

Social capital and youth transitions: do young people's networks improve their participation in education and training?

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NATIONAL CENTRE FOR
VOCATIONAL EDUCATION RESEARCH

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About the research

Social capital and young people: do young people's networks improve their participation in education and training?

Ronnie Semo and Tom Karmel, NCVER

Key messages

In recent times social capital has received considerable attention because it is seen as having the potential to address many of the problems facing modern society, including the poor educational outcomes of considerable numbers of young people.

This paper uses data from the Longitudinal Surveys of Australian Youth (LSAY) to explore the relationship between social capital at age 15 and participation in education and training at age 17. The issue is whether social capital is yet another factor which advantages the already advantaged, or whether social capital operates separately from family background.

- Social capital influences educational participation *over and above* the effects of background characteristics such as parents' education levels, parental occupation, geographic location, cultural background, school sector and academic achievement.
- For both males and females, participation in a diverse range of activities has the greatest influence on participation in education and training, followed by the strength of the relationship students have with their teachers. Increasing rates of participation in sport also increase educational participation for females.
- The authors note that, if anything, the findings underestimate the net effects of social capital because the results cannot fully account for the accumulation of social capital prior to the age of 15.

The finding that social capital matters for school education is a very positive one. It implies that activities that promote and encourage engagement at school can go some way to redressing economic and social disadvantage.

Tom Karmel
Managing Director, NCVER

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Introduction

Social capital refers to the attributes and qualities of the family, social and community networks that facilitate cooperation between individuals and communities. The quality of and extent to which individuals are engaged with these networks are likely to impact on the educational and social development of children and youth. It can be argued that network associations and influences can increase educational engagement, achievement and participation over and above the influences of family background, school type and geographical location.

In terms of participation in education and training, certain themes emerge with a clear connection to social capital constructs. The literature to date emphasises the importance of school networks in increasing levels of student engagement. Studies show that students with positive attitudes towards their school have higher educational aspirations and a corresponding increase in educational participation (Fullarton 2002; Khoo & Ainley 2005; Thomson & Hillman 2010). Teachers are also found to influence student engagement by acting as role models and raising aspirations (Banks 2010). There is also a positive relationship between participation in extracurricular activities and educational outcomes (OECD 2001; Fullarton 2002; Edwards 2004; Halpern 2005; Khoo & Ainley 2005). Studies show that informal networks, such as friends and relatives, play an important part in influencing young people (Dockery & Strathdee 2003). In addition to social capital sourced from the home and family, friendships and community participation help to build an individual's social capital (Halpern 2005).

This paper explores the links between participation in education and training and social capital. It uses data from the Longitudinal Surveys of Australian Youth (LSAY), which are particularly useful for a number of reasons. The first is that the longitudinal nature of the data allows us to examine the effects of particular characteristics on future outcomes. Second, LSAY provides a broad range of variables with clear linkages to social capital constructs. And, finally, the dataset contains a useful range of background characteristics, enabling us to control for background effects. Thus we can make use of the LSAY data to establish whether higher levels of social capital increase the likelihood of participation in education and training, *over and above* the effects of background characteristics such as Indigenous status, parental education and school sector. We investigate the relationship between the social capital measured at the first survey wave (when respondents were on average 15 years old) and participation in study or training on a full-time basis (either at school or in a post-school qualification) in the year following compulsory education, that is, when respondents were, on average, 17 years old. The period between measurement of social capital (at age 15) and outcomes (at age 17) strengthens our ability to infer a causal relationship.

The paper is divided into four sections. The first section, 'Social capital constructs', begins with a brief discussion of the existing literature, which is followed by an overview of the two social capital frameworks most prominent in the literature. Using these frameworks, the following section, 'The LSAY data and social capital', identifies items from LSAY which can be used to measure the social capital constructs discussed. A factor analysis is then conducted to group together LSAY data items that reflect these social capital constructs, thus obtaining a discrete series of social capital factors for use in the following section, 'Modelling educational participation using social capital'. Here multivariate models are used to explore the relationships that exist between the social capital factors and educational participation. The final section provides some discussion of the results.

We find that social capital does increase rates of participation in education and training, over and above the influences of family background, school type and geographical location. We were able to

obtain five discrete social capital factors: student connectedness with school; student–teacher relations; the influence of networks when thinking about the future; participation in school-based activities; and participation in sport. With the exception of network influences, we found that the remaining four factors all play some role in increasing participation in education and training.

The most important of these were participation in school-based activities and the relationship students have with their teachers. For females, higher rates of participation in sport were also found to result in higher rates of educational participation. And for males, school connectedness also helped to raise participation in education and training.

The main point of this analysis is that the effects are additional to background characteristics such as socioeconomic status. The implication is that one way of addressing disadvantage is by promoting elements of social capital – by ensuring that students relate to their teachers and participate in school activities and sport. In relation to this point, we note that our findings necessarily underestimate the net effects of social capital, given that earlier levels of social capital are not accounted for but are likely to feed into a young person’s stock of social capital.

Social capital constructs

A short review of the literature

The first authors to systematically develop social capital theory were Pierre Bourdieu, James Coleman and Robert Putnam (Biddle et al. 2009). Bourdieu's (1986) work focused on social class and the opportunities that social connections provided as a means of obtaining access to economic and cultural resources. Coleman (1988), using data from the United States, viewed communities and families as repositories of social capital and established the importance of these networks in fostering academic success. Putnam's (1993) study of social capital and democratic institutions in Italy viewed social capital as the trust, norms and networks that operate within communities and which promote cooperation among its members, thereby leading to effective democracy.

The concept of social capital is far-ranging and, as a result, so is the literature. In terms of educational participation and training, however, there are certain themes that emerge with a clear connection to these social capital constructs.

Coleman's work on social capital emphasised the role of strong communities and ties among parents, educators and pupils in fostering learning (OECD 2001). Coleman suggests that parents play a primary role in promoting the status attainment of their children (cited in Perna & Titus 2005). Numerous subsequent studies show that higher levels of parental involvement in a child's education at home support better educational outcomes, promote positive attitudes and elevate aspirations (Halpern 2005).

The strength of the community networks that link parents, students and schools is found to increase retention rates and attainment levels, even when controlling for other background factors such as parental education and income (Winter 2000; Productivity Commission 2003; Halpern 2005; Bexley 2007). Community networks are important determinants of learning outcomes and can be used to help overcome disadvantage (OECD 2001; Fullarton 2002). Positive community networks can play a role in explaining why some people from disadvantaged groups can achieve educational success, while others who lack these support networks are more likely to fail (Holland 2009).

