The schools' environment (or context) has an effect on tertiary entrance score in addition to that of students' prior achievement and other individual-level influences. The most important influence is the achievement environment of the school. However, the schools' socioeconomic context (or environment) does not affect tertiary entrance score in addition to the effects of the students' socioeconomic background and other individual-level influences.

The relationship between tertiary entrance performance and prior achievement does not vary substantially between schools. What is important is that there are the differences between schools in the average performance of their students. Similarly, schools differ little in the relationship between tertiary entrance performance and socioeconomic background.

On the issue of school effectiveness, the question is what school factors contribute to lifting student performance, independent of the mix of students? The analyses presented here are broadly consistent with the international literature which indicates that effective schools are those which have environments that are conducive to learning, and where students feel they are performing well and have high educational expectations.

Policy Implications

Social inequalities during the last three or four years of school can be addressed by educational policies. During this period the sociological and demographic characteristics of students should not affect their performance. That is, there should be little or no effect of socioeconomic background, gender, location, or ethnicity on achievement growth during the final years of schooling. Some students will perform relatively better or worse in Year 12 than they did in Year 9, but social groups as a whole should not perform better or worse. To have no social group differences in achievement growth during the final years of schooling is an achievable goal, since already many of the group differences are small.

A second area for policy development is in the area of school effectiveness. In this area we advocate a meshing of both quantitative and qualitative research techniques. The quantitative work is needed to identify the schools that more effectively lift student performance, importantly net of the prior achievement levels of the students. There is little point in studying school effectiveness in schools whose intake comprised a large number of high achieving students. The qualitative research would take the effective schools as case studies and find what characteristics are responsible for the schools' effectiveness. Other schools can then use this information, to increase their students' learning outcomes.

Relative Strength of Influences

Policy makers and others interested in educational outcomes often ask which are the most important influences. This is a reasonable question given that there are a plethora of factors that have been found to influence educational outcomes. Furthermore, from a policy perspective it is

important to understand which influences are weak and which are strong so that policies can be directed at influences that can make a difference.

As indicated throughout this report, achievement in literacy and numeracy in Year 9 has the strongest impact on *Enter* scores of all the measures examined in this report. Its raw correlation is around 0.5 indicating that over 25 percent of the variation in *Enter* scores can be accounted for by Year 9 achievement.[35]

It can be argued that after Year 9 achievement in literacy and numeracy, the effects of individual schools are the next most important influence since the between-school variation of 22 per cent can be (roughly) translated to a correlation of 0.47. However, this is a little misleading because the between-school variance declines to 9 per cent, when accounting for school type, State and the characteristics of the students, reducing the equivalent correlation to about 0.3. Furthermore, even though the between-school variance is around 10 per cent of the total variation in *Enter* scores, this variation can only be partially explained by school characteristics. However despite these qualifications, individual school factors appear to be the second most important influence on tertiary entrance performance.

It may appear contradictory that individual schools are the second most important influence since only 11 per cent of variation in *Enter* scores can be attributed to between-school differences. There is no contradiction because other factors explain less of the variation in tertiary entrance performance.

Socioeconomic background would be the next strongest influence with a raw correlation of around 0.3, which is equivalent to explaining 9 per cent of the variation in *Enter* scores. The correlation declines about a third (to around 0.2) when controlling for prior achievement. The next most important influence is school sector, which has a moderate raw correlation of 0.3 declining by about 50 per cent when controlling for socioeconomic background and achievement. Gender and region are much weaker influences with raw correlations generally below 0.10.

Concluding Note

This report has focused on a broad range of influences on student performance. Although it has been pointed out that many of the relationships are quite weak, the reader may have gained the impression that a student's tertiary entrance performance can be more or less accurately predicted from a small number of sociological and school variables. However, this impression is not correct. These analyses indicate that social background and school sector can only explain, at most, 20 per cent of the variation in student performance for tertiary entrance. The strong effect of Year 9 achievement suggests that ability also plays a role, raising the explained variance to around 30 per cent. If the effects of individual schools and psychological factors are included, at most 40 per cent of the variation in student achievement can be explained by the factors considered in this report. This leaves a large proportion unaccounted for. It is likely that motivation, perseverance, study habits, interest, enthusiasm and related factors account for much of the remaining variation in student performance. Therefore, students should not see their performance as determined by their social background and schooling. There is much that students can do to improve, or impair, their performance.

APPENDIX 1 SAMPLES AND POPULATIONS

The sample is a national representative sample of Year 9 students in 1995. It is a stratified random sample. The major stratum in the design was State (or jurisdiction) of schooling. Students from smaller States were to be over-sampled and, correspondingly, students from larger States were under-sampled. Selection of students within States was proportional by school sector. Three sectors were used as strata: government schools, Catholic schools and non-government, non-Catholic (referred to as independent) schools. The population data for strata were taken from the *Schools Australia* series (ABS). Within strata, schools were selected proportional to their size. Information on the number of Year 9 students in each school came from ACER's Sampling Frame which, in turn, was based on information provided by the relevant State authorities and, in the case of non-government schools, by the Federal Department of Educational, Employment and Training (DEET). These figures were from the 1994 annual school census. Within schools two classes were randomly selected (again, proportional to their size). Schools were asked for a list of the number of students enrolled in each of their Year 9 classes for a subject studied by all Year 9 students in the school (usually English classes).

The 1995 data was collected from self-completion questionnaires that the students were asked to fill out at the time they undertook the achievement tests in literacy and numeracy. The 1996 data was collected with mailed questionnaires and the 1997 and 1998 data was collected by telephone interview.

Cases were weighted to correct for the disproportionate sampling between strata and to correct for the variation between strata due to differential response rates and variable class sizes. Additional weights were constructed to compensate for sample attrition. Further details on the weighting procedures can be found in LSAY Technical Paper Number 15 (Marks & Long, 2000).

APPENDIX 2 TERTIARY ENTRANCE MEASURES USED IN THIS REPORT

Tertiary entrance measure (*ENTER*)

ENTER scores were obtained from the students during the 1999 telephone interview (wave 5) with the following question:

A14 Did you obtain a (according to jurisdiction):

ACT:	Tertiary Entrance Rank (TER) or University Admission Index (UAI)
NSW:	University Admission Index (UAI) formerly TER
Vic.	Equivalent Tertiary Entrance Rank (ENTER)
Qld:	Overall Position (OP)
SA:	Higher Education Entrance Information Statement
WA:	Tertiary Entrance Rank (TER)
Tas:	Tertiary Entrance Score (TE)
NT:	Higher Education Entrance Information Statement

A15 What was your result? (Qld 1-25) (Elsewhere 1-99.99)

The analyses focus on students' scores for admission to tertiary study. The States and Territories differ in how they refer to these scores (see Table 1). In New South Wales and ACT it is the Universities Admissions Index (UAI). In Victoria it is called the Equivalent National Tertiary Entrance Rank (ENTER). In South Australia, Tasmania and Western Australia, it is called the Tertiary Entrance Rank (TER).

The TER is a number between 99.95 and zero that reports the rank position relative to all other students. It takes into account the number of students who sit the tertiary entrance subjects in any year and also the number of people of Year 12 school leaving age in the total population. The performance of a student with a TER of 70.00 is equal to or better than 70 per cent of the Year 12 school leaver age population.

All States (except Queensland) report student rankings on the same scale, from zero to 99.95. In Queensland, a different measure is used which ranks students in bands from 1 to 25.

The *ENTER* scores are self-reports obtained from telephone interviews with participants in the 1999 wave of the study. There are missing data associated with this question. Of the 5,469 students who received an entrance score, 640 (11.7 per cent) could not remember their score and a further 73 (1.3 per cent) refused to volunteer their score. The reliability and validity of their responses are discussed in Appendix 3 (pg. 66).

As indicated above the tertiary entrance scores in all States except Queensland are understood as equivalent. For Queensland students who obtained an overall position, their position was converted to an *ENTER* score according to the equivalence scales constructed by the Taskforce on an Australian Tertiary Admissions System. Table A 7 presents the conversion of the Queensland Overall Position to *ENTER* score for 1998 (see pg. 74).

Because *ENTER* scores range from 30, all *ENTER* tertiary admission scores below 30 were reassigned a score of 30.

It is important to note that the *ENTER* scores cannot be compared across jurisdictions. It cannot be concluded that, on average, students in a particular State do better or worse in Year 12 than students in other States. This is because the proportion of Year 12 students receiving *ENTER* scores varies across jurisdictions.

There may be problems with the sample of Western Australian students from which *ENTER* scores were obtained. Less than 40 per cent of Year 12 students in Western Australian provided valid *ENTER* scores (Table A 1). This figure is considerably less than the estimate of more than 60 per cent provided by the Western Australian department (*Personal Communication*). Furthermore, a higher proportion of Western Australian respondents were categorised as "Don't Know" when asked for their *ENTER* score. The respective percentages are 33 per cent for Western Australian respondents compared to 13 per cent for the whole sample (see Table A 3 and Table A 6). The data for Western Australia would not be a problem if the group that provided valid *ENTER* scores were a random sample of students that actually obtained an *ENTER* score. However, it is not certain that they are a random sample.

