THE UNIVERSITY OF MELBOURNE

FACULTY OF BUSINESS & ECONOMICS

Melbourne Institute Working Paper Series

Working Paper No. 16/12

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Melbourne Institute Working Paper No. 16/12

ISSN 1328-4991 (Print)

ISSN 1447-5863 (Online)

ISBN 978-0-7340-4276-7

August 2012

***** This research was partly funded by the Australian Government Department of Education, Employment and Workplace Relations (DEEWR) under the Social Policy Research Services Agreement (2005–12) with the Melbourne Institute of Applied Economic and Social Research. The views expressed in this paper are those of the authors alone and do not represent those of DEEWR or the Melbourne Institute. All correspondence should be directed to Cain Polidano, Melbourne Institute of Applied Economic and Social Research, Level 7, Alan Gilbert Building, 161 Barry Street, University of Melbourne, VIC 3010 Australia, cainp@unimelb.edu.au, +61 3 8344 2102.

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Abstract

Relatively low rates of school completion among students from low socio-economic (SES) backgrounds is a key transmission mechanism for the persistence of intergenerational inequality. Using a rich dataset that links data from the Program for International Student Assessment (PISA) with data from the Longitudinal Survey of Australian Youth (LSAY), we use a decomposition framework to explain the gap in school completion between low and medium SES and between low and high SES. The two most important factors found to explain the gap are lower educational aspirations of low SES students and their parents (over 30% of the gaps) and lower numeracy and reading test scores at age 15 (over 20% of the gaps). Differences in the characteristics of schools (including resources, governance, teachers and peers) attended by low and higher SES students is estimated to be relatively unimportant, explaining only around 6% of the gaps.

JEL classification: I20, J01

Keywords: School completion, socio-economic status, decomposition and PISA

1. Introduction

Dropping out of school is well known to have deleterious effects on the careers and life prospects of young adults. A well-established body of 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, Taylor, Quine and Kerr 1993; Fergursson et al. 2001; Hammarström and Janlert 2002).

The risk of dropping out of school is not evenly spread throughout the population; instead, youth from low socio-economic status (SES) are much more likely to dropout than those from more advantaged families (Ewijk and Sleeger 2010, Sirin 2005). For example, in Australia, data from the Longitudinal Survey of Australian Youth (LSAY) shows a 23 percentage point gap in completion rates between low and high SES students. Closing such large gaps in completion by SES is likely to help address the imbalance in student opportunity by family background and reduce intergenerational inequity.

To the best of our knowledge, this study is the first to explain the SES gap in school completion rates using a decomposition approach. Literature to date is focussed mainly on examining the factors associated with completion/dropout, including SES, with little guidance on where the difference in school completion by SES stems from (see Rumberger 2008 for a review). That said, two studies have found, using interaction terms, that the relationship between SES and school completion is less in small schools (Howley and Howley 2004) and in schools with a low student-teacher ratio (Brunello and Checchi 2005). These contextual studies point to differences in the importance of school characteristics by SES, but they only test this with limited school information and do not estimate the contribution of these effects to the overall gap in completion rates. From a policy perspective, understanding the overall contribution of different factors is vital to identify which factors to target.

In this study we use an Oaxaca-Blinder style decomposition approach (Fairlie 2005) to break down the gap in the rates in which 15 year-old students from different SES backgrounds go onto finish secondary school. The gap is broken down into parts due to differences in levels of characteristics and parts due to differences in the effects of characteristics on school completion (differences in coefficients). The decomposition is carried out between both low

and medium SES and between low and high SES, where membership of an SES group depends on the household's relative position on a multi-dimensional scale of SES. A feature of our approach is the linking of 2003 OECD Program for International Student Assessment (PISA) data to longitudinal information on school completion from LSAY. Using such rich data allows us to analyse the contribution of a wide range of school and individual-level characteristics while controlling for a range of issues that can potentially bias the analysis, including endogenous sorting and the impacts of past educational inputs.

We find two characteristics of low SES students at age 15 that explain over half of the gaps, namely lower education aspirations of students and their parents and lower academic performance. Also important are differences in effects of characteristics between low and medium SES, which are estimated to explain around a third of the gap between these groups. Differences in the levels of school characteristics attended by low and higher SES students, such as differences in governance, resources and peer characteristics are found to play only a minor role.

The paper structure is as follows: background information on the Australian secondary school system (section 2) and datasets (section 3), the analytical framework (section 4), discussion of results and robustness checks (section 5) and conclusions (section 6).

2. The Australian secondary school system

A feature of the Australian secondary school system is a high level of choice among three sectors — government, Catholic and independent. In 2010 66% of students attended a government school, 20% attended a Catholic school and 14% an independent school (Australian Government 2011). Government schools are funded mainly by the state governments and play an important role in providing guaranteed access to all primary and secondary school students for free.[1] Although they are centrally funded, at the time the analysis was conducted government school administrators had some fiscal autonomy, but the degree varied across the states.

The strength of the independent and Catholic sectors is due in part to financial support from government, which accounts for around 77% and 45% of Catholic and independent schools' net recurrent funding, most of which is from the Australian Government and distributed on

[1] Some schools do charge modest fees, but they are not compulsory.

the basis of SES (Australian Government 2011).[2] The remainder of non-government school revenue mainly comes from fees, which vary from around AUD 1,000 to around AUD 25,000 per student per year, with the average fee for a medium SES family at around AUD 2,000 per student per year (Australian Government 2011). Although most non-government schools are not 'high fee', the fee structures does result in segregation by SES. In 2010, 36% of all government school students were from the lowest quarter of SES compared to 21% of Catholic schools and 13% of independent schools (Australian Government 2011). Differences in funding aside, non-government schools also have greater operational freedom than government schools, especially in human resource matters and in selecting and expelling students.[3]

Depending on the state, the minimum school leaving age in Australia during the period of analysis was 15 or 16.[4] At the end of compulsory education there is *no* academic test, such as the General Certificate of Secondary Education in the United Kingdom, that is used to determine suitability for going into upper-secondary school. Upper-secondary school in Australia is two years long and, like other English speaking countries, has a general curriculum with no separate vocational stream. That said, upper-secondary students have the flexibility to combine general education subjects with vocational education and training (VET) subjects, including subjects that are part of an apprenticeship or traineeship, that contribute to both an upper-secondary school certificate and a nationally accredited VET qualification.[5] The VET subjects available in schools are a subset of national training packages that are chosen by state educational authorities. VET courses are integrated into the upper-secondary school curriculum to allow less academically inclined students to commence vocational training without having to leave school (Ministerial Council on Employment Education and Training and Youth Affairs 1999). Both government and non-government schools have freedom to select their own upper-secondary curriculum, including the type and breadth of VET courses, from a set of state government endorsed subjects.

[2] Net recurrent income includes income from fees, charges, parental contributions and other private sources that is expended on the ongoing operation of schools, such as teaching and non-teaching staff salaries and school operating costs.

[3] While Government schools can expel students, for example for antisocial behaviour, this is rare.

[4] The Australian Government in 2009 introduced a mandatory requirement for all students to complete Year 10 (around 16 years of age) and must be in either full-time education, training or employment or a combination until age 17.

[5] While they may commence their apprenticeship or traineeship while in school, the demands of the training mean youth are do not become qualified unless they continue their training beyond their school years (typically beyond age 18).

At the end of upper-secondary school, when most students are 18, an upper-secondary school certificate is awarded to those who meet the minimum standards of academic performance. The upper-secondary certificate is equivalent to the International Standard Classification of Education (ISCED 1997) 3A (Australian Bureau of Statistics (ABS) 2001) and is generally required for entry into university and higher level VET courses and some entry level jobs.

