

The effect of schools in retaining disadvantaged youth in education

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Executive summary

Background

The growth in demand for higher levels of skills, driven by ongoing technological change (skill-biased technical change), means that early school leavers without further qualifications are increasingly disadvantaged in the labour market. While a previous study by Polidano, Tabasso and Tseng (2011) has shown that many early school leavers do return to study in Australia, efforts to prevent youth from disengaging in the first place may be more effective in avoiding disadvantage than efforts to return them to study.

To this end, the Australian Council of Australian Governments (COAG) has set a 90% secondary school completion (or equivalent) target for 20 to 24 year olds by 2015. Meeting this target is no trivial matter given that the school completion rate in 2010, the year after the implementation of the Learn or Earn requirements, was 78%.¹ Commentators point out that to meet this target, more needs to be done to improve the completion rates of youth from low socio-economic (SES) backgrounds, who have a completion rate of around 55% (Lamb and Mason 2008). The need to improve the school outcomes of low SES students has been recognised by COAG in the *National Partnership Agreement on Low Socio-economic School Communities*.

The aim of this report is to investigate the importance of factors that underlie the SES school completion gap. Understanding the contributing factors of the SES school completion gap will help inform policy makers on programs that are most effective in closing it. In general terms, the gap may be due to differences in the characteristics of students, differences in the characteristics of the schools attended and differences that are unrelated to either school or student characteristics. Differences unrelated to characteristics may represent social, cultural, financial differences that affect the transformation of characteristics into school outcomes. For example, students from high SES background may benefit more from having high performing peers because their higher social status may make it easier for them to form advantageous peer connections. Studies to date have focused on estimating only differences in outcomes that are *unrelated* to characteristics (see Ewijk and Sleeger 2010 and Sirin 2005 for a review).

The analysis in this report is based on estimation results from education production functions that link a binary outcome of school completion to a range of education inputs from age 15,

¹ Under the Learn or Earn requirements, those under 21 on income support without a Year 12 qualification or equivalent are required to be in full-time study, employment or a combination of the two.

including school level education inputs. To control for the effects of education inputs prior to age 15, we use a value-added specification- that involves using controls for academic performance and intention to leave school at age 15. We estimate education production functions for the entire sample as well as separate functions for low, medium and high SES student subsamples using a probit model. Student SES is defined according to whether they fall into the bottom, middle or upper third on the PISA composite index of SES, which comprises information on parents' education, parents' occupation status and home possessions.² Results from the completion models by SES are used in a Blinder-Oaxaca style approach (Fairlie 2005) to estimate and decompose the SES school completion gap between medium and low SES and between high and low SES. Decomposition analysis attributes parts of the gap to differences in characteristics and differences unrelated to characteristics. For the component due to differences in characteristics, we go further and break it down according to differences in individual characteristics.³

A feature of our approach is the linking of data from the 2003 OECD Program for International Student Assessment (PISA), an international cross-sectional survey of 15 year-old students and their school principals, to longitudinal student information from the 2003 Longitudinal Survey of Australian Youth (LSAY).⁴ Linking the two datasets gives us the best of both worlds, rich school and student performance data from PISA (including information on school resources, school governance, school programs, teacher quality and student characteristics) and detailed home and school completion information from LSAY.

Key findings

We estimate completion rates of 65% for low SES, 78% for medium SES and 87% for high SES, which translates to a gap in school completion rates of 26 percentage points between high and low SES in Australia and a 13 percentage point gap between medium and low SES. These estimates suggest that the disadvantage faced by low SES students compared to medium SES students is the same as that between medium and high SES students.

² The PISA composite index is generated using factor analysis. Results from the factor analysis suggest that each of elements in the PISA index captures a different components of SES. Research by Bollen, Glanville and Stecklov (2001) and Hauser Huang (1997) demonstrate the multi-dimensional nature of SES, which supports the use of the composite PISA index.

³ We do not decompose the part that is due to factors unrelated to differences in characteristics because the results are difficult to interpret (Jones 1983).

⁴ LSAY is one of only two longitudinal dataset that can be linked to PISA. The other is the Canadian Youth in Transition Survey (YITS).

Overall, we find that differences in student and school characteristics at age 15 are responsible for 20 of the 26 percentage point gap in school completion rates between high and low SES students, the remainder is due to unexplained factors. Digging deeper into which differences in characteristics are responsible for the school completion gap between low and high SES, we find that the main contributing factors are lower academic performance of low SES students at age 15 (7 percentage points) and lower own and parental educational aspirations at age 15 (3 percentage points and 6 percentage points respectively) of low SES youth. We find that differences in school characteristics (school resources, school governance, school programs, teacher quality and school peer characteristics) account for only 2 of the 26 percentage point difference, mostly due to differences in school peer characteristics (in particular, lower academic performance of low SES student peers).

A much stronger preference for post-school study in vocational education and training (VET) over higher education is the reason for the 6 percentage point gap that is attributed to differences in parental aspirations. Low SES parents are three times more likely to want their children to enrol in a VET course after school compared to high SES parents, who are much more likely to favour university study. Estimates from the school completion models show that youth whose parents want them to enrol in a VET course after school are much *less* likely complete school, even less likely than youth whose parents don't care what they do or youth whose parents want them to get a job after school. This result suggests that these parents may allow or encourage their children to leave school to continue study in VET courses. Unlike university study, students do not need to complete school to go onto post-school study in VET.

While school is the most obvious vehicle for delivering policies to close the SES gap, results from this report suggest that programs aimed at reducing the differences in schools attended by low and higher SES students will have little impact on the school completion gap. Instead, results point to interventions that are aimed at helping poor performing students catchup prior to age 15 and programs that engage low SES parents in their children's education. In particular, schools can harness the influence of parents by engaging them more in their child's career planning processes. In such planning, parents should be made aware of the vocational options available to students in schools, including traineeships and apprenticeships and that leaving school to commence a VET course is often not equivalent to completing school. While COAG school completion targets treat the attainment of a VET certificate level II as Year 12 equivalent, Lim and Karmel (2011) find that a VET certificate level II cannot be

considered equivalent for less academically inclined youth because it leads to inferior post-school outcomes. In particular, Lim and Karmel (2011) find that compared to school completion, certificate level II leads to poorer employment outcomes for females and is less likely to lead to the attainment of higher level qualifications.

1. Introduction

A well-established body of research literature demonstrates that compared to school completers, early school leavers have difficulty finding and retaining employment and are more likely to be in low-paid jobs (Heckman and Rubinstein 2001, Rumberger and Lamb 2003). Difficulties finding and keeping work can spill-over into social and health problems, such as depression, substance abuse, criminal behaviour and suicide (see, for example, Morrell et al. 1998; Fergusson et al. 2001; Hammarstrom and Janlert 2002).

The chances of dropping out of school are not evenly spread throughout the population; instead, youth from low socio-economic (SES) backgrounds are much more likely to dropout than those from more advantaged families (see Ewijk and Sleeper 2010 and Sirin 2005 for a comprehensive review of the literature on the relationship between SES and school completion). Data from the Census of Population and Housing shows that for 19-year-olds, the national rate of school completion is around 71% in Australia, but for youth from low socio-economic areas (bottom third of the socio-economic indexes for areas (SEIFA) measure of relative disadvantage), the rate is much lower at around 55% (Lamb and Mason 2008).

There may be many mechanisms through which SES backgrounds may affect academic performance. For example, higher SES families, through greater financial resources, may be better able to provide a more stimulating home environment for early childhood development, and a better school with more advantaged peers. Parents' socio-economic status may also determine access to cultural and social resources of their children. For example, students from high status families may receive more favourable treatment from teachers and peers.

The objective of this paper is to examine the importance of different school characteristics in leveling the playing field in school completion between youth from high and low SES. Research in this area has been limited to examining how the relationship between school performance and a single measure of school quality varies by SES. Using interaction effects, Burnello and Cheechi (2005) found that reductions in student-teacher ratios in post-war Italy helped low SES student education attainment more than high SES student attainment. Similarly, Howley and Howley (2004) find that SES moderates the effect of school size on student achievement, so that those in the lowest SES quartile gain more from being in a small school than those from higher SES. These results point to the potential role of the school in mitigating any deficiency in home resources.

We expand the scope of these studies by using a Blinder Oaxaca style decomposition method (Fairlie 2005) to examine the extent to which the SES gap in school completion rates can be explained by differences in characteristics of schools attended by low and higher SES students. A feature of our approach is the use of a novel dataset that combines data from the 2003 OECD Program for International Student Assessment (PISA), an international cross-sectional survey of 15 year-old students and school principals, to longitudinal student information from the Longitudinal Survey of Australian Youth (LSAY).⁵ LSAY starts by interviewing the same youth from the PISA 2003 study (12,500 students from 321 schools) and proceeds to track them until age 24, gathering information on a raft of school and post-school outcomes.⁶ The richness of the household and individual level data in PISA and LSAY is important in minimising any bias from endogenous sorting, which is common problem in studies that have used administrative data to examine school outcomes (Hanushek 1979, Hanushek 2006 and Todd and Wolpin 2003). Endogenous sorting in the context of this study may arise if there are differences between households, such as parents' attitudes to education, that affect both the selection of schools (and hence school characteristics) and school completion. Without a rich dataset to control for such household differences, the estimated effect of school characteristics will be biased because it will include both the effect of school characteristics on completion and the effect of the uncontrolled for factors that are correlated with both school completion and the choice of school characteristics.