Statistical summary

Table A 1 presents summary statistics for *ENTER* scores. The statistics in the first column are based on the entire sample of respondents who provided their *ENTER* score. It shows that the overall mean *ENTER* score is around 70 with a standard error of 0.5.

The summary statistics for *ENTER* scores of all students and by selected jurisdictions are presented in Table A 1. Included in this table are the percentages of the active sample members with an *ENTER* score and the percentages of Year 12 participants who obtained an *ENTER* score. In New South Wales and Victoria the *ENTER* scores show a similar mean and standard deviations. The Queensland *ENTER* scores were assigned using the conversion table (Table A 7). *ENTER* scores in this jurisdiction show a lower mean but a greater distribution (as indicated by the standard deviation and inter-quartile range). *ENTER* scores in South Australia and Western Australia show a higher mean but smaller distribution. As pointed out earlier, differences in the mean *ENTER* score across jurisdictions cannot be used to compare performance.

Table A 1 Summary Statistics for *ENTER* Scores, All Students and by Selected Jurisdictions, 1998

	All	NSW	Vic	Qld	SA
Standard Statistics (Weighted)					
Mean	70.2	69.1	70.9	64.9	79.9
(Standard Error)	(0.5)	(1.0)	(0.9)	(1.2)	(1.0)
Median	73.8	71.1	72.0	70.0	81.5
Standard Deviation	19.8	22.5	19.5	24.1	10.0
Inter-quartile Range	31.3	29.1	31.2	47.5	22.0
Percent of Sample with Score (Weighted):					
Of Year 9 Cohort	52.6	57.1	62.6	55.4	45.0
Of Year 12 Participants	68.0	73.0	76.8	70.5	59.4

Reliability and Validity

In this section we examine the validity and reliability of the *ENTER* scores reported by respondents during the 1999 telephone interview. First, we discuss the 'predictive validity' of the scores, that is whether they conform to theoretical or common-sense expectations of the relationships between the scores and a range of factors. Second, we perform a number of tests examining the reliability of the answers. Third, we compare the results obtained from this sample with the results published by Boards of Study and university admission centres. The conclusion from these verification exercises is that the *ENTER* scores obtained from LSAY respondents during telephone interviewing are valid and reliable.

Predictive Validity

The *ENTER* scores collected by telephone interviews have a high degree of predictive validity; that is, they conform to theoretical or common-sense expectations of the relationships between the scores and a range of factors. In this report, the magnitude and direction of relationships between *ENTER* scores and a range of predictor variables were not unexpected. For example:

- *ENTER* scores are highly correlated with Year 9 test scores in Literacy and Numeracy.
- *ENTER* scores vary by parental occupational and educational background in a systematic way, reflecting a social gradient.
- The correlation between parental occupational status and *ENTER* scores of between 0.2 and 0.3 is about the same as for the correlation between parental occupational status and educational outcomes in both Australia and other industrialised countries.
- Average *ENTER* scores are higher among students attending independent and Catholic schools than students attending government schools.
- Gender differences in *ENTER* scores are relatively small compared to Year 9 achievement results, socioeconomic background and school sector.
- Ethnic group differences in *ENTER* scores conform to expectations.

The major consequence of *ENTER* score is type of post-secondary study. Students attending university should show substantially higher *ENTER* scores than other students. This expectation was confirmed by the data (Table A 2).

Table A 2 Mean *ENTER* Score in 1998 by Study Type in 1999

Study/Course Type	N	Mean *ENTER* Score
University Degree	2739	81.3
TAFE course	564	56.5
Apprenticeship	109	55.5
Traineeship	161	59.2

Reliability

Having established that the *ENTER* scores used in this report satisfy the criterion of 'predictive validity', we investigate empirically the reliability of *ENTER* scores. There are several ways in which the reliability of the *ENTER* scores can be undermined. These include:

i. respondents providing inaccurate scores since they cannot remember their true scores;

ii. respondents deliberately providing incorrect scores; and

iii. the scores of respondents who refused to answer this question or who were classified as "Don't know" being systematically different from other respondents.

Inaccurate scores: We cannot test the degree to which respondents provide inaccurate *ENTER* scores without obtaining the true *ENTER* scores from system authorities. A telephone conversation between an ACER staff member and the South Australian Authorities revealed very few discrepancies and those that were found were small. However, the scores of only a dozen or so students were compared.

Deliberately providing false scores: It is possible to investigate the degree to which respondents were deliberately providing incorrect scores. It is assumed that a high proportion of respondents who do this will provide grossly inflated scores, such as 99 or above. If this was the case then these respondents will decrease the overall correlation between Year 9 achievement and *ENTER* score. Against this expectation, removing from the analyses students who said they scored 99 or above slightly reduced the correlation. The reduced correlation is because students with very high *ENTER* score were predominantly students with very high Year 9 literacy and numeracy scores. This finding suggests that the incidence of students deliberately providing over-inflated *ENTER* scores was very low.

"Don't Knows" and "Refusals" are different: There is some evidence that there is a systematic difference between those respondents who provided their *ENTER* score and those who either "refused" or "didn't know". The combined mean score for the Year 9 literacy and numeracy is higher for the group that provided their score (Table A 3). However the difference is not large and since weighting for attrition is largely based on achievement, the effects of this differential response bias will not undermine the substantive interpretations contained in this report.

Table A 3 Mean Total Year 9 Literacy and Numeracy Score by *ENTER* Score Status

***ENTER* Score Status**	**N**	**Mean Score from Year 9 Literacy and Numeracy Tests Maximum Score =40**
ENTER Score Provided	4756	28.7
"Don't Know"	640	26.0
Refused	73	25.4

Comparison with Published Statistics

New South Wales

In Appendix 2 on *ENTER* Scores and Year 12 results, the section for New South Wales noted that in 1998 76.5 per cent of the total candidature received a UAI. This figure is close to the estimate in Table A 1 of 73 per cent. The total candidature includes students not in Year 12.

Other summary statistics of UAI scores in 1998 for students in New South Wales are not readily available. However, a paper on the 1998 Higher School Certificate reported that of the total UAI cohort, 53.3 per cent were female (NSW UAC, 1998:10). This compares with 55 per cent for New South Wales students in the LSAY sample. This paper also reported the proportion of female students (of all students) performing above a certain level. This data is reproduced in Table A 4 accompanied by the comparable estimates from the sample. This table indicates very similar proportions of female students in the sample compared to the population. However, it should be noted that while the population from which the sample was drawn is similar to the population referenced in the first column of Table A 4, it is not identical.

Table A 4 Comparison of Proportion of Females with Particular *ENTER* scores in the Population and Sample for New South Wales, 1998

***ENTER* /UAI Scores**	**Year 12 Population Proportion[1]**	**LSAY Sample Proportion**
90 and above	58.8	52.4
80 and above	58.6	57.4
70 and above	58.2	61.3
60 and above	57.8	59.9
50 above	57.1	58.7

[1] Source: NSW UAC (1998:10)

Victoria

In Victoria, mean *ENTER* scores were published by VTAC (VTAC, 1998-99:107). The mean *ENTER* scores for male and female VTAC applicants in 1998 are lower than those for the 1995 Year 9 sample. The major reason for the discrepancy is that the two populations are different. Approximately 57,500 persons obtained *ENTER* scores, but only 38,235 VTAC applicants were current Victorian school leavers (VTAC, 1998-99:Table A2 and Table H14 107). Furthermore, there is evidence that current Victorian school leavers performed better in Year 12 since 90 per

cent of applicants were offered tertiary places, a higher proportion than any other group (VTAC, 1998-99:Table A2)

Table A 5 Mean *ENTER* Scores for Victoria, 1998

	VTAC Applicants[1]		Sample	
	N	Mean	N	Mean
Female	32,145	65.9	705	70.8
Male	25,308	61.5	519	71.1

1. From VTAC(1998-99:107)

South Australia

According to the Annual Report of the South Australian Senior Secondary Board of Studies, in the 1998 school year, 9,974 students were eligible for a TER score and 15,190 students were at Stage 2 (Year 12) in their senior secondary school studies (SA BOS, 1999: Table 1 pg. 80, Table 31 pg. 114). This percentage of 65 per cent, is not too dissimilar to our sample weighted estimate of the 60 per cent for proportion of Year 12 students obtaining *ENTER* scores (Table A 1). Of the 9,974 students eligible for an *ENTER* score in 1998, 5,716 or 57 per cent were female (SA BOS, 1999: Table 31 pg. 31). In the sample 58.8 per cent of South Australian respondents with an *ENTER* score were female.

