

The impact of school choice on students' university entrance rank scores in Australia

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Abstract

This paper examines the impact on students' end of school achievement of choosing a new type of school for the final two years of high school (grades 11 and 12). In some regions of Australia, high schools end at 10th grade and students are required to choose a new school to attend for 11th and 12th grade, thus requiring all families to make a new choice between schools in the Government, Catholic or Independent school sectors. By comparing students from the same source schools who make different choices of schools to attend in 11th and 12th grade, the authors examine the impact of this choice of schools on the students' eligibility for university. This eligibility is measured by their Tertiary Entrance Rank (ENTER) score awarded upon completion of 12th grade. We find that the educational aspirations, motivations and ambitions of students who choose to attend Independent schools for 11th and 12th grade are different to those who chose to attend Government or Catholic schools. Nevertheless, the positive effect of attending an Independent school on students' ENTER scores appears to reflect more than this selection effect.

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1. Introduction

In Australia, students complete 12 years of formal schooling and normally seek entry to university after completing 12th grade (at around 18 years of age). Students' results on completing 12th grade are standardised to give each student a university entrance rank score which is used to apply for admission to university courses nationwide. A student's entrance rank score is a 'high stakes' assessment of student achievement on graduation from school, as it is the principal means by which young people leaving school in Australia are offered university places. Not all students obtain an entrance rank, even among those who complete 12th grade, so there are a number of selection issues to be taken into account in analysing the impact of the school choice, in addition to sorting effects associated with school sector choices. Nevertheless there does seem to be a private school effect on entrance rank scores (Marks 2004). This effect is of the order of 5 points for Independent schools and 3 points for Catholic schools. By way of comparison, a one standard deviation in school achievement measured in 9th grade was associated with a 10 point increase in entrance rank scores (Marks 2004: Table 2).

This paper examines the impact on students' entrance rank scores of choosing a new type of school for the final two years of schooling (11th and 12th grade). In some regions of Australia, high schools end at 10th grade and students are required to choose a new school to attend for 11th and 12th grade. Students in public schools in the Australian Capital Territory, Tasmania and some rural areas in other jurisdictions face this decision, as do students in some private schools across Australia. Students in these particular schools are *required* to choose a new school after 10th grade. While these students are not randomly assigned to new schools, they are forced to make a new choice, which distinguishes them from students who make an active choice to change schools. The hope is that studying the outcomes of this group of involuntary "choosers" will reduce the role of self-selection bias in estimates of the impact of school choice on student achievement. This study compares the university entrance rank scores of students from the same source schools who make different choices of schools to attend in 11th and 12th grade, using longitudinal data that was collected both before and after these new school choices were made.

The paper begins with a description of the Australian school system and school funding arrangements, to provide essential contextual information for the reader. We then review relevant literature on the effects of school choice, from Australia and other countries. The methodology section discusses the problems associated with estimation of school sector effects, particular issues with the data and our approach to this study. We present our analysis in the Findings section and a summary in the Conclusion.

2. The Australian school system

Three sectors

The public school system in Australia is administered at the state government level, so there are eight separate public systems, with slight variations in how they are structured. The public systems educate around two-thirds of Australian school students, with the balance educated in Catholic schools (20 per cent) and other non-government or Independent schools (13 per cent).

The Catholic schools are also organised via State-level Catholic authorities, while the other non-government are known as 'independent' because they have traditionally not belonged to school 'systems'. State public education authorities are responsible for determining educational policies in the areas of curriculum and state-wide student assessment, final year assessment and certification, as well as the registration of private schools.

In institutional terms, Catholic schools in Australia are traditionally more similar to public schools than to Independent schools. The vast majority of Catholic schools are administered by state-wide Catholic Education agencies that allocate funding, determine staff salaries, and provide curriculum guidance (including a faith curriculum) to schools at all levels. Following the introduction of government subsidies in the 1970s, mainstream teaching roles for members of religious orders in Catholic schools have all but disappeared. In contrast to the US, where Catholic schools cater for half of the private school student population (Hoffer 2009, Marks 2009), Australian Catholic schools enrol almost two-thirds of the private school population and resemble a mass system of both elementary and high schools across the nation, serving rural as well as urban rural areas. Catholic schools charge relatively low fees (compared to Independent schools) and offer generous fee concessions to children from large families or from disadvantaged backgrounds, such as migrants and refugees. Catholic schools are increasingly accepting of students from non-Catholic backgrounds, although all students receive instruction in the Catholic faith. At the high school level, Catholic schools cater to a more socially advantaged student population than public schools, but are less elite in terms of student population than Independent schools (Ryan and Watson 2004).

Independent schools are traditionally non-Catholic in religious affiliation (eg. Episcopalian and Protestant denominations) and include many community-operated schools and schools based on a particular educational philosophy such as Montessorri or Steiner education. Traditionally, Independent schools have been concentrated in urban areas at the high-school level and focused on the preparation of students for university. However the Independent schools sector is now the fastest growing sector of private schooling in Australia and has gained an increased share of the student population over the past decade, in part through growth in low-fee schools.

Funding arrangements support private school choice

Under the Australian constitution, power over education resides with state governments. Thus the operation of public schools is the responsibility of state governments, which provide most of their funding. Public schools are fully government funded and enrol 59 per cent of students in 11th and 12th grade. Through its constitutional power to provide specific purpose payments to the states, the federal government provides some funding for public education, but provides more money directly for the operation of private schools. These payments effectively provide a weighted subsidy (voucher) for all students to attend the school of their choice in the private sector. Federal grants to private schools are supplemented by state government grants to the value of approximately half the federal grant. Schools in the Catholic system receive a combined (ie federal and state) grant per student that is worth approximately 80 per cent of school operating costs. Catholic system schools enrol 22 per cent of all students in 11th and 12th grade. Students attending Independent schools attract a federal voucher weighted according to the socio-economic status (SES) of their parents' home address ranging from 70 per cent to 14 per

cent of school operating costs (plus the grant from the state governments). The weighted subsidies are paid in a lump sum to the school and all students attending a particular school are charged similar fees (these vary by grade).¹

There are both high-fee and low-fee schools in the Independent sector and together, these schools enrol 19 per cent of 11th and 12th graders. A 2003 survey of fees charged in Independent schools found that these ranged for Year 12 students from around \$500 to \$19000, with a mean fee of \$6500 (median \$4500). In 2008 dollars, and converted to \$US these fees are around \$US470 to \$US 18000, with a mean fee of \$US 6000 (median \$US 4200). Average secondary school fees in Catholic schools are around \$A3000 per annum or \$US 2400. Since the introduction of government subsidies in 1974, private schools have used the additional funding to increase the quality of their services (ie. to reduce student: teacher ratios) rather than to reduce their fees. The private school enrollment share has grown in Australia since the 1970s, more among high-SES groups than among low-SES groups (Watson and Ryan 2004).

There are many policy frameworks that promote school choice, of which Australia represents only one model (Heyneman 2009). The most common approach is to allow open enrollment policies in public school systems, such as in school districts like Durham, North Carolina and Chicago Illinois, and in countries such as New Zealand (Bifulco, Ladd & Ross, 2008; Kreuger & Zhu, 2002; Ladd, 2002). A variation on this model is to establish fully funded Charter or Magnet schools as an alternative to public schools. A second approach is to offer full vouchers to private providers with varying degrees of regulation, such as in Chile (Hsieh & Urquiola, 2006) Sweden (Neal 2009) and the Netherlands (Ritzen 1997). A third approach is to provide partial vouchers to offset the cost of educating lower-income students who choose to attend private schools, such as in Australia (Ryan and Watson 2004). A fourth approach is to provide targeted full vouchers for low-income students to attend the private or public school of their choice, such as the District of Columbia Opportunity Scholarship Program (Wolf, Gutmann, Puma, Kisida, Rizzo and Eissa, 2009).

This study relates specifically to the Australian model where the government pays partial or weighted vouchers in respect of each student enrolled in the registered private school of their choice. The voucher is paid directly to the school on receipt of enrolment returns, and the level of each voucher is determined by a measure of the socio-economic status of the student's family. Although the subsidies paid to the school are differentiated by the student's socio-economic status (SES), the tuition fees charged by schools are not. All students within a school are charged similar fees, usually differentiated by year level and with some fee concessions for siblings or other groups, such as the children of school staff. As every private school student is expected to make a contribution to the cost of their education through tuition fees, private school choice in Australia is not as "free" as it is in systems where students in private schools receive full vouchers for tuition. In practice, many private schools, particularly Catholic schools in Australia receive generous government subsidies and do not make excessive demands on their students in

¹ Funding to schools in the Catholic system also occurs on the basis of the SES of students. However, the money is paid to the Catholic education authorities who have their own mechanisms for allocating the funding between schools.

terms of tuition fees. Nevertheless, the constraint on choice represented by tuition fees must be acknowledged in interpreting the results of any Australian study. Australian private school students should be recognised as coming from families who are prepared to overcome the barrier posed by tuition fees, however modest. In this sense, the scope for private school choice in Australia is compromised by the provision of only partial vouchers and students attending Australian private schools are therefore more “active” choosers than those who might choose private schools in a fully funded voucher system, all else being equal.²

In summary, since 1974, every student who enrolls in an Australian private school attracts a government subsidy worth between 14 per cent and 80 per cent of total student costs. The level of government per capita subsidy is determined on a needs basis and varies according to the socio-economic status of the school or system’s student population. There is minimal government regulation over how the government subsidies are spent (Barrera – Osorio and Patrinos 2009, Heyneman 2009) and minimal government influence over the fees charged by private schools.

Twelve Years of formal schooling

While Australian schools share a common Year 1 to Year 12 grade structure, aspects of the structure of school education differ across Australian States and Territories in many areas: grade structures, commencement and age of compulsory attendance, qualification certification, curricula and the autonomy of decision-making at the school level (OECD 2009). Key features of the education system are summarised in Table 1. Attendance is compulsory between the ages of 6 and 15, or up to 17 years in some States. The final two years of the secondary school are generally not compulsory. In most cases, students start their schooling at around 5 years of age, enrolling usually in a preparatory year which precedes Year 1.

