Socioeconomic disadvantage and participation in tertiary education: preliminary thoughts

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About the research

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This paper was written in early 2010 to encourage policy-makers to think about how to measure socioeconomic status (SES). It also provides some data on socioeconomic status and tertiary education participation. Finally, it speculates about the likely impact of an expansion in higher education on those from a low socioeconomic background.

Key messages

- Measurement of socioeconomic status is a complex issue. While the concept relates to the characteristics of individuals and their families, for practical reasons, measures based on the Australian Bureau of Statistics Socio-Economic Indexes for Areas (ABS SEIFA) are usually adopted.

- SEIFA measures are very poor in classifying individuals by socioeconomic status. Nevertheless, the SEIFA measures perform quite well in measuring the aggregate relationship between socioeconomic status and educational participation.[1]

- An implication of SEIFA's poor classificatory ability is that any policy that targets funding on the basis of SEIFA will result in the funds being badly misdirected.

- Some simple tabular analyses indicate that vocational education and training (VET) does a good job for low-socioeconomic status individuals, and is not overly biased toward lower-level qualifications for this group.

- The group most likely to be affected by an expansion in the higher education sector will be those not currently undertaking post-school study rather than those currently undertaking VET.

The paper also notes that SEIFA would be a very poor measure to implement any expansion in higher education aimed at low-socioeconomic status individuals.

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[1] The work around measuring SES in this paper was published in its final form in Lim, P & Gemici, S 2011, *Measuring the socioeconomic status of Australian youth*, NCVER, Adelaide.

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Introduction

The relationship between social and economic disadvantage and participation in tertiary education is currently receiving considerable policy attention. The Australian Government responded to the Bradley Review's (2008) recommendation that attention be paid to increasing the participation of those from a low-socioeconomic status (SES) background in higher education with the program of funding entitled *Transforming Australia's higher education system* (Australian Government 2009). The government's stated aim is to have 20% of higher education enrolments at undergraduate level to be filled by people from low socioeconomic backgrounds. More recently, the Access and Participation Principal Committee of the Ministerial Council of Tertiary Education and Employment has asked the National Centre for Vocational Education Research (NCVER) to prepare a paper on low socioeconomic status and vocational education and training (VET).

The purpose of this paper is to canvass a range of issues and also to provide some data and analysis around the topic of the paper — socioeconomic disadvantage and participation in tertiary education. Our aim is not necessarily to produce a coherent paper but rather to encourage policy-makers to think about conceptual and measurement issues and how they might consider addressing disadvantage as it relates to socioeconomic status. It is one thing to espouse a policy of redressing disadvantage; it is another to implement policy in an effective manner.

The second and third chapters of the report cover conceptual and measurement issues respectively. On the measurement issue, we find a paradox. While there is a very poor relationship between a direct SES measure and the area-based Socio-Economic Indexes for Areas (SEIFA), produced by the Australian Bureau of Statistics (ABS), the SEIFA measure is quite reasonable in monitoring the relationship between socioeconomic status and tertiary education participation. We then provide some analysis showing variations in educational participation across socioeconomic status (the fourth chapter). We find that SES is important in predicting tertiary education participation. We also find that vocational education and training does quite well in addressing the needs of low-socioeconomic status individuals in the sense that there is little bias in this analysis for this group in relation to lower-level qualifications. The apparent over-representation of low-level qualifications is because this is the sector that provides opportunities for those who are disadvantaged. In the following chapter we indulge ourselves and speculate on the impact of an expansion in higher education. We suggest that the group most affected will not be those undertaking vocational education and training but rather those who currently are not undertaking post-school education. We further show that, if expansion of higher education is directed towards those in the lowest SEIFA quintile, then this expansion will have little effect on the participation of individuals of low socioeconomic status. We end with some comments.

Some conceptual issues

Equity and education has been an important policy issue over time.[2] For example, tuition fees at universities and colleges of advanced education were abolished by the Whitlam Government in 1974 to promote wider access; means-tested allowances to all eligible students were introduced under the Tertiary Assistance Scheme to replace the Commonwealth Scholarship Scheme, and so on.

There are two dimensions that need discussion. The first is what we mean by equity. The second is what is meant by low socioeconomic status or disadvantage.

In relation to the first, there are two concepts: equality of opportunity and equality of outcomes. Equality of opportunity is achieved if all individuals face the same costs and constraints (financial, social, cultural and institutional). Such equality does not imply equality of outcomes because different groups are likely to have different values and tastes. It is also possible (although this might be contested) that some groups have more or less ability than others, and this is likely to affect educational participation if, as is likely, those with more academic ability profit more from higher levels of education than those with less ability.[3]

While equality of opportunity is an attractive construct because it does allow for different groups to have different tastes, most policy discussion is based on the idea of equality of outcomes. The idea that everyone should have the same outcome is clearly nonsense, and so this concept is usually interpreted (see the Quality of Education Review Committee 1985, para 1.15) as the situation in which the distribution of outcomes is independent of background factors such as sex, ethnicity or socioeconomic status. This principle implies that it is not desirable that tastes or values differ between groups in relation to education. For example, in Australia we have a highly segregated labour market, such that there are relatively few female plumbers and relatively few male nurses. Such differences may relate to differences in tastes or values between males and females. But the principal of equality of outcomes would view such differences as undesirable.

Recent policy pronouncements appear to be based on the concept of equality of outcomes. So the government's target, taking recommendation of the Bradley Review (Bradley et al. 2008) is to have the participation of students from the lowest socioeconomic status quartile increase to 20% by 2020, with funding of $433 million over four years to support this push (Australian Government 2009).

This policy target leads on to the second issue we want to discuss. The concepts of equality of opportunity or outcomes are couched in terms of independence between a set of background characteristics (which are presumably exogenous in the sense that they are outside the control of the individual or his/her family) and opportunity or outcomes. However, the concept of socioeconomic status implies that we can sort people into simple categories, ranging from low socioeconomic status to high socioeconomic status. There is a very large number of background characteristics which potentially can affect educational choices and outcomes. Therefore the task is to condense these into

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[2] Karmel's interest in this topic dates back to the early 1990s when he devoted a chapter of his doctoral dissertation to the topic of education expansion and equity (Karmel 1995). The chapter quoted material going back to the 1960s. No doubt the issue of equity and education goes back well before then — presumably the whole move to compulsory schooling has an equity basis to it.

[3] One can also envisage situations in which the opposite is the case, with those with less ability profiting more from education than those with higher ability. For example, some may need more schooling to achieve basic literacy from which there might be a very high pay-off.

a simple variable which it typically labelled SES. This can be done in a couple of ways. The first is to gather a number of variables pertinent to the idea of socioeconomic status and to conduct some sort of multivariate analysis to derive a summary variable. The most common technique is factor analysis. One complication is that a single summary variable may not adequately capture all the variation in the variables being considered and thus a number of SES factors may be necessary to properly capture the relevant aspects of disadvantage. For example, the ABS derives four socioeconomic indexes for areas: The Index of Relative Socio-Economic Disadvantage; The Index of Relative Socio-Economic Advantage and Disadvantage; The Index of Economic Resources; and The Index of Education and Occupation. Each of these indexes includes different components (appendix A). While the indexes are different, they are correlated.