Western Australia

The proportion of Western Australian Year 12 students from the LSAY sample providing an *ENTER* score is lower than the 60 per cent estimate provided by the Department. Of the 869 Western Australian respondents in Year 12 in 1998, 555 said they obtained a University Entrance score of some description (TER, TES or *ENTER*). Therefore 63.8 per cent of the unweighted sample indicated they received a tertiary score. However of the 535 respondents who said they received a Tertiary Entrance score, 178 or 33 per cent gave a "Don't Know" response when asked for the actual score. This compares with 12 per cent for the national sample. We can only speculate why the proportion of "Don't Know" responses in reply to the question on TER score was so high in Western Australia. It was not confusion with the terms Tertiary Entrance Rank and Tertiary Entrance Score (which are different in Western Australia) since a similar proportion of respondents who used each term were classified as 'Don't Know" in the subsequent question on actual score.

As demonstrated above, respondents who responded "Don't know" to the *ENTER* score question had slightly lower Year 9 achievement. In Western Australia this is also the case with a similar gap in Year 9 achievement scores between students who provided their *ENTER* scores and those who were classified as "Don't know" (Table A 6).

Table A 6 Mean Total Year 9 Literacy and Numeracy Score by *ENTER* Score Status, Western Australian Students 1998

***ENTER* Score Status**	**N**	**Mean Score from Year 9 Literacy and Numeracy Tests Maximum Score =40**
ENTER Score Provided	353	30.8
"Don't Know"	178	27.9
Refused	4	-

Even though the gap in the Year 9 achievement score is similar, the higher proportion of "Don't Knows" is likely to have a larger impact on the results for Western Australia than for other States and nationally. Therefore the results for Western Australia should be treated with caution and we do not report the results separately for Western Australia in the main body of this report.

APPENDIX 3 TERTIARY ENTRANCE MEASURES USED BY AUSTRALIAN STATES AND TERRITORIES IN 1998

The following information was obtained from the relevant websites or the ACACA publication, Leaving School 1998: A Guide to Tertiary Entrance Statements in Australia (ACACA, 1998).

The tertiary entrance ranks or scores awarded to Year 12 students in Australia differ among the States and Territories. This Appendix outlines the different types of tertiary entrance score which were applied to Year 12 students in 1998. This is the year in which the majority of members of the Year 9 1995 LSAY cohort who received an *ENTER* as a result of their secondary schooling completed Year 12.

Tertiary entrance ranks are understood as the percentile ranks of Year 12 students with tertiary entrance scores in a particular year. However, this is not true for *ENTER* scores. The lowest possible *ENTER* score is 30 so that all students with scores 30 or less are assigned a score of 30. Furthermore adjustments are made for inter-state comparability. Therefore, the mean and other measures of central tendency will be substantially higher than if the scores ranged from zero.

It is noteworthy that the percentile ranks may not reflect the distribution of *ENTER* scores of Year 12 students in one particular year. For example, in New South Wales the scores are based on the distribution of Year 12 students over the previous three years. In many states, a substantial minority of students who obtain tertiary entrance scores are not in Year 12, but older students also applying for tertiary study.

New South Wales

The following text is from the New South Wales Board of Studies (NSW BOS, 1999:4-5).

> The Universities Admissions Index (UAI) replaced the Tertiary Entrance Rank (TER) from 1998. The TER was a figure between 0 and 100 that was expressed in steps of 0.05 with the top students receiving 100. It was in effect the cumulative frequency percentage of the Tertiary Entrance Score (TES) of the candidate. The UAI is similar to the TER, except that notional scores are also calculated for the whole of the equivalent School Certificate (SC) cohort from two years previously. A candidate's UAI indicates the relative standing in the larger SC cohort and will be higher than the corresponding TER. The UAI is more comparable over time and from state to state in Australia than the TER was. Only candidates who present 10 or more units receive a UAI, although there is provision for a limited UAI, based on fewer than 10 units, to be awarded in certain circumstances. In 1998, 49,982 candidates were eligible for a UAI. This represented 76.5% of the total candidature.
>
> The marks used in the calculation of the UAI from the TES were rescaled by the University of Sydney. The scaled examination marks and the moderated assessment marks for each candidate as calculated by the Board were averaged and then put through a further scaling process that reshaped the distributions, producing a new mean for each course. The new distribution and mean for a course are dependent on the average performance in all courses taken by the candidates in that particular course.
>
> In order to calculate the Universities Admissions Indexes the Tertiary Entrance Scores were first calculated, although these were not reported. The TES is a score out of 500, being the sum of the candidate's best 10 composite marks on a one unit basis. Marks for Board Endorsed courses are not included in the calculation of the TES.
>
> From 1996 the 10 unit marks included in a candidate's TES have been selected in this order:

The best unit mark in English;

The best unit mark from Key Learning Area Group 1 (Mathematics, Science,Technological and Applied Studies);

The best unit mark from KLA Group 2 (the remaining Key Learning Areas);

The seven best unit marks from those remaining.

From 1997, the TER, and since then the UAI, are confidential, available only to candidates. UAI data are not available to the Board of Studies or to schools.

Victoria

The following text is from the Victorian Tertiary Admissions Centre web site (http://www.vtac.edu.au/general/enter.html).

ENTER-Equivalent National Tertiary Entrance Rank

Developed as a selection tool to assist selection officers in considering applicants for courses, the *ENTER* is used by about half of the courses in the VTAC system to select most of their Year 12 students.

The *ENTER* is an overall percentile ranking, calculated in steps of 0.05, reflecting the comparative performance of each successful VCE candidate amongst the relevant age group in the given year.

The *ENTER* is a nationally equivalent measure (e.g. a University Admissions Index [UAI] of 95 in New South Wales is equivalent to an *ENTER* of 95 in Victoria). There is a complete exchange of interstate results and ranks between all admission centres and the University of Tasmania each year. Interstate applicants applying in Victoria and Victorian students applying to other states do not therefore have to supply results.

How is the *ENTER* developed?

Each student undertaking a VCE study will receive from the Board of Studies a letter grade for their CATs in each study and a VCE study score (relative position) out of 50 for that study. The study score will be used to determine whether course-based prerequisites, in terms of study scores listed in the course entries have been met.

The *ENTER* is based on an aggregate that is the sum of:

- the student's VCE scaled study score in English/ESL
- the student's best three other scaled study scores in an acceptable combination
- 10% of the student's next two best scaled study scores.

English/ESL and the three VCE studies with the highest scaled scores are called the 'primary four'. In all up to six study scores may be used in calculating the aggregate, and all study scores are scaled, that is, adjusted to reflect differences in the cohort of students taking the study compared to other studies and differences in the difficulties of the studies.

Candidates will not be able to calculate the *ENTER* by simply using their VCE study scores. The *ENTER* is explained in greater detail in *ENTER* into Tertiary Study, provided to Victorian students currently undertaking Year 11 or 12.

Queensland

This information on OP (overall position) was obtained from the Queensland Board of Studies web-site (http://www.bssssq.edu.au/Credentials).

An OP indicates a student's rank order position based on overall achievement in Board subjects. To be eligible for an OP a student must sit for the QCS Test and have studied 20 semesters of Board subjects including at least three of these subjects for all four semesters. Subjects are weighted equally for OPs.

The calculation of OPs involves two stages of scaling: between subject-groups within a school and between schools. Scaling aims to remove bias that may be caused by differences in the competition in different subject-groups and school-groups.

An eligible student's OP is reported as one of 25 bands from 1 (highest) to 25. The approximate distribution of students across the bands is:

Band 1 — about 2% of students

Bands 2 to 6 — about 15% of students

Bands 7 to 21 — about 70% of students

Bands 22 to 24 — about 11% of students

Band 25 — about 2% of students

The number of students eligible for an OP in a particular year is used as the base population for distributing students to OP bands.

To obtain the best possible OP, students are advised to study those Board subjects that they enjoy and in which they are able to achieve good results.

Calculation of OPs

The information used in the calculation of OPs comes from two sources: first and foremost, teacher assessment of student achievement in Board subjects; second, group scores on the QCS Test.

Because subject levels of achievement are expressed broadly (e.g. almost half of the students in many subjects receive SA) and because OPs are based on fine-grained distinctions between students, a more specific indicator of achievement is needed to calculate OPs. Subject Achievement Indicators (SAIs) are used for this purpose.

An SAI represents a student's position in a subject relative to all other students in the subject in the school (referred to as a `group'). SAIs have `order' and `interval' properties.

SAIs are assigned by schools to each student in each Board subject on a scale from 400 (for the students who are the highest achievers in that subject in that school regardless of the level of achievement) to 200 (for the students who are the lowest achievers in that subject in that school regardless of the level of achievement).

An SAI is not a percentage and has meaning only when viewed in relation to the SAIs of all other students in that subject in that school.

Because students have a right to know their final positions on SAI scales, all schools are required to make SAI decisions available to students at a suitable time and in a suitable form. The SAI decisions must be made available by no later than the Wednesday following the final Friday of attendance for Year 12 students. SAIs may be displayed as numbers or graphically using student names or other identifiers, as long as the method of presentation

allows students to see their position relative to others. Students who have concerns about SAIs should discuss them with subject teachers or the school administration.