At the end of Year 12, State certification authorities provide successful students with certificates that indicate they have fulfilled the requirements of their particular jurisdiction’s Year 12 certificate. These requirements vary by state and may include public examinations and various forms of moderated, within school, assessments. Eligible students receive a tertiary entrance score which indicates the relative ranking of their marks towards their certificate within the cohort of students completing Year 12. These rankings, or ENTER scores, are used by universities, in conjunction with student applications setting out their course preferences, to allocate places in courses to the highest ranked individuals who applied to the specific courses. An ‘ENTER’ score is a generic name for these entrance ranks that is calibrated to a common, Australian-wide scale that ranges from 30 to 99.95. Students whose rankings would be less than 30 are assigned that value.

The ENTER scores awarded upon completion of Year 12 enable universities to rank students for admission to the degree courses of their choice in each higher education institution. Generalist first degrees are not common in Australian universities, so the ENTER ranking process determines which individuals are given places in many sought-after professional courses such as

² Goldhaber (2009) points out how contextual issues such as teacher attrition, the supply of private schools, and transportation availability influence market-based competition in voucher systems.

law, medicine and dentistry. Hence, the completion of Year 12 and one's ENTER score represents a 'high stakes' transition point for young people graduating from high school, which is important in determining the direction of their careers and lifetime sources of income.³

3. Choice and Schooling

The policy focus on increasing school choice has been fuelled by 25 years of research suggesting that private school students outperform public school students and that the private school advantage appears particularly strong for students from minority groups or disadvantaged social backgrounds (eg. Coleman, Hoffer, & Kilgore, 1982, Hoffer 2009, Williams and Carpenter 1990, Evans & Schwab, 1995, Marks, McMillan, and Hillman, 2001, Neal 2009, Cardak and Ryan, 2009). However, as Berends *et al.* (2009) point out, these research outcomes are "difficult and controversial" due to confounding factors such as: the question of how and why parents choose schools; how chosen schools differ from those reporting lower levels of academic achievement; and the different research methods used to make comparisons between schools (Berends *et al.* 2009: xv).

While some studies of the impact of private schools on student performance have mixed results (Wolf *et al.* 2009, Vandenberghe and Robin 2004, Hoffer, 2009, Neal 2009), in Australia, school students who attend Catholic and Independent schools appear to have better educational outcomes than those who attend Government schools. These better outcomes range from higher school achievement levels and Year 12 completion rates through to transfer rates from high school to studies at university (Marks, McMillan and Hillman, 2001, Fullarton, Walker, Ainley, and Hillman 2003, Le and Miller 2003 and Cardak and Ryan 2009). Using the same data as that used in this paper, Cardak and Ryan (2009) found that school sector has an impact on university participation through its impact on student ENTER scores, but no direct effect on university participation. Marks, McMillan and Hillman (2001) and Marks (2004) also found Catholic and Independent school effects of 3 to 5 and 5 to 6 points respectively in the two cohorts of data used in this paper, once Year 9 school achievement and parental, occupation-based SES are taken into account. Interestingly, these observed gaps in student performance on ENTER scores between public and private school students in Australia are reversed at university. Studies of student university grades suggest that private school students with the same ENTER scores as public school students achieve lower grades at university (Dobson and Skuja 2005, Win and Miller 2005, Birch and Miller 2006).

The causal determinants of families' choice of school are complex and a range of factors influence public and private schooling choices (Godwin and Kemerer 2002: 34-40). On the whole, parents from higher socio-economic backgrounds appear to be more active "choosers" of schools for their children than parents from lower socio-economic groups (Bifulco, Ladd & Ross, 2008, Berry Cullen, Jacob, & Levitt, 2003, Fiske & Ladd, 2000, Hsieh & Urquiola, 2006,

³ While this picture is changing a little, with some movement now towards general first degrees at some institutions, with postgraduate studies required for law and medicine or example, this occurs in only a few institutions and has commenced since the data we analyse were collected. In a few courses, some universities also use interviews in addition to ENTER scores to determine their offers of places, but this is also uncommon.

Levin 1998, Ryan and Watson, 2004). When all parents are given more freedom to choose a school, the segregating choices of students from advantaged backgrounds appear to outweigh any integrating choices by students from disadvantaged backgrounds (Bifulco Ladd & Ross 2008). Most choice programs also enable schools themselves to exercise more choice over student selection which may contribute to increased socio-economic segregation between schools. However social segregation is also present in public school systems that purport to limit choice, through parents' selection of a particular residential neighborhood, or through streaming policies in schools that are outwardly comprehensive in terms of student intake. It is important to acknowledge the segregating forces at play within the "quasi-public school sector" (Nechyba 2009: 293) and that parents also appear more satisfied with their child's school when they have been allowed to choose it (Figlio 2009, Wolf *et al.* 2008). However, the segregating impact of choice programs also present cause for caution (Figlio 2009) given the apparent substantial positive effects of a student's peers on student achievement, particularly for low-ability students (Hanushek, Kain, Markman, & Rivkin, 2001; Schneeweis and Winter-Ebmer 2005) In other words, a predominance of students from higher socio-economic backgrounds represents a significant 'in-school' influence on an individual student's level of educational attainment.

Another strand of the international literature has examined the way schools operate in different sectors to identify factors that might generate differential student performance. A major US longitudinal study released in 1981 and 1983 *High School and Beyond*, provided a nationally representative database suitable for comparative studies of public and private schools (Marks 2009). Analyses of this database by Coleman and Hoffer found that Catholic students completed more maths, science and foreign language courses, completed more homework, had better attendance and saw fewer school-wide discipline problems than public school students with similar sophomore achievement and social backgrounds. When these school variables were entered into the achievement regressions, Coleman and Hoffer found the academic variables (track placement, homework and coursework) explained most of the Catholic school effect on verbal skills and all of the effects on Mathematics (Hoffer 2009: 442). Hoffer (2009) concludes that "neither the individual selection nor the aggregate-student composition explanations hold up for the positive effects of Catholic schooling on growth in verbal skills and mathematics over the last two years of high school" (Hoffer 2009: 443). Hoffer points to a substantial independent effect of Catholic school attendance on the likelihood of academic program enrolment, with Catholic school students more likely to report being in an academic or college-preparatory program than public school students with comparable social backgrounds (Hoffer 2009: 442). This leads him to conclude that the main factor accounting for the Catholic High school effect on students' verbal skills and mathematics scores in 11th and 12th grade is the greater concentration of academic course taking among Catholic school students.

One consequence of this process of choice is that researchers only observe imperfectly the things that determine the choices made, so that the impact of unobserved factors (motivation, ambition and so on) may bias their estimated school sector effects (these are 'selection' effects). Among the Australian studies that have tried to address such selection issues, Le and Miller (2003) estimate a first stage choice equation using wealth measures and the proportion Catholic in the students' parents' countries of birth as instruments for this equation. Le and Miller found significant school selection effects in the Year 12 completion outcome equation for one of the cohorts they studied and substantial remaining school sector effects of Year 12 completion at the

beginning and end of the 1980s. Vella (1999) used a Catholic affiliation variable in the first stage choice equation and found no significant selection effects from attendance at a Catholic school on Year 12 completion rates. The use of such ‘religious affiliation’ variables, sometimes in conjunction with distance from schools, as instruments for the purposes of estimating Catholic school effects in the US has been questioned in the work of Altonji, Elder and Taber (2005). Problems with this approach have led Altonji *et al.* to propose a method when good instruments are not available for assessing how substantial the role of selectivity bias would have to be to completely account for any apparent school sector effects. Their approach led them to conclude that there was a positive effect of attendance at a Catholic school on at least high school graduation.

By studying the impact of school choice on university entrance ranks among groups of ‘involuntary’ choosers in the final two years of Australian high school, this paper aims to minimize any impact from self-selection biases on estimated school sector effects by studying a group where all subjects are forced to choose. Second, we examine additional data on the characteristics, motivation and outcomes of those students who choose private schools which can shed light on how the groups who choose different types of schools may be different in ways that are normally unobserved, such as in their aspirations, motivation and experiences of schooling.

4. Methodology and data

We exploit a simple framework for understanding how decisions about school sector choice are made by individuals and their families, which has implications for how to generate reliable school sector effects in our empirical analysis. The framework is sketched in Appendix A.

The school sector choices people make will reflect many factors. These include: the potential alternative outcomes that might be achieved in differing sectors, both academic as well as personal outcomes; the way different individuals value those outcomes; and the costs associated with differing sectors. Rather than necessarily having data on those factors, researchers more often are able to analyse the types of personal and background characteristics that are associated with differing school sector choices. Our interest in this paper is not on the choice of school sector itself, but on aspects of the consequences of the choice. But the framework we use has as a central element that individuals make choices with the outcomes of the choice in mind.

If individuals make their choice of school sector with the likely alternative outcomes of the sector in mind, the school sector variables in any student outcome equation cannot be estimated reliably. The estimated parameter on the school choice variables will reflect some combination of the ‘true’ effect of differing school types on the outcomes observed and the impact of selection effects, to the extent that unobserved factors affect both the school sector choices made and outcomes achieved by individuals. If individuals who would obtain good outcomes regardless of their choices are concentrated in particular sectors, we may wrongly assign some of the strong outcomes they would achieve anyway to that sector.

Methodology pursued in this paper

Researchers have adopted various approaches for estimating regression parameters to capture the impact of the choices individuals make, so that the school choice effect can be estimated consistently. These approaches include techniques that effectively remove the selection effect because the choice component in the selection of schools by individuals has somehow been limited. Examples include the use of randomised experiments where these exist, as in the Chilean private school voucher program (Hsieh & Urquiola, 2006) and the use of instrumental variable approaches where valid instruments that somehow determine or constrain decision-making can be identified (Vandenberghe and Robin 2004).

Other approaches to this missing variable problem in this and other contexts involve including terms that absorb the selection effect, such as the use of Heckman selection terms, or that remove it by using panel data techniques. Still further approaches involve the assumption that the selection process is sufficiently observed that any bias in the choice effect of can be removed by the comparison of sufficiently similar individuals (Vandenberghe and Robin 2004).

These latter techniques involve estimation of the probabilities individuals make different school choices. In propensity score matching, the outcomes of individuals from the group observed making a specific choice are compared with those who made an alternative choice who were most like them in terms of their propensity score. In regression reweighting approaches, the propensity scores are used to reweight the data so that those who made a specific choice who are most like those who made another choice are given greatest weight in the regression estimating the impact of latter choice relative to the former choice.