For those who leave school without an upper-secondary qualification, there is highly accessible and flexible second-chance education options. Early school leavers in Australia have the freedom to re-engage in education either by continuing their secondary education studies, either within or outside school (for example, at a Adult Community Education (ACE) centre), or by enrolling in a VET course.[6] The cost of these options is heavily subsidised by government and income support is also available to supplement student income.

3. Data and definitional issues

The data used for this paper combines cross-sectional information from the 2003 OECD Programme of International Student Assessment (PISA) study with panel data from the 2003 cohort of the Longitudinal Survey of Australian Youth (LSAY). PISA is an international survey of 15 year old secondary school students. First started in 2000, the survey is conducted every three years and is designed to make international comparisons on education systems and academic performance in the domains of numeracy, literacy and problem solving. The Australian PISA 2003 sample is a nationally representative sample of 12,500 15-year-old students from 321 schools and is the first to be linked with LSAY. In most cases there are around 50 students surveyed from each school, but not necessarily from the same class. A feature of the 2003 PISA study is the principal survey, which contains detailed information on school characteristics, including school resources, school governance and teacher and student characteristics. As well as a principal survey, PISA 2003 also includes assessments on student numeracy, literacy and problem solving at age 15 and a student survey on own and home characteristics.[7]

LSAY is one of only a handful of longitudinal datasets of youth that can be linked to PISA. Other datasets with the capacity to link to PISA can be found in Canada, the Czech Republic,

[6] Around 90% of early school leavers choose to re-engage in education by enrolling in a VET course (Polidano, Tabasso and Tseng 2012).

[7] Student assessments are based on the ability 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.

Denmark, Switzerland and Uruguay. LSAY 2003 is a sub-sample of around 10,000 15 year old students from the 2003 PISA study that are tracked until age 24. In this study the main reason for linking LSAY 2003 to PISA 2003 is to identify school completion, but it also provides extra information on parent and student education aspirations, student perceptions of peers and teachers and the availability of upper-secondary school programs.

3.1 Measuring Socioeconomic Status

In education 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 Sleegers, 2010, p.138).

While there is agreement over *what* SES measures, it is less clear *how* it should be measured. Results from a meta-analysis show that the estimated effect of socioeconomic status on student achievement depends on whether SES is defined using parental occupation, parental education, parental income or cultural resources such as access to books and art in the home (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).

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 scale of SES from PISA, known as the Economic, Social and Cultural Status (ESCS) index. The PISA ESCS index is derived by combining the following:

- highest occupation status between the two parents, measured on the International Socio-economic Index of Occupational Status (ISEI) 2008 scale;
- highest educational status between the two parents, measured using ISCED 1997 classification scale; and
- number of household resources from a selection of 14 items.[8]

[8] 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, books of poetry, classic literature, works of art, books to help with your school work, a dictionary, a dishwasher and more than 100 books.

The ESCS index is generated using factor analysis, with each item weighted by the factor loadings, which are roughly equal (see OECD 2005a for more details). Because we are interested in the relationship between SES and school completion at a student level, we use an individual (family) level measure of the ESCS index rather than a school-level measure.

For the purposes of decomposing the SES gap, we split the continuous ESCS index into thirds, corresponding to low, medium and high SES. This allows us to decompose not only differences between low and medium SES, but also differences between low and high SES. Decomposing the SES gap in this way gives us a crude insight into whether the magnitude of any gap and its contributing factors are non-linear.

3.2 School completion

The definition of school completion used in this study is based on whether a student received an upper-secondary school certificate at the completion of their upper-secondary school studies, which is typically at age 18. For some students, information on whether they received an upper-secondary certificate is not available because of item non-response. In these cases, the identification of school completion is based on the year and month of school exit: students who leave school before the end of the academic year (November) in the last year of secondary school (Year 12) are assumed to be early school leavers. In a small number of cases school completion for non-respondents cannot be identified because they remained in school until the end of the last year of secondary school ('missing, item non-response' in Table 1). These cases are omitted from the analysis.

Information on school completion is also not available for students who attrited from the sample before school completion could be observed ('missing, attrition' in Table 1). Analysis on the available sample suggests that low and medium SES students are more likely to attrite than high SES, which may bias the sample. To deal with this issue, we follow Ryan (2011) and conduct all the analysis on a weighted sample of those who remain in the analysis to allow school completion to be identified. Using this approach, the greatest weight in the analysis is given to individuals who most closely resemble individuals who dropout.[9]

After weighting the data, the estimated school completion rate is 78% (Table 1). Importantly, data from Table 1 also shows large differences in the rates of completion by SES: 66% for low SES, 78% for medium SES and 90% for high SES. However, these estimates may

[9] Weighting the sample proves to make little difference to the results. Unweighted results are available upon request from the authors.

somewhat over-estimate the true completion rates. Homel, Mavisakalyan, Ngueyen and Ryan (2012) show that completion rates in LSAY 2003 are over-estimated by around 3 percentage points because some 15 year olds had already left school by the time the PISA survey was conducted. Homel et al. (2012) find that the over-estimation of completion rates in LSAY 2003 is inconsequential for estimating models of school completion, with results (for common variables) much the same as results using an alternative dataset (Youth in Focus).

Table 1

School completion by socioeconomic status

	SES		
	Low	Medium	High
Completes school	1,621	2,103	2,573
Does not complete school	901	639	284
Missing. item non-response	80	68	78
Missing, attrition	818	601	493
Completion rate (non-missing, unweighted)	64.27%	76.70%	90.06%
Completion rate (non-missing, weighted)	66.49%	78.35%	89.97%

4. Methodology

The main aim of this paper is to gain insight into the nature of disadvantage faced by low SES youth using decomposition analysis, which relies heavily on output from estimated school completion models.

4.1 Estimating school completion models

Before decomposing any SES gap, we estimate probit models of school completion (dependent variable is 1 if completed school, 0 if not) separately on low SES, medium SES and high SES subsamples. 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 school inputs and parental education aspirations are combined with characteristics of the student to produce education outcomes, in this case, school completion.

An issue with using school-level information is that the error terms of students from the same school might be correlated if any characteristic that influence school completion rates, such as local labour market conditions, are not included in our model. This may lead to imprecise estimates of the coefficients of interest (Butler and Moffitt 1982). However, decomposition

results are found to be robust to probit model estimation with school random effects, which deals with correlation in unobserved heterogeneity among individuals from the same school (see Appendix A).

There are three important issues that need to be addressed when specifying the education production function of school completion, namely controlling for the effects of ability and past educational inputs, controlling for endogenous selection of school inputs (i.e. sorting) and selecting and deriving the school educational inputs.

Controlling for ability and past educational inputs

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. A common practice is to assume that the effects of all inputs that precede those observed in the data (prior to age 15 in this case) and academic ability can be controlled for by including a lagged dependent variable as a regressor, known as a 'value-added' model (Hanushek 1979 and Todd and Wolpin 2003). Because school completion occurs only once we cannot estimate a value-added model, but we instead assume that the effects of past education inputs and ability at age 15 can be controlled for by conditioning on PISA test scores (first plausible value for each of mathematics, reading and problem solving).

Controlling for endogenous sorting

Without suitable controls, any estimated effects of school inputs 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 children's education, for example by providing a stimulating environment, supervising homework and/or hiring a tutor, will also tend to invest more in schooling, models without controls for parental home investments will tend to over-estimate the importance of school inputs.