The second approach derives a summary variable of disadvantage which best predicts an outcome variable. So if participation in higher education is the policy outcome under consideration, then we can derive a measure of socioeconomic status that best predicts whether an individual goes to university or not. The drawback of this approach is that the summary variable will be different for each outcome variable and will change over time as the relationship between the background variables and the outcome variable changes.

One consideration here is whether the summary variable is calculated taking other factors into account. In particular, if we were deriving an SES summary measure for higher education in this way, we could find the combination of background characteristics that best predicts higher education participation, or we could find the combination of variables that best predicts higher education once we have taken academic ability into account.

Before we conclude this discussion, there are three further issues that we wish to touch on. The first is that of life cycle factors. The concept of equity we have been talking about has revolved around the impact of background characteristics on opportunity or outcomes; that is, we are essentially interested in the impact of family background on the opportunity and outcomes of children or young people. However, I would argue that family background becomes less relevant as an individual gets older and therefore the focus needs to change to the characteristics of the individual. Therefore, if we are looking at the education participation of older persons (say 25 years and older), it makes more sense to consider factors such as their level of education and available resources rather than those of their parents.

The second issue is a practical one. The whole discussion of socioeconomic status revolves around an individual and perhaps their parents. Thus ideally a measure of SES will be based on the characteristics of them and their parents. But such data are notoriously difficult to collect and so common practice is to use the characteristics of the area in which they live. This is the basis of the ABS SEIFA indexes. The problem here, known as 'the ecological fallacy', occurs when the average characteristics of the area are imputed to the individual. Take two areas with the same average income and assume that they have the same educational participation rate. However, in one, all the rich people could participate in education but none of the poor people. But in the other an equal proportion of rich and poor people could participate. While the measured socioeconomic status is the same, the average outcome in the areas are completely different in terms of equity of educational participation.

The reliability of the SEIFA indexes is an empirical question and NCVER is currently undertaking some work based on the Longitudinal Surveys of Australian Youth (LSAY) to see how well SEIFA does compared with a measure based on individual characteristics. The next section briefly looks at this

work. This has important implications for policy since SEIFA is readily available and it would be a great advantage if its use can be shown to be valid.

The third issue is the purpose of the SES measure. Up to this point we have been talking about socioeconomic status as a way of defining groups so we can monitor educational participation rates and outcomes. However, another possible purpose is to have a way of defining individuals who need assistance. The measures we have been discussing are not really suitable for such a purpose. For example, it might be the case that the students from one group on average need more academic support. However, it does not follow that all members in the group need academic support. What would be more sensible in this situation is to have a way of selecting students who need academic support and therefore what is needed would be measures of academic preparedness rather than background characteristics.

Measurement issues

In the previous section we discussed the difficulties of deriving a measure of socioeconomic status based on the characteristics of individuals. This has meant that, in practice, area-based measures are used, particularly those derived by the ABS from the census. Indeed, for many purposes socioeconomic status has become synonymous with the ABS SEIFA indexes. But how much is lost through using the ABS measure?

The Longitudinal Surveys of Australian Youth provide an ideal way of understanding this question. The surveys have a very rich set of characteristics of individuals at age 15 years, and are thus ideal for looking at questions of intergenerational mobility, especially those related to educational participation in the post-compulsory schooling years. Lim and Gemici (2011) derive such a measure of socioeconomic status for the LSAY Y03 cohort (a sample of individuals who were 15 years in 2003). He applies the standard technique of factor analysis to derive a summary measure that best explains the variation in available variables, which plausibly can be taken to capture the concept of socioeconomic status. This summary measure can then be compared with the SEIFA areas based measure.

Table 1 shows the variables included in the factor analysis. The variables included in this analysis are those (from a broader range of variables that may describe socioeconomic status) that best delineate participation in courses at bachelor degree level or higher by the age of 19 years. Further information on the rationale for the choice of these variables will be available in Lim (forthcoming). The variable of cultural possessions has been derived from the LSAY datasets based on a set of questions that ask respondents about possessions, including items such as the art and literature they have in their home. Parental occupation is measured using the international continuous scale of International Socio-Economic Index of Occupational Status (ISEI) and is based on the occupation of the individual's father or the mother's if the father's is missing. Education is measured using the International Standard Classification of Education (ISCED) and is based on the mother's education or the father's if missing.[4] Note that the definition of mother and father includes an individual's primary male or female care giver at age 15 years, as opposed to simply being the biological parent. Family structure is a variable that identifies families, as nuclear, single-parent, blended or other.

The factor analysis identified two underlying traits that are important in describing the data. We loosely call the two factors SES and family structure.[5] The weights for the individual variables are included in the tables. As can been seen, SES comprises parental education and occupation, and cultural possessions.

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[4] It is treated as a continuous variable with values 1 to 6. This simplifies the analysis compared with the use of dummy variables.

[5] Factor analysis means that these two underlying traits are orthogonal (independent).

Table 1   Factor weightings

Variables	Factor 1 standardised score	Factor 2 standardised score
Parental education	0.483	-0.049
Parental occupation	0.481	0.025
Cultural possessions*	-0.459	-0.025
Family structure	0.0009	0.998

Note: * Derived summary variable.

The SES measure (factor 1), with high weightings on parental education, parental occupation and cultural possessions, is quite plausible. However, we need to acknowledge that the derivation of the measure is more of an art than a science and does depend on the variables included in the analysis. The general consideration for inclusion was the ability of each measure to differentiate participation in higher education. Further, a conscious decision was made to exclude some possibilities based on relevance to the concept of socioeconomic status. For example, gender, Indigeneity and regionality have been excluded, as individuals in these groups can be of either low or high socioeconomic status. We acknowledge that regional status may well indicate socioeconomic status, but this may be more related to factors such as access to services and infrastructure rather than a direct measure of family status. Further, families of both high and low socioeconomic status can live in the same regional area (as for metropolitan regions). We standardise each of the primary factors to a distribution with a mean of 1000 and a standard deviation of 100.

Having derived this individual measure of socioeconomic status we are interested in how it compares with SEIFA. We do this in a couple of ways. First we present some simple correlations between the individual measure and the various SEIFA indexes (table 2).

Table 2   Correlation between individual SES and various SEIFA indexes

SEIFA measure	Correlation with derived SES measure
Index of education and occupation	0.39
Index of economic resources	0.34
Index of relative advantage	0.38
Index of relative disadvantage	0.34

Note: The SEIFA indexes are derived from the 2001 census.

The agreement between the area-based and individual measure of socioeconomic status is low, with correlations between 0.34 and 0.39. In order to easily compare the performance of area-based measures we choose the one with the strongest correlation to our measure. The SEIFA measure with the highest correlation is the index of education and occupation and thus we would argue that this is the one that should be used as a proxy. We compare the two measures (SEIFA and individual) in a variety of ways.