In this paper, we adopt a two stage strategy for dealing with the unobserved data or selection problem in analysing the impact of school sectors on university entrance rank scores. In the first stage, we choose subjects who have something in common, in terms of their initial school choice, to see what the impact of a later school choice they make is on their outcomes. We expect such people to be more alike in terms of both their observed and unobserved characteristics than is the case for the broader the population. In this case, there is no ‘instrument’ that forces individuals into particular types of schools, but individuals are forced to make a new decision, since we limit our analysis to students who attended schools that did not have Year 11 and 12 programs, so we observe two sets of school sector choice decisions. Specifically, we use a ‘within’ estimator to assess what the impact of the later school sector choice is on the outcomes of individuals who made the same initial school choice. That is, the comparison of outcomes is made between individuals who attended the same initial schools, but who made different later choices. The hope is that individuals whose first actual school choices are the same are identical in terms of their ‘unobservables’ so that the ‘within’ estimator effectively removes any bias term in a school outcome equation.

The other two approaches to estimation of the impact of school sectors on university entrance rank scores use this same data, but involve the use of propensity scores as outlined earlier: propensity score matching and regression reweighting. These techniques involve estimation of a first-stage equation explaining the sector of choice of individuals. The regression parameters of

that equation are used to estimate the probability or propensity score of each individual of attending a specific school sector. This propensity score is used in two ways in this paper.

The first is to match individuals who choose to go to a private school with those most like them in the group who did not, in terms of their values of propensity scores, and to compare their outcomes. This gives an estimate of the ‘treatment on the treated’. An alternative is to match those who did not go to a private school to those most like them who did and compare their outcomes. This gives us an estimate of how much the treatment could have benefited those who did not undertake it, known as the ‘treatment on the untreated’ effect. Various forms of propensity-score matching are available that make the necessary comparisons between treatment and untreated groups, in this case, those who chose differing school sectors. Matching techniques are summarised in Angrist and Krueger (1999), Blundell and Costas-Dias (2000, 2009), Heckman, Ichimura and Todd (1997) and Heckman, LaLonde and Smith (1999). Lechner (2002) shows how the normal binary treatment situation can be extended to more than two groups, as is the case here with public, Catholic and Independent schools.

A second approach to estimating the school sector effects is to conduct regression analysis with reweighted data, effectively estimating the outcome equation in such a way that the role of any selection effect is minimised through the reweighting procedure. Hirano, Imbens, and Ridder (2003) show that efficient estimates of average treatment effects of binary treatments on outcomes can be obtained by weighing the data with the inverse of a nonparametric estimate of the propensity score. Regression reweighting methodologies are explored empirically in Brunell and DeNardo (2004), Altonji, Bharadwaj and Lange (2008) and Nicholls (2008, 2009). Essentially the procedure involve reweighting ‘treatment’ and ‘control’ or ‘non-treatment’ groups so that the characteristics of some individuals receive greater weight in estimation than others. For example, those members of the control group most like treatment group members, in terms of their estimated propensity score, can be given greater weight in estimation than those less like the treatment group. This allows estimation of a ‘treatment on the treated’ parameter. Reweighting treatment group members to the characteristics of the control group allows estimation of a ‘treatment on the non-treated’ parameter. Suitable reweighting of both groups, as specified by Hirano *et al.* (2003), allows estimation of an ‘average treatment effect’.

This re-weighting approach means the estimate of the impact of attending a particular school sector on outcomes is derived giving greatest emphasis to comparisons of those most alike in terms of their background characteristics and ambitions in the groups making differing sectoral choices and less weight to those whose characteristics differ. In this paper, these various sectoral choice parameters estimated by both regression reweighting and using propensity-score matching methods are reported.

Both of these methods involve the assumption that the set of controls or observed characteristics of individuals are extensive enough, such that, conditional on these factors, the distribution of outcomes is independent of assignment to treatment (the *conditional independence* or *ignorable treatment* assumption), in this case whether individuals chose a specific school sector or not. Essentially, our set of explanatory variables influences the outcomes of interest to the extent that there are no unobserved factors that influence the outcomes indirectly through the decision to study in a particular school sector or not (such as *selection* effects, for example).

If this assumption holds, the resulting estimates can be given a causal interpretation. Unfortunately, this is an assumption that cannot be tested. In this case, however, the range of variables at our disposal provides some good reasons for arguing why it might hold. First we have a measure of school achievement, collected at an earlier point in the young people's lives, while they were in Year 9. Second, we have an extensive set of background characteristics, including parental education and occupation and measures of the socioeconomic status of the area where they live. Specifically our set of controls include parental employment, education and occupation variables, as well as the tax office non-labour income ranking of the postcode where subjects live, their country of birth and whether it was English-speaking, the number of siblings, and the state in which they originally lived. Third, we have measures of students' intentions to complete Year 12, as well as whether they intend to go to university after completing their schooling and the type of job they expect to obtain in the future, which will be reflected in their school choices if these outcomes differ between sectors. Many unobserved factors that might impact on people's decisions will also affect their plans. For example, young people who are particularly motivated towards their schooling may have better outcomes in the future because of this motivation, but they are also likely to have educational plans that reflect this high motivation. In this case, we capture such motivation through the plans people report. Fourth, we have a measure of students' assessment of their school performance relative to their peers, from which we remove the effect of the students' own school achievement and their school's average achievement. We interpret this variable as a measure of self-confidence, which might affect both education choices and outcomes. In addition, we can also use students' school choice in 9th grade, which provides us with something like a within sector weight. All of these factors mean that our choice of controls for this purpose is quite rich.

Data

The data used in this study are drawn from the Longitudinal Surveys of Australian Youth (LSAY). This is a national government-funded data collection that follows cohorts of students from the middle of high school through to their mid-twenties. It contains extensive information on students' academic performance, social background, future study plans, occupational ambitions and their attitudes to schooling, as well as the type of school they attend.

Data from two cohorts of 9th graders in 1995 and 1998 are used for our analysis. These cohorts were drawn as two-stage cluster samples of Australian school children. In the first stage, schools were randomly selected. In the second stage, intact classes of Year 9 students from those schools were randomly selected. The samples were stratified by school sector (Government, Catholic or Independent private schools). Around 14,000 individuals in 300 schools were surveyed initially in each cohort. This represents close to 6 per cent of students in Year 9 in Australian schools and 12 per cent of schools with secondary school students. The number of students per school varies between 4 and 156, but averages just over 50. Population means in this paper are estimated with weighted data to account for this stratification.⁴ In the first survey year, when students were in Year 9, they completed literacy and numeracy tests at their schools, along with a questionnaire to elicit background information.

⁴ The weights also attempt to take account of survey attrition for waves after the initial contact.

There was a significant overlap of items in the literacy and numeracy tests administered to both cohorts, so it was possible to develop common scales for these dimensions of school achievement. Rothman (2002) contains details of the development of these scales.⁵ The achievement scale used in this paper is the average of students' literacy and numeracy scores.⁶ The individual scales were constructed to have a mean of 50 and standard deviation of 10 and the average scale has a standard deviation of 8.5. The same sets of questions were used to elicit background information from the two cohorts, which were collected by the same market research company and administered by the same institutions.

Participants were surveyed in subsequent years by mail and/or telephone questionnaires. In their fifth and subsequent contact years in both surveys, subjects were asked whether they had received the relevant certificate from their jurisdiction to indicate they had completed Year 12, whether they had obtained an ENTER score and whether they were studying at university. A student is awarded an ENTER score if they complete a pre-university entrance program in their final (twelfth) year of schooling. The ENTER score is based on their achievement in statewide examinations and other assessment tasks and reflects the percentile rank of the student's performance within their cohort.⁷

Key background characteristics and some outcome indicators for the two surveys are shown in Table 2. It indicates that the important features of the two cohorts are broadly comparable, which is important, because we are forced to pool the data for the analysis presented below. The private school enrollment share is higher in the second cohort, which reflects a long term trend increase. Other features are almost identical in the two cohorts – average achievement levels, parental socio-economic status and student occupational ambitions. The gender and regional distributions in the data differ a little and the outcomes show small increases between cohorts in school completion and ENTER scores, but no change in university participation rates. In general, the data confirm that little changed in Australian education and the characteristics and ambitions of young people between the 1995 and 1998 cohorts of Year 9 students.

Schools without a Senior Program

As previously indicated, in this study we principally analyse the ENTER scores of individuals who attended schools that did not have a Year 11 and 12 program. This is one of the design features of the public school systems in the Australian Capital Territory (ACT) and the state Tasmania. Such schools also occur in the private sector. There are Catholic schools in the ACT that also end after Year 10, as well as in other jurisdictions. It is much less common for Independent schools not to have a senior (Year 11 and 12) program. Unfortunately, the ACT and

⁵ In fact, the scales developed by Rothman (2002) linked school achievement for a series of cohorts over a much longer time frame, because the earlier instruments also included overlapping items.

⁶ Where only one of the literacy and numeracy scales is available, it was used as the achievement score. This constituted about 3 per cent of the pooled data from both cohorts.

⁷ The name given to the university entrance rank score differs between Australian jurisdictions, as do their scales, the requirements for obtaining them and the proportion who undertake Year 12 studies who obtain an entrance rank. An ENTER score is a generic name for these entrance ranks that is calibrated to a common, Australian-wide scale that ranges from 30 to 99.95

Tasmania are relatively less populous jurisdictions within Australia and while they are over-sampled in the data, the relatively small number of observations means that we must pool the data for the two years for our analysis.