In this paper, we rely on controls for home investments in education by including parents' aspirations for their children's post-school education, which are assumed to be highly correlated with home investments and school choice. Parents' aspirations are measured in LSAY 2003 by asking students what their parents want them to do when they leave school; including whether or not their parents: want them go onto university study; want them to take

some other form of education and training, such as VET; want them to get a job or look for work; don't mind; or don't know. For flexibility in estimation, we allow the relationship with parents' aspirations to vary by students' own stated intentions to complete school (see Table 2). To the extent that parents' aspirations are not a sufficient control for home investments, the results in this study will tend to *over-estimate* the effects of school inputs on school completion.

Selecting and deriving school educational inputs

A feature of this paper is the use of detailed school level information on a number of key school characteristics including school resources, school governance, education programs, teacher quality and peer quality. When the information comes from the PISA principal survey, unless otherwise stated, it is in the form of an index derived by the OECD that combines responses to many related questions that tap into the same underlying school factor (see Table 2 for the origins of the information). Such indices are derived by the OECD using weighted maximum likelihood estimation and are normalised for ease of interpretation. It is important to note that for negatively phrased variables, such as 'Qualified teacher shortages', higher values on the normalised score represents lower quality. For more information on the derivation of the OECD indices, see OECD 2005b.

School resources

School resources included in the analysis are the availability of infrastructure, equipment and teachers, including the availability of specially qualified teachers, corresponding to PISA variables 'quality of physical infrastructure', 'quality of education resources', 'student/teacher ratio' and '(qualified) teacher shortage'. PISA indices of the quality of physical infrastructure and education resources and (qualified) teacher shortages are generated by asking principals the extent to which (on a 4-point scale) instruction is hindered by a shortage or inadequacy of a number of particular resources.

We include student/teacher ratio as well as reported shortages of (qualified) teachers because the latter is a measure of the appropriate mix of specifically qualified teachers, such as the adequacy of the number of mathematics qualified teachers, while the former just measures the adequacy of overall teacher numbers.

School governance

In Australia and in other OECD countries, there has been a series of reforms to improve the responsiveness of schools to student needs by increasing both school autonomy and

accountability. Greater autonomy and accountability are widely considered as important in mobilising individual incentives to improve school and teacher performance (Barrera-Osorio, Fasih, Patrinos and Santibáñez 2009). To capture the possible effect of school autonomy, we derive indicator variables from principal responses to questions related to staffing restrictions. In particular, we derive an indicator of whether the principal reports that the school is restricted in hiring and firing staff or whether they are restricted only in firing. Principal responses to statements regarding restrictions on budget allocations, disciplinary policies and student assessment policies were not included in the analysis because they are not widely restricted in Australian schools.

School accountability is measured by using principal perceptions of the frequency of student assessments 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 is 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.[10] To allow for possible non-linearity of effects, we enter the information as a categorical variable, where numbers of assessments (based on a 40 week school calendar) are grouped as less than one a fortnight (less than 20 per year), 1 a fortnight to 1 a week (20 to 39 per year) and more than one a week (more than 40 per year).

To measure whether student assessments are used to monitor school performance, we derive an indicator variable on whether the school does 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 their childen's performance) or were almost always reported no (to judge teacher effectiveness).

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 in-school apprenticeship/traineeships that some schools offer as part of a suit of upper-secondary VET courses. Given that 24% of early school leavers in

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

LSAY report leaving to start an apprenticeship/traineeship, 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 report undertaking VET study as part of an apprenticeship/traineeship in upper-secondary 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 2012). Whether or not a school offers career counseling at age 15 is identified by whether any students 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 students 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 paper, 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 all mathematics classes. Both variables are dummy indicators, coded 1 if the school has remedial mathematics classes/practices streaming in all mathematics classes; 0 otherwise.

Teacher quality

Teacher quality is generally considered to be important in educational attainment (Nye, Konstantopoulos and Hedges 2004). Measures of teacher quality are PISA indices of 'teacher morale and commitment' and extent to which learning is hindered by 'teacher-related factors affecting school climate'. The former is derived from principal's responses on the extent to which they agree with various statements regarding teachers including: *the morale of teachers in school is high, teachers work with enthusiasm, teachers value academic achievement and teachers take pride in the school.* The latter is derived from principal responses to statements regarding the extent to which student learning is hindered by teacher behaviour, including:

low expectations of students, poor relationships with students, absenteeism, resisting change and being too strict with students.

As well as principal perceptions, LSAY also includes student perceptions of teacher quality; however, decomposition results using student perceptions are found to be much the same as those using principal perceptions (see Appendix A).

Peer quality

As well as teacher quality, peer quality is often found to contribute towards student academic success (Ewijk and Sleegers 2010). In this study we measure peer effects on completion through three channels, namely through student attitudes to the school and learning, through poor behaviour affecting the learning climate and through peer academic performance and education aspirations. The first two channels are captured using OECD indices of principal perceptions of 'student morale and commitment' and the extent to which principals believe that learning is hindered by 'student-related factors affecting school climate'. The third channel is captured by generating individual measures of peer academic performance and intensions to finish school, where peers are defined as all other students from the same school, but not necessarily from the same class. Measures of peer academic performance are the proportion of peer scores (combined across the three domains and excluding own scores) in the lowest and highest quartiles of all PISA test scores in Australia and the proportion of peers who intend to finish school (excluding own intensions).

As for teacher quality, there are also student perceptions of peer quality in LSAY. We also find that using student perception measures instead of principal perceptions yield much the same results (see Appendix A).

Table 2

School, home and personal characteristics by socioeconomic status

	Data source[a]	Low SES[b]		Medium SES[b]		High SES[b]	
		Mean	Std. Dev.[c]	Mean	Std. Dev.[c]	Mean	Std. Dev.[c]
School Completion Rate	L,S	66%		79%		90%	
Personal Characteristics							
Number of siblings	P,S	2.1	0.0	1.9	0.0	1.8	0.0
Lives in single parent household	P,S	35%		27%		20%	
Speaks mainly English at home	P,S	88%		92%		93%	
Indigenous	P,S	3%		2%		1%	
Male	P,S	49%		52%		49%	
Lives in metropolitan area	P,S	64%		71%		80%	
State of residence	P,S						
Australian Capital Territory		1%		2%		3%	
New South Wales		34%		30%		34%	
Victoria		22%		27%		22%	
Queensland		21%		18%		18%	
South Australia		9%		9%		8%	
Western Australia		10%		12%		12%	
Tasmania		3%		2%		2%	
Northern Territory		1%		1%		1%	
Academic test scores at 15							
PISA test score: reading (1st PV)	P,T	497.5	2.3	531.0	2.1	578.8	1.8
PISA test score: problem solving (1st PV)	P,T	507.0	2.2	534.5	2.2	576.7	1.7
PISA test score: mathematics (1st PV)	P,T	497.9	2.3	528.9	2.2	573.9	1.8
Education aspirations at 15	L,S						
Student don't intend to finish school & ...							
Don't know parent's aspirations		5%		2%		1%	
Parents don't mind		2%		2%		1%	
Parents want me to get a job		4%		2%		1%	
Parents want me to do other study/training		8%		6%		2%	
Parents want me to go to university		5%		5%		6%	
Student intend to finish school & ...							
Don't know parent's aspirations		14%		14%		11%	
Parents don't mind		9%		10%		10%	
Parents want me to get a job		7%		6%		4%	
Parents want me to do other study/training		12%		10%		5%	
Parents want me to go to university		33%		43%		60%	
School characteristics							
School Resources							
Student/teacher ratio	P,Pr	13.4	0.1	13.7	0.1	13.6	0.0
(Qualified) teacher shortages (norm. index)	P,Pr	0.3	0.0	0.1	0.0	-0.1	0.0
Quality of educational resources (norm. index)	P,Pr	-0.4	0.0	-0.5	0.0	-0.7	0.0
Quality of physical infrastructure (norm. index)	P,Pr	0.0	0.0	0.1	0.0	0.3	0.0