While the two measures are clearly correlated, there are a considerable number of individuals for whom the two measures differ. Considerable numbers of high-SES individuals live in low-SES areas and vice versa. If we assume that the individual socioeconomic status measure is gospel, we can get an understanding of the level of the error in SEIFA by taking the difference between the two units. In figure 2, we present the distribution of the differences between our standardised measure and the SEIFA score. As both measures are on the same scale, the units for calculation are standard

deviations. A difference of 100 indicates a discrepancy between the measures equal to a standard deviation.

Figure 1   Error associated with SEIFA, LSAY Y03 cohort (histogram of SEIFA index minus individual measure)
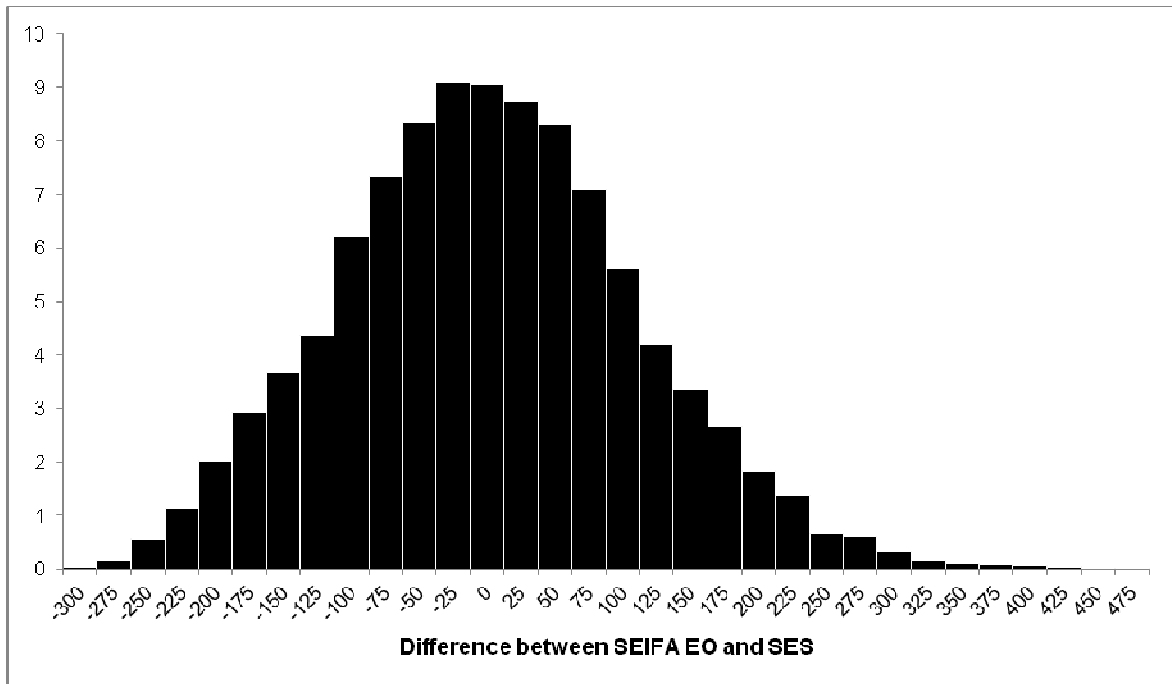
Figure 1 shows us that the majority of the differences lie between -135 and 135; however, there is still a substantial number of differences greater than this. In fact, there are some differences of greater than five standard deviations.

A second method of determining the extent of misclassification is to define quintiles according to the two measures. Quintiles divide the distribution of each measure into five categories, whereby each category contains 20% of the values. Table 3 presents the cross-tabulation of the quintiles for each of the two measures. With a perfect relationship between the two measures, we would observe the row totals along the diagonals, and the off-diagonals would be close to 0. It is the off-diagonals that give us the extent of misclassification at this level.

Table 3   Quintiles according to the individual SES and SEIFA measures, LSAY Y03 cohort, frequency counts

SES quintile	SEIFA EO quintile					
	1	2	3	4	5	Total
1	**495**	542	403	233	120	**1792**
2	410	**493**	403	294	177	**1777**
3	332	393	**459**	334	252	**1771**
4	258	323	447	**334**	428	**1790**
5	129	197	318	314	**758**	**1716**
Total	**1624**	**1947**	**2031**	**1510**	**1734**	**8846**

While we observed a positive correlation between the two measures (r = 0.39), the use of SEIFA results in a high level of misclassification. In particular, we observe a high number of individuals classified as having high individual socioeconomic status but reported as having low socioeconomic

status using SEIFA and vice versa. In fact, the total level of correct classification is a little less than 30%. This result is similar to that observed in Coelli (2010) using the Household, Income and Labour Dynamics in Australia (HILDA) Survey dataset. In his paper, he found that for various different measures of individual SES (such as parental income, occupation and education) there was about a 30% agreement between these individual measures and area-based measures of socioeconomic status.

We now investigate what this means for a particular variable that is of great policy interest: participation in higher education. We do this in three ways, beginning with a very simple tabulation of the participation rate by quintile (table 4).

Table 4   Participation in higher education at age 19 years by quintiles according to the individual SES and SEIFA measures, LSAY Y03 cohort

Quintile	% of quintile (SES) in higher ed.	% of quintile (SEIFA) in higher ed.
1	23.7	26.0
2	28.4	29.8
3	35.8	33.7
4	44.2	39.4
5	61.2	59.6

We see that the SEIFA index attenuates the data a little. The participation rate in the most disadvantaged quartile is higher than if we used the individual SES measure (26.0% compared with 23.7%) and the rate in the most advantaged quartile is understated (59.6% compared with 61.2%). Thus while the pattern is similar, the SEIFA measure understates the level of inequity.

Our second approach is a little more sophisticated. We find the relationship between socioeconomic status and higher educational participation at age 19 years by running a series of logistic regressions. In the first regression we have a single variable — SES. In the second model we also include academic achievement at age 15 years and a series of controls for non-SES characteristics which we know to affect participation in higher education: sex, regionality, Indigenous status and school sector. Our interest is in the effect of measurement error of SES on the coefficients of the variables. If there is little change between the individual SES model and the SEIFA model, then we would conclude that the SEIFA measure does an adequate job for estimating multivariate relationships.