The sequence of questions that elicits information from subjects about school changes from the relevant years of the LSAY surveys is shown in the box below. In the 1995 and 1998 cohorts of 9th graders, 787 and 829 respondents respectively reported when they were in Year 11 that they had changed schools because their Year 9 school did not offer 11th and 12th grade. School dropout, attrition from the survey in the following two years before students report their ENTER scores and the fact that not all school completers necessarily get an ENTER score all mean that we lose observations from this group.⁸

Unfortunately, not all of the responses are reliable. If a school has no senior program, it seems reasonable to expect just about every student from the school should indicate that when asked. Twenty-one individuals indicated their school had no senior program when the vast majority of their peers remained at the same school. Since it seems unlikely so many could be repeating the previous grade, it seems more likely such individuals were trying to indicate the school did not provide a program that suited them. These individuals were recoded into an ‘other’ mover category and not analysed here. Other cases were a little harder to deal with. In one boy’s school, 12 students indicated they had left the school because it had no senior program, while 14 remained at the school and obtained Year 12 certificates. Since so many indicated the school had no program, it seems reasonable to treat them as conveying information about a substantial gap in the program offered at the original school that meant they had to remake their school choice decision. There were two other cases where the student body gave such contradictory responses about the existence of the senior program. In these cases, students who moved were treated as moving because their school did not have a senior program. This involved 37 observations in the no-program group.

The distribution of students across school sectors in the LSAY data is shown in Table 3. These data are weighted and reflect enrolment patterns evident in national data at the time. Approximately two-thirds of students attended a Government school in Year 9, with just over 20 per cent in Catholic schools and thirteen percent of students in other or ‘Independent’ schools. Between Year 9 and Year 12, there was some shift of students from public to private schools, with the Year 12 distribution of students across school sectors shown in the third row of the table. The proportion attending Government schools fell by 3-4 percentage points, with a small increase in the shares of both Catholic and Independent schools.

⁸ Specifically, of the 1619 who reported their school had no senior program, 21 were reclassified because they were the only students from their schools to claim that; 431 dropped out of the panel before the wave they reported an ENTER score, 52 remained in the panel but did not complete 12th grade; 385 of 12th grade completers did not obtain or report an ENTER score; and 23 had missing data on other variables included in the regression equation, leaving 711 observations for the regression analysis.

The LSAY questionnaire

Students who were at school when interviewed in the previous wave were asked:

Are you still going to {school name from the previous wave}? [Yes or No]

If no, subjects were asked

In which month and year did you leave {school name}?

Month _____

Year _____

Did {school name} offer Years 11 and 12? [Yes or No]

The 'no Year 11 or 12 program' question was asked only in the third wave of Y95 (97% of subjects at school were in Year 11 in that wave, with three-quarters of the balance in Year 12), but in waves three and four of Y98.

In all waves, those subjects who had changed school were asked

Are you now going to a Government school, a Catholic school or some other non-Government school?

1 Government

2 Catholic

3 Other

The Year 9 distribution of students whose schools had no Year 11 and 12 program is also shown in Table 3. Just less than two thirds of such students attended Government schools, close to the Government school share of students in Year 9, but the distribution of students within private schools was different. Students in schools without a senior program were much more likely to have attended a Catholic school than an Independent school, with less than five per cent of students originally from an Independent school. Once more, the proportion of students at an Independent school increased between Year 9 and Year 12 among these students, this time however, at the expense of the Catholic system share of students.

The distribution of students who attended a school without a senior program by state is shown in Table 4. Most such students attended Government schools in the ACT and Tasmania, as anticipated, but a substantial number attended predominantly rural Government schools in Victoria. Students from the Catholic system who attended schools without a senior program were drawn from New South Wales, Tasmania and Victoria. As foreshadowed, there were very few

Independent schools without senior programs. A few cells in the table have small cell sizes. These cases mostly arose from small non-metropolitan schools where both school dropout and attrition from the panel meant there were few students observed still at the school in Year 12. The final two columns of the table show the weighted distributions of the group who attended schools without a senior program and of the group who did not change schools between Years 9 and 12, whose distribution across states more closely reflects the distribution of the population.

The transition matrix between school sectors from Years 9 to 12 for those students whose school had no senior program (and who had not left school) is shown in Table 5. Almost 90 per cent of students who attended a Government school in Year 9 were at a new Government school in year 12, if they were still in school. The proportion remaining in the Catholic school system was similar. Few students whose original school was an Independent one went to a new Independent school, which suggests the actual schools observed to have no program must have been quite unusual. In fact, they were all non-metropolitan schools, which makes them unrepresentative, since almost two-thirds of non-government school students attend metropolitan schools. To a considerable extent, this limits what we can say about the students in those schools and their experiences as being representative of other students in the Independent schools system. The other point of note about the table is that it is almost a symmetric matrix – that is, about the same number of students left Government schools for Catholic ones as went in the opposite direction, with similar patterns for all other sector pair flows.

Characteristics of the students in schools without a Senior Program

We now assess how similar the background characteristics of students from the differing school systems are. Our empirical strategy is based on the idea that by choosing individuals from the same initial schools we can minimise the differences in observed, and hopefully, the unobserved characteristics of individuals that affect their ENTER scores, so that any estimated school sector effects essentially reflect the impact of the schools in the sector. In Table 6 we present the mean values for a key set of demographic variables by school sector for two groups – the group who did not change school and the group who did change schools. For this latter group, we show the average characteristics by both their Year 9 school sector and their Year 12 school sector choice.

The average characteristics for the group who did not change schools are shown in the top panel of Table 6. These show a number of well-known features about the characteristics of students from the sectors – students from private schools come from higher socio-economic status (SES) backgrounds – they live in wealthier neighbourhoods, their parents are more educated and work in higher status jobs. Previous studies using comparable earlier data have suggested that, in part because their SES is higher, students in private schools also have higher levels of school achievement (Williams and Carpenter 1990).⁹

The second panel of Table 6 shows the average characteristics of the students forced to change schools, according to their Year 9 school sector. These show that the students in Government schools were quite like the Government group who did not change schools, except that they were

⁹ Limitations on the public presentation of the achievement data mean we cannot report these results, but our results pick up any differences between the sectors that exist.

less likely to live in a metropolitan region, which also affected the SES of the region where they lived. Their characteristics were much more like that of the Catholic students who also had to move than was the case for the group who did not change schools, especially their parents' education and occupation levels and their levels of school achievement. They were also more like students from the Independent schools sector in terms of their parental background than was the case for the groups who did not change schools.

The final panel of Table 6 shows the average characteristics of students according to their Year 12 school sector. The average characteristics of students in the Government and Catholic systems remain very similar, in terms of school achievement and SES background. Moreover, the average characteristics of students in the Independent sector are also now substantially closer to those of the other two systems than was previously the case, in terms of parental education and occupation and school achievement. At least in terms of observable characteristics, the background characteristics of the students in the different sectors in Year 12 who had been forced to change schools are more alike than those of the group who never changed schools. Joint tests of differences in the means between the sectors indicate that significant differences in the characteristics of individuals remain, however. Hence, while our choice of groups for comparison has identified groups who are more alike than in the broader population, differences in key characteristics remain.

5. Findings

Differences in ENTER scores by school sector

The average university ENTER scores of students are shown in Table 7 according to the sectors of their original school in Year 9 and their transition Year 12 school. These averages can be compared with the average scores of individuals who did not change schools, which are shown in the bottom row of the table. The general pattern of results for the school changers is similar to that of the group who did not change school – those who attended private schools in Year 12 tended to achieve higher ENTER scores than those who attended Government schools, regardless of the type of school they attended in Year 9. For two of the three Year 9 school types, the ENTER scores were higher for those who attended Independent schools in Year 12, which also matches the ranking among those who did not change schools. Those who remained in the Government system had average ENTER scores that were comparable with those from the Government system who never changed schools. Those who left the Government system obtained higher ENTER scores than those who moved to new Government schools. The other notable feature of the pattern of these results is that students who attended Catholic schools in Year 9 tended to do worse across all Year 12 school choices than those who never changed schools. We consider whether this reflects their poorer than average characteristics associated with high achievement in the next section.

Characteristics of students who chose Independent schools

In Table 8 we make the same set of comparisons as in Table 6, but this time our focus is on a set of factors that are likely to reflect the normally 'unobserved' characteristics of individuals, such as their motivation, ambition, levels of perseverance, energy and enthusiasm. The set of

measures we analyse include students' further study plans, their desired future occupations, a set of scales that reflect satisfaction with their Year 9 schooling experience and their attitudes towards homework and average weekly hours of homework when in Year 12.

Once more, the patterns between the school sector groups for those who never changed school reflect common perceptions about the sectors – students in private schools tend to plan to attain higher levels of education, expect to have higher status occupations, have more positive attitudes about their schooling and spend more time doing homework each week than student in Government schools. Among private school students, those at Independent schools tend to have higher values for these measures that do students at Catholic schools.

These patterns are much less apparent among the group forced to change schools when analysed in terms of their Year 9 schools. Government school students' intentions regarding Year 12 completion, university study and future occupations are closer to those of the private school students, and their average values for the school satisfaction scales are slightly higher than the students from Catholic schools. With the exception of the homework measures, students from Independent schools tended to have higher values for these measures than students from Government schools.

The process of choice leads to subtle changes in these comparisons across sectors for these measures, when analysed in terms of students' Year 12 school sectors. The gap in the proportion who planned in Year 9 to complete Year 12 between Government and Independent schools widened, as did the gap in the status of future occupations and the average weekly hours of homework students undertook in Year 10. One consequence of the choices made by individuals about their schools was that there was a small shift of the more ambitious and hard-working into the Independent schools sector, and away from the Government system.

This is most evident from Table 9. It contains 'within' estimates of these variables that reflect the 'unobservable' characteristics of individuals. The analysis involves comparing individuals with the mean value of the characteristic within their original Year 9 school, with the variable 'standardised' by dividing the difference by the standard deviation of the resulting measure. The columns in the table show the average characteristics, in standard deviations from the mean, of individuals according to their Year 12 choice of school. The predominantly positive values in the private schools columns indicate that the students who attended private schools in Year 12 were above average for those characteristics within their Year 9 schools. For example, students in Independent schools in Year 12 were around a third of a standard deviation above average in terms of their future occupational intentions in Year 9. Other differences in characteristics for Independent students are also large, notably their intentions to attend university, their views of their teachers in Year 9 and their homework attitudes and behaviours. Interestingly, this is not true in terms of the Year 9 achievement – they were below average in terms of their school achievement in the schools they attended in Year 9.