The importance of school networks in raising educational outcomes is well documented. Fullarton (2002) found that the school environment (as measured by a positive school climate, high-quality teachers and effective discipline) increases levels of student engagement. Khoo and Ainley (2005) show that students with positive attitudes towards their school (measured by students' general satisfaction with school, and their motivation, attitudes to their teachers, views on school provision of opportunities, and sense of achievement) have higher educational intentions and aspirations and a corresponding increase in education and training participation. Teachers influence student engagement by acting as role models, raising aspirations, influencing career goals and choices (Banks 2010).

Building networks through community participation, including social and leisure activities, is also important in achieving wellbeing and educational outcomes (Edwards 2004). Participation in extracurricular activities has also been found to have a positive effect on educational and social outcomes (OECD 2001; Fullarton 2002; Edwards 2004; Halpern 2005; Khoo & Ainley 2005). Fullarton (2002) shows that students who participate in extracurricular activities have higher levels of school engagement, with subsequent effects on academic achievement, while Khoo and Ainley (2005) show

that participation in extracurricular activities is likely to raise educational aspirations and participation in education.

Friendships and participation in community activities have been found to overcome the reliance on parental social capital and encourage the accumulation of social capital specific to the individual (Halpern 2005). The influence of informal networks, such as friends and relatives, is shown to play a part in the outcomes of young people, particularly males. Other studies that look at how young people use their informal networks to obtain employment have argued that informal networks play an important part in the job-finding methods of young males (Dockery & Strathdee 2003).

But social capital can also have negative effects. High levels of certain types of social capital can be a constraint, particularly among disadvantaged communities. Citizens can often be tied to family and community, making it difficult to move ahead of their current situation (Holland 2009). Some social networks can also create obstacles for young people. For example, youth can be connected to deviant social networks, or 'gangs', where they share knowledge and skills about street crime (Halpern 2005). In such socially debilitating networks, criminal behaviour might be considered acceptable, or even expected.

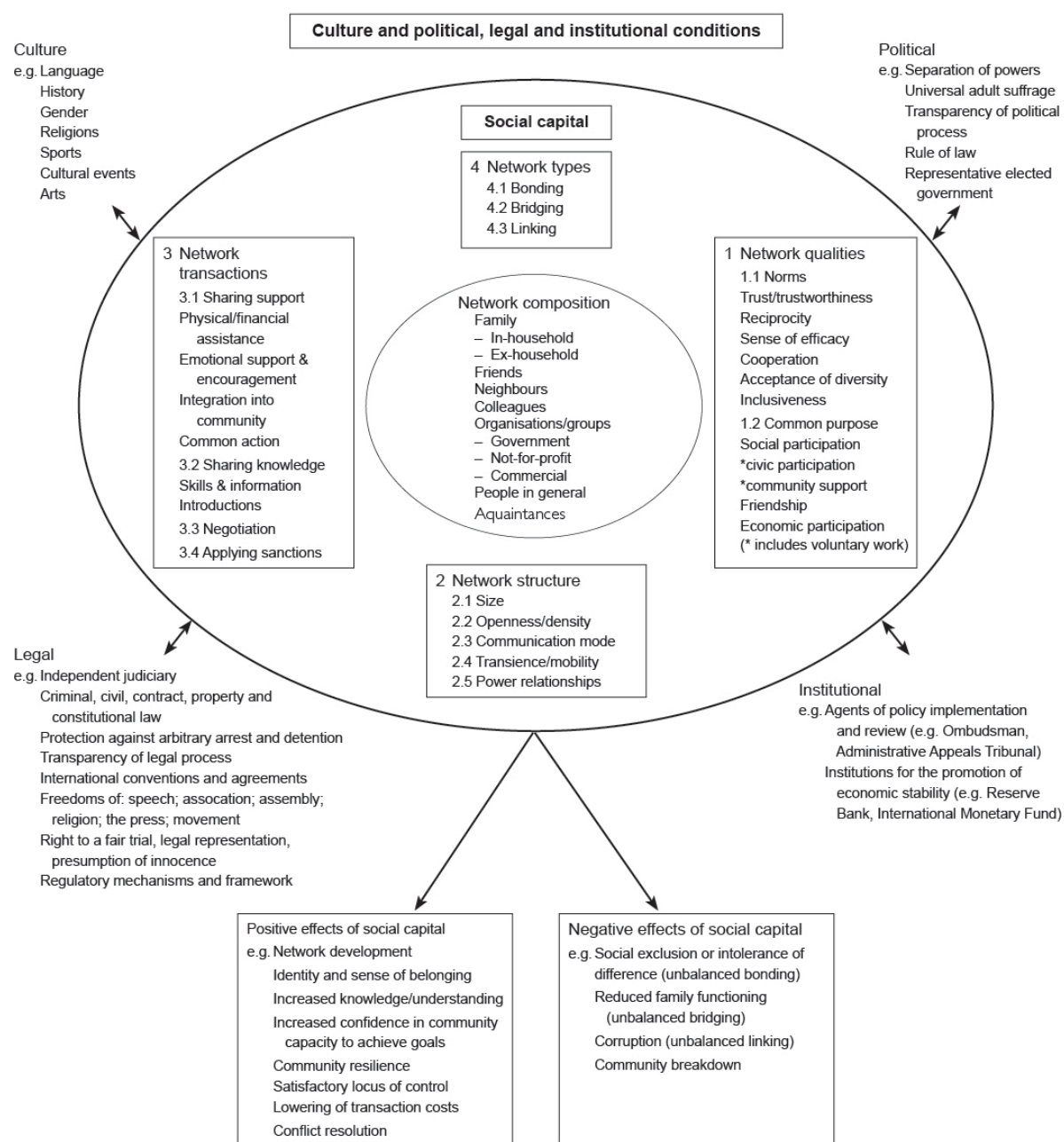
The effects of mobility on educational outcomes and its relationship to social capital are also discussed in the literature. High levels of mobility can sever network ties and disrupt family connections and thereby reduce a family's stock of social capital (Halpern 2005), with subsequent effects on educational retention. By contrast, mobility has the capacity to facilitate the formation of new ties and relationships (Edwards 2004), thus expanding and increasing those opportunities with the potential to influence student choices.

Measuring social capital

Social capital is a multi-dimensional concept, since different types of relationships and norms operate across different network types (Stone & Hughes 2002). So a range of measures are required to capture different elements of social capital. To identify data items that reflect social capital constructs, we draw on two prominent frameworks for measuring social capital: the Australian Bureau of Statistics (ABS) framework (Edwards 2004) and the Australian Institute for Family Studies (AIFS) conceptual framework (Stone & Hughes 2002).