Since students choose various combinations of the 50 or so Board subjects offered, and attend over 300 high schools in Queensland (state and non-state, city and country, large and small) the calculations used to arrive at OPs (and FPs) require that the values for achievement indicators be expressed on a common scale. The students' group performance on the QCS Test provides this scale.

Scaling aims to remove bias that may be caused by differences in the competition in different subject-groups and school-groups.

There are two stages of scaling (between subject-groups within a school and between schools), each of which involves the mean and mean difference of results on the QCS Test in conjunction with a linear transformation.

Students' SAIs that have been scaled using the subject-group QCS Test results are then combined to produce Overall Achievement Indicators (OAIs) which are then subject to further scaling using the school-group QCS Test results.

Combining involves taking 100 Weighted Semester Units (WSUs) from results in students' best Board subjects. WSUs are calculated by multiplying the same weighting (5) for each Board subject by the number of semester units (e.g. a student who studied French for four semesters has 20 WSUs of French — i.e. 5 x 4).

Ranking occurs after scaling, combining and scaling again, when students across the State who take different combinations of subjects and attend different schools can be listed in rank order, on the basis of their scaled OAIs, from 1st to 30 000th (assuming there are 30 000 OP-eligible students).

Banding is the `chunking' of the statewide rank order listing of all OP-eligible students into 25 bands so that student results can be reported as an overall position (from 1 to 25) within the State.

Conversion of OP scores to ENTER Scores

The following discussion and table relates to the Queensland overall position to the *ENTER* scores in other jurisdictions.

The aim of this table is to provide 1999 Year 12 Queensland applicants with information about the conversion of their results across Australasia. The conversions are based on 1998 results and must be used as a guide only.

The conversions are based on a common index, which allows comparisons to be made across states/territories and across academic years. Most states/territories have decided to use this index to report overall measure of student achievement, but with different names. South Australia/Northern Territory made this change in 1997, with the Australian Capital Territory, New South Wales, Tasmania, Victoria and Western Australia changing in 1998. As the table shows, the measures of overall achievement for New South Wales, Australian Capital Territory, Victoria, Western Australia, Tasmania, South Australia and Northern Territory will be exactly the same for 1999. An Equivalent National Tertiary Entrance Rank (*ENTER*) of 81.00 in Victoria = a Universities Admission Index (UAI) of 81.00 in NSW/ACT = a Tertiary Entrance Rank (TER) of 81.00 in South Australia/Northern Territory, Western Australia and Tasmania.

The conversions for Australian data were developed by members of the Australasian Conference of Tertiary Admission Centres by agreement of the Taskforce on an Australian Tertiary Admissions System. The Taskforce, with members from each state and territory, was appointed by the Ministerial Council on Education, Training and Youth Affairs.

Table A 7 Relationship between Overall Position (OP) in Queensland and *ENTER* Scores in the Other States, for 1998

NSW/ACT: UAI; VIC: *ENTER*; SA/NT, WA, TAS: TER	QLD Overall Position
99.95	1
99.50	1
99.00	2
98.50	2
98.00	2
97.50	3
97.00	3
96.50	3
96.00	4
95.50	4
95.00	4
94.00	5
93.00	6
92.00	6
91.00	6
90.00	7
89.00	7
88.00	8
87.00	8
86.00	9
85.00	9
84.00	9
83.00	10
82.00	10
81.00	11
80.00	11
75.00	13
70.00	14
65.00	16
60.00	17
55.00	19
50.00	20
45.00	21
40.00	22
35.00	23
30.00	24

Note: From http://www.vtac.edu.au/general/resultsconv.html

South Australia and Northern Territory

The following information on the South Australian Certificate and Tertiary Entrance requirements was obtained from the Senior Secondary Assessment Board of South Australia (http://www.ssabsa.nexus.edu.au)

> The SACE (South Australian Certificate of Education) is the basic requirement for entry to higher education. The higher education institutions use a tertiary entrance rank (TER), derived from SACE studies, to rank students for selection to particular courses. To be eligible for a TER, students must complete five Stage 2 (Year 12) subjects.
>
> To be awarded the SACE, students must:
>
> - study 22 semester (half-year) units, some of which may be combined to form full-year programs;
> - reach a level of successful achievement in at least 16 of the 22 units;
> - meet the study pattern requirements;
> - satisfy a writing-based literacy requirement.

Western Australia

The following information on the Tertiary Entrance Rank TER is from the Western Australian Tertiary Institutions Service Centre (http://www.tisc.edu.au)

> Selection for university admission for most university courses is based on a student's Tertiary Entrance Rank.
>
> Applicants for each university course will be ranked in order of merit based on their TER.
>
> The TER is a number between zero and 99.95 that reports a student's rank position relative to all other students of Year 12 school leaving age in the state. It takes into account the number of students with a Tertiary Entrance Score (TES) and the number of people of Year 12 school leaving age in the population of this state.
>
> For example, a TER of 75.00 indicates an overall result equal to, or better than, 75% of the Year 12 school leaving age population in Western Australia. The TER is derived from the Tertiary Entrance Score (TES).
>
> The TES will be calculated by multiplying the best average (mean) mark of four or five Tertiary Entrance (TEE) subjects, as listed below, by 5.1. The maximum TES is 510.
>
> At least one List 1 (Humanities/Social Sciences) subject and at least one List 2 (Quantitative/Sciences) subject must be included in the TES calculation.
>
> For subjects which may contribute to the TER, the results are the 50:50 composite of TEE results and school assessments except where subjects are taken on a private basis. All marks/assessments are scaled/moderated before they are used for university admission purposes. The University of Western Australia (and Murdoch University up to 2001 admission) require that all of the subjects which contribute to the TER must be taken in the same year.
>
> For Curtin University of Technology, Edith Cowan University and Murdoch University (Murdoch from 2002 admission) the marks which contribute to the TER may be accumulated over three years. Edith Cowan University provides a language bonus to eligible students sitting a TEE language subject.. The Tertiary Entrance Score will be boosted by 10% of the final scaled mark in a language subject other than English. The Tertiary Entrance Rank will then be calculated on the basis of this enhanced Tertiary Entrance Score. Where students complete more than one language other than English, the bonus will be calculated on the basis of the language subject with the highest final result.

Tasmania

(From ACACA, 1998)

In order to obtain a tertiary entrance score in 1998, Tasmanian students were required to complete two year full-time study in Years 11 and 12 of which four courses must be approved pre-tertiary (Group C) courses. At least three of these courses must be completed in Year 12.

The Tertiary Entrance Score is the sum of the 20 point scores for the best three approved syllabuses studied in Year 12 plus the best other two approved syllabuses studied in either Year 11 or Year 12.

The *ENTER* score is a percentile ranking of students within the age-cohort by percentile groups. It is calculated on the basis of Tertiary Entrance Scores.

Australian Capital Territory

(From ACACA, 1998)

In order to obtain a tertiary entrance score in 1998, students in the Australian Capital Territory were required to complete two years full-time study in Years 11 and 12. There are complex rules as to which subjects students may study if they intend to obtain a tertiary entrance score. "T' courses are the only courses accepted for tertiary entrance. Students must take at least 72 points of T subjects out of a total of 120 points.

Students must sit the general aptitude test –AST which moderates the school based assessments. (For more details see ACACA, 1998)

The Tertiary Entrance Score is the sum of the three highest major T course scaled scores plus 60 per cent for the 4th highest T course scaled score.

The *ENTER* score is a percentile ranking of students based on the Aggregate score.

Some schools in the ACT use the NSW system.

APPENDIX 4 INDIVIDUAL-LEVEL MEASURES USED

This appendix describes the individual-level variables used in Chapter 3 of this report. Socio-demographic data were collected from responses to questions in self-enumerated questionnaires completed by Year 9 students while at the school. School achievement was measured through standardised achievement tests in reading and mathematics administered in schools at the same time as the socio-demographic questionnaires. Measures of rurality were derived from census data on the population density of the locality of the respondent's home address. School sector was, in part, obtained from the sample design. Additional variables analysed in Chapter 3 were developed from information collected in the 1996 mail questionnaire (wave 2) and the subsequent annual telephone interviews from 1997 to 1999 (waves 3 to 5).

At the end of this Appendix, a statistical summary of these variables is provided in Table A 9 and

Table A 10. For each of the categorical variables, the frequency distributions are presented in Table A 9 for respondents with a valid *ENTER* score. For each of the continuous variables means, standard deviations, and maximum and minium values are presented in

Table A 10 again only for respondents with a valid *ENTER* score.

State/Territory. This measure refers to the jurisdiction (State or Territory) in which the student obtained an *ENTER* score in 1998. This information was collected during the 1999 telephone interview. It should be noted that this State/Territory measure differs from those used in many earlier LSAY reports, which were based on the State or Territory in which the respondent's school was located at the time of the first wave in 1995. However, for the majority of students, the State/Territory in which they sat the Year 9 achievement tests is the one in which they obtained an *ENTER* score.