School education programs							
VET as apprenticeship/traineeship	L,S	76%		73%		64%	
Personal career counseling at 15	L,S	7%		6%		2%	
VET/career counseling unknown	L,S	81%		83%		87%	
Mathematics remedial classes	P,Pr	89%		88%		90%	
Streaming in all mathematics classes	P,Pr	46%		46%		45%	
School Governance							
School Sector	P,Pr						
Government		75%		62%		46%	
Catholic		18%		24%		25%	
Independent		7%		14%		30%	
School staffing restrictions	P,Pr						
None		42%		53%		65%	
Restricted on firing		19%		18%		15%	
Restricted on firing and hiring		39%		29%		20%	
Number of student assessments per year	P,Pr						
< 20 per year		22%		20%		19%	
20-39 per year		64%		67%		64%	
>=40 per year		13%		13%		17%	
Assessments are used to monitor school performance	P,Pr	84%		79%		76%	
Teacher quality							
(Learning hindered by) teacher-related factors affecting school climate' (norm. index)	P,Pr	-0.4	0.0	-0.2	0.0	0.1	0.0
Teacher morale and commitment (norm. index)	P,Pr	0.0	0.0	0.2	0.0	0.5	0.0
Peer quality							
(Learning hindered by) student-related factors affecting school climate (norm. index)	P,Pr	-0.3	0.0	0.0	0.0	0.2	0.0
Student morale and commitment (norm. index)	P,Pr	0.1	0.0	0.4	0.0	0.8	0.0
% of peers who plan to finish Year 12	L,S	79.8	0.2	82.2	0.2	86.0	0.2
% of peers in bottom quartile of PISA scores	P,T	31.4	0.4	25.5	0.4	17.5	0.3
% of peers in top quartile of PISA scores	P,T	17.8	0.3	23.0	0.4	33.3	0.4
Sample size[d]		2427		2629		2771	

[a]Data is from LSAY (L) or PISA (P), using student (S), Principal (Pr) or test score (T) information. [b]The definition of low, medium and high SES is based on terciles of the PISA SES composite index (ESCS). [c]Standard deviations are reported for continuous variables only. For categorial variables, they result immediately from the mean (Std. dev. = Mean.(1-Mean)$^{0.5}$). [d]Sample size is based on sample at age 15. **Note:** mean estimates are based on the sample of individuals for whom we observe completion, weighted for attrition. It is important to note that for negatively phrased variables, such as 'Qualified teacher shortages', higher values on the normalised score represent lower quality.

4.3 Decomposing the SES gap

The SES gap, or differences in the rate of completion by SES, is decomposed using an Oaxaca-Blinder type approach (Oaxaca 1973 and Blinder 1973), 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 and breaks any gap into two parts: parts due to

differences in characteristic levels and parts due to differences in characteristic effects (model coefficients).

For the differences in characteristic levels component, we dig deeper and attribute the gap to individual characteristics, which tells us something about which characteristic levels to target. We do not do the same for differences in characteristic effects because such estimates are arbitrarily based on the reference point from which they are calculated, making the results difficult to interpret (Jones 1983).

In essence, the differences in characteristic levels component is estimated as the difference in the characteristics between low and higher SES, weighted by the estimated model coefficients for low SES, while the differences in characteristic effects component is the differences in the coefficients between low and higher SES, weighted by the characteristics of the higher SES group. An alternative way to estimate the decomposition is to make higher SES the indexed group: weight the differences in characteristics by the coefficients from the higher SES model coefficients and weight the differences in coefficients by the characteristics of the low SES group. Alternative ways of conducting decomposition has been shown to affect the results and is known as the 'indexing problem' (Fairlie 2005), but we find no evidence that this is an issue in this paper (see Appendix A).

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 (or common support) in the distribution of the variables across the three SES groups (Table 2). If no overlap existed, then there is the risk that the decomposition would suffer from extrapolation bias.

5. Results

The key results from the decomposition are discussed below. Estimated coefficients from the probit school completion models, upon which the decomposition results depend, are presented in Table B.1 in Appendix B.

Using model predictions, we estimate a 23 percentage point gap in completion rates between high and low SES and a 12 percentage point gap in completion rates between medium and low SES (Table 3), which is consistent with the gap using raw data (Table 2). These gaps are predicted by averaging the predicted completion probabilities for all individuals in the same

SES group and then differencing them. The average predicted completion probabilities are 66%, 79% and 90% for low, medium and high SES respectively.

We find that differences in the effects of educational inputs are restricted mainly to differences in the effects between low and medium SES — explaining 4 out of the 12 percentage point gap between low and medium, which is the same between low and high (Table 3).[11] Although we do not decompose this part of the gap further, we find some significant differences in model coefficients between low and higher SES groups by estimating a pooled model with interactions between SES and other characteristics (see Table B.2 in Appendix B). In particular, we find that two school programs, upper-school apprenticeships and streaming in mathematics, have more positive effects on students from higher SES background. These programs may not help to retain low SES students in the same way as higher SES students because the lure of higher income from attaining an apprenticeship or traineeship may entice many to leave school and because poor performing peers may limit the benefits of streaming in mathematics.

Table 3
Decomposition of the SES school completion gap

	Low - High	Low - Medium
	% ppt.	% ppt.
Decomposition of the total gap		
Differences in characteristics effects	-4.29	-4.03
Differences in characteristics levels	-18.80	-8.25
Total gap	*-23.09*	*-12.28*
Decomposition of gap due to differences in characteristic levels		
Test Scores at age 15	-7.15	-2.72
Personal characteristics	-1.26	-0.75
Own and parents' education aspirations	-8.89	-3.99
School characteristics	-1.50	-0.79
Total gap due to differences in characteristic levels	*-18.80*	*-8.25*
Decomposition of gap due to differences in school characteristic levels		
School resources	-0.54	-0.21
School education programs	-0.39	-0.21
School governance	-0.05	-0.03
Teacher quality	1.54	0.91
Peer quality	-2.07	-1.24
Total gap due to differences in school characteristics	*-1.50*	*-0.79*

[11] In a separate decomposition between high and medium SES, we found less 1 out of the 11 percentage point gap was due to differences in the importance of educational factors. This confirms that there are negligible differences in characteristic effects between medium and high SES. Results available upon request from the corresponding author.

One factor that is more important to the chances of completion of low SES students is learning being hindered by teacher-related factors affecting the school climate (see Table B.2 in Appendix B). All else being equal, teachers having a positive impact on school climate is estimated to have a significant positive relationship with the chances of completion among low SES students, but is estimated to have no significant relationship with other students. Previous studies have found evidence that suggests a supportive culture within schools matters more to the retention of low SES students; proxied by school size (Howley and Howley 2004) and student-to-teacher ratios (Brunello and Checchi 2005). However, this is the first study to demonstrate a direct link to the importance of school culture for low SES students. A possible explanation is that because academic success may not be valued as highly among low SES students, school culture takes on greater importance in motivating low SES students to complete school.