The ABS framework for measuring social capital (figure 1) is centred around networks composed of family, friends and acquaintances, neighbours, colleagues, organisations and groups, and people in general (for example, strangers) or acquaintances. It distinguishes between four network attributes: qualities, structure, transactions and broad network types. *Network qualities* identifies behavioural norms and values that improve how networks function, such as trust and reciprocity. *Network structure* includes information about the size of the network, frequency of communication within the network and how dense or open the network is. *Network transactions* are the interactions that occur within networks and between organisations, including the provision of financial or emotional support and sharing knowledge. *Network types* overlaps with other framework attributes and differentiates between bonding, bridging and linking social capital. Bonding social capital refers to relationships between similar groups of people, while those with less in common are identified as having bridging social capital. Linking social capital is described as the 'vertical' relationships with those in authority needed to access financial resources or power.

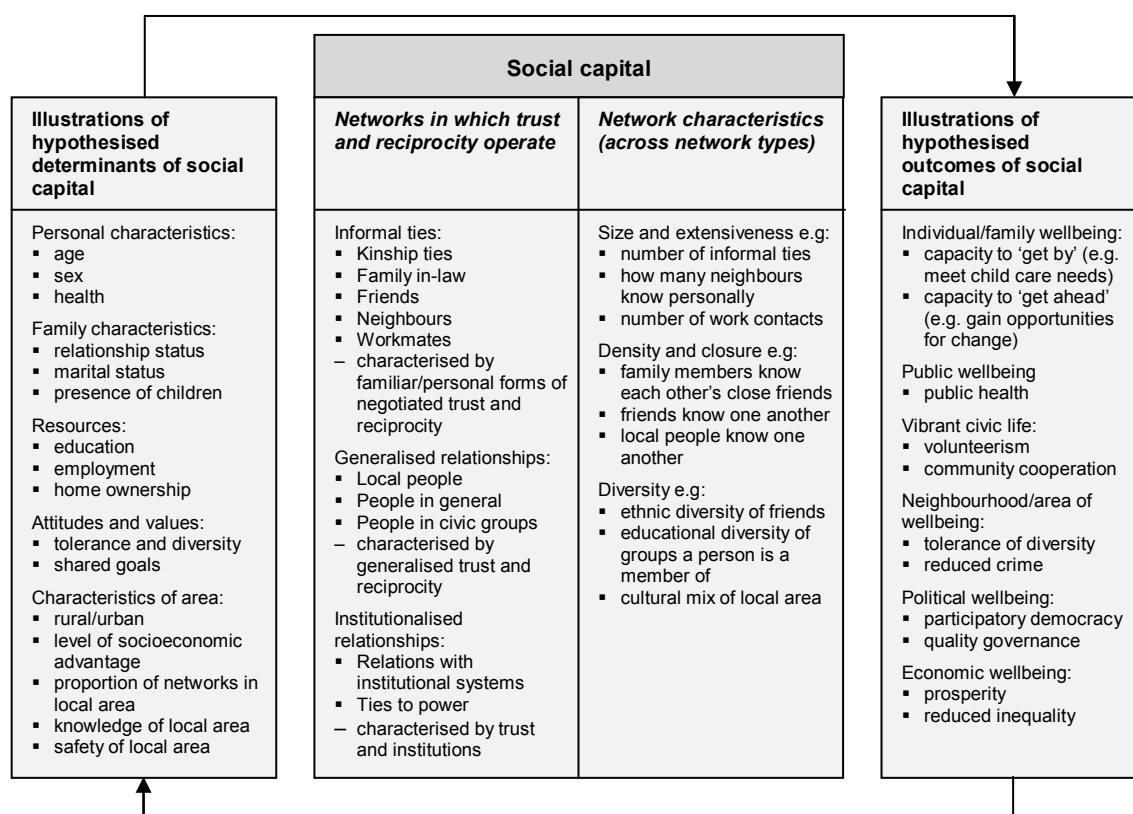
Figure 1 ABS framework for measuring social capital



Source: Edwards (2004).

The Australian Institute for Family Studies' conceptual framework for measuring social capital (figure 2) identifies three discrete network types: informal (friends, family, neighbours); general (strangers, civic groups); and institutional (legal system, the church, police, media, government). Informal, general and institutional networks are broadly characterised as 'bonding', 'bridging', and 'linking' ties, respectively. Each network type has a series of structural network characteristics which include network size, network density (that is, how network(s) may overlap) and network diversity.

Figure 2 Australian Institute for Family Studies conceptual framework for measuring social capital



Source: Cited in Stone & Hughes (2002).

Measuring social capital using LSAY

Drawing on the frameworks and measures of the ABS and the Australian Institute for Family Studies discussed in the previous section, a suite of LSAY¹ data items were identified which could be useful in measuring elements of social capital. We draw on the data items from the first wave of the LSAY 2003 cohort² that relate to those qualities and activities with a clear connection to social capital constructs. These questions and their relationship with social capital theory are outlined in table 1. We find that all three network types are represented by the LSAY data items.

Bonding social capital refers to the relationships between similar groups of people and is commonly represented by informal ties, including friends, family, neighbours and school networks. Data items 1–7 examine the bonds students have with their school by exploring the feelings of belonging they have to their school and whether their school is a place where they feel safe. Bonding social capital is also measured by the series of data items (8–12) that look at the quality of the relationship students have with their teachers, asking questions about how well students get along with their teachers, the level of help they are provided with, and how fairly they are treated.

¹ The Longitudinal Surveys of Australian Youth (LSAY) is a survey program that tracks groups of young Australians with the aim of studying their transition from school to further education and work. It uses nationally representative samples of 15-year-old students (or Year 9 students, as in the case for the earlier cohorts) and respondents are tracked annually using telephone interviews.

² This is the third LSAY cohort. Interviewing for this cohort commenced in 2003, when respondents were, on average, 15 years old.

Table 1 Social capital-related questions, LSAY 2003 cohort, wave 1 (2003)

Data item	Social capital-related questions	Network type	Network attributes
	School	Bonding	Qualities (trust and reciprocity)
	My school is a place where:		
1	▪ I feel like an outsider (or left out of things)		
2	▪ I make friends easily		
3	▪ I feel like I belong		
4	▪ I feel awkward and out of place		
5	▪ Other students seem to like me		
6	▪ I feel lonely		
7	Your school is a place where you feel safe and secure		
	Teachers	Bonding	Qualities (trust and reciprocity)
	Thinking about the teachers at your school: To what extent do you agree with the following statements?		
8	▪ Students get along well with most teachers		
9	▪ Most teachers are interested in students' wellbeing		
10	▪ Most of my teachers really listen to what I have to say		
11	▪ If I need extra help, I will receive it from my teachers		
12	▪ Most of my teachers treat me fairly		
	Activities	Bridging	Structure (size and frequency)
	During 2003, how often did you take part in the following school-organised activities:		
13	▪ Sport		
14	▪ Music, band or orchestra		
15	▪ Debating		
16	▪ Drama, theatre, dance or a school play		
	On average, how many hours do you spend each week:		
17	▪ playing sports		
	Community support	Bonding and bridging	Qualities (reciprocity) Structure (size and frequency)
	During 2003, how often did you take part in the following school-organised activities:		
18	▪ School support such as peer mediation, peer support or student representative council		
19	▪ Volunteer activities in the wider community which were organised by the school		
20	On average, how many hours do you spend each week:		
	▪ Doing unpaid/voluntary work		
	Influences of informal networks	Bonding and bridging	Qualities (trust) Structure (density)
21	▪ In thinking about your future, how much does your family influence your thinking?		
22	▪ How about your friends, in thinking about your future, how much do they influence your thinking?		
23	▪ Your school teachers, do they influence your thinking about what you'd like to do in the future?		
24	▪ How about the career advisor or counsellor at school, do they influence your thinking?		
25	▪ Finally, your own involvement in jobs or work experience at school? Does this influence your thinking?		
	Influences of institutional networks	Linking	Qualities (trust) Structure (density)
26	▪ And when you think about your future, how much does the media influence you?		