Year 9 Achievement in Literacy and Numeracy. Students were asked to complete two tests on literacy and numeracy when they were first contacted in 1995. From their answers in these two tests three measures were constructed: achievement in literacy in Year 9; achievement in numeracy in Year 9; and combined achievement in literacy and numeracy in Year 9.

The measure of *literacy* is the students' raw scores on the literacy test, and could range from 0 to 20. The literacy test comprised 20 items. Students were asked to read some text and then asked several questions about the text. The text comprised short newspaper articles and longer textual passages. The material from newspapers included stories about a tug of war with a camel, a hang gliding flight, an armed robbery, birds trapped by dumped oil, scientific explanations of floating, and the flight of bees. The longer textual passages were on diverse topics such as the birth of a volcano, a railway worker's near fatal experience with an express train, and a dispute between two motorists.

The measure of *numeracy* is the students' raw score on the numeracy test. Scores could range from 0 to 20. The numeracy test comprised 20 questions. Three broad types of questions were asked. The first type dealt with mathematical operations (mainly computations) with little or no practical component. This included simple operations such as addition and subtraction, and more complex operations such as long division, fractions, squares, cubes, and square roots. The second type of question required practical applications of numerical skills. Examples are questions about buying things, reading scales, tables, and graphs, and calculating interest. The third type of question required the application of abstract mathematical concepts. These were mainly logical and spatial problems.

The *combined measure of achievement in literacy and numeracy* represents an overall measure of early school achievement. The scores for the literacy and numeracy tests were centred about the means and summed to produce a combined measure of achievement. The combined measure was then standardised to a mean of zero and a standard deviation of one. This measure was used in correlational and regression analyses. For the presentation of means and box and whisker plots, the continuous measure was split into four categories, based upon quartiles of achievement (that is, the highest quartile represents the top 25 per cent of students, then next quartile represents the next 25 per cent of students, and so forth).

Parental occupation. In 1995 students were asked to report the occupations of their father/male guardian and mother/female guardian, and to describe their work. This information was used to create two parental occupational measures.

The first parental occupation measure, *parental occupational group*, is a categorical variable. Responses were assigned occupational prestige scores based on the ANU2 scale. Six categories -- a condensation of the full scale -- were used: professional; managerial; white-collar; skilled; semi-skilled; and unskilled. This categorical measure was used when reporting means and box and whisker plots.

The second parental occupational measure, *parental occupational status*, is a continuous variable. Responses were assigned occupational status scores based upon the ANU3 scale. The ANU3 scale ranges from 0 (low status) to 100 (high status). Examples of jobs at the top of the status hierarchy are medical practitioners, university teachers and legal professionals. Examples of jobs at the bottom of the status hierarchy are various mining, construction and related labourers, forklift drivers, cleaners and product assemblers (Jones, 1989). This continuous measure was used for the correlational and regression analyses.

To simplify the presentation and to make the best use of available information, the occupation of the male parent/guardian was taken as the basis for both the categorical and the continuous occupational measures. Where information was missing on the male parent the occupation of the female parent/guardian was substituted. This approach was taken because a large proportion of respondents indicated that the occupation of the female parent was ‘home duties’, an occupation for which there is no occupational prestige score.

Parental education. Respondents were asked to report the highest level of education completed by each parent. Two parental education variables based upon this information are used in this report. The first measure is a simple dichotomy. Students whose parents hold a post secondary degree or diploma are distinguished from other students. Post-secondary education includes university and college education but not TAFE. The second is a continuous measure of education, ranging from 1 (no secondary school) to 5 (degree or diploma).

Both the dichotomous and the continuous parental education measures are based on a combination of father’s and mother’s education in a manner similar to that used for parental occupation. In this case, however, mother’s education was taken as the base measure, which if missing, was replaced by father’s education.

Family wealth. An indirect measure of family wealth was constructed, based on information about household possessions obtained from the 1996 mail survey. Respondents were presented with a list of 10 household items such as dishwashers and swimming pools, and asked which of these items their family possessed. A scale was created by summing the number of listed items that were possessed by the family.

Socioeconomic Background (SES). The continuous measures of parental occupational status, parental education and family wealth were combined to form composite measure of

socioeconomic background (SES). By using sheaf coefficient methodology, these variables were combined in a manner which maximised the explanatory power of the composite variable; that is, the composite measure combines those aspects of occupational status, parental education and wealth that influence *ENTER* score. For an explanation of sheaf coefficients, see Whitt (1986). A centred composite measure (with a mean of zero) and a standardised composite measure with a mean of zero and a standard deviation of one are used in the analyses.

Gender. Information on the sex of the students was obtained from responses to the 1995 questionnaire. In cases where information was not provided, the students' names were used to determine the students' sex. This information was confirmed in subsequent telephone interviews.

School sector. This measure refers to the school attended during Year 12 (1998). Three categories are used – government schools, Catholic non-government schools, and non-Catholic non-government schools – identified respectively as government, Catholic and independent. The measure is based upon information from the sampling frame (school sector when in Year 9), updated where applicable from information provided by the students in response to questions in the annual surveys on whether they had changed schools and the sector of their present school.

Region. Three measures of region are used in this report. The measures are based on the students' home address in 1995.

The first measure is simply a dichotomous measure, distinguishing metropolitan (lives in a place with 100,000 or more persons) from non-metropolitan students.

The second measure, based upon population densities, is a quartile measure. Students were arranged from the student with a home address in the most sparsely populated census district (CD), to the student with a home address in the most densely populated CD. The 25 per cent of students in the most sparsely populated CDs make up the first (most rural) quartile. The 25 per cent of students in CDs with the highest population densities make up the fourth (most urban) quartile. Similarly, the remaining respondents were categorised into the second or third quartiles.

The third measure, also based on the population densities, is a continuous measure. Each respondent was assigned the population density of the CD (or appropriate equivalent) in which their home was located.

Ethnicity. Two measures of ethnicity are used in this report. Both are based upon the country of birth of the respondent's father (or the country of birth of mother if data on the father is missing).

The first measure has three categories. A respondent is defined as *Australian* if their father was born in Australia, *English* if their father was born outside Australia in a predominantly English-speaking country, and as *non-English* if their father was born outside Australia in a predominantly non-English-speaking country. The countries classified as 'predominantly English-speaking' are listed in the second line of Table A 8.

The second more detailed measure has nine categories. Again, the first category comprises students whose fathers were born in Australia, and the second category comprises respondents whose fathers were born in another predominantly English speaking country. The remaining seven categories comprise respondents whose fathers were born outside Australia in a predominantly non-English-speaking country. The countries are classified into seven regions: Southern Europe; Other Europe; Asia; Middle East and North Africa; Other Africa; Central and South America; and Pacific Islands. The details of the classification are presented in Table A 8.

Table A 8 Categorisation of Birthplaces to Regional Groups

Group	Countries
Australia	Australia
English Speaking Country	UK, Ireland, New Zealand, United States, Canada, South Africa
Southern Europe	Greece, Italy, Spain, Portugal, Yugoslavia, Albania, Malta, Cyprus, Macedonia
Other Europe	France, Switzerland, Germany, Austria, Hungary, Netherlands, Belgium, Czech Republic, Slovakia, Romania, Albania, Denmark, Sweden, Norway, Iceland, Finland. Bulgaria, Armenia, Russia, Ukraine, Latvia, Estonia , Lithuania, Uzbek
Asia	Vietnam, Kampuchea, Laos, Thailand, Burma, China, Singapore, Malaysia, Hong Kong, Taiwan, Korea, Japan, India, Sri Lanka, Pakistan, Bangladesh, Philippines, Indonesia, Timor, Brunei, Borneo, Afghanistan, Maldives, Cocos, Christmas Is, Nepal
Middle East & North Africa	Turkey, Lebanon, Israel, Syria, Jordan, Iran, Iraq, Saudi Arabia, U.A.E, Bahrain, Oman, Kuwait, Qatar, Egypt, Libya, Tunisia, Morocco, Sudan, Algeria,
Other Africa	Somalia, Eritrea, Zaire, Zimbabwe, Kenya, Mauritius, Seychelles, Nigeria Botswana, Mozambique, Angola
Central and South America	Chile, Argentina, Brazil, Venezuela, Peru, Columbia, El Salvador, Uruguay, Guatemala.
Pacific Islands	Fiji, Tonga, Samoa, Solomon, Vanuatu, Norfolk Is, Papau New Gineau, Tahiti, New Caledonia, Pacific Islands: Other (Inc. Cook, Gilbert).

Indigenous status. In the 1995 questionnaire students were asked if they were an Aboriginal person or a Torres Strait Islander person. A dichotomous measure was constructed from the responses to this question.

Self-concept of ability. Self-concept of ability was measured in Year 9 by responses to the question: 'Compared with most of the students in your year level at school, how well are you doing in your school subjects overall?' Five response options were provided: very well; better than average; about average; not very well; and very poorly.

Students' educational aspirations. These were obtained in Year 9 asking students whether they planned to pursue post-school study.