Measuring the contribution of school inputs to the SES gap in school completion is important in helping policy makers decide which inputs to target and which types of programs may be most effective in closing the school completion gap. Therefore, analysis in this study is an important input into the design of programs to meet the Council of Australian Governments (COAG) objective of improving low SES educational outcomes, including rates of secondary certificate attainment.^{7 8} Improvements in educational outcomes of low SES will help address issues of intergenerational inequity and social exclusion.

The report follows a conventional structure, starting with a description of the datasets and definitions of key issues (section 2). We then describe the analytical framework and the

⁵ LSAY is one of only two longitudinal dataset that can be linked to PISA. The other is the Canadian Youth in Transition Survey (YITS).

⁶ Depending on the state, age 15 is either at the end of compulsory education or just prior.

⁷ Objectives for improving the outcome of low SES students are spelt out in the National Partnership Agreement on Low Socio-economic School Communities.

⁸ The COAG target is 90% of 20 to 24 year olds to attain a secondary certificate, or equivalent, by 2015.

derivation of key variables, including descriptions of indices of school characteristics (section 3). In the final two sections (4 and 5 respectively), we present the results and conclusions.

2. Data and definitional issues

The data used for this report combines cross-sectional information from the 2003 OECD Programme of International Student Assessment (PISA) study with down-the-track panel data from the 2003 cohort of the Longitudinal Survey of Australian Youth (LSAY). PISA 2003 is a nationally representative sample of 12,500 15-year-old students that is designed to enable international comparisons on education systems and student outcomes. The 2003 PISA study includes a principal survey on school characteristics and a student survey of home education inputs from the last year of compulsory education in Australia.⁹ More specifically, information gathered includes details of educational inputs at home, school size, student-teacher ratios, teacher qualifications, class streaming by academic ability, use of remedial classes, school equipment and infrastructure and principal perceptions on issues such as school autonomy, school accountability and student/teacher attitudes and behaviours. A feature of PISA data is that it includes student assessments on numeracy, literacy and problem solving at age 15.¹⁰

Linking PISA to LSAY produces a valuable dataset because it enables researchers to trace the impacts of school characteristics and student performance at age 15 to post-school outcomes. Post-compulsory education inputs that may be important in retaining youth in school include vocational courses and career advice. Vocational courses in Australian schools, including school-based apprenticeships and traineeships, are highly integrated into the upper secondary school curriculum. Nationally, over 90% of schools offer vocational programs in schools, with a participation rate of over 40% of all secondary students (NCVER 2010). Participation in vocational courses during school leads to both a nationally recognised qualification and a secondary school certificate. To the degree that these programs offer an alternative education pathway for less academically inclined students, the availability of these programs should help retain youth in school.

⁹ Since the time the data was collected, the legal leaving age was increased in most states and territories. From 2010, the National Youth Participation Requirement requires all young people to participate in schooling (or an approved equivalent) to Year 10, and then participate full-time (at least 25 hours per week) in education, training or employment, or a combination of these activities, until age 17.

¹⁰ These assessments are based on the ability of students to apply concepts learnt at school when faced with situations where they need to apply their knowledge. For example, in the mathematics domain, the assessments evaluate the extent to which students can use their mathematical knowledge and skills to solve various kinds of numerical and spatial challenges and problems.

As well as post-compulsory school information, LSAY also includes detailed student information at age 15 on perceptions of their life at school, their teachers and their classes and whether or not they intend to complete school.

2.1 Measuring Socioeconomic Status

In educational research, SES status of students is said to measure “the extent to which individuals, families or groups have access (either realised or potential) to, or control over valued resources, including wealth, power and status” (Ewijk and Slegers, 2010, p.138). While there is agreement over *what* should be measured by SES, it is less clear *how* it should be measured. Results from a meta-analysis show that the estimated effect of socioeconomic status on students’ achievements varies depending on the measure of SES used. SES is commonly measured using parental occupation, parental education, parental income or home resources such as access to computers, books and a quiet place to study (Sirin 2005).

Studies suggest that each of these commonly used indicators represent different aspect of SES status and are not necessarily interchangeable (Bollen, Glanville and Stecklov 2001 and Hauser Huang 1997). Parental income, parental occupation and parental education may all be measures of the economic resources available to the student, but parental education and parental occupation may also measure access to social, cultural and informational resources. For example, the occupational status of parents may determine the informational resources embedded in networks, so that parents with high educational status may have better information on how to improve the educational outcomes of their children. A less commonly used measure of SES in education research is home resources, such as access to a computer, a quiet place to study and books (McLoyd 199, Eccles, Lord and Midgley 1991). Home inputs may be a measure of not only financial resources, but also the importance of education to the parents.

Given that different measures capture different aspects of SES, the best indicators are those that combine information from a number of measures (Duncan, Featherman and Duncan 1972). In this study, we adopt the multi-component PISA scale of SES, known as the Economic, Social and Cultural Status (ESCS) index, combines information on parents’ occupation, parents’ education and household educational resources. The ESCS index is derived by combining the following PISA information:

1. highest occupation status between the two parents, measured on the International Socio-economic Index of Occupational Status (ISEI) 2008 scale;

2. highest educational status between the two parents, measured using the International Standard Classification of Education (ISCED) 1997 classification scale; and
3. number of household education inputs from a selection of 14 items.¹¹

Number of household education inputs is used as a measure of wealth and the importance that the household places on education. The ESCS index is generated using factor analysis, with each item weighted by the factor loadings, which are roughly equal (OECD 2005).

Because we are interested in the impacts of SES on student academic performance, rather than school performance, our indicator of SES is at the individual (family) level. Using aggregate school level SES measures would introduce the problem of 'ecological fallacy', where inference regarding individual performance of a member of a group is based on the *average* performance of the group as a whole (Sirin 2005). Given the high degree of heterogeneity within an SES group, assuming that individuals from an SES group all behave in the same way may lead to erroneous inference on the effects of SES on individual performance.

For the purposes of decomposing the SES gap, we split the continuous ESCS index into thirds, corresponding to low, medium and high SES. Splitting the index into thirds allows us to decompose not only differences between low and medium SES, but also differences between low and high SES, which gives us insight into whether the gap between low and medium SES is different from the gap between medium and high SES.

2.2 School completion

The definition of school completion is based on whether a student receives a secondary school certificate upon leaving school. A secondary school certificate is a credential awarded to students who successfully meet the academic requirements of upper secondary school (Year 11 and Year 12). This means that students who remain in education until the end of the final year of secondary school, but did not attain a secondary school certificate because they did not meet the academic requirements are treated as early school leavers. As discussed in section 2.1, upper secondary students can choose vocational courses that count towards a nationally recognised qualification and a secondary school certificate.

For some students, information on whether they received a high-school certificate is not available because of item non-response (Table 1). In these cases, the identification of school

¹¹ These items are a desk for study, a room of your own, a quiet place to study, a computer for school work, educational software, internet access, your own calculator, classic literature, books of poetry, classic literature, works of art, books to help with your school work, a dictionary, a dishwasher and more than 100 books.

completion is based on the year and month of school exit: all students who leave school before they start Year 12, or who leave school during Year 12 but before the school year is finished (i.e. in January to October of the year when they started Year 12) are assumed to have not completed Year 12 and thus to have not received a high school certificate. We cannot identify school completion for a small number of students who stay in school until the end of Year 12 (i.e., they leave school only in November or December of the school year) but do not report whether they received a high school certificate.¹² These students are coded as having missing school completion information (item non-response). For some students information on school completion is not available because they attrited from the sample before they left school. These students are also coded as having missing school completion information. The overall school completion rate is 77%, but data in Table 1 shows a gap in SES completion between low and higher SES groups: 13% gap relative to medium SES 26% relative to high SES.

Table 1
School completion by socioeconomic status

	Low	SES Medium	High
Completes school	1,637	2,111	2,579
Does not complete school	906	643	285
Missing (item non-response)	80	68	78
Missing (attrition)	822	605	493
Completion rate (non-missing)	64.4%	76.7%	90.0%
Count (N)	3445	3427	3435

3. Methodology

The main aim of this project is to gain insight into the nature of disadvantage faced by low SES youth. Our approach involves two steps, the first is to estimate school completion models and then to use output from these models to decompose the SES gap.

3.1 Modelling school completion

Before decomposing any SES gap, we estimate probit models of school completion (dependent variable is 1 if completed school, 0 if not) on the entire sample to test for the presence of an SES effect and separately on low SES, medium SES and high SES

¹² Even if they stay until the end of Year 12 it is unclear whether they fulfilled the academic requirements to receive the high school certificate, such as regular school attendance.

subsamples, which are used in the decomposition. The SES effect is what is most often estimated in multivariate analysis and may reflect differences in culture, social status or financial resources that affect educational outcomes. The SES effect is only one of two parts of the SES gap, the other being the part that is due to differences in characteristics. If no SES effect is present, then the decomposition could be undertaken by simply concentrating on explaining the gap due to differences in characteristics.