In general, this analysis of the selection process poses problems for the 'within' estimator. While the regression analysis can deal with differences in Year 9 achievement, other differences in the underlying motivation and ambition levels of the individuals who made differing choices after their initial schooling choices cannot be removed using the 'within' estimator – some residual

bias will remain. These factors can be used in the estimates of the new school choice, however. Hence, the matching and regression reweighted estimates probably should be preferred over the within estimator results.

Regression Results

For the purposes of comparison with results from earlier studies, Table 10 contains the parameter estimates on the Catholic and Independent schools variables for a variety of specifications for the group who did not change schools between Years 9 and 12. While other studies have not looked directly at this group, since they are overwhelmingly the most common group, aggregate estimates from earlier studies largely reflect the experience of this group. The top row shows the parameter estimates from a least squares regression equation with and without a set of other controls, where the data are weighted to deal with aspects of the survey design and attrition from the panel. The with-controls parameter estimates are smaller than the without estimates, and are similar in magnitude to earlier studies: just over four points for Catholic schools and closer to five points for Independent schools. The least squares results with the full set of controls are presented in the first column of Table A.2.¹⁰

The rows below this show the estimates from a number of other specifications – firstly regression results where the data are reweighted to alternately give greatest weight to Government students most like private school ones, and then *vice versa*. The second set of results show the comparable matching estimates, where first private school students are matched with those most like them among Government students, then *vice versa*. The matching estimates are based on Mahalanobis nearest neighbour matching, using the five nearest control group matches for any treatment group observation, with the matching being based on the relevant propensity score, school achievement, gender and parents' SES.¹¹ The estimated matching effects are smaller than the basic specification with controls, but quite robust across specifications – the Catholic school estimate is below four points, while the Independent school estimate is consistently around 4.5 points.

Table 11 contains comparable estimates for the group whose school had no senior program. There is one addition to the table in the estimates presented, the within estimates where the estimates are identified through students making different Year 12 choices who originated from the same initial Year 9 schools. These are the second set of estimates presented. Once more, the least squares results with the full set of controls are presented in the second column of Table A.2.¹²

The results generally show positive and significant effects for attending an Independent school in Year 12 among this group, but not for attending a Catholic school. Other features of the results

¹⁰ The multinomial logit regression estimates on which the weights are based are available from the authors.

¹¹ The program *nnmatch* in *stata* written by Abadie *et al.* (2004) was used to conduct the analysis. It was conducted alternatively using the nearest one, two, five or ten matches. The estimated private school effects were largest where just one nearest neighbor was used, but little different whether two, five or ten matches were used.

¹² The multinomial logit regression estimates on which the weights used in both the regression reweighting procedure and for the propensity scores used in the matching estimator are based are available from the authors.

also differ compared to those for the group who did not change school. The Independent school effect is larger in the regression with controls than without; the magnitude of the estimated Independent school effect fluctuates somewhat across the various estimators, showing no real sign of getting smaller as the nature of the comparison being made becomes a little ‘tighter’ in the matching and regression reweighting results. The smaller number of observations for this analysis means that the results are measured much less precisely than for the group who do not change schools, with substantially larger standard errors.

In fact, the number of observations used for the regression equations who are studying at an Independent school, after those with missing data are excluded, is very small. Just 26 observations can be used, with 482 Government school students and 203 students at Catholic schools.

Why is the estimated Independent school effect larger in the regression equation with controls than without controls? Analysis of the observations actually in the regression equation indicates that the 26 students who attended Independent schools had poorer university entrance rank related characteristics than the students who attended Government schools, yet received higher average university entrance rank scores. There were two principal factors that contributed to their poorer characteristics – the subset of Independent school students had lower average achievement levels in Year 9 than the Government school students, lower by about half a point. Second, a higher proportion of them were Indigenous, associated with a very heavy penalty in the regression results reported in Table A.2. While they retained higher SES background characteristics on average, these were estimated to have little impact on university entrance rank scores for this group. Other observed characteristics were almost identical on average between the groups.

These factors also explain why the *within* estimator provides a larger Independent school effect than the estimate without any controls. Those in the Independent schools were slightly less above average within their original school in terms of their Year 9 achievement than were students in Government schools in Year 12. In terms of most of their other characteristics, they came from similar parts of the distribution relative to their Year 9 peers. However, as before, the students from Independent schools seemed a little more ambitious in terms of their intentions to go to university, their expected future occupations and industrious in terms of the hours of homework they undertook. Hence, while this group of Independent and Government school (and Catholic) students are very similar in terms of their demographic characteristics, it is possible that differences in important unobservables may play some part the regression-based estimates. To the extent that the propensity scores of attending different types of schools reflect differences in these plans and ambitions between the groups, at least part of these differences will be picked up in the reweighted regressions and in the matching estimates. As noted above, these estimates do not appear to be lower than those from the more standard regression equations. The fact that the Independent school estimated effect fluctuates a little across the alternative estimators likely reflects the small number of observations of students at Independent schools. For example, if only a subset of these students receive high weights in the reweighted regression of the ‘treatment on the untreated’ than the parameter will be estimated of very few ‘effective’ observations.

Other issues that may make the results problematic do not appear to be driving the estimated differences university entrance rank scores between Independent and Government school students. For example, re-estimating the regression equations to deal with the limited range in which the dependent variable falls did not affect the parameter estimates qualitatively.¹³ Further, attempts to deal with the selection issue of who actually obtains university entrance rank scores did not affect the estimated differences in these scores between students who attended different types of schools.¹⁴ In general then, alternative approaches seems to support the result that there is a significant positive effect on university entrance rank scores from attending an Independent school compared with a Government school in these data, but not from attending a Catholic school. In all cases however, the estimates for the two private school sectors are not significantly different from those estimated over the broader group of students who did not change schools.

An obvious question we need to address is just why there might be an Independent school effect compared with Government school students among the group forced to change schools, but not a Catholic school effect, when both effects are evident for the group who do not change schools. This does not seem to be a peculiarity of the group studied here but also applies to another, larger group of school changers who are not included in our analysis. These are students who chose for some other reason to change schools after Year 9 or 10. This may have been because they were asked to leave, but more often students indicated a desire to go to a better school, or one with a program that suited them more. While there are a whole new set of selection issues about the choices of these students, the results for similarly-specified regression equations are qualitatively similar for this group – there is a significant positive (larger) Independent school effect, but not a significant positive Catholic school effect.

This finding contrasts with the North American literature on the educational benefits of attending Catholic schools (eg. Hoffer 2009, Marks 2009, Neal 2009). However Hoffer (2009) suggests that part of the Catholic school effect is due to the greater academic focus of US Catholic school educational programs compared to public schools. In this Australian study, by choosing to look at university ENTER scores, we condition on those taking academic programs in both Catholic and public schools. This makes the comparison of outcomes more direct in terms of school programs and reduces the potential role of selection effects via different ambition levels between students, since they all at least obtain an ENTER score.

Australian studies have found differences in the academic programs undertaken by students in the 12th grade across different types of school, with students in Independent and Catholic schools being more likely to undertake courses of study involving advanced mathematics, foreign languages and science units, all subjects weighted favourably in the calculation of ENTER scores (Teese 1989, Fullarton *et al.* 2003), and less likely to undertake low-weight subjects. It is possible these differences are less apparent in the specific jurisdictions studied here than across

¹³ This was conducted by re-estimating the equation with the dependent variable replaced by its logistic transformation, that is $\ln [(enter/100)/(1-(enter/100))]$.

¹⁴ This was conducted via a Heckman selection-correction approach, using as first stage ‘instruments’ the future study plans of individuals, as revealed in Year 9. These are clearly not ideal instruments, but experimentation across these and other potential candidates did not change the differentials between students from different sectors in any qualitative way.

the country as a whole, and that we have partially conditioned on successful students, since everyone studied here at least obtained an ENTER score.

We can only speculate about why two years may not be a sufficient time for the Catholic school effect on university entrance rank scores to become apparent for school changers, but sufficient for those who attend Independent schools. In general in Australia, Catholic schools appear to have similar resource levels to Government schools, with class sizes and student teacher ratios that are similar to the Government system. However, at least one of the Governments systems that dominates in this analysis of students forced to change schools, the ACT Year 11 and 12 schools have traditionally been very well resourced compared to other Government high schools and this may have affected our results on student performance. Independent schools vary substantially in terms of their resource levels, but on average, class sizes and student teacher ratios are better than in either the Government or Catholic systems. The impact of resources on student performance remains a contentious issue, but in conjunction with the time required to generate whatever it is Catholic schools must do to have a positive impact, may contribute to the results found here for this group of school changers.

6. Conclusion

This paper examined the impact on students' educational outcomes of choosing a new type of school for the final two years of high school (grades 11 and 12). By comparing the university entrance rank scores of students from the same source schools who make different choices of schools to attend in 11th and 12th grade, we identified the impact of choice of school on the student's access to university, as measured by their Tertiary Entrance Rank (ENTER) score awarded upon completion of 12th grade. This approach narrowed the differences in school achievement and family background between students who attend different types of schools from that in the broader school population.

This choice of a specific group of students to analyse for this comparison of school sector effects appears to 'work' in terms of reducing the potential for self-selection biases in estimating the impact of school choice on student achievement. Differences in the observed characteristics of students who attend different types of schools in 12th grade are much narrower for this group than for the broader school population. Unfortunately we cannot test conclusively whether their unobserved levels of motivation, ability and ambition, for example, are also more similar. However, we do find that in these data, there are differences between students choosing different school sectors in measures related to these normally unobserved factors.

In spite of there being less difference in the school achievement and family background among the students who were required to change schools after 10th grade, we found that the educational aspirations, motivations and ambitions in 9th grade of students who chose to attend Independent schools for 11th and 12th grade were different to those who chose to attend Government or Catholic schools. Specifically, individuals who chose Independent schools were more above average in terms of their intentions to attend university, their occupational aspirations, their interactions with teachers, and their attitude towards and hours spent on homework, than students within their original schools – in spite of being below average in terms of their Year 9 school achievement. Nevertheless, the positive effect of attending an Independent school on students'

ENTER scores in this group appears to reflect more than this selection effect, since it is apparent in estimates where some selection effects would have been captured separately from the school sector effects.