While the SES completion gap due to differences in the importance of education inputs between low and high SES is notable, it is relatively unimportant compared to the gap due to differences in characteristic levels — 19 out of 23 percentage points and 8 out of 12 percentage points between low and high and between low and medium respectively (Table 3). Therefore, most gains in closing the SES school completion gap may be realised by closing gaps in characteristic levels, rather than targeting specific characteristics that are most important to low SES students.

5.1 Decomposition by characteristic levels

A further break-down of the gap by differences in individual characteristic levels is presented in Table 3. For ease of interpretation, we present the break-down across broad types of characteristics, the breakdown by individual characteristics is presented in Table B.3 in Appendix B.

A key finding of this study is that differences in education aspirations of students and their parents at age 15 is the most important factor explaining the gaps in school completion — 9 of the 19 percentage point gap between low and high SES and 4 of the 8 percentage point gap between low and medium SES (Table 3). The importance of lower educational aspirations in explaining the SES gap in completion is consistent with previous studies that have shown that aspirations are important in predicting test score outcomes (Schoon 2001, Reynolds and Burge 2008, Chowdry, Crawford and Goodman 2011, Sikora and Saha 2011), including school completion (Rumberger 2008 and Homel et al. 2012). The contribution of this study is

in highlighting just how important differences in education aspirations are in explaining the gap in school completion by SES.

Not only are low SES students less likely to want to go on and complete school (76% relative to 83% for medium SES and 90% for high SES), but they are less likely to report that their parents want them to go onto post-school study (58% relative to 64% for medium SES and 73% for high SES)(Table 2). More importantly though, low SES parents are more likely to favour VET courses, which have no school completion pre-requisite, over university courses (20% relative to 16% for medium SES and 7% for high SES). Therefore, low SES parents may be more willing to concede to (or approve of) their children leaving school early to commence a VET course, despite the fact almost all schools now offer some VET courses in upper-secondary school.

According to social cognitive theory (of self-regulation), setting challenging education aspirations or goals is important to performance because it drives self-motivation, a process that includes the development of strategies to achieve goals, investments in time and effort to carry out the strategies, reflection on performance and the re-evaluation of strategies (Zimmerman 1989). Failure to set challenging goals can lead to poor academic performance, disengagement from learning (Zimmerman 1989) and potentially school dropout (Wehlage, Rutter, Smith, Lesko and Fernandez 1989). Key to this process are own perceptions of self-efficacy, or beliefs that individuals have about their ability to meet goals, and the value placed on reaching the goals (Schunk 1994). Students with higher perceptions of self-efficacy who set more desirable goals are more likely to persist longer when faced with difficulties (Schunk and Ertmer 2005).

The other main factor explaining the gap due to differences in characteristic levels is lower academic attainment of low SES students at age 15 — 7 of the 19 percentage point gap between low and high SES and 3 of the 8 percentage point gap between low and medium SES (Table 3). Average PISA numeracy and reading test scores for low SES students at age 15 are around 13% lower than the average scores for high SES and around 6% lower than the average scores for medium SES. This result is consistent with previous multivariate studies that have shown test scores during middle-school to be an important predictor of completion (Heck and Mahoe 2006, Hill and Jepsen 2007) and is consistent with the theory that school dropout is a slow rather than a sudden process of disengagement in learning (Wehlage et al. 1989). What is important about our finding is that while we find that prior academic performance matters, it still only accounts for less than half of the SES gap in school

completion, which underlines the importance of taking a multi-faceted approach to closing the gap in completion and not just focus on closing the gap in test scores.

Differences in levels of school characteristics (governance, school programs, resources, teachers and students) after age 15 are relatively unimportant in explaining the SES completion gap, accounting for only 1.5 of the 19 percentage point gap between low and high SES and around 1 of the 8 percentage point gap between low and medium SES. The relatively small contribution of differences in the levels of school characteristics to explaining the SES completion gap is consistent with previous studies that have shown these factors to be relatively un-important in test score performance, especially compared to the effect of family background (Hanushek 2006 and Hanushek and Woessman 2011) and in explaining school dropout (Li 2007). Not only are these factors relatively unimportant to completion, but with the exception of peers, there are only minor differences in the levels of these characteristics by SES (Table 2). The minor differences in school level characteristics may be because school funding (government and non-government) in Australia is linked to the SES of the school district.

Interestingly, we find that the SES school completion gap between low and medium and low and high SES is closed by 1 and around 1.5 percentage points respectively by more positive attitudes of teachers in low SES schools (Table 3). In particular, principals of low SES students report that learning is hindered less by teacher-related factors affecting the school climate than principals of higher SES students (Table 2). A possible explanation is that principals of low SES schools put particular emphasis on school culture to motivate low SES students who typically have lower high academic aspirations than other students.

6. Conclusions

There is a large body of international research that show the chances of school dropout is much higher among youth from low SES backgrounds (see Ewijk and Sleeger 2010, Rumberger 2008 and Sirin 2005 for reviews). However, to the best of our knowledge, there is no study to date that explains where the SES gap in completion rates stems from. This paper fills this hole in the literature by using a decomposition approach to estimate the importance of a range of home, school and individual factors in explaining the SES school completion gap. Findings from this paper provide some guidance to schools and policy makers on where to focus policies aimed at closing the SES completion gap, which is vital to reduce inequality of opportunity by background.

Results from this paper point to potential of policies in two key areas, namely, early intervention programs aimed at increasing academic performance and educational aspirations of students and their parents. This recommendation is based on the finding that over half of the gaps (between low and high SES and between low and medium SES) in completion are due to lower educational aspirations and PISA test scores at age 15. Low SES students and their parents may have lower education aspirations because many low SES parents have not completed school themselves and may not see the benefit of school completion for their children, especially when there are accessible vocational second chance options available. According to social cognitive theory, raising education aspirations is important to spark the academic motivation of disengaged students (Zimmerman 1989). However, to maintain effort towards meeting educational aspirations, it is important that students maintain perceptions of their own self-efficacy, or beliefs about their ability to achieve their aspirations, and that students highly value their aspirations (Schunk and Ertmer 2005). For schools, this may mean including parents in ongoing, individual level, career counseling from early secondary school.

Although of lesser importance, our results also point to school factors that are especially important in the retention of low SES students. We find that around a third of the gap in school completion between medium and low SES students is because of differences in the effectiveness of education inputs in retaining low and medium SES students in school. In particular, we find that some school programs, such as offering students time out from school to start apprenticeships/traineeships in upper-secondary and streaming by ability in mathematics, tend to increase the gap because they favour students from higher SES backgrounds. On the other hand, we find that teachers contributing to a positive school culture tends to reduce the gap because it has a greater estimated effect on retaining low SES students. This result underlines the particular importance of teachers in promoting a positive learning culture in low SES schools where academic achievement may not be the norm among students and their parents.

Finally, our results suggest that while other aspects of school, such as school resources, school governance and student peers may affect academic performance up until age 15, we find that these factors play only a small part explaining differences in completion by SES. An implication of this finding is that policies that increase the resourcing of upper-secondary school may have little effect on school completion.

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Appendix A: Robustness checks

There are two key parts of the analysis, which if carried out in different ways, may give rise to different results. These are alternative estimation methods to deal with within-school correlation in the error terms and the indexing problem and alternative probit model specifications.