Table 5a   Bias associated with using SEIFA rather than an individual-based SES measure to predict higher education at age 19 years, LSAY cohort, simple model

| Variable | Regression coefficients – simple model | | |
	SEIFA	SES	% difference
Intercept	-6.6571	-6.5434	1.7
SES	0.00616	0.00608	1.3

Table 5b Bias associated with using SEIFA rather than an individual-based SES measure to predict higher education at age 19 years, LSAY cohort, comprehensive model

Regression coefficients – comprehensive model			
Variable	SEIFA	SES	% difference
Intercept	-9.5011	-9.1266	4.1
SES	0.00286	0.00294	-2.7
Male	-0.633	-0.6761	-6.4
Non-Indigenous	0.47	0.4703	-0.1
Non-metropolitan	-0.1962	-0.2969	-33.9
Government school	-0.75	-0.7183	4.4
Catholic school	-0.2672	-0.2414	10.7
Mathematics achievement	0.00689	0.00718	-4.0
Reading achievement	0.00362	0.00304	19.1
Science achievement	0.00147	0.000997	47.4

The results of this exercise are rather interesting. The coefficient on the SES variable is very robust, despite the poor correlation between the two variables. On the other hand the use of SEIFA affects a number of the other variables (in the comprehensive model) considerably.[6] It would seem that the geography implicit in the SEIFA measures interacts with some of the variables but not with others.

So our tentative conclusion is that, although SEIFA looks unsatisfactory at first sight, its use in measuring relationships is in fact not too bad.

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[6] The size of the change to the coefficients does not seem to be closely related to their standard errors.

Socioeconomic status and tertiary education participation

As noted earlier, statistics on the relationship between socioeconomic status and tertiary education are constrained by what is available. Currently, the VET students and courses database uses the SEIFA Index of Relative Disadvantage as its measure of SES. This is an area-based index and in Students and Courses database, the student's locality and postcode is used to derive the statistical local area, which is then given an index value by the ABS. The variables in this index are the proportion of the population with low income, no post-school qualification, did not complete school, are unemployed, who are drivers, labourers or service workers, have low rent, whose housing is overcrowded who rent public housing, who have a disability (and are under 70 years), whose English is poor, are Indigenous, do not have a car, do not have a computer, are single-parent households and who are divorced. Appendix A (extracted from Foley 2007) provides details.

Further, in the previous section we concluded that SEIFA did a reasonable job in describing aggregate relationships.

In the following tables we tabulate the number of students who are from low-, medium- and high-SES areas. The low, medium and high groups are defined by sorting all statistical local areas (SLAs) by the 2006 SEIFA Index of Relative Disadvantage and then defining quintiles. One of the drawbacks is that the low-SES areas do not contain 20% of the actual population (even in 2006). Therefore to make sense of the following tables we need to estimate the proportion of the relevant population in the low, medium, and high-SES areas.

A further refinement is that we tabulate students aged 15—24 years to reflect our interest in intergenerational mobility; that is, we are primarily interested in the background of parents. One difficulty with our approach is that we are implicitly assuming that these young students are living in the same area as their parents, or at least in areas with the same SEIFA value. Thus we will be overstating participation in low-SES areas, to the extent the students from quite privileged backgrounds have left home and are currently living in a low-SES area.

When planning this paper, we intended to provide a comprehensive picture of the relationship between socioeconomic status and tertiary education participation. However, in the time available we have been unable to obtain a data file containing higher education unit records. Thus the best we can do to indicate the differences in participation rates across the VET and higher education sectors is to reproduce a figure from Foley (2007).

Figure 2 Comparison of education sectors, by SEIFA Index of Economic Resources score (SEIFA 2001)
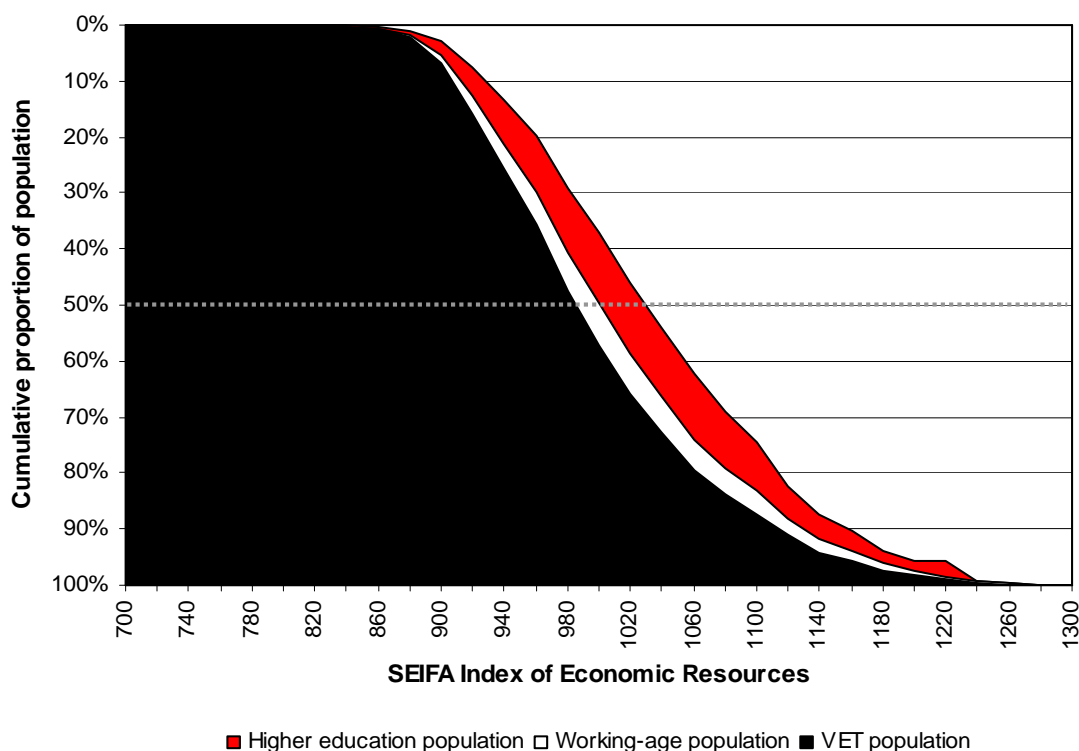
Source: Foley (2007).

The data in figure 1 are rather dated, and the SEIFA index is different from the one we intend to use, but the figure clearly shows that the distribution of VET students is over-represented among groups of lower socioeconomic status, while the distribution of higher education students is under-represented in this group.

Within vocational education and training by contrast we can present a more detailed picture. In table 6 we show participation rates by presenting the number of students, divided by the respective number of 15 to 24-year-olds. The population is broken into three groups: low-SES (the bottom quintile), medium-SES (quintiles 2—4) and high-SES (the top quintile).

Table 6   Participation rates for 15 to 24-year-olds, by SES, 2009

	Low-SES	Medium-SES	High-SES	Total enrolments
Non-AQF	3.9	2.9	1.9	3.1
Certificate I	2.1	1.3	0.7	1.4
Certificate II	7.0	5.5	2.8	5.3
Certificate III	9.1	9.6	6.5	9.1
Certificate IV	1.8	1.9	1.7	2.0
Diploma or higher	2.1	2.0	2.3	2.7
Total students	**26.0**	**23.4**	**16.0**	**23.6**

The first point to come from this table is that overall participation rates are high. In 2009 almost one in four of the 15 to 19-year-old population participated in vocational education. The highest

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participation rate was for the low-SES group and the lowest rate for the high-SES group. But what is even more interesting is that the high participation rate for the low-SES group is driven by the high participation rate for non-Australian Qualifications Framework (AQF) qualifications and certificates I and II, and the disparities between the three groups is rather small when we consider the higher-level certificates and diplomas. We make this point clearer by presenting the above data relative to the medium-SES group; that is, we index medium-SES participation at 100 for each level and present the rates for the low and high groups relative to it (table 7).