The magnitude of the Independent schools effect is no smaller in our group of students who were required to change school than that found in the broader school population. While we find no significant positive effect from attending a Catholic school, our estimates for these are also not significantly different from those estimated from the broader school population. Hence, our results do not necessarily support the proposition that attendance at a Catholic school has no positive effect. It is possible that the Catholic effect cannot be realized by transferring to a Catholic school for the final two years of schooling. In contrast, transferring to the Independent sector for the final two years of high school produces a positive effect within those two years. As Independent schools enjoy, on average, higher levels of income than either Catholic or Government schools, and enroll the highest proportion of students from higher socio-economic backgrounds, it is possible that these two factors – resources and peer effects – contribute to the better educational outcomes observed for choosers of Independent schools in the final two years of high school.

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Table 1 Summary features of the Australian education system

Features	Trends	
<i>Structure of Schooling</i>		
<p>School year aligns with the calendar year – late January to December</p> <p>Schooling delivered in eight jurisdictions by state governments</p> <p>Entrance rules vary substantially across jurisdictions, but most students start school between their fifth and sixth birthdays.</p> <p>Grade structure involving ‘Grades’ or ‘Years’ 1 through 12</p> <p style="padding-left: 20px;">With a pre-Year 1 grade, ‘Kindergarten’, in most states</p> <p style="padding-left: 20px;">Grades 1 to 6 (or 7 in some states) are known as ‘Primary School’</p> <p style="padding-left: 20px;">Grades 7 (or 8) to 12 are known as ‘Secondary’ or ‘High’ School</p> <p>In some jurisdictions and regions, high schools end after Year 10, whereupon students attend ‘Colleges’ or private schools for their senior program in the final two years of secondary school (Years 11 and 12)</p>	<p>Becoming more aligned</p>	
<i>Student Participation</i>		
<p>Minimum school leaving laws make schooling compulsory between ages of 6 and 15 – 17 years, depending on the jurisdiction.</p> <p>National Year 12 completion rate is 75%</p>		
<i>Three school sectors</i>		
<p>Two-thirds of students are educated in public schools, 20 per cent in ‘Catholic’ schools, the balance in other types of private schools (‘Independent’ schools)</p> <ul style="list-style-type: none"> • At Secondary level, private schools’ enrolment share is higher • Public schools are run by state governments, funded from government revenue • Private schools are privately managed, funded from tuition fees plus government subsidies (weighted vouchers) • Weighted vouchers subsidise between 15 to 85% of private school operating costs 	<p>Private share is growing</p> <p>Public subsidies growing</p>	
<i>Post-school destinations</i>		
<p>Year 12 certificate awarded by all jurisdictions, under different assessment systems, each comprised of a mix of external examinations and moderated school-based assessment.</p> <p>Apprenticeship and traineeship systems (vocational education) used by many school leavers, including those who have completed Year 12</p> <p>Around one-third of grade cohorts proceed from school to university</p> <p>Individuals are offered university places based on their entrance rank (ENTER) scores, which reflect Year 12 school certificate performance</p> <ul style="list-style-type: none"> • These ranks determine both to whom institutions make offers and the courses to which the offer refers 		<p>Access to university competitive</p>

Table 2 Key descriptive features of the two cohorts

	1995	1998
Government School in Year 9 (%)	67.2	66.4
Catholic school in Year 9 (%)	20.2	20.4
Independent School in Year 9 (%)	12.7	13.2
Male (%)	48.9	51.1
Parental SES (occupation based status scale, 0-100)	36.3	36.8
Metropolitan school in Year 9 (%)	55.0	53.1
Year 9 school achievement	50.0	50.1
SES of student's expected occupation (occupation based status scale, 0-100)	50.5	50.5
Obtained a Year 12 certificate (%)	76.1	78.2
Has an ENTER score (%)	53.8	56.2
Attending university (%)	35.2	35.8
ENTER score	71.8	72.5

Source: Estimated from LSAY Y95 and Y98 cohort.

Table 3 Distribution of students across school sectors (%)

	Government Schools	Catholic schools	Independent Schools
Year 9 distribution - entire LSAY cohorts (Y95 & Y98)	66.8	20.3	13.0
Year 9 distribution - of those who remained in sample to Year 12	67.6	20.1	12.3
Year 12 distribution - of those who remained in sample to Year 12	63.4	21.7	14.9
Year 9 distribution of those whose school had no Year 11 & 12 program	63.9	31.3	4.8
Year 12 distribution of those whose school had no Year 11 & 12 program	64.0	30.3	5.7

Source: Estimated from LSAY Y95 and Y98 cohort.

Table 4 Distribution of students across school sectors

	<u>Unweighted observations</u>			Weighted distributions	
	Government Schools	Catholic schools	Independent Schools	No Year 11 & 12 program	No change group
Australian Capital Territory	327	0	0	15.3	0.8
New South Wales	4	129	19	26.3	33.6
Victoria	141	46	1	20.5	25.4
Queensland	50	15	0	8.4	21.5
South Australia	4	12	0	1.0	7.8
Western Australia	53	2	0	6.4	10.0
Tasmania	251	72	24	21.3	0.5
Northern Territory	17	0	0	0.7	0.4
Total observations	847	276	44	934	10,694

Source: Estimated from LSAY Y95 and Y98 cohort.

Table 5 Transitions across school sectors between Years 9 and 12 (unweighted data)

	<u>Year 12 school</u>			Total	% of distribution
	Government Schools	Catholic schools	Independent Schools		
<hr/> Year 9 school <hr/>					
Government Schools	781	28	38	847	72.6
Catholic schools	26	244	6	276	23.7
Independent Schools	34	5	5	44	3.8
Total	841	277	49	1,167	
% of distribution	72.1	23.7	4.2		
<hr/>					
Number who did not change school	6,151	2,562	2,062	10,775	
% of distribution	57.1	23.8	19.1		

Source: Estimated from LSAY Y95 and Y98 cohort.

Table 6 Comparison of ‘observable’ characteristics across groups

	Government Schools	Catholic schools	Independent Schools
Group who did not change schools			
Male (%)	45.7	49.5	54.1
Parental SES (occupation based status scale, 0-100)	33.2	41.2	50.1
Metropolitan school in Year 9 (%)	53.3	72.0	69.9
Indigenous background (%)	1.8	0.7	1.1
Father had degree	16.4	27.7	42.1
Mother has degree	15.4	23.3	36.0
Siblings (#)	2.1	2.1	1.9
Student born in non-English-speaking country	8.8	7.8	6.1
Wealth rank of region where student lives (0-100)	45.7	50.7	62.3
Group forced to change schools			
	Year 9 school sectors		
Male (%)	45.4	46.7	62.0
Parental SES (occupation based status scale, 0-100)	35.3	36.9	41.7
Metropolitan school in Year 9 (%)	37.6	37.6	23.9
Indigenous background (%)	1.7	1.9	3.7
Father had degree	17.0	16.3	30.6
Mother has degree	20.1	19.2	12.7
Siblings (#)	2.1	2.1	3.4
Student born in non-English-speaking country	3.1	5.1	3.3
Wealth rank of region where student lives (0-100)	37.8	46.9	61.1
Group forced to change schools			
	Year 12 school sectors		
Male (%)	46.6	45.6	53.0
Parental SES (occupation based status scale, 0-100)	36.1	36.3	35.6
Metropolitan school in Year 9 (%)	35.8	37.6	46.9
Indigenous background (%)	2.4	0.0	4.7
Father had degree	17.8	17.1	15.2
Mother has degree	19.0	18.4	30.2
Siblings (#)	2.1	2.1	3.0
Student born in non-English-speaking country	3.5	4.4	2.5
Wealth rank of region where student lives (0-100)	38.7	46.7	49.5

Source: Estimated from LSAY Y95 and Y98 cohort.

Table 7 Average ENTER scores by transitions across school sectors between Years 9 and 12

	<u>Year 12 school</u>			Total
	Government Schools	Catholic schools	Independent Schools	
Year 9 school				
Government Schools	69.8	76.4	73.5	70.2
Catholic schools	61.6	71.7	72.7	70.9
Independent Schools	67.5	70.3	80.1	69.6
Total	69.2	71.9	74.1	70.4
Number of observations	496	206	32	743
Among those who did not change school	69.0	74.8	79.9	72.3
Number of observations	6151	2562	2062	10775

Source: Estimated from LSAY Y95 and Y98 cohort.

Table 8 Comparison of factors that reflect ‘unobservable’ characteristics across groups

	Government Schools	Catholic schools	Independent Schools
Group who did not change schools			
In Year 9			
Planned to undertake Year 12 (%)	81.1	87.3	89.6
Planned to go to university (%)	52.3	66.0	71.6
Planned to undertaken an apprenticeship (%)	7.8	4.2	4.1
Planned to undertake vocational qualifications (%)	15.7	11.0	7.8
SES of future expected job	51.2	56.7	58.7
School satisfaction scale	27.9	28.8	28.9
Interactions with teachers satisfaction scale	16.4	16.9	17.1
Opportunities or school relevance scale	15.6	16.0	16.0
Sense of achievement scale	21.6	21.9	21.6
Positive attitude towards homework (4-12)	6.7	6.8	6.9
Hours of weekly homework	5.6	7.9	8.0
Group forced to change schools			
Year 9 school sectors			
In Year 9			
Planned to undertake Year 12 (%)	75.4	77.9	84.2
Planned to go to university (%)	49.9	58.0	57.6
Planned to undertaken an apprenticeship (%)	9.9	6.9	0.0
Planned to undertake vocational qualifications (%)	14.3	11.0	4.7
SES of future expected job	49.8	55.9	51.7
School satisfaction scale	28.9	28.1	31.6
Interactions with teachers satisfaction scale	16.8	16.6	18.9
Opportunities or school relevance scale	15.8	15.6	17.1
Sense of achievement scale	21.8	21.4	22.8
Positive attitude towards homework (4-12)	6.9	6.7	6.8
Hours of weekly homework	5.5	6.9	4.7

Table 8 Comparison of factors that reflect ‘unobservable’ characteristics across groups (continued)

	Government Schools	Catholic schools	Independent Schools
Group forced to change schools	Year 12 school sectors		
In Year 9			
Planned to undertake Year 12 (%)	74.6	79.2	84.8
Planned to go to university (%)	49.2	60.8	51.2
Planned to undertaken an apprenticeship (%)	11.0	4.6	1.3
Planned to undertake vocational qualifications (%)	13.2	12.8	7.8
SES of future expected job	49.7	55.8	56.0
School satisfaction scale	28.7	28.4	30.9
Interactions with teachers satisfaction scale	16.9	16.7	17.9
Opportunities or school relevance scale	15.8	15.8	16.8
Sense of achievement scale	21.8	21.5	22.5
Positive attitude towards homework (4-12)	6.8	6.7	7.4
Hours of weekly homework	5.2	7.2	7.4

Source: Estimated from LSAY Y95 and Y98 cohort.