Parents' educational aspirations. Parents' educational aspirations are measured indirectly by asking students when they were in Year 9 'In the year after leaving school, what do your parents want you to do?' Students who believed that their parents aspired for them to engage in post-secondary study are distinguished from other students.

Table A 9 Unweighted and weighted Frequency Distributions of Categorical Variables (Respondents with a Valid *ENTER* Score)

	Unweighted		Weighted	
	Frequency	Per cent	Frequency	Per cent
State				
NSW	1148	24	1648	36
Vic	1210	25	1309	28
Qld	975	21	960	21
SA	642	13	299	6
WA	371	8	237	5
Tas	118	2	55	1
NT	74	<2	23	0
ACT	218	5	92	2
Year 9 Achievement Quartiles				
Lowest Quartile	416	9	571	12
Second Quartile	908	19	987	21
Third Quartile	1411	30	1353	29
Highest Quartile	2013	42	1702	37
Parental Occupation				
Professional	1312	30	1190	28
Managerial	1114	25	1056	25
Clerical, Sales, Service	652	15	618	14
Skilled Manual	692	16	716	17
Semi-Skilled Manual	290	7	325	8
Unskilled Manual	379	9	384	9
Parental Education				
Not post-secondary	2625	67	2619	69
Post-secondary	1282	33	1162	31
Gender				
Male	2064	43	2033	44
Female	2692	57	2589	56
School Sector				
Government	2603	55	2660	58
Catholic	1125	24	1137	25
Independent	1028	22	826	18
Region				
Non-Metropolitan	1863	39	1812	39
Metropolitan	2893	61	2811	61
Region (Population Density Quartiles)				
Least Dense Quartile	1089	23	1039	22
2nd Quartile	1113	23	1033	22
3rd Quartile	1217	26	1107	24
Most Dense Quartile	1337	28	1444	31
Ethnicity (Father's Birthplace)				
Australia	3087	67	2912	65
Other English Speaking Country	500	11	465	10
Southern Europe	296	6	327	7
Other Europe	189	4	174	4
Asia	370	8	391	9
Middle East and North Africa	112	2	148	3
Other Africa	25	<1	23	<1
Cental and South America	18	<1	19	<1
Pacific	28	<1	42	<1

	Unweighted		Weighted	
	Frequency	Per cent	Frequency	Per cent
Indigenous status				
Non-Indigenous	4478	99	4354	99
Indigenous	45	1	48	1
Post-School Study Aspirations				
Not Full or Part-time Study	1647	35	1662	36
Full or Part-time Study	3109	65	2961	64
Parents' Post-School Study Aspirations				
Not full-time study	2822	59	2787	60
Full-time study	1934	41	1835	40

Table A 10 Statistical Summary of Continuous Measures (Unweighted)

Variable	N	Mean	Standard Deviation	Min.	Max
ENTER Score	4756	72.66	19.72	30.00	99.99
Literacy achievement in Year 9	4722	14.79	3.11	2.00	20.00
Numeracy achievement in Year 9	4716	13.96	3.19	0.00	20.00
Literacy and Numeracy Achievement in Year 9	4690	3.16	5.33	-23.59	14.41
Parental Occupational Status	4439	43.40	23.49	1.60	100.00
Parental Education	3907	3.56	1.28	1.00	5.00
Family Wealth	4170	6.77	1.64	1.00	10.00
Socioeconomic Background (1)	3357	18.55	5.35	5.23	31.40
Socioeconomic Background (2)	4756	18.32	4.94	5.23	31.40
Region (Population Density)	4724	1063.58	1045.10	0.01	8721.08
Self-Concept of Ability	4627	3.86	0.75	1.00	5.00
General Satisfaction with School (Year 9)	4181	53.27	15.72	0.00	100.00
Attitudes to Teachers (Year 9)	4289	60.39	14.98	0.00	100.00
Relevance of School work (Year 9)	4435	72.94	16.98	0.00	100.00
Sense of Achievement (Year 9)	4410	71.33	14.58	0.00	100.00
Teacher Performance (Year 10)	4170	22.62	3.57	7.00	30.00
Engagement (Year 10)	4101	10.99	3.15	5.00	20.00
School Climate (Year 10)	4207	8.53	1.89	0.00	12.00
General Satisfaction with School (Year 11)	4270	61.77	11.39	0.00	100.00
Classroom Climate (Year 10)	4105	10.83	1.69	4.00	16.00

APPENDIX 5 SCHOOL-LEVEL MEASURES USED

School-level Achievement

The School's mean Year 9 Achievement level was calculated from the students' individual combined Year 9 achievement score. Students were assigned the school's mean.

School SES

School SES measure was calculated calculating the school's mean socioeconomic status from the students' individual combined (the sheaf measure) socioeconomic background. Students were assigned the school's mean.

Engagement in school life

School engagement is measured by summing the students' involvement with extra-curricular activities (sport, community work, music, debating and drama) in Year 10 to form a 16-point continuous scale. School-level engagement was constructed by taking the school's mean level of engagement.

Satisfaction with School Life

The 1995 (wave 1) questionnaire contained a section about students' attitudes to school. Students were asked about a range of items – school in general, how they got on with their teachers, and how they felt about school work and their achievements at school. The items were prefaced by the words '*My school is a place where...'*, and students were asked to indicate whether they strongly agreed, agreed, disagreed or strongly disagreed with each one.

All of the items used in 1995 were positively worded, so that a higher percentage of students agreeing indicated a higher level of satisfaction with school. The scales correspond to measures used in earlier ACER studies. There is a general satisfaction scale or index (*General Satisfaction*), a measure comprising items on relationships with teachers (*Teachers*), a scale comprising items that focus on the relevance of school work to future life (*Opportunity*) and a scale of items about the students' achievement at school (*Achievement*). In this report only the general satisfaction scale was used. These scales have been used in an earlier LSAY Research Report No. 5.

The first general satisfaction scale collected from the first wave consisted of the following items:

My School is a place where:
I am given the chance to do work that really interests me
I feel happy
I like learning
I get enjoyment from being there
I like to ask questions in class
I like to do extra work
I really like to go each day
I enjoy what I do in class
I get excited about the work we do
I find that learning is a lot of fun

Have chance to do interesting work

A second measure of general satisfaction of school was asked in the 1997 (wave 3) questionnaire when the students were in Year 11.

The work we do is interesting
I feel happy
I really like to go each day
I get enjoyment from being there
I like to do extra work
I enjoy what I do in class
I find that learning is a lot of fun
I get excited about the work we do
I like learning

The two school-level general satisfaction with school measures were constructed by taking the school's mean level and assigning it the mean score to each student in that school.

Classroom Climate

Classroom climate was constructed from student responses (Strongly Agree, Agree, Disagree, Strongly Disagree,) to statements about student's classes 'Students Eager to Learn, Students, Make Good Progress, Students were well-behaved). These questions were asked in the 1996 survey (Wave 2) survey. The school-level measure of school climate was constructed by calculating the school's mean level school climate and assigning that score to each student.

School Climate

Three Likert-type items measured school climate from the 1996 questionnaire. Students were asked how they would rate their school overall in terms of (i) interested teachers, (ii) effective discipline and (iii) student learning. The fourth item on school spirit was not included in the scale.

Table A 11 Statistical Properties of School-level Variables (N=224)

	Mean	Standard Deviation	Minimum	Maximum
Socioeconomic Background	12.73	2.87	5.04	20.41
Year 9 Achievement	-0.14	2.75	-9.55	5.97
Self-Concept of Ability	3.75	0.24	3.10	4.63
Aspirations for Post-School Study (Year 9)	0.34	0.13	0.05	0.68
General Satisfaction with School (Year 9)	51.76	5.39	37.98	68.48
Attitudes to Teachers (Year 9)	59.29	5.80	43.22	87.62
Relevance of School work	71.78	5.19	57.41	84.00
Sense of Achievement (Year 9)	69.73	4.52	57.14	83.07
Classroom Climate (Year 10)	10.71	0.64	8.60	12.30
Teacher Performance (Year 10)	22.46	1.28	19.27	27.78
Engagement (Year 10)	10.71	1.29	6.13	14.67
Teachers (Combined)	81.75	6.59	63.89	115.40
School Climate (Year 10)	8.36	0.79	6.39	10.56
General Satisfaction with School (Year 11)	59.50	3.28	49.33	70.90

REFERENCES

ACACA (1997) *Leaving School 1998: A Guide to Year 12 Certificates and Tertiary Entrance Statements in Australia.* Australian Curriculum, Assessment and Certification Authorities (ACACA). New South Wales. Board of Studies.

Ainley, J., Frigo, T., Marks, G., McCormack, S., Mcmillan, J., Meiers, M. and Zammit, S. (2000) *The Measurement of Language Background, Culture and Ethnicity for the Reporting of Nationally Comparable Outcomes of Schooling*. Draft Report (Version 3) for the National Education Performance Monitoring Taskforce.

Ainley, J., & Sheret, M. (1992). *Progress through High School*. (ACER Research Monograph Vol. 23). Hawthorn: ACER.