When specifying school completion models, we use the education production function approach (Hanushek 1979, and Todd and Wolpin 2003), which assumes that education inputs, such as equipment and infrastructure and teacher quality, are combined with student learning methods to produce education outcomes, in this case, school completion.

In theory, an education production function model of school completion would include information on all educational inputs from the time of birth as well as information on intellectual endowment. However, in practice researchers only have information on education inputs over a limited time-frame and no information on ability. When faced with such data restrictions, researchers have to make assumptions about the effects of ability and past educational inputs. In this study, we follow standard practice and use “value-added” specifications that assume the effects of all past educational inputs and intelligence are captured by including past values of the dependent variable on the right hand side.

In estimating models of school completion, we cannot include past values of the dependent variables on the right-hand-side because school completion is a once off event. Instead, we assume that we can capture the effects of all inputs, including academic ability, prior to age 15 (the commencement of the LSAY survey) by including information on PISA test scores and intentions to leave school at age 15, which is prior to the minimum school leaving age (see Appendix A for a more detailed discussion of this value-added model). The PISA test scores on mathematics, reading and literacy and problem solving at age 15 are included in the model by using factor analysis to produce an index of overall performance. The index is a sum of the three scores, weighted by the factor loadings and normalised.¹³

To test whether these variables provide adequate controls for the effects of past educational inputs, we ran a number of specification tests by introducing more base year variables, in particular a series of variables on own attitudes to school and education, to the models estimated on the entire sample. Including these additional variables did not add to the overall

¹³ The factor loadings are approximately equal so that the three scores are given similar weights.

explanatory power of the model and were not jointly significant, which suggests that using past education performance and intention to leave school are sufficient for controlling for the effects of past inputs.¹⁴

3.2 Specifying the school completion models

There are two important issues that need to be addressed when specifying the education production function of school completion. The first is selecting and deriving the school characteristic variables and the second is controlling for endogenous selection of school characteristics. Endogenous selection occurs when individual and family characteristics determine both the choice of school and the chance of completing school. Failure to adequately control for endogenous sorting may lead to biased results. For example, if having aspirations to study at university is correlated with both the choice of schools with low student teacher ratios and school completion, then failure to control for student aspirations will over-state the effect of student teacher ratio on the chances of school completion.

School characteristics

This section provides an overview of how school characteristic variables (presented in Table 2) were derived. A more detailed map of how the survey question responses were transformed into variables used in the analysis is presented in Table B.1 of Appendix B.

School variables used in the analysis are either from the PISA principal survey or are derived by aggregating PISA or LSAY student information to the school level. Many of the variables are indices, derived by combining responses to many related questions that tap into the same underlying school factor. For example, the responses to the LSAY questions on whether *school is a place where the things you learn are important* is likely to be highly correlated to the responses to the question on whether *school is a place where you gain skills that will be of use when you leave school*. Including both separately in any multivariate analysis doesn't make sense because they reflect different aspects of the same underlying factor — perceived importance of school. Unless otherwise stated, all indices generated in this analysis are generated in the following way.

Table 2
School completion by socioeconomic status

	Low SES ^a	Medium SES ^a	High SES ^a
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¹⁴ Results are available on request from the authors.

	Mean	Std. dev. ^b	Mean	Std. dev. ^b	Mean	Std. dev. ^b
School-Dropout Rate	36%		23%		10%	
<i>Personal Characteristics</i>						
Number of siblings	2.2	1.4	1.9	1.3	1.8	1.1
Lives in single parent household	39%		29%		22%	
Speaks mainly English at home	91%		93%		93%	
Indigenous	9%		5%		2%	
Male	48%		50%		49%	
Lives in metropolitan area	61%		70%		80%	
<i>State of residence</i>						
ACT	4%		7%		11%	
NSW	24%		21%		24%	
VIC	19%		21%		19%	
QLD	17%		15%		15%	
SA	10%		10%		10%	
WA	14%		15%		14%	
TAS	8%		6%		5%	
NT	4%		5%		3%	
<i>Academic status at 15</i>						
PISA test score (normalised Index)	-0.4	1.0	0.0	0.9	0.5	0.9
Student plans to finish Year 12	0.8	0.4	0.8	0.4	0.9	0.3
<i>Parents' education aspirations</i>						
Don't Know	21%		16%		13%	
Parents Don't Mind	11%		12%		11%	
Get a Job/ Look for Work/ Other	12%		8%		5%	
Other Study/Training	21%		16%		7%	
University	35%		48%		64%	
<i>School Resources</i>						
Students to teacher ratio	14.4	14.9	14.4	11.5	13.9	9.0
Shortage of qualified personnel (normalised index)	0.2	1.0	0.0	1.0	-0.3	1.0
Shortage of teaching equipment (normalised index)	0.1	1.0	0.0	1.0	-0.2	1.0
Shortage of instructional space (normalised index)	0.1	1.0	0.0	1.0	-0.1	1.0
<i>School education programs</i>						
VET as apprenticeship/traineeship	80%		78%		68%	
Personal career counselling in Year 9	82%		83%		84%	
VET/career counselling unknown	5%		3%		2%	
Mathematics remedial classes	88%		88%		90%	
Streaming in all math classes	36%		41%		43%	
<i>School Governance</i>						
<i>School Sector</i>						
Government	78%		66%		49%	
Catholic	17%		23%		22%	

Independent	5%		12%		29%	
School staffing restrictions						
None	40%		49%		61%	
Restricted on firing	22%		22%		18%	
Restricted on firing and hiring	38%		30%		21%	
Number of student assessments per year	43	18	44	18	45	18
Monitoring of school performance	84%		79%		75%	
<i>Student attitudes to school and education</i>						
Peers' attitudes to education (normalised index)	0.0	1.0	0.0	1.0	0.0	1.0
Peers' behaviour in class (normalised index)	-0.3	0.9	-0.1	0.9	0.3	1.0
Peers' school enjoyment (normalised index)	-0.2	0.9	-0.1	1.0	0.3	1.1
Peers' social attachment to school (normalised index)	-0.2	1.0	0.0	1.0	0.2	1.0
<i>Student academic achievement</i>						
Proportion of peers who plan to finish Year 12 (%)	79.3	8.9	81.9	8.7	85.8	8.1
Proportion of peers in bottom quartile of PISA scores (%)	31.6	15.7	25.5	15.9	17.7	14.3
Proportion of peers in top quartile of PISA scores (%)	18.0	12.8	23.4	15.3	33.7	19.5
<i>Teacher characteristics</i>						
Peers' Perception of teachers' manner (normalised index)	-0.1	1.0	-0.1	1.0	0.2	1.0
Peers' perception of teachers' efficacy (normalised index)	-0.3	1.0	0.0	1.0	0.3	0.9
Sample size ^c	3445		3427		3435	

^aThe definition of low, medium and high SES is based on terciles of the PISA SES composite index. ^b Standard deviations are reported for continuous variables only. For categorical variables, they result immediately from the mean (Std. dev. = Mean.(1-Mean)^{0.5}). ^c Sample size is based on sample at age 15.

The first step to form an index is to identify the underlying factors using factor analysis. For each factor we derive a student level index by summing the individual responses to each question in the factor, weighted by the factor loading.¹⁵ To avoid bias that may arise if unobserved individual characteristics, such as student mental health, affect both the student index and the chances of completion, for each student we derive a 'peer index'. The peer index is unique to each student and is calculated as the sum of all student indices for other students that attend the same school.¹⁶ Finally, each peer index is normalised (mean 0 and unitary standard deviation) to make them comparable.

School characteristics in LSAY and PISA includes information on five broad categories: school resources, school governance, education programs, teacher quality and student characteristics.

School resources

¹⁵ Factor loading is the correlation between the item and the other items in the factor.

¹⁶ In most cases, this means summing the individual indices of around 30 students.

School resources reflect the extent to which a schools' ability to instruct is limited by a shortage of resources, in particular teacher, infrastructure and equipment shortages.

The adequacy of teacher levels is measured using students to teacher ratio. All else being equal, the lower the number of students per teacher, the higher the quality of education because teachers have more time to plan lessons and provide one-on-one instruction to meet individual learning needs. We estimate the students to teacher ratio by dividing the number of students by the full-time equivalent number of teachers, where part-time teachers are assumed to have half the teaching load of a full-time teacher.

A limitation of the student to teacher ratio is that it measure only the number of teachers available to cater for the needs of the available student population, it does not account for the types of teachers that are available. Regulation of salaries means that in fields for which there is a high demand for teacher graduates, such as mathematics and science, some schools may have a shortage of teachers who are qualified in these fields. To take into account the adequacy of the mix of teacher skills, we produce an index on the extent to which the principal reports instruction is affected by a shortage of qualified personnel.

To evaluate the role that school physical assets play in school completion, we derive two indices on the extent to which principals believe instruction is hindered by school assets. These factors are restrictions due to a lack of teaching equipment (such as computers, audio visual material and science laboratory equipment) and restrictions due to a lack of school infrastructure (such as a lack of classrooms and school buildings and poor heating/cooling).