Table 9 Comparison of factors that reflect ‘unobservable’ characteristics across groups

	Government Schools	Catholic schools	Independent Schools
Group forced to change schools	Year 12 school sectors		
Standardised comparison with Year 9 school average In Year 9	(standard deviations)		
Planned to undertake Year 12 (%)	-0.01	0.03	-0.02
Planned to go to university (%)	-0.06	0.07	0.34
Planned to undertaken an apprenticeship (%)	0.04	-0.05	-0.21
Planned to undertake vocational qualifications (%)	0.03	0.03	-0.42
SES of future expected job	-0.02	0.00	0.37
School satisfaction scale	-0.01	0.02	-0.01
Interactions with teachers satisfaction scale	-0.02	0.01	0.20
Opportunities or school relevance scale	-0.03	0.07	0.01
Sense of achievement scale	-0.02	0.04	0.02
Positive attitude towards homework (4-12)	-0.04	0.04	0.20
Hours of weekly homework	-0.05	0.05	0.23
Year 9 achievement	-0.03	0.09	-0.12

Source: Estimated from LSAY Y95 and Y98 cohort.

Table 10 Regression-based school sector effects – group who did not change schools

	<u>No other controls</u>		<u>With controls²</u>	
	Catholic school	Independent School	Catholic school	Independent School
<i>Group who did not change school</i>				
Regression (standard weights)				
β	5.73***	10.84***	4.29***	4.84***
<i>Std error</i>	(1.17)	(1.17)	(0.67)	(0.69)
Reweighted regression (private school treatment)				
β			3.19***	4.55***
<i>Std error</i>			(0.61)	(0.64)
Reweighted regression (treatment on untreated)				
β			3.23***	4.46***
<i>Std error</i>			(0.75)	(0.74)
Matching estimator ³ (private school treatment)				
β			3.94***	4.39***
<i>Std error</i>			(0.58)	(0.60)
Matching estimator (treatment on untreated)				
β			3.68***	4.53***
<i>Std error</i>			(0.64)	(0.81)

Source: Estimated from LSAY Y95 and Y98 cohort, using weights that account for the sample design and attrition.

Notes:

1. * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level

2. The set of controls include: school achievement, parental employment and education and occupation and location SES measures, number of siblings, Indigenous, metropolitan, birthplace, state and cohort indicators and a measure reflecting students' self-assessed relative school performance.

3. Mahalanobis nearest neighbour matching, based on the five nearest control observations using the propensity score, gender, school achievement and parental occupation-based SES.

Table 11 Regression-based school sector effects – group forced to change schools because their initial school had no senior program

	<u>No other controls</u>		<u>With controls²</u>	
	<u>Catholic school</u>	<u>Independent School</u>	<u>Catholic school</u>	<u>Independent School</u>
<i>Group who changed, no senior program</i>				
Regression (standard weights)				
β	2.09	6.30	2.13	7.47***
<i>Std error</i>	(1.99)	(4.03)	(2.26)	(2.19)
Within regression (sample weights)				
β			1.67	6.93**
<i>Std error</i>			(4.55)	(2.83)
Rewighted regression (private school treatment)				
β			2.01	4.89**
<i>Std error</i>			(1.62)	(2.33)
Rewighted regression (treatment on untreated)				
β			-2.57	1.70
<i>Std error</i>			(1.92)	(3.36)
Matching estimator ³ (private school treatment)				
β			6.21**	6.67*
<i>Std error</i>			(3.16)	(4.02)
Matching estimator (treatment on untreated)				
β			-1.92	Too few
<i>Std error</i>			(2.86)	observations

Source: Estimated from LSAY Y95 and Y98 cohort, using weights that account for the sample design and attrition.

Notes:

1. * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level
2. The set of controls include: school achievement, parental employment and education and occupation and location SES measures, number of siblings, Indigenous, metropolitan, birthplace, state and cohort indicators and a measure reflecting students' self-assessed relative school performance.
3. Mahalanobis nearest neighbour matching, based on the five nearest control observations using the propensity score, gender, school achievement and parental occupation-based SES.

Appendix A: Methodology

The framework within school sector choices are made

We envisage a framework within which individuals and their parents choose between government and private schools according to their financial resources and how they weigh up the costs of private schooling in terms of the fees they pay, with their estimates of the relative benefits it provides. These benefits may include the perceived superior quality of the learning process, the type and range of personal values developed in different types of schools or the nature of the personal contacts made through private schooling. Though an abuse of the term (and economic methods, since we are bundling up ‘preferences’ and budget constraints), we treat individuals engaging in an assessment of these factors to estimate some level of ‘utility’ associated with each potential choice. They choose that sector that provides the highest level of utility.

Let the utility of the j^{th} school sector choice for individual i be described as

$$(1) \quad U_{ij} = V_{ij} + \varepsilon_{ij}, \quad i \text{ indexes individuals}; j = \text{Government, Catholic or Independent}$$

where the V_{ij} represents the deterministic component of ‘utility’ and ε_{ij} denotes its random component. As indicated, in this school choice context, this utility can be thought of as the way individuals and their parents value the package of current and expected future educational and personal outcomes provided by different types of schools relative to the costs of the choice. Individuals choose the alternative that provides them with the highest resulting utility, so that for many choice, c

$$(2) \quad \text{prob}[c=j] = \text{prob}[U_j > U_k] \quad , \text{ all } k \neq j \\ = \text{prob}[\varepsilon_k - \varepsilon_j < V_j - V_k]$$

The school sector choices people make will reflect many factors. These include: the potential alternative outcomes that might be achieved in differing sectors, both academic as well as personal outcomes; the way different individuals value those outcomes; and the costs associated with differing sectors. Rather than necessarily having data on those factors, researchers more often are able to analyse the types of personal and background characteristics that are associated with differing school sector choices. In estimation the relationship between background factors and the choice of sectors such as equation (2), researchers need to make assumptions about the distribution of the error terms and would normally estimate the equation via some form of multinomial logit or probit.

Our interest in this paper is not on the choice of school sector itself, but on aspects of the consequences of the choice. But the framework we have sketched has as a central element that individuals are making choices with the outcomes of the choice in mind. Hence, the observed choice should be treated as endogenous in any outcome equation, unless we can find situations where individuals are unable to exercise choice for some reason.

The consequences of choice for our methodology

Fundamentally, our interest in this paper is to estimate the impact of the type of school an individual attends on their subsequent university entrance rank, or ENTER, score. In a regression framework, this equation is of the form

$$(3) \quad y_{ij} = X_{ij}'\beta + c_{ij}'\lambda_j + u_{ij}, \quad j = \text{Catholic, Independent}$$

where y_i is individual i 's end-of-school ENTER score, the c_{ij} represent the school sector choices of individuals and the X_i are the other background characteristics of individuals (the set used here are described further below and in Appendix Table A.1) and β and λ are parameters or parameter vectors and u_i is an error term.

The main interest in this paper is on the magnitudes of the parameter on the sector choice parameters λ_j . However, the framework set out earlier makes clear that the structure of equation (3) is likely to be problematic. If individuals make their choice of school sector with the likely alternative outcomes of the sector in mind, the choice variables are endogenous in equation (3) and the parameters on the school sector (and all other variables) cannot be estimated consistently. The estimated parameter on the school choice variables will reflect some combination of the 'true' effect of differing school types on the outcomes observed and the impact of selection effects, to the extent that unobserved factors affect both the school sector choices made and outcomes achieved by individuals.

If we can partition the residual in equation (3) into the selection element that is correlated with the choice, denoted by s_{ij} and a random term v_i , then we can re-write equation (3) as a missing variable problem as

$$(4) \quad y_{ij} = X_{ij}'\beta + c_{ij}'\lambda_j + s_{ij} + v_{ij}, \quad j = \text{Catholic, Independent}$$

Researchers have adopted various approaches for estimating regression parameters to capture the impact of the choices individuals make, so that the choice c is not related to the composite residual of equation (4) ($s_{ij} + v_{ij}$). These include the use of randomised experiments (Hsieh & Urquiola, 2006), instrumental variable approaches where valid instruments that somehow determine or constrain decision-making can be identified (Vandenberghe and Robin 2004), inclusion of terms that absorb the selection effect, such as the use of Heckman selection terms; attempted removal of selection effects through the use of panel data techniques and the use of propensity score matching (Vandenberghe and Robin 2004).

These latter propensity score matching techniques involve estimation of a variant of equation (2) and use of the estimated probabilities of the various school choices for individuals in differing ways. In propensity score matching, the outcomes of individuals from the group observed making choice j are compared with those who made choice k who were most like them in terms of their propensity score. In regression reweighting approaches, the propensity scores are used to reweight the data so that those who made choice k who are most like those who made choice j are given greatest weight in the regression estimating the impact of choice j relative to k .

Methodology pursued in this paper

In this paper, we adopt a two stage strategy for dealing with this unobserved data or selection problem in analysing the impact of school sectors on university entrance rank scores. In the first stage, we choose subjects who have something in common, in terms of their initial school choice, to see what the impact of a later school choice they make is on their outcomes. We expect such people to be more alike in terms of both their observed and unobserved characteristics than is the case for the broader the population. In this case, there is no ‘instrument’ that forces individuals into particular types of schools, but individuals are forced to make a new decision, since we limit our analysis to students who attended schools that did not have Year 11 and 12 programs, so we observe two sets of school sector choice decisions. Specifically, we use a ‘within’ estimator to assess what the impact of the later school sector choice is on the outcomes of individuals who made the same initial school choice. That is, the comparison of outcomes is made between individuals who attended the same initial schools, but who made different later choices. The hope is that individuals whose first actual school choices are the same are identical in terms of their ‘unobservables’ so that the ‘within’ estimator effectively removes the bias term from equation (4)

The other two approaches to estimation of the impact of school sectors on university entrance rank scores use this same data, but involve the use of propensity scores as outlined earlier: propensity score matching and regression reweighting. These techniques involve estimation of a first-stage equation explaining the sector of choice of individuals, an equation of the form:

$$(5) \quad \text{prob}[c_i = j] = g(X_i' \pi + W_i' \gamma) + v_i$$

where the W_i are a set of other variables that influence the school sector of choice of individuals in addition to those in X and π and γ are parameter vectors. Equation (5) is estimated in this paper by multinomial logit, so this determines the form of the function $g()$. The regression parameters are used to estimate the probability or propensity score, P_{ij} , for each individual of attending a school of type j . This propensity score is used in two ways in this paper.