Broom, L. D.-J. P. M., Patrick. (1977). *Investigating Social Mobility*. Canberra, Department of Sociology, the Research School of the Social Sciences, Australian National University, Departmental Monograph. Canberra: Department of Sociology.

Bryk, A. S., & Raudenbush, S. W. (1989). Toward a more Appropriate Conceptualization of School Effects: A three-level hierarchical linear Model. In B. R.D. (Ed.), *Multilevel Analysis of Educational Data.* (pp. 159-204). New York: Academic Press.

Cassidy, S. (1999). 'Gender gap widens to a gulf'. *Times Education Supplement, 4309*, 19 January, p. 6.

Coleman, J. S., Campbell, E., Hobson, C., McPartland, J., Mood, A., Weifeld, F., & York, R. (1966). *Equality of Educational Opportunity*. Washington D.C: US Government Printing Office.

Coleman, J. S., Hoffer, T., & Kilgore, S. (1982). *High School Achievement. Public, Catholic, and Private Schools Compared*. New York: Basic Books.

Collins, C., Kenway, J. & McLeod, J. (2000) *Factors Influencing the Educational Performance of Males and Females in School and their Initial Destinations after leaving Schoo*l. Report Commissioned by the Analysis and Equity Branch of the Department of Education, Training and Youth Affairs. Commonwealth of Australia, July 2000.
http://www.detya.gov.au/iae/documents/merged_recovered1.pdf

Gannicott, K. (1997) *Taking Education Seriously*, The Centre for independent Studies (370.994 GAN)

Gannicott, K. (1998) *School Autonomy and Academic Performance*, Commonwealth Department of Employment, Education and Training (371.2 GAN).

Goldstein, H. (1995). *Multilevel Statistical Models*. (2nd ed.). London New York: Edward Arld Halstead Press.

Heckman, James (1979), Sample Selection Bias as a Specification Error, *Econometrica*, 47:153-161.

Heckman (1990) *Varieties of Selection Bias.* American Economic Association Papers 1990 pg. 313-318.

Hill, P., & Rowe, K. J. (1996). Multilevel Modelling in School Effectiveness Research. *School Effectiveness and School Improvement*, 7(1), 1-34.

Jencks, C., Smith, M., Acland, H., Bane, M. J., Cohen, D., Gentis, H., Heynes, B., & Michelson, S. (1972). *Inequality: A Reassessment of the Effect of Family and Schooling in America*. New York: Basic Books.

Jones, F.L. (1989). Occupational Prestige in Australia: A New Scale. *Australian and New Zealand Journal of Sociology.* 25(2), 187-199.

Kreft, I. G. G. (1993). Using Multilevel Analysis to Assess School Effectiveness: A Study of Dutch Secondary Schools. *Sociology of Education*, 66, 104-129.

Kreft, I., & de Leeuw, J. (1998). *Introducing Multilevel Modeling*. London: Sage.

Lee, V. E., & Bryk, A. S. (1989). A Multilevel Model of the Social Distribution of High School Achievement. *Sociology of Education*, 62, 172-192.

Levine, D. U. (1992) An Interpretative review of US Research and Practice dealing with unusually Effective Schools. In Reynolds & Cuttance (eds.) *School Effectiveness: Research Policy and Practice.* London: Cassell.

MacCann, R. (1995). Sex Differences at the NSW Higher School Certificate after Adjustment for the Effects of Differential Selection. *Australian Journal of Educational research*, 39(2), 163-188.

Marks, G. N. (1999) *Urban/Rural Differences in Literacy and Numeracy Achievement. Tables and other Results.* Request from DETYA.

Marks, G N. & Ainley, J. (1997) *Reading comprehension and numeracy among junior secondary school students in Australia*. LSAY Report No. 3. March 1997.

Marks, G. N. & Long, M. L. (2000) *Weighting The 1995 Year 9 Cohort Sample For Differential Response Rates and Sample Attrition.* LSAY Technical Paper number 15.

Marks, G. N. & McMillan, J. (2000) *Social Background and Educational Outcomes: Preliminary Results from the Longitudinal Surveys of Australian Youth.* Report for the National Education Performance Monitoring Taskforce. June 2000.

Marks, G. N., Fleming, N. Long, M. & McMillan, J. (2000) *Patterns of Participation in Year 12 and Higher Education in Australia: Trends and Issues*. LSAY Report No. 17. December 2000

Masters, G. N. & Forster, M. (1997) *Mapping Literacy Achievement: Results of the 1996 National School English Literacy Survey: incorporating a report on the survey principles, procedures and findings.* Canberra: Dept of Employment, Education, Training and Youth Affairs (DEETYA), 1997. ISBN 0864312490.

MCEETYA (1997) *National Report on Schooling in Australia 1997*. Ministerial Council on Education, Employment, Training and Youth Affairs (Australia). Curriculum Corporation (Australia). ISBN 10360972.

NSW BOS (1999) *1998 Higher School Certificate Examination Statistics.* Board of Studies NSW 1999 http://www.boardofstudies.nsw.edu.au February 1999. ISBN 0 7313 4244 5

NSW UAC (1998) *New South Wales Vice Chancellors Conference. Report on the Scaling of the 1998 NSW Higher School Certificate*.http://www.uac.edu.au/publications/sc22-frameset.html

Puhani, P. (2000) The Heckman Correction for Sample Selection and its Critique, *Journal of Economic Surveys* 14(1):53-68.

Rowe, K.J. (1999). *VCE Data Project (1994-1999): Concepts, issues, directions & specifications*. A research and evaluation project conducted for the Board of Studies, Victoria. Centre for Applied Educational Research, The University of Melbourne.

Scheerens, J. & Bosker, R. (1997) *The Foundations of Educational Effectiveness*. Oxford: Pergamon.

Singer, J. (1998) Using SAS PROC MIXED to Fit Multilevel Models, Hierarchical Models, and Individual Growth Models. *Journal of Educational and Behavioural Statistic*s, 24(4) 323-355.

Snijders, T.A.B., & Bosker, R.J. (1999). *Multilevel analysis. An introduction to basic and advanced multilevel modeling*. Newbury Park / London / New Delhi: Sage.

Teese, R (2000) *Academic success and social power : Examinations and Inequality.* Carlton Vic.: Melbourne University Press

VBOS (1998) *Report on the 1997 VCE General Achievement Test*. June 1998 Victoria Board of Studies: Melbourne.

VTAC (1998-1999) *VTAC Annual Statistics.* Victorian Tertiary Admissions Centre. Melbourne http://www.vtac.edu.au/pubs/report/index.html

Young, D. J. (1994). A Comparison of Student Performance in Western Australian Schools: Rural and Urban differences. *Australian Educational Researcher*, 21(2), 87-105.

Whitt, H. P. (1986). The Sheaf Coefficient: A Simplified and Expanded Approach. *Social Science Research*, 15, 174-189.

Wolf. F. D. (1986) 'Meta-Analysis. Quantitative Methods for Research Synthesis'. Volume 59. *Quantitative Applications in the Social Sciences.* Sage: Beverly Hills.

Websites

Victorian Tertiary Admissions Centre web site http://www.vtac.edu.au/general/enter.html). http://www.vtac.edu.au/general/resultsconv.html

Queensland board of studies web-site http://www.bssssq.edu.au/Credentials

Senior Secondary Assessment Board of South Australia http://www.ssabsa.nexus.edu.au

Western Australian Tertiary Institutions Service Centre http://www.tisc.edu.au

NOTES

1 In contrast, the graphical representations -- the 'Box and Whisker' and regression plots – are based on unweighted data since they are plots of actual data points which represent individual students.

2 The Heckman (1979, 1990) correction is the most common procedure used to estimate relationships in a sub-group that is a non-random selection of the larger parent group. The correction, in theory, provides estimates of what the relationship would be if the sub-group were in fact, a random selection from the larger parent group. Despite substantive problems we have with the procedure (too hypothetical and counterfactual), it has statistical problems in these data. The two-step procedure first models the selection (that is those who obtain a score) and then models the variable of interest (*ENTER* score). One assumption of the procedure is that the variables that predict selection are independent of the variables that predict the variable of interest. This assumption cannot hold because the same variables that predict obtaining an *ENTER* score (achievement, gender, socioeconomic status, State and school sector) are also correlated with *ENTER* scores. The Heckman procedure was used to investigate the weaker relationships of achievement and socioeconomic status with *ENTER* scores in South Australia. However, different specifications produced widely differing results strongly indicating that the procedure is inappropriate in this context. This instability is discussed by Puhani (2000).

3 This has the effect of producing larger correlations that would be the case if the variables were standardised using only the cases in a particular analysis. Therefore in these analyses the Pearson correlation is not equivalent to the square-root of the R square goodness-of-fit measure.

4 The standard errors are larger for the bottom quartile since fewer students in that group obtained *ENTER* scores.

5 The South Australian correlations may be smaller because a smaller proportion of the original cohort provided *ENTER* scores (Table A 1). Students with lower levels of literacy and numeracy were less likely to obtain an *ENTER* score in South Australia than in states. Therefore the correlation is attenuated. Compared to other states, a greater proportion of Year 12 students undertake non-tertiary entrance subjects.