A.1 Alternative estimation methods

As discussed in section 4.1, the binary probit models of school completion may yield imprecise coefficient estimates if there is correlation in the error terms that may occur in the presence of uncontrolled for school-level factors that affect school completion. To test how robust our results are to such correlations, we introduce school random effects, or a school random intercept term, into the binary probit completion models and repeat the decomposition (Butler and Moffitt 1982). Results from this alternative model are found to make no noticeable difference to the standard results presented in Table 3 (see Table A.1),

Another alternative estimation method trialed is to change the index group when conducting the decomposition. The standard decomposition of the school completion gap (Table 3) is calculated with low SES as the index category. That is, the component of the gap due to differences in characteristic level is weighted by the estimated coefficients for low SES and the part due to differences in coefficients is weighted by the characteristic levels of the higher SES. The alternative decomposition method tested is to switch the index group from low to higher SES: weight the differences in characteristics by the coefficients from the higher SES and weight the differences in coefficients by the characteristics of the low SES group. Overall there are very small differences in results and we conclude that the results presented in Table 3 are robust to alternative estimation methods (from Table A.1).

Table A.1

Decomposition of the SES school completion gap using alternative estimation approaches

	Standard results		Estimation with school random effects		Alternative index category	
	Low - High	Low - Medium	Low - High	Low - Medium	Low - High	Low - Medium
Decomposition of the total gap						
Differences in characteristics effects	-4.68	-4.21	-5.89	-3.31	-3.68	-3.39
Differences in characteristics levels	-18.80	-8.25	-19.97	-9.28	-19.80	-9.06
Total gap	*-23.48*	*-12.46*	*-25.86*	*-12.59*	*-23.48*	*-12.46*
Decomposition of gap due to differences in characteristic levels						
Test Scores at age 15	-7.15	-2.72	-7.63	-3.05	-6.76	-2.76
Personal characteristics	-1.26	-0.75	-1.48	-0.90	-2.05	-0.94
Own and parents' education aspirations	-8.89	-3.99	-9.15	-4.30	-8.85	-3.40
School characteristics	-1.50	-0.79	-1.71	-1.02	-2.14	-1.97
Total gap due to differences in characteristic levels	*-18.80*	*-8.25*	*-19.97*	*-9.28*	*-19.80*	*-9.06*
Decomposition of gap due to differences in school characteristic levels						
School resources	-0.54	-0.21	-0.35	-0.19	0.01	0.28
School education programs	-0.39	-0.21	-0.30	-0.13	0.21	-0.08
School governance	-0.05	-0.03	-0.06	-0.10	0.10	-0.51
Teacher quality	1.54	0.91	0.91	0.50	0.47	0.20
Peer quality	-2.07	-1.24	-1.93	-1.10	-2.93	-1.86
Total gap due to differences in school characteristics	*-1.50*	*-0.79*	*-1.71*	*-1.02*	*-2.14*	*-1.97*

A.2 Alternative specifications of the probit models

Standard results presented in Table 3 are based on the use of principal perceptions of both teacher and student quality from PISA. However, it could be argued that students have better information on the quality of both teachers and students because they spend more time in the classroom than principals. To test the sensitivity of result to using student perceptions, we re-estimate the standard results, but replace principal perceptions of students and teacher quality with student perceptions.

Student perceptions of their peers in LSAY are derived by asking students the extent to which they agree (on a four-point scale) with various statements on their school and classroom environment. Using factors analysis, we identify three underlying factors, with responses to

statements related to perceived *importance of education* loading on one, perceived *student behaviour and attitudes to education* loading on another and perceived *attitudes to school* on a third. Student perceptions of their teachers in LSAY is elicited by asking students the extent to which they agree (on a four-point scale) with statements related to *teacher-student relationships* and with various aspects of *teacher efficacy* (on a five-point scale). Results from a factor analysis found two underlying factors with statement responses loading on their respective statement topics: teacher-student relationships and teacher efficacy. Five indices were derived from the five factors using the factor loadings as weights, which were normalised for ease of interpretation. The indices are positively scaled so that higher levels of the index relate to more positive student perceptions of teacher and peer quality. Results using student own perceptions of teacher and student quality in their school are presented in columns 4 and 5 in Table A.2.

A potential problem with using student's own perceptions of teacher and peer quality is that there is a possibility of reverse causation, that is, student's own performance in school, and hence their risk of dropout, may influence their own perceptions of teachers and peers. Therefore, we also estimate alternative results using peer responses (columns 6 and 7 in Table A.2), which are calculated for each individual by averaging the weighted scores under each factor across the individual's peers from the same school.

Results using students own perceptions of teacher and peer quality are much the same as those using principal perceptions, with only small differences in the relative importance of characteristic levels versus effects of characteristics (Table A.2). One noticeable difference is that using students' own perceptions of teacher quality widens rather than closes the SES gap in school completion, which given the results using peer average responses, may be related to reverse causation. Overall, these tests support our main conclusions.

Table A.2

Decomposition of the SES school completion gap using alternative model specifications

	Standard results		Student's own perceptions of students & teachers at their school		Student peer's perceptions of students & teachers at their school	
	Low - High	Low - Medium	Low - High	Low - Medium	Low - High	Low - Medium
Decomposition of the total gap						
Differences in characteristics effects	-4.68	-4.21	-3.94	-3.73	-4.48	-4.28
Differences in characteristics levels	-18.80	-8.25	-19.16	-8.97	-18.64	-8.35
Total gap	-23.48	-12.46	-23.10	-12.70	-23.12	-12.64
Decomposition of gap due to differences in characteristic levels						
Test Scores at age 15	-7.15	-2.72	-6.85	-2.87	-6.96	-2.74
Personal characteristics	-1.26	-0.75	-1.16	-0.68	-1.29	-0.87
Own and parents' education aspirations	-8.89	-3.99	-7.59	-3.23	-8.63	-3.90
School characteristics	-1.50	-0.79	-3.56	-2.20	-1.75	-0.84
Total gap due to differences in characteristic levels	-18.80	-8.25	-19.16	-8.97	-18.64	-8.35
Decomposition of gap due to differences in school characteristic levels						
School resources	-0.54	-0.21	-0.22	-0.08	-0.37	-0.19
School education programs	-0.39	-0.21	-0.32	-0.18	-0.25	-0.16
School governance	-0.05	-0.03	0.22	0.10	0.08	0.07
Teacher quality	1.54	0.91	-0.69	-0.38	0.44	0.22
Peer quality	-2.07	-1.24	-2.55	-1.66	-1.66	-0.78
Total gap due to differences in school characteristics	-1.50	-0.79	-3.56	-2.20	-1.75	-0.84