Bridging social capital is characterised by more general networks and tends to be related to strangers and broader community groups. Bridging social capital is explored using data items 13–17, which look at the bridges made through students' involvement in additional school-based activities, such as sport, music, debating and drama. These data items represent network attributes such as size and frequency by determining if and how often participation in additional activities occurs. Other school-organised activities, such as peer mediation, peer support and volunteering (data items 18–20), can represent both bonding and bridging network types, as they emphasise the strength of students'

bonds to their peers, although these can also help to establish broader, more general networks. Peer support and volunteering activities clearly represent network qualities of trust and reciprocity.

Bonding and bridging social capital are further represented by data items 21–5, which look at whether students are influenced by their networks when thinking about their future. Bonding social capital is represented by informal networks such as friends and family, while bridging social capital is represented by broader networks, such as careers advisors and work experience. The influence of the media when thinking about the future (data item 26) reflects ‘linking’ social capital, as it examines aspects of the relationship with an institutional network. This suite of data items illustrates the level of trust students have with their networks and also indicate the density of their networks – students influenced by their networks are likely to represent a dense network structure by having strong linkages and showing high levels of cooperation with those within the network.

Rather than attempting to analyse each of the 26 social capital items and their relationship with participation at age 17 separately, we group together the items that measure the same underlying social capital construct. We do this by conducting a factor analysis. A variety of response options and formats were available for each series of questions, so responses were recoded from the original categories into a seven-point scale, where one indicated a low incidence of social capital and seven indicated a high incidence of social capital.

The factor analysis in appendix A shows the correlations between the variables and the resulting factors. Five discrete factors were obtained from the analysis: student connectedness with school; student–teacher relations; influence of networks when thinking about the future; participation in school-based activities; and participation in sport.

The selection of the factors was based on two criteria: the ‘latent root criterion’ and the ‘percentage of variance criterion’. The latent root criterion is the most commonly used technique in determining the number of factors to retain. This criterion suggests that only factors having latent roots (eigenvalues) greater than one are considered significant, and all factors with latent roots less than one are considered insignificant and disregarded (Hair, Anderson & Tatham 1984). The ‘percentage of variance criterion’ suggests that factors should continue to be retained until the extracted factors account for at least 95 per cent of the variance, or the last factor accounts for only a small portion, that is, less than five per cent (Hair, Anderson & Tatham 1984).

Examining the eigenvalues of the correlation matrix and using the latent root criterion, it appears that our factor analysis would retain six factors, as the first six factors generated display eigenvalues greater than one. However, on considering the percentage of variance criterion, it is evident that only the first four factors are able to add to the amount of variance explained by more than five per cent. By the fifth factor, the amount of variance explained has dropped to below five per cent. We also considered the fifth factor, as it is evident that the underlying questions relate to participation in sport. Given that the literature on social capital suggests that sport contributes to the creation and development of social capital, this factor was also retained.

Analysis

The LSAY 2003 cohort at age 17

This analysis examines the influence of social capital on full-time participation in education and training at age 17. This age (rather than later ages) is used, in part because it broadly represents the first year following compulsory education. In 2005, when the respondent's average age was 17, the legal school leaving age was either 15 or 16 (depending on the state or territory in which the respondent resided).³ Measuring participation at any age prior to 17 years would not provide much insight, given that participation at this age was, broadly speaking, compulsory.

We also note that social capital is likely to change throughout a person's lifetime, and higher levels of social capital evidenced at early stages are likely to help in increasing social capital in the future. In this study, the earliest measures of social capital are available at the first wave of surveying, when respondents are aged 15 years. The cumulative effects of social capital are likely to increase at later ages (that is, at 18 or 19) and participation rates are likely to be a reflection of other unobservable effects, including changing levels of social capital. Measuring participation at age 17 therefore minimises these cumulative effects, and is more likely to represent the effects of social capital than if participation were measured at later ages.

There were 10 370 respondents who undertook the initial LSAY 2003 telephone interviews when they were, on average, 15 years of age. By the third wave in 2005, there were 8691 respondents. Table 2 profiles the LSAY respondents in 2005 during the third wave of interviewing when respondents were, on average, 17 years of age. The first variable in the table shows that at this age, about 80 per cent of respondents were still undertaking some form of education and training on a full-time basis. This includes study or training undertaken at school or as part of a recognised qualification. We see a reasonably equal split between males and females, about five per cent of our sample is Indigenous, and about four in five of the respondents are native students, that is, they are Australian-born and born to Australian parents. Close to one-third of the sample have parents with a university education, while more than two in five have upper secondary or vocational education and training (VET) qualifications. The remainder, about one in four, have lower secondary education or a VET certificate. Parental occupation is categorised using the International Standard Classification of Occupations (ISCO), and about half fall under the category 'white collar high skilled'. This category includes occupations from ISCO major groups 1, 2 and 3 (that is, 1 Legislators, senior officials and managers; 2 Professionals and technicians; and 3 Associate professionals). Close to two-thirds of respondents surveyed went to government schools, and about 70 per cent went to schools in metropolitan areas.

Table 3 provides summary statistics for student achievement scores. The achievement scores for maths, science, reading, and problem-solving are all normally distributed around a mean of about 526. Science has a slightly higher level of variability than the other subjects, with a standard deviation of 101.8, while problem-solving has the lowest standard deviation — about 91.3. The ranges for achievement scores also vary slightly; science has the largest range, from 96 to 868, while problem-solving has the smallest range, from 181 to 831.

³ Note that since the introduction of the Commonwealth Government's 'Compact for Young Australians', the school leaving age has now been raised to age 17 (from 1 January 2010).