Table 7   Participation rates for 15 to 19-year-olds, relative to medium SES

	Low-SES	Medium-SES	High-SES
Non-AQF	134	100	66
Certificate I	159	100	53
Certificate II	127	100	51
Certificate III	95	100	68
Certificate IV	94	100	87
Diploma or higher	100	100	114
Total students	**111**	**100**	**69**

It is clear that relative to the medium-SES group the VET sector is serving the low-SES group very nicely. The participation rates for certificates III/IV and diplomas are the same or virtually the same for the two groups. So the very high participation rate of the low-SES group in vocational education and training is fundamentally because it is providing what might be described as preparatory or remedial courses, not because the low-SES group are underrepresented in the medium and higher-level qualifications.

It is also clear from the table that the participation of the high-SES group is quite different from the medium-SES group, except perhaps among certificates IV and diplomas. Wheelahan (2009) showed that VET provides an opportunity for individuals from low-SES backgrounds to pursue further education and training. However, as table 7 shows, individuals from low-SES backgrounds are more likely to be studying lower-level VET courses (certificate II or below), and that as the qualification level increases, we start to observe disparities between low and high socioeconomic status in terms of participation. At the diploma or higher level in particular we see that those from high SES are more likely to undertake these than their low-SES counterparts.

In future versions of this paper, we intend to look at the pattern for those who have completed Year 12 and also completions — participation is all very well but what counts is outcomes.

While we do not (yet) have administrative data for higher education and thus cannot paint a complete picture of socioeconomic status and tertiary education participation, we can use LSAY data As a substitute. While the LSAY data are not ideal for providing estimates of absolute numbers, they are very good for uncovering underlying relationships.

The dataset we use for this analysis is the one we used earlier: the 2003 cohort of the Longitudinal Surveys of Australian Youth.

We model the relationship between tertiary education participation and a series of background characteristics. The models are run separately for males and females in order to account for the very different educational choices they make (females dominate higher education, while males dominate apprenticeships). The education choices are shown in table 8.

Table 8   Education choices in model

Males	Females
Degree	Degree
Diploma	Diploma
Apprenticeship	Other VET (including apprentice/traineeships)
Other vocational education and training (incl. traineeships)	No post-school study
No post-school study	

In addition to socioeconomic status we include a series of characteristics: academic achievement at age 15 years (mathematics, reading, science), school type, regionality and Indigeneity. The SES variable is the individual one derived earlier.

The regression parameters for the full models of multinominal logistic regressions appear in appendix B. Here we draw out the main features. First, socioeconomic status turns out to be the most important variable, in the sense that the model loses the greatest degree of explanatory power if we drop it relative to dropping academic achievement, or school type, as can be seen from table 9, in which we present the effect of removing each term from the full model. The SES variable provides the greatest change on the model, followed by the achievement variables.

Table 9   Importance of each effect in the multinomial logistic

Model	Males			Females		
	Log likelihood (LogL)	Change in df from the full model	Change in -2LogL from full model	Log likelihood (LogL)	Change in df from the full model	Change in -2LogL from full model
Full	7493.46	-	-	6095.98	-	-
-SES	8536.10	4	1042.64*	6962.07	4	896.09*
-Achieve (group)	8018.68	12	525.22*	6422.40	12	356.42*
-Indigenous	7500.11	4	6.65	6070.11	4	4.13
-Locality	7531.61	4	38.15*	6098.75	4	32.77*
-Sector	7564.25	8	70.79*	6113.04	8	47.05*

Note: * Significant difference from the full model (at the 5% level).

The simplest way of presenting the model as it relates to socioeconomic status is to predict probabilities for the lowest, middle and highest SES quintile, holding the other variables at their reference levels[7] as seen in tables 10a and 10b.

Table 10a Predicted probabilities for the lowest, middle and highest SES quintiles, males

Qualification	Predicted probability of participating		
	Low-SES	Average SES	High-SES
Apprenticeship	0.25	0.18	0.11
Bachelor degree or higher	0.24	0.36	0.48
Diploma/advanced diploma/associate degree	0.02	0.02	0.03
Other VET (incl. apprenticeships and traineeships)	0.05	0.04	0.03
No study	0.43	0.40	0.35

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[7] Non-Indigenous, independent school, metropolitan area, maths = 535.956, read = 536.729, science = 537.076.

Table 10b Predicted probabilities for the lowest, middle and highest SES quintiles, females

Qualification	Predicted probability of participating		
	Low-SES	Average SES	High-SES
Bachelor degree or higher	0.43	0.50	0.57
Diploma/advanced diploma/associate degree	0.03	0.02	0.02
Other VET (incl. apprenticeships and traineeships)	0.09	0.08	0.07
No study	0.45	0.40	0.34

For males, we see the biggest impact of socioeconomic status is on those studying bachelor degrees and those undertaking apprenticeships. There is little variation in the other categories of diploma study and other vocational education and training (which are quite small). For females, all the action is in bachelor degrees, although the variation is less marked than for males. As an aside, we found little variation in diploma study by SES — a result that appears to be at odds with that of Wheelahan (2009).

While socioeconomic status is important, it is worth noting that the relationship between SES and educational participation is compounded by the other variables. To make this point we show the effect of omitting the control variables.

Table 11 Comparison of predicted probabilities of tertiary education participation with omission of control variables

Qualification	Males		Females	
	Low-SES	High-SES	Low-SES	High-SES
Apprenticeship	0.30	0.09	NA	NA
Bachelor degree or higher	0.16	0.56	0.28	0.64
Diploma/advanced diploma/associate degree	0.03	0.04	0.06	0.03
Other VET (incl. apprenticeships and traineeships)	0.12	0.04	0.18	0.07
No study	0.40	0.27	0.49	0.26

We see that the disparity between low socioeconomic status and tertiary education participation is greatly exaggerated by the omission of relevant control variables.

Expanding higher education

While tertiary education participation is not a zero sum game, an increase in participation in higher education must have an effect on VET participation. Young people choose a pathway and if more choose university, then surely fewer will undertake an apprenticeship or traineeship or some other VET course.

Our interest here is to speculate on the likely effect of the government policy of increasing the higher education participation rate of low-SES individuals. Our approach is to conduct a mind experiment in which we assume that the number of places in higher education is expanded. We then predict, on the basis of a model linking higher education participation, socioeconomic status and other characteristics, which individuals would go to higher education, even though they did not previously. Our prediction comprises simply those individuals with the highest predicted probabilities who currently do not go to higher education. We can then tabulate the characteristics of these individuals in relation to their current educational participation. Our starting point is a model that predicts participation in higher education (that is, a degree program). We fit a simple logistic regression in which participation in higher education by age 19 years is a function of socioeconomic status, academic achievement and other control variables. Using this model we then predict the probability of participating in higher education for each person in our sample.