School governance

School governance, or improving how schools govern their resources, has been a focus of education policy reform in Australia and in other OECD countries in recent times. The reforms are based around an emerging consensus that governance, especially school autonomy and accountability, are important in mobilising individual incentives to improve school and teacher performance (Barrera-Osorio et al. 2009). To capture the possible effect of school autonomy, we include indicator variables on staffing restrictions faced by the school, in particular, whether the principal reports that the school is restricted in hiring and firing staff or whether restricted only in firing. The autonomy to hire and fire staff may be important if it sharpens teacher incentives to perform and gives schools the ability to control the quality and type of teaching staff. Other restrictions in PISA, such as restrictions on budget allocations,

disciplinary policies and student assessment policies were not included because they are not restricted in Australian schools.

School accountability is measured using information from the PISA principal survey on the frequency of student assessment and whether the school uses this information to monitor school performance. All else being equal, we may expect that the more often students are assessed and the more the assessment information is used to monitor performance, the better equipped the school to identify problems and respond accordingly. The frequency of student assessment per year is derived by summing the number of times that the principal reports each of the assessment types are carried out per year.¹⁷ Whether student performance is used to monitor school performance is measured by whether they do at least one of the following: compare the school performance to national or district performance, monitor the school's progress from year to year, or compare the school with other schools. Other uses that student performance measures were used for were not included because either almost all principals reported yes (for example, to inform parents about child's performance) or were almost always reported no (to judge teacher effectiveness).

Other aspects of governance, such as the ability of schools to select and expel students and set fees for tuition are captured by including an indicator variable of school type. Generally speaking, government schools in Australia select students within their local area and not on their ability or on their capacity to pay fees, which are usually voluntary and regulated at a nominally low level. Government schools also have limited ability to expel students. Private schools (Catholic and independent) on the other hand are free to select the conditions upon which they allow entry and expel students and have no fee restrictions.

Education programs

Besides the school governance framework, education programs offered by schools may play a role in retaining youth in school, especially those that encourage learning among disengaged youth. One such program is VET in schools that allows students to remain in school and study for both a secondary school certificate and a nationally accredited VET qualification. While most Australian schools now offer these programs, most offer only courses that do not involve an employment contract. Some schools have relationships with employers and offer students the opportunity to enter an employment contract and commence an apprenticeship/traineeship while studying towards a secondary school certificate (school-

¹⁷ There are five assessment types: standardised tests, teacher designed tests, teacher judgment ratings, student portfolios and student assignments/projects/homework.

based apprenticeship/traineeship). All else being equal, given that 'started an apprenticeship/traineeship' is one of the main reasons why students in LSAY report leaving school early, schools that offer students school-based apprenticeships/traineeships may do better at retaining students in school. Whether the school offers school-based apprenticeships/traineeships is identified by whether or not any individuals from a school with more than 20 respondents reports that they have undertaken VET study as part of an apprenticeship/traineeship in the last two years of school. Schools with fewer than 20 respondents are deemed to have too few observations to be able to credibly judge whether they do or do not offer school-based apprenticeships/traineeships. These schools are retained in the analysis and are classified as 'status unknown' in a separate indicator.

As well as giving less academic students an alternative pathway to complete a secondary school certificate, offering career counseling before the end of compulsory education (age 15) might help students develop a post-school career plan and help them appreciate the importance of completing school (Polidano, Tabasso and Tseng 2011). Whether or not a school offers career counseling at age 15 is identified by whether any students in the first wave of LSAY report receiving advice from a career counselor or are involved in a group discussion about careers.

A third type of program identified in the data that may help retain student in school is academic programs that are targeted at meeting the academic needs of poor performing students, namely remedial classes and streaming by ability. Both programs involve the separation of classes by ability, but unlike streaming, remedial classes involves a modified curriculum. In this study, we examine the relationship between these programs and school completion by using information from the PISA principal survey on the availability of school remedial classes and the use of streaming in mathematics. Both variables are dummy indicators, with the one outcome corresponding to a school that has remedial mathematics classes and a school that practices streaming in *all* mathematics classes.

Teacher quality

Teacher quality is generally considered to be important in educational attainment (Nye, Konstantopoulos and Hedges 2004). In this study, we use PISA and LSAY information on principal and student perceptions to derive indices of teacher quality. We choose to include only student perception information because the factor analysis on student information generated two clear factors — 'Teacher manner' and 'Teacher efficacy' — rather than one using principal perceptions and because we assume that students have better information on

the quality of teachers than principals.¹⁸ Teacher manner reflects teacher interpersonal skills such as their ability to get along with students, teacher empathy, approachability and interest in student well-being. Teacher efficacy can be thought of as 'hard' or 'technical' skills related to the teaching profession, such as knowledge of the material, ability to control a class and maintain student interest.

Student characteristics

As well as teachers performance, peer performance is often found to contribute towards student academic success (Ewijk and Slegers 2010). In this study we examine the role of both peer academic performance and peer attitudes to school and education. For peer academic performance, we include the proportion of peers who plan to finish Year 12 and also peer academic performance in PISA tests. For peer attitudes, we produce four indices from student perceptions using factor analysis — importance of education, enjoyment of school, social attachment to school and classroom behaviour.

Controlling for endogenous sorting

Without suitable controls, any estimated effects of school factors on completion are likely to be biased because these inputs are chosen by parents and students and are not randomly allocated. Given that parents who invest more time and money at home in supporting their kids' education, for example by providing a stimulating environment, supervising homework and/or hiring a tutor, also tend to invest more in schooling, studies that have limited or no controls for parental home investments will over-estimate the effects of school inputs. In this study, we rely on controls for home investments in education by including parents' aspirations for their child's education, which are assumed to be highly correlated with home investments. If parents' aspirations are not a sufficient control for home inputs, then results in this study will tend to over-estimate the effects of school characteristics on school completion.

3.3 Decomposing the SES gap

The SES gap, or differences in the rate of completion by SES, is decomposed using an Oaxaca-Blinder (Oaxaca 1973 and Blinder 1973) type approach, but modified for a binary outcome as suggested by Fairlie (2005). This type of decomposition was first developed in an attempt to explain the gender wage gap (see Box 1 for more information) and breaks any gap into two parts: the 'characteristic adjusted' component, which in this study we call the SES effect and the 'characteristic differences' component. In essence, the characteristic differences

¹⁸ We re-estimated the results with an index from the principal perception information and found similar results.

component is estimated as the difference in the characteristics between low and higher SES, weighted by the estimated model coefficients for low SES and the characteristics adjusted component is the differences in the coefficients between low and higher SES, weighted by the characteristics of the higher SES group.

For the characteristics differences component, we dig deeper and attribute the gap due to differences in the levels of individual characteristics. We do not break down the characteristic adjusted part in the same way because such estimates are arbitrarily based on the reference point from which they are calculated, making the results difficult to interpret (Jones 1983). Decomposing the explained gap by characteristics tells us something about which characteristics to target in order to close any SES gap.

Because we have three SES subsamples (low, medium and high), we decompose both the gap between low and medium SES and the gap between low and high SES. We are able to decompose both the gap between medium and low SES and high and low SES because there is overlap in the distribution of the variables between low and high SES group (Table 2). If no overlap existed, then there is the risk of extrapolation bias.

Although the small number of observations means that we cannot decompose any gap for specific disadvantaged groups, we do test for differences in the SES effect. Any SES effect may vary across disadvantaged groups if, for example, there are cultural impediments to education that are particular to these groups. Evidence that any SES effect varies across disadvantaged group is present if there is a significant interaction effect in the probit model between SES and membership of a disadvantaged group. To test this, we re-estimate the probit model of school dropout, but with interaction terms between SES and membership of the following groups:

- indigenous;
- youth from non-English speaking background;
- single-parent households; and
- youth from rural and remote areas.

Box 1: The Oaxaca-Blinder decomposition methodology and estimating discrimination in economics

This methodology was developed simultaneously and independently by two US economists Ronald Oaxaca and Alan Blinder in 1973 following the need to establish if the observed male-female wage gap was discriminatory or not. The idea behind it is simple, but the implications can be far reaching. Men were observed to be paid on average a higher hourly wage than women. This was called the pay gap. The purpose of the Oaxaca-Blinder method was to discover if the pay gap was the result of pay discrimination against women (which was defined as man being paid more for doing the same job) or if it was because men and women were engaging in the labour market in different ways doing different jobs. For example, it was then argued that the average women at work was younger than the average man at work, so that given that wages increase with age, the male-female pay gap was in part due to differences in the age of men and women in employment. To discover if the data supported the general feeling that there was pay discrimination in the labour market, the pay gap had to be adjusted to account for the different characteristics of men and women in employment. This was done in two steps.

First, the proportion of the wage gap that was due to observed differences was calculated. This part was given many names such as the productivity differences, the explained (by the model) differences, characteristics differences, and other. Second, these characteristics differences were subtracted from the total observed differences, in order to derive (characteristics) adjusted differences.