Table 2 Characteristics of the LSAY 2003 cohort at age 17, 2005¹

	n	%
In full-time education or training		
Not in full-time education and training	1677	19.3
In full-time education and training	7014	80.7
Sex of respondent		
1 Male	4241	48.8
2 Female	4450	51.2
Indigenous status		
0 Non-Indigenous	8259	95.0
1 Indigenous	432	5.0
Immigration status		
1 Native students	6813	78.4
2 First-generation students	942	10.8
3 Non-native students	813	9.4
9 Missing	123	1.4
Parental education		
1 University	2559	29.4
2 Upper secondary/VET qualification	3712	42.7
3 Lower secondary/VET certificate	2248	25.9
9 Missing	172	2.0
Parental occupation		
1 White collar high skilled	4281	49.3
2 White collar low skilled	895	10.3
3 Blue collar high skilled	1939	22.3
4 Blue collar low skilled	1382	15.9
9 Missing	194	2.2
School sector		
1 Government	5406	62.2
2 Catholic	1874	21.6
3 Independent	1411	16.2
Geographic location		
1 Metro	6157	70.8
2 Provincial	2361	27.2
3 Rural	173	2.0
All	8691	100.0

Note: 1 With the exception of the variable, 'In full-time education or training', the remaining variables are based on information collected at the time of the first interview in 2003.

Table 3 Summary statistics for student achievement scores¹, LSAY 2003 cohort at age 17, 2005

Variable	n	Mean	Standard deviation	Minimum	Maximum
Plausible value in math	8691	524.2	95.5	161.3	833.3
Plausible value in reading	8691	525.7	97.3	112.0	848.2
Plausible value in science	8691	525.3	101.8	96.1	868.3
Plausible value in problem-solving	8691	530.0	91.3	181.3	830.7

Note: 1 Plausible values are used to counteract biases that may result from using different questionnaire booklets for student assessment. Further information about plausible values is available from the LSAY 2003 cohort user guide available at: <<http://www.lsay.edu.au/publications/2225.html>>.

The distribution plots of the social capital factor scores can be found in appendix B: Distribution of social capital. Examining these plots elicits some interesting observations and shows large differences in how the social capital factors are distributed. Both school connectedness and student–teacher

relations are negatively skewed; a large proportion of respondents display high levels of connectedness with their school and in student–teacher relations, but for those with lower levels, the distribution is more widely spread. The distribution of the social capital factor that depicts the influence of peers shows a slight negative skew, no activity in the tails, and a relatively small range, indicating that peer influences are a lot more homogenous than for the other factors. Participation in activities displays a positive skew, indicating that most respondents have, on average, low levels of participation in activities. For those with above average participation in activities, these levels are more variable. Finally, the distribution of participation in sport is a little obscure and appears to demonstrate a somewhat bi-modal nature. This may reflect the fact that only two questions constitute this social capital factor. Respondents tend to either have low (below average) or high (above average) levels of participation in sport, with little variation.

Survey attrition

It is also important to note the limitation of the analysis due to survey attrition, which occurs when respondents drop out of the survey. This limitation is made worse if we find that attrition is biased, that is, respondents with certain characteristics are more likely to drop out of the survey. This issue is, in part, dealt with by creating attrition weights in an attempt to address bias.

Characteristics considered in the LSAY Y03 weights include: family structure; parents' highest education level; immigration status; year level; intended occupational level; education program; Indigenous status; sex and geographic location (Rothman 2007). These variables, which were used to calculate the LSAY weights, encapsulate the variables we use to determine a respondent's background (which we use later to control for background effects). We can therefore be confident that any attrition bias that results from using data from the third wave is accounted for by using weights, and we subsequently use weights for all analyses conducted for this paper.

We also need to consider how attrition bias may pose other limitations on our analysis, as there could be some attrition bias present relating to differing levels of social capital. For example, respondents with low levels of social capital may be more likely to drop out of the survey than their peers with high levels of social capital. We test this theory by comparing the distribution of social capital from the first wave of interviewing (2003) to the wave of interest (wave 3 in 2005).

Table 4 shows the distribution of respondents using social capital quartiles. The social capital quartiles are calculated using the scores from the factor analysis in wave 1 in 2003. We note that social capital factor scores are missing for about one-third of respondents,⁴ which allows for about 17 per cent of respondents to fall within each quartile. The distribution of respondents in 2005 is then compared using the same social capital quartiles calculated in 2003. We find that the distributions of social capital are comparable between the two survey waves, and any differences are only minor. This suggests that any attrition bias related to social capital would only be small.

⁴ A missing response to just one of the 26 data items would result in a missing factor score.

Table 4 LSAY 2003 respondents by social capital factor score quartile (unweighted), 2003 and 2005

	2003		2005	
	<i>n</i>	%	<i>n</i>	%
Factor 1: Connectedness with school				
1 Lowest quartile	1 758	17.0	1 479	17.0
2 Second quartile	1 759	17.0	1 473	16.9
3 Third quartile	1 758	17.0	1 500	17.3
4 Highest quartile	1 758	17.0	1 490	17.1
9 Missing	3 337	32.2	2 749	31.6
Factor 2: Student–teacher relations				
1 Lowest quartile	1 758	17.0	1 399	16.1
2 Second quartile	1 759	17.0	1 481	17.0
3 Third quartile	1 758	17.0	1 513	17.4
4 Highest quartile	1 758	17.0	1 549	17.8
9 Missing	3 337	32.2	2 749	31.6
Factor 3: Influence of peers				
1 Lowest quartile	1 758	17.0	1 471	16.9
2 Second quartile	1 759	17.0	1 498	17.2
3 Third quartile	1 758	17.0	1 518	17.5
4 Highest quartile	1 758	17.0	1 455	16.7
9 Missing	3 337	32.2	2 749	31.6
Factor 4: Participation in school-based activities				
1 Lowest quartile	1 758	17.0	1 453	16.7
2 Second quartile	1 759	17.0	1 471	16.9
3 Third quartile	1 758	17.0	1 492	17.2
4 Highest quartile	1 758	17.0	1 526	17.6
9 Missing	3 337	32.2	2 749	31.6
Factor 5: Participation in sport				
1 Lowest quartile	1 758	17.0	1 451	16.7
2 Second quartile	1 759	17.0	1 487	17.1
3 Third quartile	1 758	17.0	1 494	17.2
4 Highest quartile	1 758	17.0	1 510	17.4
9 Missing	3 337	32.2	2 749	31.6
All	10 370	100.0	8 691	100.0

Modelling educational participation using social capital

In developing our model, we conceptualise the relationship between social capital and future participation in education and training by using an ‘education production function’.⁵ Production functions simply describe maximum feasible outputs, based on different sets of inputs (Hanushek 1979). Education production functions have commonly been used to examine relationships between schooling inputs and test score outcomes (Todd & Wolpin 2003). For this study, the output can be conceptualised as participation in education and training, and measures of social capital (and the other background variables) provide us with the model inputs. If the production function is known for educational participation, then it is possible to predict what would happen if certain resources, that is, social capital, were added or removed (Hanushek 1989); this therefore enables us to determine the relative importance of the social capital inputs.