We conduct the mind experiment in two parts. First, we assume that the higher education sector expands by 10% through additional places (that is, we are assuming that current participation is supply constrained by the number of available places) and that these places are filled by those with the highest probability of attending university but who do not currently attend. We then tabulate their characteristics and deduce the effect on the other education alternatives. Table 12 contains the results, showing the impact on each of our categories.

Table 12a   Effect of hypothetical expansion in higher education places, males

Qualification	Original numbers	New participation rate	% difference
Bachelor degree or higher	1160	1261	8.0
Diploma/advanced diploma/associate degree	118	115	-2.6
Apprenticeship	609	598	-1.8
Other VET (incl. apprenticeships and traineeships)	248	242	-2.5
No post-school study	1161	1080	-7.5
Total	**3296**	**3296**	**0.0**

Table 12b   Effect of hypothetical expansion in higher education places, females

Qualification	Original numbers	New participation rate	% difference
Bachelor degree or higher	1549	1719	9.9
Diploma/advanced diploma/associate degree	153	142	-7.7
Other VET (incl. apprenticeships and traineeships)	393	373	-5.4
No post-school study	1267	1128	-12.3
Total	**3362**	**3362**	**0.0**

A general expansion of the availability of higher education would result in those not in any study taking up places in higher education. For males, there is little leakage from those undertaking an

apprenticeship, a diploma or other vocational education and training. For females, the biggest group come from 'no post-school study'; but the diploma and VET groups suffer a drop of around 8% in their numbers.

We can also tabulate the numbers by socioeconomic status (table 13) in order to see whether a general expansion would benefit the low-SES group.

Table 13a   Effect of hypothetical expansion in higher education places, males, change in SES participation

SES quintile	Original number in higher ed.	New numbers in higher ed.	% change
1	102	102	0.0
2	140	142	1.4
3	179	190	6.1
4	275	309	12.4
5	396	450	13.6
Total	**1092**	**1193**	**9.2**

Table 13b   Effect of hypothetical expansion in higher education places, females, change in SES participation

SES quintile	Original number in higher ed.	New numbers in higher ed.	% change
1	169	177	4.7
2	195	209	7.2
3	269	293	8.9
4	327	375	14.7
5	509	585	14.9
Total	**1469**	**1639**	**11.6**

The answer is very clear. Those in the queue for a higher education place are skewed toward high socioeconomic status and there would be little benefit to the low-SES group. This result indicates that, from an equity perspective, any expansion in higher education needs to be targeted at those of a low socioeconomic status. In our second mind experiment we expand the number of low-SES places by 25%.

We proceed as before, but restrict our interest to individuals in the lowest SES quintile. By construction, we know the effect on higher education participation and so our interest is on the impact on VET participation. Table 14 shows the results.

Table 14a   Effect of hypothetical expansion in higher education places for the lowest SES quintile, males

Qualification	Original numbers	Numbers under 25% increase in higher education from low-SES	% difference
Bachelor degree or higher	1160	1176	1.4
Diploma/advanced diploma/associate degree	118	118	0.0
Apprenticeship	609	604	-0.8
Other VET (incl. traineeships)	248	247	-0.4
No post-school study	1161	1151	-0.9
Total	**3296**	**3296**	**0.0**

Table 14b Effect of hypothetical expansion in higher education places for the lowest SES quintile, females

Qualification	Original numbers	Numbers under 25% increase in higher education from low-SES	% difference
Bachelor degree or higher	1549	1601	3.4
Diploma/advanced diploma/associate degree	153	150	-2.0
Other VET (incl. traineeships)	393	388	-1.3
No post-school study	1267	1223	-3.5
Total	**3362**	**3362**	**0**

Overall, we see little impact on those undertaking an apprenticeship, a diploma or other vocational education and training. The main impact would be more low-SES females going to university, most of whom otherwise would not be studying.

As a final twist, we assume that the government can only identify students' socioeconomic status by the SEIFA index, and therefore the number of places going to the first SEIFA quintile is expanded by 25%. We then tabulate these places by the individual SES quintiles to see the effect on university numbers. Because there is considerable misclassification, we now find that in fact considerable numbers of the new places go to higher-SES individuals (when we measure SES correctly).

Table 15 Effect on SES quintiles assuming a 25% increase in higher education attendance based on SEIFA quintiles

SES quintile	Original numbers	Numbers under 25% increase in higher education from low SEIFA	% difference
1	271	289	6.6
2	335	350	4.5
3	448	464	3.6
4	602	628	4.3
5	905	917	1.3
Total	**2561**	**2648***	**3.4**

Note: The total difference does not sum to 89; this is due to missing values in the SES information (when compared with the SEIFA quintiles).

Thus of the additional 89 places that would be created, we see that only 18 of these are taken up by truly low-SES individuals, meaning the leakage is of the order of 80%. The use of SEIFA in implementing an expansion of places aimed at low-SES individuals would be entirely unsatisfactory.

Concluding comments

As stated at the outset, this paper is intended to prompt policy-makers to think about the relationship between socioeconomic status and tertiary — vocational and higher education — participation. It has ended up combining what in reality are three papers, and limitations in time have meant that none of the three are fully complete.

The three potential papers correspond to three pieces of work, all of which are important in their own right. The first is on the measurement of socioeconomic status. We have reported preliminary work that has produced a paradox: the commonly used area-based SEIFA index does a very poor job in identifying the SES of individuals, but does a reasonable job in allowing measurement of the aggregate relationship between socioeconomic status and tertiary education participation. Further work needs to be done, firstly, on the ideal SES measure to be inserted into the LSAY data file and, secondly, whether SEIFA can be improved in some way so that it does a better job in predicting individual SES. For example, perhaps it can be combined with a simple question on an enrolment form such as parental occupation or education. This work needs to be done for the Australian Vocational Education and Training Management Information Statistical Standard (AVETMISS) review and will also be of great interest to the Data and Performance Measure Principal Committee of the Ministerial Council for Tertiary Education and Employment.

The second piece to be completed is a fuller description of the relationship between socioeconomic status (even if measured by SEIFA) and tertiary education participation based on the very extensive administrative databases. Some work has been done, but there is plenty more to do. While SEIFA has many limitations, the initial work reported in this paper indicates that it is a useful index for monitoring educational participation.

The third piece needs to focus on the current policy push in higher education, both to expand it (via demand funding) and to encourage low-SES participation. The initial work here suggests that the impact on the VET sector will be small. However, the work also suggested that the encouragement of low-SES participation could go astray if SEIFA is influential in directing funds. In any case, there is plenty more to do here.