The adjusted differences were used as a measure of the degree to which men were paid more than women for doing the same job. This decomposition of observed differences can be summed up as:

Total Observed Differences = Adjusted Differences + Characteristics Differences

35 years, scores of court cases and hundreds of publications later, the principle of the Oaxaca-Blinder decomposition methodology remains a powerful tool for understanding adjusted group differences. In essence, this methodology allows us to distinguish between differences that can be attributed to observed differences in characteristics between two groups (such as age, wealth, education, length of labour market experience) which all sum up to the Characteristics Differences and residual differences that can only be attributed to belonging to one or the other group which are (characteristics) Adjusted Differences.

This report uses this tool. In our case we have differences in school completion between those from low SES and middle SES backgrounds. The observed Total Observed Difference in school completion is decomposed into the Characteristics Difference and (characteristics) Adjusted Difference. The Characteristics Difference measures the part of the Total Observed Difference that is due to the sum of the individual differences between low and middle SES and the Adjusted Difference measures the part of the Total Observed Difference that can be attributed to belonging to one or the other SES group. For the purpose of this study, Adjusted Differences are of most interest and represent the part of Total Observed Difference that is due to belonging to an SES group. In the following analysis the terms Total Observed Differences, Characteristics Differences and Adjusted Differences will be used and should be interpreted according to the definitions provided here.

4. Results

As outlined in section 3, our analysis involves estimating the SES effect for the entire sample and for particular disadvantaged groups and decomposing the SES gap. Results for each of these steps are reported below.

4.1 Estimates of the SES effect

As discussed in section 3.1, estimates of the SES effect, or the effect of being a member of an SES group independent of the effect of other characteristics, is typically reported as the marginal effect of SES on education outcomes. All marginal effects for the variables in the pooled model of school completion, together with standard errors are presented in Table 3 (see box 2 for more information on the derivation and interpretation of marginal effects and standard errors). Because many of the marginal effects are small, we multiply both the marginal effects and standard errors by 100.

Box 2: Derivation of marginal effects and standard errors and their interpretation

Marginal effects in this report are *mean* marginal effects and are calculated by taking the average of the marginal effects calculated for each individual in the sample. Marginal effects represent the estimated percentage point change in the probability of completing school for a one unit change in each of the explanatory variables, independent of the effects of all other explanatory variables in the model. For categorical variables, the marginal effects represent the percentage point change in the probability of completion for a given explanatory variable category, relative to the reference category that is omitted.¹⁹ As an example, consider the interpretation of the marginal effect of number of being a male (-2.679) in Table 3. We can say that all else being equal, males are around 3 percentage points less likely to complete school than females.

The standard errors that accompany the marginal effects can be interpreted as the average error of the estimates, so that the larger the standard error relative to the size of the marginal effect, the greater the associated error of the estimate and the less confident that the estimate is statistically significant (significantly different from zero). All standard errors are estimated using the delta method.

To highlight statistically significant results, we mark the marginal effects using asterisks: one asterisk is significant at 10%, two asterisks is significant at 5% and three asterisks is significant at 1%.²⁰

From the results presented in Table 3, we can conclude that after controlling for differences in characteristics related to SES, those from low SES backgrounds are 3 percentage points less

¹⁹ Crucially, the statistical significance also depends on the choice of reference case.

²⁰ A marginal effect that is marked significant at 10% means that there is less than a 10% chance that the marginal effect is equal to zero (significant), while one marked significant at the 5% means that there is less than a 5% chance that the marginal effect is zero and similarly for the 1% level of significance.

likely to complete school than those from middle SES and are 6 percentage points less likely to complete than those from high SES. Compared to the raw gap estimates from Table 2 (13 percentage points and 26 percentage points respectively), the estimated SES effect is small, which suggests that the SES gap in school completion may be related more to differences in levels of characteristics than to the independent effect of belonging to a low SES group.

Table 3
Mean marginal effects of school completion, entire sample

	m.e.	s.e.
<i>Personal Characteristics</i>		
Number of siblings	-0.724**	0.313
Lives in single parent household	-6.363***	0.865
Speaks mainly English at home	-9.557***	1.450
Indigenous	-3.724**	1.863
Male	-2.679***	0.860
Lives in metropolitan area	2.397*	1.236
State of residence		
ACT	0.768	2.087
VIC	6.615***	1.601
QLD	9.644***	1.337
SA	-1.976	2.131
WA	-1.824	1.760
TAS	-4.716***	1.952
NT	-3.128	2.943
Wald test of joint significance of coefficients (χ^2 (dF))	207.91 (13)***	
<i>Academic status at 15</i>		
PISA test score (normalised index)	7.839***	0.527
Student plans to finish Year 12	15.800***	1.390
Wald test of joint significance of coefficients (χ^2 (dF))	370.26 (3)***	
<i>Socioeconomic Background</i>		
PISA composite index (reference category: Low (bottom third))		
Medium (middle third)	3.103***	1.025
High (top third)	6.133***	1.207
Wald test of joint significance of coefficients (χ^2 (dF))	26.97 (2)	
<i>Parents' Aspirations (reference category: University)</i>		
Don't Know	-9.395***	1.260
Parents Don't Mind	-8.059***	1.399
Get a Job/ Look for Work/ Other	-11.323***	1.802
Other Study/Training	-19.606***	1.670
Wald test of joint significance of coefficients (χ^2 (dF))	179.57 (4)***	
<i>School Resources</i>		

Students to teacher ratio	-0.022*	0.012
Shortage of qualified personnel (normalised index)	-0.244	0.679
Shortage of teaching equipment (normalised index)	-0.643	0.637
Shortage of instructional space (normalised index)	0.596	0.557
Wald test of joint significance of coefficients (χ^2 (dF))		7.85 (4)
<i>School education programs</i>		
VET as apprenticeship/traineeship	0.337	1.272
Personal career counselling in Year 9	3.301	2.999
Mathematics remedial classes	-1.643	1.498
Streaming in all maths classes	-0.277	0.932
Wald test of joint significance of coefficients (χ^2 (dF))		3.28 (5)
<i>School Governance</i>		
School Sector (Reference category: Government)		
Catholic	1.610	1.631
Independent	1.535	2.072
School staffing restrictions		
None	-0.733	1.441
Restricted on firing	0.288	1.336
Restricted on firing and hiring	-0.009	0.027
Number of student assessments per year	1.259	1.324
<i>Student attitudes to school and education</i>		
Peers' behaviour in class (normalised index)	0.267	0.554
Peers' school enjoyment (normalised index)	0.693	0.754
Peers' social attachment to school (normalised index)	0.561	0.706
Wald test of joint significance of coefficients (χ^2 (dF))		2.55 (6)
<i>Student academic achievement</i>		
Proportion of peers who plan to finish Year 12 (%)	0.035	0.071
Proportion of peers in bottom quartile of PISA scores (%)	-0.015	0.050
Proportion of peers in top quartile of PISA scores (%)	0.104*	0.057
Wald test of joint significance of coefficients (χ^2 (dF))		4.52 (4)
<i>Teacher characteristics</i>		
Peers' Perception of teachers' manner (normalised index)	-0.449	0.695
Peers' perception of teachers' efficacy (normalised index)	-0.330	0.601
Wald test of joint significance of coefficients (χ^2 (dF))		0.52 (2)
Number of Observations		6740
Log-Likelihood		-2442.94
Pseudo R ²		0.291
Wald-Test: Model Significance		1570.36 (51)***

***Significant at 1%, **significant at 5% and *significant at 10%. Note: all marginal effects and standard errors are multiplied by 100.

We note that any SES effect depends on the chosen model specification. It could be argued that parental education aspirations should be part of an SES effect is because it may represent a cultural resource. However, removing this variable from the regression does not greatly

affect the estimated SES effect, with the marginal effect estimates increasing to 4 and 8 percentage points compared to medium and high SES respectively.²¹

We find, from estimates of a separate model with interactions, that the SES effect varies from the average for those who are from a single-parent household and for those who are Indigenous.²² In particular, we find that low SES indigenous students are 17 percentage points *less* likely to complete school than high SES indigenous students (Table 4). The greater sensitivity of Indigenous youth to their parents' SES status may be because strong kinship ties mean that Indigenous youth are influenced more by the cultural norms within their local community. In contrast, we find that completion rates for youth from non-English speaking backgrounds is less sensitive to SES background than the average. In particular, we find no significant difference in school completion rates between low and high SES youth from non-English speaking backgrounds (Table 4). Migrants from non-English speaking backgrounds in Australia are typically economic, and by definition, are motivated to improve their status, regardless of their parents' SES status.

Table 4
Estimated SES school completion gap for disadvantaged groups

		Predicted completion rate			Gap: Low-High	Gap: Low-Medium		
		Low SES	Medium SES	High SES	Diff.	s.e.	Diff.	s.e.
Single parent household	no	0.777	0.811	0.844	0.067***	0.013	0.035***	0.012
	yes	0.715	0.741	0.778	0.062***	0.021	0.026	0.019
Non-English speaking background	no	0.75	0.784	0.82	0.071***	0.013	0.034***	0.011
	yes	0.881	0.877	0.865	-0.016	0.033	-0.004	0.027
Indigenous	no	0.761	0.793	0.819	0.058***	0.012	0.031***	0.011
	yes	0.707	0.742	0.872	0.166***	0.048	0.035	0.048
Rural and remote area	no	0.735	0.782	0.805	0.070***	0.020	0.047***	0.015
	yes	0.77	0.794	0.831	0.061***	0.015	0.023**	0.013

***Significant at 1%, **significant at 5% and *significant at 10%. Notes: Predictions are made for each individual in the particular group and then averaged.