Appendix B: Extra results

Table B.1

Coefficients from completion models by SES

	Low SES		Medium SES		High SES	
	Coeff.	s.e.	Coeff.	s.e.	Coeff.	s.e.
Personal Characteristics						
Number of siblings	-0.016	0.029	-0.028	0.030	-0.079**	0.037
Lives in single parent household	-0.291***	0.071	-0.353***	0.078	-0.358***	0.099
Speaks mainly English at home	-0.611***	0.156	-0.379**	0.167	-0.045	0.201
Indigenous	-0.101	0.159	-0.263	0.179	0.351	0.269
Male	-0.062	0.076	-0.182**	0.080	-0.146	0.097
Lives in metropolitan area	0.184**	0.087	0.005	0.088	0.217*	0.123
State of residence (ref. category: New South Wales)						
Australian Capital Territory	0.073	0.221	0.078	0.182	-0.088	0.184
Victoria	0.241	0.224	0.535***	0.180	0.391**	0.189
Queensland	0.409*	0.221	0.653***	0.192	0.414**	0.208
South Australia	-0.183	0.233	0.117	0.204	0.011	0.218
Western Australia	-0.214	0.225	-0.014	0.188	-0.037	0.197
Tasmania	-0.082	0.246	-0.130	0.208	-0.123	0.228
Northern Territory	-0.296	0.297	-0.137	0.237	-0.274	0.278
Academic performance at age 15						
PISA test score: reading (1st PV)	-0.002	0.004	0.008*	0.005	0.005	0.006
PISA test score: reading (1st PV squared)	0.000	0.000	0.000	0.000	0.000	0.000
PISA test score: problem solving (1st PV)	0.004	0.006	-0.011	0.007	-0.010	0.009
PISA test score: problem solving (1st PV squared)	0.000	0.000	0.000	0.000	0.000	0.000
PISA test score: mathematics (1st PV)	0.007	0.006	0.002	0.006	0.012*	0.007
PISA test score: mathematics (1st PV squared)	0.000	0.000	0.000	0.000	0.000	0.000
Educational aspirations at 15						
Student don't intend to finish school & ...						
Don't know parent's aspirations	-1.273***	0.170	-0.903***	0.219	-1.235***	0.278
Parents don't mind	-1.047***	0.228	-1.171***	0.226	-1.162***	0.275
Parents want me to get a job	-1.427***	0.162	-1.573***	0.247	-1.648***	0.303
Parents want me to do other study/training	-1.886***	0.144	-1.391***	0.159	-2.123***	0.273
Parents want me to go to university	-0.245	0.174	-0.370**	0.172	-0.294	0.208
Student intend to finish school & ...						
Don't know parent's aspirations	-0.561***	0.105	-0.358***	0.113	-0.221	0.136
Parents don't mind	-0.478***	0.136	-0.358***	0.124	-0.432***	0.133
Parents want me to get a job	-0.549***	0.147	-0.215	0.160	-0.461**	0.185
Parents want me to do other study/training	-0.627***	0.115	-0.793***	0.114	-0.806***	0.165
Parents want me to go to university (ref. category)						

School characteristics						
School Resources						
Student/teacher ratio	-0.014	0.025	-0.009	0.021	0.004	0.026
(Qualified) teacher shortages (norm. index)	-0.012	0.051	0.045	0.055	0.013	0.074
Quality of educational resources (norm. index)	-0.064	0.054	-0.032	0.057	0.068	0.062
Quality of physical infrastructure (norm. index)	0.032	0.059	-0.133**	0.060	0.104	0.070
School education programs						
VET as apprenticeship/traineeship	-0.154	0.105	0.153	0.095	0.146	0.107
Personal career counseling at 15	-0.088	0.107	-0.027	0.110	-0.022	0.124
VET/career counseling unknown	-0.120	0.285	0.636**	0.289	-0.022	0.316
Mathematics remedial classes	-0.148	0.116	-0.013	0.120	-0.114	0.161
Streaming in all mathematics classes	-0.095	0.077	0.111	0.078	0.135	0.090
School Governance						
School Sector (ref. category)						
Catholic	0.049	0.135	0.208	0.132	-0.090	0.167
Independent	-0.005	0.183	0.143	0.172	-0.068	0.185
School staffing restrictions (ref. category: None)						
Restricted on firing	0.046	0.110	-0.090	0.118	-0.085	0.163
Restricted on firing and hiring	-0.037	0.106	0.028	0.119	-0.125	0.158
Number of student assessments per year (ref. category: <20)						
20-39 per year	-0.059	0.108	-0.080	0.106	-0.191	0.134
>=40 per year	-0.059	0.128	-0.093	0.139	-0.058	0.171
Assessments are used to monitor school performance	0.079	0.101	0.063	0.101	0.109	0.115
Teacher quality						
Learning hindered by) teacher-related factors affecting school climate (norm. index)	-0.149**	0.063	0.037	0.067	0.018	0.074
Teacher morale and commitment (norm. index)	-0.050	0.052	-0.079	0.049	-0.080	0.055
Peer quality						
(Learning hindered by) student-related factors affecting school climate (norm. index)	0.089	0.063	0.031	0.064	0.172**	0.072
Student morale and commitment (norm. index)	0.001	0.048	0.080	0.050	-0.021	0.054
Proportion of peers who plan to finish Year 12 (%)	0.002	0.005	0.008	0.006	0.010	0.007
Proportion of peers in bottom quartile of PISA scores (%)	-0.005	0.004	0.006	0.004	-0.001	0.005
Proportion of peers in top quartile of PISA scores (%)	-0.002	0.006	0.013**	0.005	0.003	0.004

***Significant at 1%, **significant at 5% and *significant at 10%. Standard errors are robust standard errors clustered on the school identifier.

Table B.2

Coefficients from a pooled school completion model with 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.
SES						
PISA composite SES index (ref.category: Low SES)						
Medium	0.161	2.156				
High	-1.548	2.043				
Personal Characteristics						
Number of siblings	-0.016	0.030	-0.012	0.039	-0.062	0.047
Lives in single parent household	-0.291***	0.066	-0.063	0.106	-0.068	0.117
Speaks mainly English at home	-0.611***	0.147	0.232	0.206	0.566**	0.229
Indigenous	-0.101	0.162	-0.161	0.259	0.452	0.301
Male	-0.062	0.074	-0.121	0.111	-0.084	0.128
Lives in metropolitan area	0.184**	0.083	-0.180	0.111	0.032	0.134
State of residence (ref. category: New South Wales)						
Australian Capital Territory	-0.073	0.229	-0.005	0.279	0.161	0.306
Victoria	0.168	0.123	0.289**	0.140	0.310*	0.181
Queensland	0.336***	0.108	0.239	0.147	0.166	0.178
South Australia	-0.256*	0.137	0.295	0.180	0.355*	0.214
Western Australia	-0.287**	0.116	0.195	0.145	0.338*	0.184
Tasmania	-0.155	0.133	-0.053	0.146	0.120	0.187
Northern Territory	-0.369**	0.186	0.154	0.251	0.183	0.236
Wald test of joint significance of coefficients (χ2(dF))			16.51 (13)		16.84 (13)	
Academic performance at age 15						
PISA test score: reading (1st PV)	-0.002	0.004	0.011*	0.006	0.008	0.007
PISA test score: reading (1st PV squared)	0.000	0.000	0.000	0.000	0.000	0.000
PISA test score: problem solving (1st PV)	0.004	0.006	-0.014	0.009	-0.013	0.011
PISA test score: problem solving (1st PV squared)	0.000	0.000	0.000	0.000	0.000	0.000
PISA test score: mathematics (1st PV)	0.007	0.006	-0.004	0.009	0.005	0.009
PISA test score: mathematics (1st PV squared)	0.000	0.000	0.000	0.000	0.000	0.000
Wald test of joint significance of coefficients (χ2(dF))			10.34 (6)		8.00 (6)	
Education aspirations at age 15						
Student don't intend to finish school & ...						
Don't know parent's aspirations	-1.273	0.172	0.370	0.296	0.038	0.324
Parents don't mind	-1.047	0.215	-0.124	0.331	-0.115	0.334
Parents want me to get a job	-1.427	0.179	-0.145	0.308	-0.221	0.359
Parents want me to do other study/training	-1.886	0.130	0.495	0.204	-0.237	0.322
Parents want me to go to university	-0.245	0.188	-0.126	0.272	-0.050	0.276