⁵ We thank an anonymous referee for suggesting this conceptualisation.

Our choice of background variables draws on the substantial body of previous research using LSAY data. Students whose parents had higher education levels and occupational status are more likely to participate in education and training (Marks et al. 2000; Fullarton 2002; Curtis & McMillan 2008). Cultural background is also an important predictor: students' whose parents are born in non-English speaking countries are more likely to stay in education (Lamb 1997; Marks et al. 2000). Indigenous students are also found to have significantly lower rates of participation than non-Indigenous students (Marks et al 2000; Curtis & McMillan 2008). There are also gaps in participation, based on school sector and location: independent school students and students from metropolitan schools have higher retention rates than those from non-independent and non-metropolitan schools (Lamb 1997; Marks et al. 2000; Curtis & McMillan 2008). And finally, academic achievement is also a strong predictor of educational participation (Lamb 1997; Marks et al. 2000; Curtis & McMillan 2008).

As with all models of this type, we are not immune from missing variables, such as teaching quality or a child's capacity to learn, and endogeneity. In relation to the latter, our models condition importantly on two variables: the extent of social capital at age 15 and academic achievement at age 15. Clearly, there are broader factors that impinge on the variables, but we have no way of capturing — or instrumenting these. Instrumental variables (IV) regression can be used to obtain consistent estimates of the unknown coefficients of the regression model by using additional variables to isolate variations in the covariates that are uncorrelated with the error term. However, in practice, finding valid instruments can be extremely difficult (Stock & Watson 2003).

The inclusion of educational achievement is our attempt to at least partially overcome these issues. A 'value-added' specification incorporates a lagged achievement score into the model to account for historical inputs and heritable endowments (Todd & Wolpin 2003); this specification is generally regarded as being better than that based on purely contemporaneous specifications. Academic achievement is used because it is an outcome of a cumulative process of acquired knowledge, and past achievement is likely to influence future outcomes. By controlling for academic achievement at age 15, we are able to consider the effect that personal characteristics, such as ability, might have on our social capital and educational participation. We can therefore estimate the effect of social capital on educational participation, conditional on past educational achievement.

However, we acknowledge that our approach most likely underestimates the effect of social capital on participation. This is because high levels of early social capital are likely to have led to better academic achievement at age 15 — on which we are conditioning.

Multivariate logistic regression modelling

Using the five social capital factors obtained in the previous section, we use logistic regression to model the impact of these five explanatory social capital variables (at an average age of 15) on participation in education and training two years later (at age 17). We control for a range of background effects that are known predictors of educational retention including: Indigenous status; immigration status; parental education; parental occupation; school sector; school location; and student achievement.

Separate models are estimated for males and females on the basis that levels of social capital and its effects are likely to be different for males and females. For example, boys' rates of participation in sport are higher than those of females, while females have higher rates of participation in other activities such as drama. These different levels of participation reflect different rates of access to social capital and may be an influence on future participation in education and training. Studies show

that, after taking into account school achievement, individual schools and other factors, boys are more likely to leave school early than girls (Fullarton 2002). One could hypothesise that this difference could be attributed to boys' lower rates of participation in some types of school-based activities.

Results from the logistic regression models are reported in table 5. The estimated coefficients represent the average effect of the explanatory variables on the likelihood of participation in education and training at age 17. A positive coefficient indicates that having larger values of that characteristic increases an individual's likelihood of educational participation.

We find that, for both males and females, student–teacher relations and participation in school-based activities are positively and significantly related to the likelihood of participation in education and training at age 17.

For females, participation in sport also plays an important role in predicting educational participation. In contrast, participation in sport appears to have a negligible and insignificant relationship to future educational participation for males. However, the connectedness males have with their school, while not statistically significant at the ten per cent level, does still show some importance. The effect of school connectedness for females is less pronounced.

Table 5 Logistic regression results for males and females, LSAY 2003 cohort

Parameter		Males		Females	
		Coeff.	Pr > Chi Sq	Coeff.	Pr > Chi Sq
Intercept		0.658	0.574	-0.497	0.519
F1_school		0.075	0.152	0.058	0.225
F2_teacher		0.158	0.002	0.158	0.003
F3_peer		0.048	0.401	0.022	0.658
F4_activities		0.243	0.000	0.234	<.0001
F5_sport		-0.001	0.985	0.149	0.008
Indigenous status	0 Non-Indigenous	0.668	0.044	0.171	0.601
Indigenous status	1 Indigenous	-	-	-	-
Immigration status	1 Native students	-0.319	0.109	-0.041	0.814
Immigration status	2 First-generation students	0.080	0.758	0.045	0.836
Immigration status	3 Non-native students	-	-	-	-
Parental education	1 University	0.601	0.000	0.428	0.002
Parental education	2 Upper secondary/VET qualification	0.153	0.213	0.273	0.015
Parental education	3 Lower secondary/VET certificate	-	-	-	-
Parental occupation	1 White collar high skilled	0.422	0.005	-0.042	0.772
Parental occupation	2 White collar low skilled	0.297	0.134	-0.152	0.408
Parental occupation	3 Blue collar high skilled	0.278	0.077	-0.222	0.135
Parental occupation	4 Blue collar low skilled	-	-	-	-
School sector	1 Government	-0.390	0.025	-0.234	0.119
School sector	2 Catholic	0.181	0.370	0.167	0.337
School sector	3 Independent	-	-	-	-
School location	1 Metro	-1.290	0.222	-0.106	0.855
School location	2 Provincial	-1.406	0.183	-0.214	0.714
School location	3 Rural	-	-	-	-
Maths achievement		-0.001	0.690	0.004	0.007
Reading achievement		0.003	0.025	0.001	0.394
Science achievement		0.000	0.873	0.002	0.112
Problem-solving achievement		0.001	0.658	-0.003	0.046

The coefficients from table 5 can be used to calculate the predicted likelihood of each respondent participating in education and training at age 17, based on their individual characteristics, as represented by the explanatory variables.

To better understand the results of the logistic regression, we determine the relative importance of the social capital factors by calculating the likelihood of participation in education and training based on the ‘size’ of a respondent’s social capital. The ‘size’ of a respondent’s social capital can be illustrated using percentiles of the factor scores. For example, respondents who have weak bonds with their teachers are represented by the fifth percentile of factor scores for student–teacher relations, and respondents with strong bonds with their teachers are represented by the 95th percentile of factor scores. Similarly, we define low and high scores for student connectedness with their school, influence of networks, participation in school-based activities, and participation in sport.