6 In the Victorian General Achievement Test (GAT) there are three components: Written Communication; Maths, Science and Technology; and Arts, Social Science and Humanities. Although there were some exceptions, Rowe (1999) found the appropriate component had stronger effects in a given subject. For example, the mathematical component of GAT had stronger effects on scores in accounting, chemistry, mathematics, and physics whereas the communication component had stronger effects on scores in English, literature and legal studies.

7 It should be noted that very low achievers in Year 9 generally did not have an *ENTER* score in Year 12.

8 Another measure of Year 9 achievement, a sheaf variable, was constructed to test if a sheaf variable produced stronger correlations since it combines those aspects of literacy and numeracy most relevant to *ENTER* score. However the correlations were almost identical to the correlations presented for simple additive index.

9 It was concluded that the impact of socioeconomic background on *ENTER* score net of Year 9 achievement is small. *ENTER* scores range from 30 to 99.9. A four standard deviation difference in socioeconomic background translates to a difference of 15 *ENTER* points (4 x 3.7 from Table 6). A four standard deviation comparison is an extreme comparison, comparing students at the 95th percentile in the distribution of socioeconomic background to the 5th percentile. A difference of 15 *ENTER* points is small compared to the possible difference of 70 *ENTER* points.

10 This is due to the continuing debates surrounding gender differences in senior secondary school. In addition, information on the students' gender is routinely collected by the relevant Boards of Study and Tertiary Admission Centres.

11 Strictly speaking, since gender is a categorical variable it should not be treated as if it was a continuous variable. However, correlation coefficients for dichotomous variables are often calculated. They provide a good indication of the strength of a relationship.

12 The regression equation for males is:

ENTER = 73.8929 - 1.469367*achievement + 0.029171*achievement^2 –0.000128*achievement^3.

The regression equation for females is:

ENTER = 49.02051 - 0.094488*achievement + 0.006917*achievement^2 - 9.773E-6*acheivement^3.

13 Figure 5 could be interpreted as suggesting that boys who had low Year 9 achievement levels, performed better (in Year 12) than expected. However, there are too few cases at that end of the graph to be confident that this is the case. Few students who performed poorly in Year 9 achievement tests obtained *ENTER* scores. A high proportion left school (see LSAY reports on early school leaving) and the ones who remained tended to pursue non-tertiary entrance courses.

14 The regression equation for males is:

ENTER=63.20359 + 0.194021*(occupational status).

The regression equation for females is:

ENTER=65.5307 + 0.19782*(occupational status).

15 The inclusion of the 'fees charged' measure should control for the variation in independent schools from the very prestigious 'Public' schools to the newer low-fee independent schools. It is not clear how this measure was constructed or its statistical properties, but it appears to have had no significant effect on the probability of schools achieving at least two students in the 1000 of the state.

16 It can be argued that controlling for performance in the GAT and other general ability tests will underestimate school and therefore school sector differences. Schools will to some extent influence performance in ability tests, so that any comparison using an ability variable as a control will underestimate school and school sector differences. This is especially the case where the general ability tests are administered in Year 12. This means that school sector differences reported by Gannicott and Rowe would be larger if the general ability tests were administered some years prior to Year 12.

17 For the entire period 1994-1998 the effects sizes for independent schools compared to government schools were 0.37, 0.31, 0.25, 0.30 and 0.22 (Rowe, 1999). These effect sizes are equivalent to correlations of 0.18, 0.15, 0.12, 0.15 and 0.11.

Note that effect sizes can be converted to correlations with the following formula:

$$r = \frac{d}{\sqrt{d^2 + 4}}$$

where r is the correlation and d is the effect size (Wolf, 1986)

18 For the period 1994-1998 the effect sizes for Catholic compared to government schools were 0.14, 0.13, 0.10, 0.11 and 0.07 (Rowe, 1999).

19 It can be argued that other factors also contribute to school sector differences in *ENTER* scores. These include parental and student aspirations, school climate, and the quality of school resources. Although these factors do play a role, it is debatable how relevant they are to school sector comparisons. For example, statistical analysis indicates that parental aspirations may be associated with school sector differences in performance, but these aspirations are not entirely exogenous to sector. Rather, such aspirations may in part be a consequence of school sector. In contrast, socioeconomic background and Year 9 achievement are exogenous to the influence of school sector during the final years of secondary school.

20 The 6-percentile difference between independent and government schools is equivalent to an effect size of 0.30 which is larger than Rowe's Victorian estimate for 1998. However, as the GAT test is taken in Year 12 it incorporates a larger school sector component than achievement in Year 9. Therefore, it is expected that school sector effects net of the GAT score will be weaker than school sector effects net of Year 9 achievement.

21 This analysis addresses the specific question 'Does achievement growth between Years 9 and 12 differ between school sectors?' Therefore, it is not necessary to include other predictor variables. However, if the subsequent research is asked 'What are factors responsible for differences in achievement growth?' then further analyses are required. The analyses in the next chapter suggest that the academic environment of independent schools is responsible for the higher level of student growth in this sector compared to the government sector. These analyses also suggest that classroom climate is, in part, responsible for the higher levels of achievement growth in Catholic schools compared to government schools. However, these analyses are by no means conclusive and to adequately address the research question of 'why' would require a research report devoted to school sector differences. Ideally such a report would investigate school and teacher effects with a larger number of schools available than in these data.

22 As with other graphical presentations of socioeconomic background in this report, a linear specification is used since the relationship is not strong enough to estimate a non-linear relationship.

23 It is not possible to create measures of region for students in Year 12. As few students move regions, the results based on a Year 9 measure are unlikely to differ substantially from those based on the Year 12 student or school addresses. Furthermore, a measure based on school location in Year 12 will may undermine the effects of regional disadvantage because if a proportion of high achieving students living in regional areas will move to a larger centre. Therefore, a Year 9 measure is arguably a superior measure of regional disadvantage.

24 First, separate analyses were performed for metropolitan and non-metropolitan students, examining the effect of Year 9 achievement on Tertiary entrance performance. For metropolitan students the effect was 11.3 compared to 10.4 for non-metropolitan students. However the associated standard errors were large (around 0.6). Second, more formal interaction models were also analysed. These specified main effects for region and Year 9 achievement and an interaction term between the two. The interaction effect was in the expected direction but small and not statistically significant. This result was found with two measures of region (metropolitan/non-metropolitan and population density).

25 The result for the Southern Europe group is a little surprising since this group shows similar (slightly higher) participation rates in higher education than students classified as 'Australian' (Marks et al, 2000). This apparent anomaly is probably due to selection effects since a substantially higher proportion of the 'Southern Europe' group compared to the 'Australia' group participated in Year 12.

26 It should be noted that the estimates in the first column of Table 17 match the mean *ENTER* scores presented in the first column of Table 16. For example in Table 17, the effect of 9.0 percentile points for the 'Asia' group when added the estimate for the intercept (69.9) equals their mean

ENTER score of 78.9 (in Table 16). The same applies to the estimates for the other groups (within rounding error).

27 The small effect for region moves out of statistical significance.

28 Parental Aspirations were not included in this analysis since they have a substantial correlation with student aspirations.

29 This figure of 20 per cent as the variance accounted for by social background is high compared to that for this study and other contemporary research. In the previous chapter it was reported that the correlation between socioeconomic background (the composite measure) and *ENTER* score was around 0.3 which is equivalent to about 10 per cent of the variation in *ENTER* scores being accounted for by socioeconomic background.

30 The number of schools within each State is too small to present the intra-class correlations by jurisdiction. Preliminary analyses indicated that the estimates were too unstable to provide reliable interpretations.

31 The caveats to this estimate are that it is based on only 229 schools and only a small number of students in each school. (Schools in the original sample which did not offer Year 12 were excluded as were schools with very small numbers of students). More definitive conclusions would be generated from an analysis which included all Year 12 students in all schools. However, we are confident that the estimates presented are accurate.

32 In this instance, the inclusion of socioeconomic background appears to have a larger effect than Year 9 achievement. It should be remembered that the focus is on school differences not on individual students. At the individual student level, achievement in literacy and numeracy Year 9 has a much stronger impact on *ENTER* scores than socioeconomic background.

33 The correlation between socioeconomic background and Year 9 achievement is around 0.3 (or less) so that at most 9 per cent of the variation in achievement in literacy and numeracy is attributable to socioeconomic background.

34 Analysis of the Australian data in the PISA study showed that a composite measure of socioeconomic background comprising father's and mother's occupation and education could only explain 13 per cent of the variation in achievement in reading literacy and mathematics. The PISA data has far more extensive measures of literacy and numeracy than in the LSAY data.

35 Year 9 achievement in literacy and numeracy is only partially explained by socioeconomic background. Around 9 per cent of the variance in Year 9 achievement scores is explained by the composite measure of socioeconomic background.