The first is to match individuals who choose to go to a private school with those most like them in the group who did not, in terms of their values of P_{ij} , and to compare their outcomes. This gives an estimate of the ‘treatment on the treated’. An alternative is to match those who did not go to a private school to those most like them who did and compare their outcomes. This gives us an estimate of how much the treatment could have benefited those who did not undertake it, known as the ‘treatment on the untreated’ effect. Various forms of propensity-score matching are available that make the necessary comparisons between treatment and untreated groups, in this case, those who chose differing school sectors. Matching techniques are summarised in Angrist and Krueger (1999), Blundell and Costas-Dias (2000, 2009), Heckman, Ichimura and Todd (1997) and Heckman, LaLonde and Smith (1999). Lechner (2002) shows how the normal binary treatment situation can be extended to more than two groups, as is the case here with public, Catholic and Independent schools. Comparisons between school sectors j and k are conducted by estimating propensity scores $P_{ijk} = \text{prob}[c_i = j] / (\text{prob}[c_i = j] + \text{prob}[c_i = k])$.

A second approach to estimating the school sector effects is to conduct regression analysis with reweighted data, effectively estimating equation (4) in such a way that the role of the selection term is minimised through the reweighting procedure. Hirano, Imbens, and Ridder (2003) show that efficient estimates of average treatment effects of binary treatments on outcomes can be obtained by weighing the data with the inverse of a nonparametric estimate of the propensity score. Regression reweighting methodologies are explored empirically in Brunell and DeNardo (2004), Altonji, Bharadwaj and Lange (2008) and Nicholls (2008, 2009). Essentially the procedure involve reweighting ‘treatment’ and ‘control’ or ‘non-treatment’ groups so that the characteristics of some individuals receive greater weight in estimation than others. For example, those members of the control group most like treatment group members, in terms of their estimated propensity score, can be given greater weight in estimation than those less like the treatment group. This allows estimation of a ‘treatment on the treated’ parameter. Reweighting treatment group members to the characteristics of the control group allows estimation of a ‘treatment on the non-treated’ parameter. Suitable reweighting of both groups, as specified by Hirano *et al.* (2003), allows estimation of an ‘average treatment effect’. The ‘treatment on the treated’ effect can be estimated by reweighting all students at Government schools by the weights $[P_{ij}/(1 - P_{ij})]$ (treated observations retain a weight of unity) and the ‘treatment on the untreated’ effect by reweighting all private school students by the weights $[(1 - P_{ij})/P_{ij}]$.

This re-weighting approach means the estimate of the impact of attending a particular school sector on outcomes is derived giving greatest emphasis to comparisons of those most alike in terms of their background characteristics and ambitions in the groups making differing sectoral choices and less weight to those whose characteristics differ. In this paper, these various sectoral choice parameters estimated by both regression reweighting and using propensity-score matching methods are reported.

Appendix Table A.1: Data and variable description

<u>Background characteristics</u>	Variable Description	Mean	Std dev
Male	A dummy variable taking the value 1 if the individual was Male	0.50	0.50
Achievement	The average of literacy and numeracy tests undertaken by subjects in Year 9 (or the sole result if one was missing). The original scales developed in Rothman (2002) had means of 50 and SDs of 10, and were equated between surveys using overlapping test items. The average scale has a mean of around 50 and an SD of 8.5.	50.0	8.5
Parents occupational status	Based on the father's reported current or past occupation, or the mother's occupation where the father's was missing. This was then placed on the ANU 3 occupational status scale, which lies between 0 (farm labourers) and 100 (medical specialists). See Jones (1989) and McMillan and Jones (2000).	36.6	23.2
Metropolitan	Student attended a school in a major metropolitan city (=1).	0.54	0.50
Indigenous	Student indicated they were from an Aboriginal or Torres Strait Island background, in which case the variable takes the value 1.	0.03	0.17
Father worked	Father worked when the student was in Year 11 (=1)	0.76	0.43
Father degree	Father completed a university degree (=1)	0.19	0.40
Mother degree	Mother completed a university degree (=1)	0.18	0.39
Number of siblings	Number of siblings reported by the individual	2.1	1.4
Born overseas in English-speaking country	Student born overseas from Australia in a predominantly English-speaking country - specifically the British Isles, New Zealand, Canada and USA (=1).	0.03	0.18
Born overseas in non-English-speaking country	Student born overseas in a predominantly non-English-speaking country - specifically born overseas in a country other than those identified above (=1)	0.07	0.25
Wealth rank of region	Ranking from 0 to 1 of postcode-based regions (zipcodes) of average reported asset income in the region from Australian Taxation Office data. Data were averaged for 2001 - 2003 for the ranking of regions.	0.47	0.28

(continued . . .)

Appendix Table A.1: Data and variable description (continued)

<u>Background characteristics</u>	Variable Description	Mean	Std dev
Self-confidence scale	Based on students' Year 9 assessment of their overall school performance relative to others at their school (very well; better than average; about average; not very well; very poorly). The mean response, conditional on their actual achievement, whether they were in high or low performing schools and their gender, was removed from this assessment, with the residual reflecting levels of self-confidence. The response was placed on a scale with a mean of 50 and SD of 10.	50.1	3.2
<u>Student plans and expectations</u>	In Year 9 when first surveyed, students were asked when they intended to leave school and about any study plans they had for the future, at any time after they left school.		
Planned to complete Year 12	Student planned to leave school after Year 12 (=1)	0.72	0.45
Planned to attend university	Student planned to attend university sometime after leaving school (=1)	0.48	0.50
Planned to do apprenticeship	Student planned to undertake an apprenticeship sometime after leaving school (=1)	0.10	0.29
Student planned study at TAFE	Student planned to attend a TAFE (vocational education) college sometime after leaving school (=1)	0.15	0.36
Future occupation status score	In wave 2, students were asked about the job or occupation they intend to work in when they completed their studies (school or further study), which was also placed on the ANU 3 occupational status scale	50.5	20.8
<u>School satisfaction scales.</u>	In Year 9 when first surveyed, students were asked 30 questions about the 'quality' of school life at their current school. Research (Marks 1998) has shown these responses support the four scales used here, which pick up differing aspects of the school climate.		
Overall school satisfaction	Overall school satisfaction, which reflects student's favourable feelings about school as whole (range 11-44).	27.4	5.6
Teaching satisfaction scale	Assessment of teachers, which refers to students views about the adequacy of the interaction between teachers and students (range 6-24).	16.1	3.2
Opportunities	The Opportunities or Relevance scale which represents the belief in the relevance of schooling for the future (range 5-20).	15.4	2.8

Appendix Table A.1: Data and variable description (continued)

<u>Background characteristics</u>	Variable Description	Mean	Std dev
Sense of achievement scale	Sense of achievement, which reflects the student's sense of confidence in their ability to be successful in school work (range 7-28).	21.1	3.2
<u>Homework variables</u>	In wave 2, students were asked 2 questions about their approach towards homework: whether they completed all set and undertook additional homework (always, sometimes, most, rarely or never). Responses to these questions (score 1 to 5 for low through to more positive responses) were summed to generate an attitudes toward homework scale. Students were also asked about the average weekly hours of homework they undertook.		
Homework attitudes	Homework attitudes, on a scale ranging from 2 through 10.	6.6	1.5
Weekly homework hours	Weekly homework hours	6.0	5.1

Appendix Table A.2 ENTER score regression equation - school effects along with other controls

Variable	Group who did not change schools	Group who did change schools
Male	-4.51*** (0.48)	-7.09*** (1.61)
Achievement	1.12*** (0.03)	1.29*** (0.09)
Parental SES (occupation based status)	0.03*** (0.01)	0.01 (0.03)
Metropolitan school in Year 9	1.45*** (0.55)	-0.21 (1.72)
Indigenous background	-3.68 (2.28)	-17.63*** (2.84)
Father worked when student was in Year 11	1.54*** (0.58)	-1.97 (1.75)
Father had degree	3.40*** (0.48)	2.32 (1.65)
Mother has degree	2.31*** (0.48)	2.86** (1.39)
Number of siblings	-0.57*** (0.16)	-0.59 (0.47)
Student born in English-speaking country	-1.42 (1.19)	-4.09* (2.45)
Student born in non-English-speaking country	6.95*** (0.84)	9.33*** (2.34)
Wealth rank of region where student lives	6.25*** (0.95)	4.03 (2.87)
Self-confidence	0.26*** (0.10)	0.26 (0.18)
VIC	1.54* (0.80)	-0.73 (2.70)
QLD	7.20*** (0.79)	4.70** (2.32)
SA	8.34*** (0.87)	10.97*** (1.94)

(continued . . .)

Table A.2 ENTER score regression equation - school effects along with other controls (continued)

Variable	Group who did not change schools	Group who did change schools
WA	9.26*** (0.81)	0.49 (3.23)
TAS	-3.08** (1.57)	-7.84** (2.82)
NT	3.49* (1.96)	6.89** (3.41)
ACT	2.05* (1.13)	2.10 (2.95)
Y98 cohort	0.60 (0.54)	2.49* (1.43)
Catholic school	4.29*** (0.67)	2.13 (2.26)
Independent School	4.84*** (0.69)	7.47*** (2.19)
Constant	-11.56*** (4.93)	-9.97 (10.65)
Number of observations	7,751	711
R2	0.379	0.391

Source: Estimated from LSAY Y95 and Y98 cohort, using weights that account for the sample design and attrition.

Notes:

1. * Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level