The coefficients on the social capital variables are difficult to understand intuitively, so we convert them to the probability of educational participation being associated with a particular social capital factor in isolation from the impact of the remaining explanatory variables. We do this by taking the average values for the remaining explanatory variables and substitute values for the social capital factor at the fifth and 95th percentiles. This illustrates how the probability of educational participation varies across the range of social capital factor scores.

Table 6 shows the likelihood of participating in education and training based on the lowest (fifth percentile) and highest (95th percentile) scores for the five social capital factors for both males and females.

Table 6 Probability of participating in education and training at 17 years by level of social capital at 15 years, LSAY 2003 cohort

Social capital factor	Level of social capital					
	Males			Females		
	Low (5th percentile)	High (95th percentile)	Difference	Low (5th percentile)	High (95th percentile)	Difference
1 Connectedness with school	0.817	0.849	0.032	0.789	0.817	0.029
2 Student–teacher relations	0.800	0.870	0.070	0.770	0.842	0.073
3 Influence of networks	0.828	0.848	0.020	0.803	0.814	0.011
4 School-based activities	0.804	0.891	0.087	0.760	0.871	0.111
5 Sport	0.840	0.839	0.000	0.776	0.839	0.064

Note: Probabilities are calculated for males and females for all social capital factors; however, not all social capital factors were found to impact significantly on the likelihood of educational participation. Those deemed significant at the five per cent level are highlighted.

Table 6 shows that positive student–teacher relations is a very important influence on a student’s future educational participation. The probability of participating in education and training at age 17 increases from 80 to 87 per cent for males and from 77 to 84 per cent for females as the factor score for student teacher relations increases from the fifth to the 95th percentile.

Participation in school-based activities has an even larger impact on the likelihood of participating in education and training at age 17. As the factor score for participation in school-based activities increases from the fifth to the 95th percentile, the likelihood of participation in education and training increases from 80 to 89 per cent for males, and from 76 to 87 per cent for females.

We also find that females who participate in sport more frequently were also more likely to participate in education and training two years later. For females at the fifth percentile of

participation in sport (that is, with the lowest rates of sporting participation), the likelihood of participating in education and training at age 17 was 78 per cent. For females at the 95th percentile of participation in sport (that is, with the highest rates of sporting participation), educational participation rose to 84 per cent.

For males, their sense of belonging to their school, while not significant at the ten per cent level, does play some role in increasing their rates of educational participation. An increase of the factor score for school connectedness from the fifth to the 95th percentile increases the likelihood of participation in education and training for males from 82 to 85 per cent.

From this analysis we can conclude that higher levels of social capital, at least in the form of student–teacher relations and school-based activities, do impact significantly on future participation in education and training for both males and females. In addition, participation in sport is an important influence for females, while the connectedness that males have with their schools also plays some role on their future rates of educational participation.

Social capital and academic orientation

We have inferred from our model that social capital matters and this suggests that intervention to increase social capital could affect disadvantage, such as low socioeconomic status. However, this conclusion would be problematic if it turned out that all variation in social capital occurs among the advantaged students. In that case, our model would merely be telling us that increasing social capital adds to advantage.

We must therefore test whether the results presented here suffer from a problem of ‘common support’. In randomised experiments, the common support problem occurs when there is a lack of overlap in the distributions of the key predictors between the treatment and control groups (Rubin 2008). For our study, a common support problem would equate to a lack of overlap in the distributions of the social capital factor scores between respondents from both advantaged and disadvantaged backgrounds.

Rather than investigate the relationships between each background characteristic and factor score separately (which would require 50 separate analyses), we summarise the effects of the background characteristics on educational participation using an academic orientation score. We measure academic orientation by modelling the probability of participation in education and training at age 17 against a series of background variables that are known predictors of educational retention. These include respondent’s Indigenous status, their parents’ socioeconomic status as measured by parental educational and occupational levels, school sector, geographic location, and student achievement (Dockery 2005). Cultural background, measured by immigration status, is also included in the model, as students whose parents are from non-English speaking backgrounds are found to have higher rates of educational participation (Marks et al. 2000). A logistic regression model is used to estimate the effect of these individual background characteristics on the probability of educational participation. The results of the regression analysis can be found in appendix D: Logistic regression (2).

The coefficients from the model are then used to calculate the predicted likelihood of each respondent participating in education and training at age 17, based on their individual characteristics as represented by the explanatory variables. This calculation produces a score for each respondent that represents educational orientation – a high score would indicate they are more likely to participate in education and training, while a low score would indicate the reverse.

We then compare the distribution of the social capital factor scores for respondents with high and low educational orientations. For this analysis, we define those with low educational orientation as those with an educational orientation score in the bottom 25th percentile (that is, the lowest quartile), and similarly those with high educational orientations as those with an educational orientation score in the top 25th percentile (that is, highest quartile). The distributions of the social capital scores for the two groups can be found in appendix E: Distribution of social capital by academic orientation.

We find that the distributions of social capital are comparable across respondents with high and low academic orientations. We can therefore conclude that social capital is not simply something that occurs among the already advantaged.

We can further examine the relationships between the social capital factor scores and academic orientation by calculating a simple correlation between the variables. The results are shown in table 7. Broadly speaking, the correlations between academic orientation and the social capital factor scores are weak and do not vary much between males and females.

We can therefore be confident that social capital is relevant across the full range of backgrounds, which is important because it means that social capital has the potential to address the influence of disadvantageous background characteristics.

Table 7 Pearson correlation coefficients of academic orientation scores with social capital factor scores

Social capital factor	Males		Females	
	Coeff.	Pr > r	Coeff.	Pr > r
1 Connectedness with school	0.00	0.943	0.05	0.003
2 Student—teacher relations	0.20	<.0001	0.20	<.0001
3 Influence of networks	-0.20	<.0001	-0.18	<.0001
4 Participation in school-based activities	0.19	<.0001	0.16	<.0001
4 Participation in sport	0.03	0.134	0.12	<.0001

Conclusion

This paper has explored the notion that social capital is an important determinant of educational outcomes. From our analysis, it is clear that social capital does play an important role in influencing educational participation. What is most interesting is that we were able to demonstrate the relative importance of different types of social capital.

We found that, for both males and females, participation in school-based activities was the most important social capital factor influencing educational participation; this was followed by the strength of the relationship students have with their teachers. Increasing rates of participation in sport also increased educational participation at age 17 for females. And for males, the level of connectedness they had with their school also appears to have played some role in promoting higher rates of participation in education and training.

Overall, it is likely that our findings underestimate the net effects of social capital. This is because the results obscure the role of social capital accumulated prior to the age of 15. Specifically, the effect of previous social capital will have been captured to some extent by our academic achievement control.