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Appendix A: SEIFA 2001 methodology

The ABS undertook a comprehensive review of the methodology for SEIFA 2001 and, as a result, incorporated a new variable selection strategy — based on a theoretical model of disadvantage — into SEIFA 2001. The theoretical model grouped potential variables into three levels:

- Level 1: consists of core variables such as eeducation (or qualification), income and occupation, which are always included in SEIFA indexes because they are fundamental to measuring socioeconomic status.

- Level 2: are direct measures of an aspect of disadvantage that relate to things like wealth (number of motor vehicles, number of rooms in house), living conditions (type of residence, number of bedrooms), employment status (unemployment), language disadvantage (low fluency in English) and access to services (access to the internet).

- Level 3: includes variables that reflect — but do not directly measure — disadvantage. For example, Indigenous status may be associated with poor health or living conditions or divorced/separated status, which may be associated with low income. Some components of the disadvantage may have already been captured by the higher, level two variables. Level three variables have been included where it appeared that some additional aspect of disadvantage still remained to be measured over and above that from level one and level two variables. Level three variables can be thought of as indicators which signal that an area has some disadvantage. The inclusion of level three variables means that, while it may reflect an area's disadvantage, it is not possible to identify all aspects of disadvantage being represented. Only the Index of Disadvantage has level three variables (ABS 2003, 2004).

The ABS used principal components analysis to summarise selected variables for SEIFA 2001. The analysis produced a socioeconomic score for each collection district in Australia. These index scores were standardised to have a mean of 1000 and a standard deviation of 100 across all collection districts in Australia. Consequently, approximately 95% of index scores are between 800 and 1200.

SEIFA 2001 consists of four distinctive socioeconomic indexes, which use different combinations of variables from the 2001 census. These indexes are:

- Index of Disadvantage

    This is the most general measure of disadvantage of all four SEIFA indexes. It is the only index that incorporates three levels of variables that either reflect or measure disadvantage. This index is most comparable of all 2001 indexes to its 1996 counterpart, as it uses the same method and the same variables as the 1996 Index of Disadvantage.

    The lower an Index of Disadvantage score, the more disadvantaged that area is. Low scores occur when areas have high numbers of households on low incomes and large numbers of unskilled people. In contrast, high index scores indicate that areas have few households on low income and few people with little training and employed in unskilled occupations. High scores denote a lack of disadvantage rather than high advantage.

- Index of Advantage and Disadvantage

  This index measures and ranks an area in terms of both advantage and disadvantage. The higher the index score, the 'more advantaged' an area is considered to be. Areas with high index scores are more likely to have higher proportions of people on high incomes and more skilled workforces than areas with lower scores, which are more likely to have higher proportions of individuals with low incomes (and few people with high incomes) and a relatively unskilled workforce.

- Index of Education and Occupation

  The educational and occupational structure of a community is reflected in this index. The index only uses level one variables and provides specific rankings based on educational background and type of occupation. For education, variables such as the level of qualification achieved or whether further education is being undertaken are used. Occupation variables use the major groups of the Australian Standard Classification of Occupations (ASCO) and the unemployed.

  Areas with low index scores are more likely to have higher proportions of individuals with lower educational levels and a relatively unskilled workforce than areas with high scores, which are more likely to have high proportions of qualified people and more skilled workforces.

- Index of Economic Resources

  This index summarises the economic resources of families within an area. It only includes variables that measure economic disadvantage, such as income (income specified by family structure, to determine disposable income), expenditure (rent) and wealth (home ownership, dwelling size) of families. High index scores indicate an area with a large proportion of families on high incomes, a small proportion of low-income families, and many households living in large houses; that is, four or more bedrooms. In contrast, a low index score indicates an area with a relatively high proportion of households on low incomes and living in small dwellings.

SEIFA geography

The core unit of analysis for SEIFA is the collection district, and the indexes can be aggregated up into higher units of analysis. SEIFA 2001 is available at various Australian Standard Geographical Classification areas such as:

- Statistical local area (SLA)
- Statistical subdivision (SSD)
- Statistical division (SD)
- State/territory (S/T)
- Local government area (LGA).

SEIFA 2001 is also available according to different census geographic areas such as:

- Postal area (POA)
- State suburbs (SSC)
- State electoral division (SED)
- Commonwealth electoral division (CED).

Importantly, the indexes for these higher-level areas have not been standardised.

Appendix B: Regression results

Table B1 Multinomial logistic regression for males: full model, SES

Model fit statistics

Criterion	Intercept only	Intercept and covariates	
AIC	8506.812	7565.458	
SC	8530.804	7781.386	
-2 Log L	8498.812	7493.458	
R-Square	0.2868	Max-rescaled R-Square	0.3042

Testing global null hypothesis: BETA = 0

Test	Chi-Square	DF	Pr > Chi-Sq.
Likelihood ratio	1005.355	32	<.0001
Score	876.5826	32	<.0001
Wald	505.393	32	<.0001

Type 3 analysis of effects

Effect	DF	Wald Chi-Square	Pr > Chi-Sq.
SES	4	59.871	<.0001
Indigenous status	4	11.7077	0.0197
Locality	4	25.1809	<.0001
School sector	8	50.1358	<.0001
Mathematics achievement	4	68.3817	<.0001
Reading achievement	4	13.2417	0.0102
Science achievement	4	11.3917	0.0225

Analysis of maximum likelihood estimates

Parameter	XSTUD2007	DF	Estimate	Standard error	Wald Chi-Sq.	Pr > Chi-Sq.	Exp(Est)
Intercept	Apprenticeship	1	0.5534	0.8018	0.4765	0.490	1.739
Intercept	Bachelor degree or higher	1	-10.6156	0.8543	154.4087	<.0001	0.000
Intercept	Diploma/advanced diploma/associate degree	1	-2.7555	1.7703	2.4228	0.1196	0.064
Intercept	Other VET incl. traineeships	1	-0.3609	1.1162	0.1046	0.7464	0.697
SES	Apprenticeship	1	-0.0021	0.000662	10.0356	0.0015	0.998
SES	Bachelor degree or higher	1	0.00316	0.000638	24.548	<.0001	1.003
SES	Diploma/advanced diploma/associate degree	1	0.00181	0.00133	1.85	0.1738	1.002
SES	Other VET incl. traineeships	1	-0.00146	0.000978	2.233	0.1351	0.999
Indigenous status	0	Apprenticeship	1	0.8898	0.3604	6.0957	0.0136	2.435
Indigenous status	0	Bachelor degree or higher	1	0.9745	0.3633	7.1933	0.0073	2.650
Indigenous status	0	Diploma/advanced diploma/associate degree	1	0.3431	0.7665	0.2003	0.6545	1.409