²¹ If we remove parents' education aspirations from the model, the estimated SES gaps increase to 3.8 and 8.1 percentage points compared to medium and high SES respectively.

²² To save space, we do not present the model results for the interaction model. These are available upon request from the authors.

Besides estimates of the SES effect, results in Table 3 also bring to light some important findings on factors associated with school completion that are worth discussing. From the age of 15, we find that school factors do not play a significant role in retaining youth in school. Based on the Wald tests of joint significance, we find no relationship between each group of school characteristics and the chances of school completion. There are only two school characteristics that are independently significant, students to teacher ratio and the proportion of school peers in the top 25% of PISA test scores. However, the marginal effects of these characteristics are small in magnitude — a one point decrease in the teachers to student ratio is associated with a 0.02 percentage point increase in the chances of completing school and a one percentage point increase in the proportion of peers in the top quartile of PISA test scores is estimated to reduce the chances of dropping out by 0.1 percentage points.

A possible reason why school characteristics beyond age 15 make little difference to school completion is because compared to other characteristics, there is relatively minor variation in their levels. The relative homogeneity of schools is a result of a public funding model in Australia, for both private and public schools, that allocates resources on the basis of school family SES. The effects of many school factors on education outcomes are not likely to be linear, that is, differences in characteristics up to a point make no difference, but beyond a threshold, they can have significant and increasing effects. For example, whether 78% of school peers report wanting to complete school or 85% is likely to make no difference to the likelihood of school completion because the norm is still to finish. However, if there were schools where peer intention to complete was 35%, then we may have estimated significant results for peer intentions.

Although beyond age 15 school characteristics make little difference to the chances of school completion, it does not follow that the school does not play a role in retaining youth. Rather, the strong relationship between academic performance at age 15 and the likelihood of dropout suggests that the school may be more important earlier. We find that a 1 standard deviation increase in the PISA test score index is associated with a 8 percentage point increase in the chance of completing school. Put another way, those at the 75th percentile are 11 percentage points more likely to complete than those at the 25th percentile.

Rather than school characteristics, these results point to the importance of parents in retaining youth in school. Independent of student's own aspirations and academic performance, students whose parents expect them to go onto university at age 15 are much more likely to go on and finish school. For example, students whose parents want them to go onto university are

estimated to be 11 percentage points and 9 percentage points more likely to stay in school than students whose parents want them to get a job or whose parents don't mind respectively. The biggest discrepancy in completion rates is 20 percentage points between students whose parents want them to go onto VET rather than university. Unlike university study, students do not need to complete school to go onto post-school study in VET and hence there may not be the same parental pressure to finish school. The large significant effect of parents' aspirations, independent of students' own aspirations, may be because parents' aspirations are more stable and may be influential in swaying students' own aspirations in post-compulsory education.

4.2 Decomposition results

Using model predictions, we estimate a 26 percentage point gap in completion rates between high and low SES and a 13 percentage point gap in completion rates between medium and low SES, which is consistent with the gap using raw data (Table 2). These gaps are predicted by averaging the predicted probability of completing for all individuals in a given SES group and then differencing them. The average predicted chance of completing for individuals in the low, medium and high SES sub-samples are 65%, 78% and 91% respectively.

Confirming the initial analysis conducted in section 4.1, we find that most of the gap (over 70%) is due to differences in the levels of characteristics (characteristics differences component in Table 5), rather than due to differences in the effects of characteristics by SES (characteristics adjusted component). Another way of explaining this result is that if those from low SES backgrounds had the same characteristics (academic status at age 15, personal characteristics, school characteristics and parental aspirations) as those from high SES students, the SES completion gap would fall from 26 percentage points to 6 percentage points. Similarly, if low SES backgrounds had the same characteristics, as medium SES students, the SES completion gap would fall from 13 percentage points to 4 percentage points.

Although we do not further decompose the characteristics adjusted component because the results are not interpretable (see section 3.1), it may stem partly from differences in the effects of school characteristics across SES. Results from the Wald test (presented in Table C.1 of Appendix C) show that differences in school characteristic coefficients are estimated to be highly significantly across SES. A difference worthy of note is offering school-based apprenticeships and traineeships increases the chances of low SES dropping out, but reduces the retention of students from higher SES groups. For low SES students, attaining an apprenticeship through school may entice them to leave in order to increase their hours of

work and their income. Given more limited family resources, obtaining financial independence may be a more pressing need for low SES students.

Decomposition by levels of characteristics

The break-down of the gap due to differences in levels of characteristics is presented in Table 5. For ease of interpretation, we present the break-down for categories of characteristics, the breakdown for *individual* characteristics is presented in Table C.2 in Appendix C.

In explaining the SES school completion gap, we find that differences in school characteristics after age 15 are relatively unimportant, accounting for only 1.8 percentage points of the 26 percentage point gap between high and low SES and 1 percentage point of the 13 percentage point gap between medium and low SES, with the most important difference being in attitudes to education of school peers between students of low and higher SES students.

The most important explanation for the lower school completion rates of low SES students is lower academic status at age 15, which accounts for 10 out of the 26 percentage point difference between high and low SES completion rates and 4 out the 13 percentage point difference between medium and low SES completion rates. Most of this can be attributed to a 6 percent and 13 percent lower average combined PISA score for low SES compared to medium and high SES (see Table C.2 in Appendix C). Lower parental aspirations for their children to go onto higher education at age 15 is responsible for around a quarter of the school completion gap between high and low SES and between medium and low SES.

The component of the SES school completion gap due to lower parental educational aspirations is not so much due to lower importance of post-school education, but more because low SES parents are more likely to report wanting their children to do VET after school (21% compared to 7% for high SES parents). Unlike higher education, students can commence VET training without finishing school; therefore, low SES parents may be more likely to concede to their children leaving school early, especially if they intend to commence a VET course instead. As shown in a previous study by Polidano, Tabasso and Tseng (2011), 56% of all early school leavers in Australia are estimated to commence a post-school VET course within 6 months of leaving school.

Table 5
Decomposition of the SES school completion gap

	Low - High	Low - Medium
<i>SES school completion gap</i>	<i>0.257</i>	<i>0.129</i>
<i>SES school completion gap decomposition</i>		
Characteristics adjusted component	0.060	0.037
Characteristic differences component	0.197	0.092
Academic status at age 15	0.101	0.043
Personal characteristics	0.019	0.010
Parents' education aspirations	0.058	0.029
School characteristics	0.018	0.010
School resources	0.005	0.002
School education programs	0.001	0.000
School governance	-0.002	0.000
Peers' attitudes to education	0.013	0.006
Students' academic achievement	0.003	0.003
Teacher characteristics	-0.001	0.000

5. Conclusions

There is a large body of international research that show the chances of leaving school early is much higher among youth from low SES backgrounds (see Ewijk and Sleeper 2010 and Sirin 2005 for a review). In this study, we estimate a gap in school completion rates of 26 percentage points between high and low SES in Australia and a 13 percentage point gap between medium and low SES.

In correcting this imbalance in opportunity, policy makers tend to target the school environment. In the United States for example, the 'No school left behind' program attempted to improve low SES school performance by introducing accountability measures matched with sanctions that included sacking staff and closing the school. In Australia, efforts to rectify the SES imbalance have mainly been through the school funding model, which allocates resources to schools according to the SES of their student body.

However, we show that from age 15, differences in school characteristics have no significant relationship with the likelihood of school completion and on the SES school completion gap (explaining less than 10% of the gap). These results suggest that to close the school SES completion gap, policy focus should go beyond improving senior school quality.

If there is a role for schools in closing the SES completion gap, it is in improving the academic performance of low SES youth prior to age 15 and in better engaging low SES parents in the education of their children. We find that around half of the school completion gap is due to lower academic scores at age 15 and lower parental education aspirations. Lower parental aspirations are estimated to explain more of the gap than students own educational aspirations.

Raising expectations of low SES parents does not mean that they need to encourage their children to go onto higher education, but rather they need to encourage them to do well enough to finish school. Evidence suggests that many low SES parents may concede to (or approve of) their children dropping out of school if their child intends to instead enroll in a VET course. All else being equal, youth whose parents say they want their child to go onto VET after school are estimated to be 20 percentage points more likely to dropout compared to children whose parents want them to go onto university, which is a larger effect for children whose parents have not post-school study aspirations (11 percentage point difference). Parents who want their child to get a job after school may be more likely to insist that they at least complete school first.

There are two main reasons why parents shouldn't view commencing VET study as an alternative to completing school. First, almost all schools now have VET in school programs that allow students to complete a VET qualifications while completing a secondary school certificate. Second, a recent study by Lim and Karmel (2011) find that a VET certificate level II, which is the most common pathway back into education for early school leavers,²³ cannot be considered equivalent for less academically inclined youth because it is less involved, has poorer employment outcomes for females and is less likely to lead to the attainment of higher level qualifications.