Student intend to finish school & ...						
Don't know parent's aspirations	-0.561	0.108	0.202	0.156	0.339	0.174
Parents don't mind	-0.478***	0.144	0.120	0.192	0.046	0.191
Parents want me to get a job	-0.549***	0.158	0.333	0.228	0.088	0.248
Parents want me to do other study/training	-0.627***	0.120	-0.166	0.161	-0.179	0.187
Parents want me to go to university (ref. category)			18.09 (9) **		9.99 (9)	
Wald test of joint significance of coefficients (χ2(dF))						
School characteristics						
School Resources						
Student/teacher ratio	-0.014	0.021	0.005	0.028	0.018	0.032
(Qualified) teacher shortages (norm. index)	-0.012	0.049	0.057	0.060	0.025	0.078
Quality of educational resources (norm. index)	-0.064	0.047	0.032	0.065	0.132*	0.072
Quality of physical infrastructure (norm. index)	0.032	0.058	-0.165**	0.083	0.072	0.090
School education programs						
VET as apprenticeship/traineeship	-0.154	0.114	0.307**	0.132	0.301**	0.140
Personal career counseling in Year 9	-0.088	0.093	0.061	0.128	0.067	0.165
School size less than 20	-0.120	0.259	0.755*	0.438	0.098	0.404
Mathematics remedial classes	-0.148	0.104	0.135	0.144	0.034	0.185
Streaming in all mathematics classes	-0.095	0.067	0.206**	0.092	0.230**	0.108
School Governance						
School Sector (ref. category: Government)						
Catholic	0.049	0.151	0.159	0.166	-0.139	0.218
Independent	-0.005	0.194	0.148	0.220	-0.063	0.265
School staffing restrictions (ref. category: None)						
Restricted on firing	0.046	0.091	-0.136	0.134	-0.131	0.192
Restricted on firing and hiring	-0.037	0.109	0.065	0.138	-0.088	0.188
Number of student assessments per year (ref: <20)						
20-39 per year	-0.059	0.101	-0.021	0.129	-0.132	0.153
>=40 per year	-0.059	0.114	-0.033	0.142	0.001	0.195
Assessments are used to monitor school performance	0.079	0.099	-0.016	0.108	0.030	0.142
Teacher quality						
(Learning hindered by) teacher-related factors affecting school climate (norm. index)	-0.149**	0.063	0.187**	0.080	0.168*	0.092
Teacher morale and commitment (norm. index)	-0.050	0.049	-0.029	0.062	-0.030	0.072
Peer quality						
(Learning hindered by) student-related factors affecting school climate (norm. index)	0.089	0.070	-0.058	0.077	0.084	0.100
Student morale and commitment (norm. index)	0.001	0.047	0.079	0.065	-0.022	0.069
Proportion of peers who plan to finish Year 12 (%)	0.002	0.005	0.005	0.007	0.007	0.008
Proportion of peers in bottom quartile of PISA scores (%)	-0.005	0.004	0.011**	0.005	0.004	0.006
Proportion of peers in top quartile of PISA scores (%)	-0.002	0.005	0.014**	0.006	0.005	0.007
Wald test of joint significance of coefficients (χ2(dF))			45.66 (23) ***		34.14 (23) *	

***Significant at 1%, **significant at 5% and *significant at 10%. Standard errors are robust standard errors clustered on the school identifier.

Table B.3

Decomposition of the of the SES school completion gap due to differences in characteristic levels

	Low - High		Low - Medium	
Personal Characteristics				
Number of siblings	-0.001	0.003	-0.001	0.002
Lives in single parent household	-0.010***	0.003	-0.006***	0.002
Speaks mainly English at home	0.002***	0.001	0.001	0.001
Indigenous	-0.001	0.001	0.000	0.001
Male	0.000	0.000	0.000	0.001
Lives in metropolitan area	-0.007**	0.003	-0.004**	0.002
State of residence				
Australian Capital Territory	0.001	0.002	0.001	0.004
Victoria	0.000	0.001	-0.003	0.002
Queensland	0.002*	0.001	0.001	0.001
South Australia	0.000	0.001	0.001	0.001
Western Australia	0.002	0.001	0.001	0.001
Tasmania	0.000	0.001	0.000	0.001
Northern Territory	0.000	0.000	0.000	0.000
Academic performance at age 15				
PISA test score: reading (1st PV)	0.054	0.097	0.023	0.043
PISA test score: reading (1st PV squared)	-0.095	0.099	-0.035	0.042
PISA test score: problem solving (1st PV)	-0.047	0.064	-0.013	0.013
PISA test score: problem solving (1st PV squared)	0.059	0.066	0.016	0.012
PISA test score: mathematics (1st PV)	-0.088**	0.039	-0.025***	0.007
PISA test score: mathematics (1st PV squared)	0.044	0.039	0.008**	0.004
Education aspirations at age 15				
Student don't intend to finish school & ...				
Don't know parent's aspirations	-0.017	0.002	-0.014	0.002
Parents don't mind	-0.004	0.001	-0.002	0.001
Parents want me to get a job	-0.019	0.002	-0.014	0.001
Parents want me to do other study/training	-0.036	0.002	-0.005	0.001
Parents want me to go to university	0.001	0.001	0.001	0.001
Student intend to finish school & ...				
Don't know parent's aspirations	-0.001	0.001	0.002	0.001
Parents don't mind	0.002***	0.001	0.001*	0.001
Parents want me to get a job	-0.003***	0.001	-0.002**	0.001
Parents want me to do other study/training	-0.013***	0.003	-0.008***	0.002
Parents want me to go to university (ref. category)				

School characteristics				
School Resources				
Student/teacher ratio	0.001	0.002	0.001	0.002
(Qualified) teacher shortages (norm. index)	-0.001	0.004	0.000	0.002
Quality of educational resources (norm. index)	-0.004	0.003	-0.002	0.002
Quality of physical infrastructure (norm. index)	-0.001	0.002	-0.001	0.001
School education programs				
VET as apprenticeship/traineeship	-0.003	0.002	-0.002	0.001
Personal career counseling in Year 9	0.001	0.001	0.000	0.001
School size less than 20	-0.001	0.003	0.000	0.001
Mathematics remedial classes	0.000	0.000	-0.001	0.000
Streaming in all mathematics classes	0.000	0.000	0.000	0.000
School Governance				
School Sector (ref. category: Government)				
Catholic	-0.001	0.003	-0.001	0.002
Independent	0.000	0.007	0.000	0.003
School staffing restrictions (ref. category: None)				
Restricted on firing	0.000	0.001	0.000	0.000
Restricted on firing and hiring	-0.001	0.004	-0.001	0.002
Number of student assessments per year (ref. category: <20)				
>=40 per year	0.000	0.001	0.000	0.001
Assessments are used to monitor school performance	0.000	0.000	0.000	0.001
Number of student assessments per year (ref. category: <20)	0.001	0.002	0.001	0.001
Teacher quality				
Learning hindered by) teacher-related factors affecting school climate (norm. index)	0.011**	0.005	0.006**	0.003
Teacher morale and commitment (norm. index)	0.005	0.005	0.003	0.003
Peer quality				
(Learning hindered by) student-related factors affecting school climate (norm. index)	-0.010	0.007	-0.006	0.005
Student morale and commitment (norm. index)	0.000	0.006	0.000	0.004
Proportion of peers who plan to finish Year 12 (%)	-0.003	0.007	-0.001	0.003
Proportion of peers in bottom quartile of PISA scores (%)	-0.012	0.010	-0.006	0.006
Proportion of peers in top quartile of PISA scores (%)	0.004	0.014	0.002	0.006

***Significant at 1%, **significant at 5% and *significant at 10%. Standard errors are robust standard errors clustered on the school identifier.