Analysis of maximum likelihood estimates

Parameter		XSTUD2007	DF	Estimate	Standard error	Wald Chi-Sq	Pr > Chi-Sq	Exp(Est)
Indigenous status	0	Other VET incl. traineeships	1	0.2014	0.3806	0.28	0.5967	1.223
Locality	0	Apprenticeship	1	0.3998	0.1362	8.6094	0.0033	1.491
Locality	0	Bachelor degree or higher	1	-0.0675	0.1321	0.2612	0.6093	0.935
Locality	0	Diploma/advanced diploma/associate degree	1	-1.0266	0.3761	7.4486	0.0063	0.358
Locality	0	Other VET incl. traineeships	1	0.4169	0.1873	4.9521	0.0261	1.517
Sector	1	Apprenticeship	1	0.4759	0.2051	5.3847	0.0203	1.609
Sector	1	Bachelor degree or higher	1	-0.5109	0.1535	11.0695	0.0009	0.600
Sector	1	Diploma/advanced diploma/associate degree	1	-0.5964	0.3698	2.601	0.1068	0.551
Sector	1	Other VET incl. traineeships	1	1.1747	0.3964	8.7827	0.003	3.237
Sector	2	Apprenticeship	1	0.4436	0.2284	3.7732	0.0521	1.558
Sector	2	Bachelor degree or higher	1	-0.0605	0.1773	0.1164	0.733	0.941
Sector	2	Diploma/advanced diploma/associate degree	1	0.1117	0.3734	0.0894	0.7649	1.118
Sector	2	Other VET incl. traineeships	1	0.991	0.4255	5.4251	0.0198	2.694
Mathematics achievement		Apprenticeship	1	-0.00104	0.00123	0.7225	0.3953	0.999
Mathematics achievement		Bachelor degree or higher	1	0.00782	0.00126	38.3837	<.0001	1.008
Mathematics achievement		Diploma/advanced diploma/associate degree	1	-0.00105	0.00221	0.2247	0.6355	0.999
Mathematics achievement		Other VET incl. traineeships	1	-0.00525	0.00178	8.6962	0.0032	0.995
Reading achievement		Apprenticeship	1	-0.00208	0.00131	2.5333	0.1115	0.998
Reading achievement		Bachelor degree or higher	1	0.00265	0.00129	4.2216	0.0399	1.003
Reading achievement		Diploma/advanced diploma/associate degree	1	0.000107	0.0025	0.0018	0.966	1.000
Reading achievement		Other VET incl. traineeships	1	-0.00316	0.0019	2.7472	0.0974	0.997
Science achievement		Apprenticeship	1	0.00208	0.00134	2.3919	0.122	1.002
Science achievement		Bachelor degree or higher	1	0.00149	0.00137	1.1887	0.2756	1.001
Science achievement		Diploma/advanced diploma/associate degree	1	-0.00129	0.00273	0.2243	0.6358	0.999
Science achievement		Other VET incl. traineeships	1	0.00625	0.00198	9.9218	0.0016	1.006

Table B2 Multinomial logistic regression for females: full model, SES

Model fit statistics

Criterion	Intercept only	Intercept and covariates	
AIC	6388.429	5736.014	
SC	6406.497	5898.623	
-2 LogL	6382.429	5682.014	
R-Square	0.2052	Max-rescaled R-Square	0.2341

Testing global null hypothesis: BETA = 0

Test	Chi-Square	DF	Pr > Chi-Sq.
Likelihood ratio	700.4154	24	<.0001
Score	629.3756	24	<.0001
Wald	427.994	24	<.0001

Type 3 analysis of effects

Effect	DF	Wald Chi-Square	Pr > Chi-Sq.
SES	3	16.2713	0.001
Indigenous status	3	3.1337	0.3715
Locality	3	24.8619	<.0001
Sector	6	53.3424	<.0001
Mathematics achievement	3	39.9711	<.0001
Reading achievement	3	9.9791	0.0187
Science achievement	3	9.8958	0.0195

Analysis of maximum likelihood estimates

Parameter		XSTUD2007	DF	Estimate	Standard error	Wald Chi-Sq.	Pr > Chi-Sq.	Exp(Est)
Intercept		Bachelor degree or higher	1	-7.0128	0.7072	98.3214	<.0001	0.001
Intercept		Diploma/advanced diploma/associate degree	1	-1.543	1.1383	1.8374	0.1753	0.214
Intercept		Other VET (incl. AT)	1	-0.3818	0.9592	0.1585	0.6906	0.683
SES		Bachelor degree or higher	1	0.00205	0.000546	14.0657	0.0002	1.002
SES		Diploma/advanced diploma/associate degree	1	0.000299	0.001	0.0894	0.765	1.000
SES		Other VET (incl. AT)	1	-0.00008	0.000785	0.0112	0.9159	1.000
Indigenous status	0	Bachelor degree or higher	1	0.3723	0.2722	1.8707	0.1714	1.451
Indigenous status	0	Diploma/advanced diploma/associate degree	1	0.00884	0.4689	0.0004	0.985	1.009
Indigenous status	0	Other VET (incl. AT)	1	-0.1876	0.2913	0.4146	0.5196	0.829
Locality	0	Bachelor degree or higher	1	-0.3722	0.116	10.3002	0.0013	0.689
Locality	0	Diploma/advanced diploma/associate degree	1	-0.6786	0.2534	7.1735	0.0074	0.507
Locality	0	Other VET (incl. AT)	1	0.2713	0.1493	3.299	0.0693	1.312
Sector	1	Bachelor degree or higher	1	-0.6534	0.1462	19.9655	<.0001	0.520
Sector	1	Diploma/advanced diploma/associate degree	1	-0.0366	0.3289	0.0124	0.9114	0.964

Analysis of maximum likelihood estimates

Parameter		XSTUD2007	DF	Estimate	Standard error	Wald Chi-Sq	Pr > Chi-Sq	Exp(Est)
Sector	1	Other VET (incl. AT)	1	0.6548	0.267	6.0142	0.0142	1.925
Sector	2	Bachelor degree or higher	1	-0.0805	0.1693	0.2259	0.6346	0.923
Sector	2	Diploma/advanced diploma/associate degree	1	0.6049	0.3566	2.8777	0.0898	1.831
Sector	2	Other VET (incl. AT)	1	0.7189	0.2967	5.8697	0.0154	2.052
Mathematics achievement		Bachelor degree or higher	1	0.00651	0.00104	39.1651	<.0001	1.007
Mathematics achievement		Diploma/advanced diploma/associate degree	1	0.00321	0.002	2.5695	0.1089	1.003
Mathematics achievement		Other VET (incl. AT)	1	0.00199	0.00142	1.9557	0.162	1.002
Reading achievement		Bachelor degree or higher	1	0.00226	0.00118	3.6776	0.0551	1.002
Reading achievement		Diploma/advanced diploma/associate degree	1	0.0017	0.00222	0.5868	0.4436	1.002
Reading achievement		Other VET (incl. AT)	1	-0.00273	0.0016	2.9095	0.0881	0.997
Science achievement		Bachelor degree or higher	1	0.000901	0.0012	0.5616	0.4536	1.001
Science achievement		Diploma/advanced diploma/associate degree	1	-0.00656	0.00244	7.1929	0.0073	0.993
Science achievement		Other VET (incl. AT)	1	-0.00153	0.00173	0.7834	0.3761	0.998

Note: AT = apprenticeships and traineeships.