²³ Certificate II is also considered to be equivalent to school completion by the Council of Australian Governments (COAG).

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Appendix A: A value-added binary probit model of school completion

In modeling school completion, we assume that each individual i in household j has an unobservable continuous variable D_{ija}^* that represents their latent propensity to dropout of school, which varies with age (a). We also assume, consistent with the educational production function approach (Hanushek 1979, and Todd and Wolpin 2003), that this latent propensity to leave school depends upon individual characteristics, such as their intellectual endowment, and home and school educational inputs. Therefore the latent propensity to leave school can be represented by:

$$D_{ija}^* = F_a(H_{ij}(a), S_{ij}(a), \mu_{ij0}), \quad (1)$$

where $H_{ij}(a)$ and $S_{ij}(a)$ are all the home and school educational inputs up until age A , μ_{ij0} is individual characteristics and $F_a(\cdot)$ is the production technology that transforms the history of inputs into the propensity to dropout of school in the last year of study. The subscript a on $F_a(\cdot)$ allows the impact of inputs up until the year of leaving school to vary with the child's age.

In theory, this model would include information on all educational inputs from the time of birth as well as information on intellectual endowment; however, in practice researchers only have information on education inputs over a limited time-frame and no information on ability. When faced with such data restrictions, researchers have to make assumptions about the effects of individual characteristics and past educational inputs. In this study, we follow standard practice and estimate equation (1) using a “value-added” specification, which assume that the effects of all past inputs are captured by including past values of the dependent variable on the right hand side. Using the standard assumption of time-invariant parameters, the value-added specification of equation (1) becomes:

$$D_{ija}^* = \alpha + X_{ija}\beta + \lambda D_{ij0}^* + \eta_{ija}, \quad a = 1, \dots, A, \quad (2)$$

where D_{ij0}^* is the propensity to dropout of school in the base year, which in this study is the first wave of the sample or the year before the end of compulsory education, X_{ija} are the school and home educational inputs between the base year and the final year of study (A), α is a constant and η_{ija} is an error term. It is assumed that D_{ij0}^* can be represented by a range of base year outcomes, including PISA assessment in numeracy, literacy and problem solving

(Table 19) and intention to dropout of school, and that any measurement error is orthogonal.²⁴ Because dropping out of school is a ‘once only’ event and we are not interested in the timing of the event, only its occurrence, we pool all information from the A post-compulsory study periods. Therefore, the value-added propensity of completion in this study is:

$$D_{ij}^* = \alpha + X_{ij}\beta + \psi T_{ij0} + \eta_{ij} \quad (3)$$

Because the propensity to leave school D_{ij}^* is not observable, only its binary realisation D_{ij} , we apply standard observational criteria. In particular, we observe an individual leaving school without a Year 12 certificate or its equivalent ($D_{ij}=1$) if D_{ij}^* is greater than 0, otherwise we observe school completion ($D_{ij}=0$). Assume the error term η_{ija} follows a normal distribution with unit variance, we can estimate equation (3) using a binary probit model.

²⁴ Given are not the actual scores, but a random draw from the estimated distribution of test scores given the students’ test answers. This is to account for measurement error in the measurement of skills by test scores.

Appendix B: Deriving school characteristics from 2003 PISA and LSAY

Table B.1

Description of school characteristics

School characteristic	Survey	Index items	Variable values
<i>School resources</i>			
Students to teacher ratio	PISA		ratio ^a
Shortage of qualified personnel	PISA	On a scale from 1 (not at all) - 4(a lot), to what extent is your school's capacity to provide instruction hindered by a shortage/inadequacy of any of the following ... Qualified mathematics teachers? Qualified Science teachers? Qualified English teachers? Qualified foreign language teachers? Experienced teachers? Emergency/replacement teachers? Support personnel?	individual index, normalised
Shortage of teaching equipment	PISA	On a scale from 1 (not at all) - 4(a lot), to what extent is your school's capacity to provide instruction hindered by a shortage/inadequacy of any of the following ... Special equipment for disabled students? Computers for instruction? Computer software for instruction? Calculators for instruction? Library materials? Audio-visual resources? Science laboratory equipment and materials?	
Shortage of infrastructure	PISA	On a scale from 1 (not at all) - 4(a lot), to what extent is your school's capacity to provide instruction hindered by a shortage/inadequacy of any of the following ... Instructional space (e.g. classrooms)? School buildings and grounds? Heating/cooling and lighting?	
<i>Education programs</i>			
School-based apprenticeship /traineeship	LSAY	-	1 at least one student in the school sample enrolled in a school-based

Career counselling at 15	LSAY	-	apprenticeship/train eeship in Yr 11 or Yr 12 ^b 1 <i>at least one</i> student at the school took part in a group discussion about careers or saw a counsellor, 0 otherwise ^b
Remedial mathematics classes	PISA	-	1 remedial mathematics are used to promote engagement with mathematics, 0 otherwise
Streaming by ability in all mathematics classes	PISA	-	1 all classes, 0 otherwise
<i>School governance</i>			
School type	PISA	-	0 government school
Catholic		-	1 catholic school, 0 otherwise
Independent		-	1 independent school, 0 otherwise
Staffing restrictions		-	0 firing and hiring is a school responsibility
Restricted on firing		-	1 firing is not a school responsibility, 0 otherwise
Restricted on hiring and firing		-	1 hiring and firing is not a school responsibility, 0 otherwise
Frequency of student assessment	PISA	At your school how often are students assessed using: Teacher developed tests? Teacher judgement ratings? Student assignments, homework, projects?	number of times per year ^c
Monitoring of school performance	PISA	In your school, are assessments of students used to... Compare the school to district or national performance?	1 at least one, 0 otherwise

Monitor the school's progress from year to year?

Compare the school with other schools?

Student characteristics

Perceived importance of education	LSAY	On a scale of 1 (strongly agree) - 4 (strongly disagree). School is a place where... The things you learn are important to you? You have gained skills that will be of use to you when you leave school? The things you learn will help you in your adult life? The things you are taught are worthwhile?	peer index, normalised
Student behaviour	LSAY	On a scale of 1 (strongly agree) - 4 (strongly disagree). In most of your classes... Students are eager to learn? Students make good progress? Students work hard? Students are well behaved?	peer index, normalised
School enjoyment	LSAY	On a scale of 1 (strongly agree) - 4 (strongly disagree). School is a place where... You feel happy? You like learning? You get enjoyment from being there? You really like to go each day? You are given the chance to do work that really interests you? You find that learning is a lot of fun? You feel safe and secure?	peer index, normalised
Social attachment to school	PISA	On a scale of 1 (strongly agree) - 4 (strongly disagree). School is a place where... I feel like an outsider (or left out of things)? I make friends easily? I feel I belong? I feel awkward and out of place? Other students seem to like me? I feel lonely?	peer index, normalised
Proportion of students in Yr 9 who want to finish Year 12	LSAY	-	0-1

Proportion of students performing in the <i>highest</i> quartile in Yr 9	PISA	Combined numeracy, reading and problem solving scores	0-1
Proportion of students performing in the <i>lowest</i> quartile in Yr 9	PISA	Combined numeracy, reading and problem solving scores	0-1
<i>Teacher characteristics</i>			
Teacher manner	PISA	Thinking about the teachers at your school: to what extent, on a scale of 1 (strongly disagree) - 4 (strongly agree), do you agree with the following... Students get along with most teachers? Most teachers are interested in students' well-being? Most teachers really listen to what I have to say? If I need extra help, I will receive it from my teachers? Most of my teachers treat me fairly?	peer index, normalised
Teacher efficacy	LSAY	On a scale of 1 (excellent) - 5 (very poor), how do you rate most of your teachers... On knowing their subject matter well? On being able to explain things clearly? On being well prepared and organised? On being able to communicate with students? On being able to maintain student interest? On managing student discipline well?	peer index, normalised

^a In calculating this ratio, part-time teachers are discounted by half because they are assumed to have half the teaching load of a full-time teacher. ^b To ensure that the estimate is reliable, we only include schools for which there are 20 or more students. For those with less than 20, we include a dummy variable that is 1 if there are less than 20 students and 0 otherwise. ^c In the survey, the principal responds by choosing between categorical outcomes of frequency: never, 1-2 times a year, 3-5 times a year, monthly, more than once a month. To produce a count of the number of times students are assessed, we convert all categories to number of times per year. Responses to the second and third categories are assigned the midpoint (1.5 and 4 respectively) and the final category is assumed a value of 24.

Notes: normalised indices have been generated using factor analysis. Each factor identified in the factor analysis becomes a separate variable. It is worth noting that the items under each factor are not an exhaustive list of those included in the factor analysis. They are the ones that are said to have 'loaded' on the factor, that is, they are the main items that explain variation in the factor and have a loading greater than 0.3. Once the factor analysis is complete, individual indices are calculated as the sum of the items, weighted by the loadings from the factor analysis. If it is a peer index, the individual indices are summed across an individual's school peers. To make the indices comparable, the weighted sums are normalised (zero mean and unitary standard deviation).

Appendix C: Extra results

Table C.1
Results from school completion model, SES interacted with all variables

	Low SES		Interaction: Variable and Medium SES		Interaction: Variable and High SES	
	Coeff.	s.e.	Coeff.	s.e.	Coeff.	s.e.
<i>Personal Characteristics</i>						
Number of siblings	-0.026	0.024	-0.022	0.035	-0.017	0.043
Lives in single parent household	-0.278***	0.055	-0.061	0.093	-0.071	0.103
Speaks mainly English at home	-0.642***	0.142	0.095	0.203	0.402*	0.231
Indigenous	-0.229*	0.133	-0.016	0.210	0.622**	0.282
Male	-0.091	0.064	-0.087	0.100	-0.041	0.108
Lives in metropolitan area	0.136	0.084	-0.011	0.111	-0.086	0.122
State of residence						
ACT	-0.041	0.257	-0.004	0.345	0.266	0.291
VIC	0.280**	0.132	0.067	0.145	0.129	0.191
QLD	0.460***	0.104	0.091	0.151	0.169	0.181
SA	-0.206*	0.120	0.102	0.156	0.235	0.235
WA	-0.145	0.113	0.067	0.159	0.175	0.176
TAS	-0.278**	0.121	-0.041	0.148	0.329	0.201
NT	-0.264*	0.158	0.129	0.235	0.201	0.224
Wald test of joint significance of coefficients (χ^2 (dF))			3(13)		13(13)	
<i>Academic status at 15</i>						
PISA test score (normalised index)	0.324***	0.051	0.136*	0.071	0.098	0.070
PISAT test scores squared	-0.020	0.034	0.100**	0.050	-0.008	0.048
Student plans to finish Year 12	0.713***	0.083	-0.083	0.126	-0.097	0.133
Wald test of joint significance of coefficients (χ^2 (dF))			5(3)		2(3)	
<i>Parents' Aspirations</i> (reference category: University)						
Don't Know	-0.612***	0.092	0.313***	0.131	0.278*	0.143
Parents Don't Mind	-0.351***	0.114	-0.059	0.150	-0.131	0.156
Get a Job/ Look for Work/ Other	-0.548***	0.112	0.158	0.175	-0.159	0.188
Other Study/Training	-0.805***	0.096	-0.017	0.130	-0.169	0.151
Wald test of joint significance of coefficients (χ^2 (dF))			9(4)**		9(4)*	
<i>School Resources</i>						
Students to teacher ratio	0.002*	0.001	-0.010***	0.001	-0.003**	0.002
Shortage of qualified personnel (norm. index)	-0.003	0.045	0.002	0.061	-0.047	0.076
Shortage of teaching equipment (norm. index)	-0.075	0.048	0.035	0.066	0.155**	0.074
Shortage of instructional space (norm. index)	0.014	0.041	0.092	0.062	-0.098	0.067
<i>School education programs</i>						

VET as apprenticeship/traineeship	-0.143*	0.083	0.251***	0.106	0.236*	0.134
Personal career counselling in Year 9	0.019	0.108	-0.071	0.146	-0.078	0.165
School size less than 20	0.260	0.198	-0.026	0.284	-0.464	0.355
Mathematics remedial classes	-0.135	0.110	0.174	0.133	-0.111	0.183
Streaming in all maths classes	-0.043	0.066	0.045	0.089	0.052	0.109
<i>School Governance</i>						
School Sector (Reference category: Government)						
Catholic	0.140	0.146	-0.051	0.168	-0.231	0.205
Independent	0.004	0.173	0.128	0.187	-0.069	0.235
School staffing restrictions						
None	0.127	0.088	-0.251*	0.137	-0.301*	0.179
Restricted on firing	0.078	0.100	-0.088	0.136	-0.220	0.166
Restricted on firing and hiring	-0.000	0.002	-0.000	0.003	-0.001	0.003
Number of student assessments per year	0.030	0.103	-0.048	0.120	0.165	0.154
<i>Student attitudes to school and education</i>						
Peers' attitudes to education (normalised index)	0.009	0.040	-0.051	0.048	0.067	0.061
Peers' behaviour in class (normalised index)	0.050	0.057	0.052	0.079	-0.154*	0.091
Peers' school enjoyment (normalised index)	0.031	0.048	0.002	0.063	-0.040	0.079
Peers' social attachment to school (normalised index)	0.051	0.038	-0.078	0.049	0.069	0.060
<i>Student academic achievement</i>						
% of peers who plan to finish Year 12	-0.001	0.004	0.008	0.007	0.003	0.008
% of peers in bottom quartile of PISA scores	-0.005	0.003	0.008	0.005	0.004	0.006
% of peers in top quartile of PISA scores	-0.003	0.004	0.011*	0.006	0.015**	0.007
<i>Teacher characteristics</i>						
Peers' Perception of teachers' manner (norm. index)	-0.002	0.048	-0.066	0.059	0.040	0.076
Peers' perception of teachers' efficacy (norm. index)	-0.005	0.043	-0.009	0.060	-0.054	0.073
Wald test of joint significance: school characteristics (χ^2 (dF))			210(24) ***		57(24) ***	
<i>Socioeconomic Background</i>						
PISA composite index (reference category: Low (bottom third))						
Medium (middle third)			-1.054	0.644		
High (top third)					-0.563	0.733
Constant	1.546***	0.445				
All Interaction Terms (Chow-Test)			382(44) ***	0.000	130(44) ***	0.000
Number of Observations			7069			
Log-Likelihood			-2567.35			
Pseudo-R2			0.300			

***Significant at 1%, **significant at 5% and *significant at 10%.

Table C.2

Decomposition of the characteristic differences component of the SES school completion gap

	Low - High		Low - Medium	
<i>Academic status at 15</i>				
PISA test score (normalised index)	0.072***	0.010	0.028***	0.004
PISAT test scores squared	0.001	0.002	0.002	0.002
Student plans to finish Year 12	0.028***	0.003	0.013***	0.002
<i>Personal Characteristics</i>				
Number of siblings	0.003	0.002	0.002	0.002
Lives in single parent household	0.010***	0.003	0.006***	0.001
Speaks mainly English at home	-0.001	0.000	-0.001***	0.000
Indigenous	0.004*	0.002	0.002*	0.001
Male	0.000	0.000	0.000	0.000
Lives in metropolitan area	0.006*	0.004	0.003*	0.002
<i>State of residence</i>				
ACT	0.000	0.002	-0.001	0.003
VIC	0.000	0.001	0.003*	0.002
QLD	-0.003**	0.001	-0.003**	0.001
SA	0.000	0.001	0.000	0.000
WA	0.000	0.000	0.000	0.001
TAS	0.001	0.001	0.001	0.001
NT	0.000	0.000	-0.001	0.001
<i>Parents' Aspirations</i> (reference category: University)				
Don't Know	0.008***	0.002	0.007***	0.001
Parents Don't Mind	-0.002***	0.001	-0.002***	0.000
Get a Job/ Look for Work/ Other	0.012***	0.003	0.009***	0.002
Other Study/Training	0.040***	0.005	0.014***	0.001
<i>School Resources</i>				
Students to teacher ratio	0.000	0.000	0.000	0.000
Shortage of qualified personnel (norm. index)	0.000	0.005	0.000	0.002
Shortage of teaching equipment (norm. index)	0.005	0.003	0.002	0.001
Shortage of instructional space (norm. index)	-0.001	0.002	0.000	0.001
<i>School education programs</i>				
VET as apprenticeship/traineeship	0.003	0.002	0.001	0.001
Personal career counselling in Year 9	-0.001	0.001	-0.001	0.001
School size less than 20	0.000	0.000	0.000	0.000
Mathematics remedial classes	-0.001	0.001	0.000	0.000
Streaming in all maths classes	-0.001	0.001	-0.001	0.001
<i>School Governance</i>				
School Sector (Reference category: Government)				
Catholic	0.003	0.003	0.003	0.003
Independent	0.000	0.009	0.000	0.003

<i>School staffing restrictions</i>				
None	-0.001	0.001	-0.001	0.001
Restricted on firing	-0.003	0.003	-0.002	0.002
Restricted on firing and hiring	0.000	0.001	0.000	0.000
Number of student assessments per year	-0.001	0.002	0.000	0.002
<i>Student attitudes to school and education</i>				
Peers' attitudes to education (normalised index)	0.000	0.000	0.000	0.000
Peers' behaviour in class (normalised index)	0.006	0.007	0.003	0.003
Peers' school enjoyment (normalised index)	0.002	0.004	0.001	0.001
Peers' social attachment to school (normalised index)	0.004	0.003	0.002	0.002
<i>Student academic achievement</i>				
% of peers who plan to finish Year 12	-0.002	0.007	-0.001	0.003
% of peers in bottom quartile of PISA scores	0.012	0.009	0.007	0.005
% of peers in top quartile of PISA scores	-0.008	0.012	-0.004	0.005
<i>Teacher characteristics</i>				
Peers' Perception of teachers' manner (norm. index)	0.000	0.002	0.000	0.001
Peers' perception of teachers' efficacy (norm. index)	-0.001	0.005	0.000	0.003

***Significant at 1%, **significant at 5% and *significant at 10%.