One of the key discussions emerging from the literature is how social capital can mediate the effects of disadvantage. Social capital has been used to explain how students from low socioeconomic backgrounds are able to achieve successful outcomes, and this analysis sheds further light on this issue. We observed that, on controlling for background characteristics that considered the socioeconomic predictors of student retention (including parental education and occupation, Indigenous status, school sector and geographic location), increases in social capital factor scores were found to increase the likelihood of participation in education and training. This analysis thus shows that social capital does have the potential to mediate the effects of disadvantage.

Our confidence in this conclusion is further strengthened by our analysis of the distribution of social capital across young people with different academic orientations. It is not the case that social capital is heavily skewed towards those who already have high probabilities of participation in education and training and that social capital is merely loading advantage on advantage. This suggests that increased social capital can have a real effect on the educational outcomes of young people from disadvantaged backgrounds.

References

- Banks, G 2010, 'Advancing Australia's "human capital agenda"', lecture presented at the fourth Ian Little lecture, 13 April 2010, Melbourne, viewed April 2010, <<http://www.apo.org.au/research/advancing-australias-human-capital-agenda>>.
- Bexley, E 2007, *Social capital theory and practice*, Centre for the Study of Higher Education, University of Melbourne.
- Biddle, N, Davis, E, Myers, J & Dodhy, RS 2009, *Exploring measures of social capital*, cat.no.1351.0.55.024, ABS, Canberra.
- Bourdieu, P 1986, 'The forms of capital', in J Richardson (ed.), *Handbook of theory and research for the sociology of education*, Greenwood, New York, pp.183–98.
- Coleman, JC 1988, 'Social capital in the creation of human capital', *American Journal of Sociology*, vol.94, pp.595–S120.
- Curtis, D & McMillan, J 2008, *School non-completers: profiles and initial destinations*, LSAY research report no.54, Australian Council for Educational Research, Camberwell, Vic.
- Dockery, A 2005, *Assessing the value of additional years of schooling for the non academically inclined*, LSAY research report no.38, Australian Council for Educational Research, Camberwell, Vic.
- Dockery, AM & Strathdee, R 2003, *The job finding methods of young people in Australia: an analysis of the Longitudinal Surveys of Australian Youth, Year 9 (1995) sample*, LSAY research report no.37, Australian Council for Educational Research, Camberwell, Vic.
- Edwards, RD 2004, *Measuring social capital: an Australian framework*, cat.no.1378.0, ABS, Canberra.
- Fullarton, S 2002, *Student engagement with school: individual and school-level influences*, LSAY research report no.27, Australian Council for Educational Research, Camberwell, Vic.
- Hair, JF Jr, Anderson, RE & Tatham, RL 1984, *Multivariate data analysis with readings*, 2nd edn, Macmillan Publishing Company, New York.
- Halpern, D 2005, *Social capital*, Polity Press, Cambridge, UK.
- Hanushek, EA 1979, 'Conceptual and empirical issues in the estimate of educational production functions', *The Journal of Human Resources*, vol.14, no.3, pp.351–88.
- 1989, 'The impact of differential expenditures on school performance', *Educational Researcher*, vol.18, no.4, pp.45–62.
- Holland, J 2009, 'Young people and social capital: uses and abuses', *SAGE publications*, vol.17, no.4, pp.331–50.
- Khoo, ST & Ainley, J 2005, *Attitudes, intentions and participation*, LSAY research report no.41, Australian Council for Educational Research, Camberwell, Vic.
- Lamb, S 1997, *School achievement and initial education and labour market outcomes*, LSAY research report no.4, Australian Council for Educational Research, Camberwell, Vic.
- Marks, GN & McKenzie, P 2000, *Early school leaving and 'non-completion' in Australia*, LSAY briefing paper no.2, Australian Council for Educational Research, Camberwell, Vic.
- Marks, GN, Fleming, N, Long, M & McMillan, J 2000, *Patterns of participation in Year 12 and higher education in Australia: trends and issues*, LSAY research report no.17, Australian Council for Educational Research, Camberwell, Vic.
- OECD (Organisation for Economic Cooperation and Development) 2001, *The well-being of nations: the role of human and social capital*, Paris.
- Perna, LW & Titua, MA 2005, 'The relationship between parental involvement as social capital and college enrolment: an examination of racial/ethnic group differences', *Journal of Higher Education*, vol.76, no.5, pp.485–518.
- Productivity Commission 2003, *Social capital: reviewing the concept and its policy implications*, research paper, AusInfo, Canberra.
- Putnam, R 1993, *Making democracy work and civic traditions in modern Italy*, Princeton University Press, Princeton, NJ.
- Rothman, S 2007, *Sampling and weighting of the 2003 LSAY cohort*, LSAY technical report no.43, Australian Council of Educational Research, Camberwell, Vic.
- Rubin, DB 2008, 'For objective causal inference, design trumps analysis', *The Annals of Applied Statistics*, vol.2, no.3, pp.808–40.
- Stock, JH & Watson, MW 2003, *Introduction to econometrics*, Addison Wesley, Boston, MA.

- Stone, W & Hughes, J 2002, *Social capital: empirical meaning and measurement validity*, Australian Institute of Family Studies, Melbourne.
- Thomson, S & Hillman, K 2010, *Against the odds: influences on the post-school success of 'low performers'*, NCVER, Adelaide.
- Todd, PE & Wolpin, KI 2003, 'On the specification and estimation of the production function for cognitive achievement', *The Economic Journal*, vol.113, no.485, pp.F3–F33.
- Winter, I 2000, *Towards a theorised understanding of family life and social capital*, working paper no. 21, Australian Institute of Family Studies, Melbourne.

Appendix A: Factor analysis

A factor analysis is conducted to group together 26 data items from the LSAY 2003 cohort to establish factors that reflect discrete social capital constructs. Responses were recoded from the original categories into a seven-point scale, where 1 indicates a low incidence of social capital and 7 indicates a high incidence of social capital.⁶

The correlations between the variables and the resulting factors can be found in table A1. The eigenvalues of the correlation matrix and percentage of variance explained for each factor can be found in table A2.

Five discrete factors were retained: student connectedness with school; student–teacher relations; influence of networks when thinking about the future; participation in school-based activities; and participation in sport. This decision was based on two criteria: the ‘latent root criterion’ and the ‘percentage of variance criterion’. On examining the eigenvalues of the correlation matrix, and using the latent root criterion, our factor analysis would retain six factors, as the first six generated factors display eigenvalues greater than 1. However, on considering the percentage of variance criterion, it is evident that only the first four factors are able to add to the amount of variance explained by more than five per cent. The fifth factor was also retained, as the underlying questions relate to participation in sport and the literature on social capital suggests that sport contributes to the creation and development of social capital.

Table A1 Rotated factor pattern

Social capital data items			Factor					
Data item	Variable name	Variable label	1 School	2 Teacher	3 Influences	4 Activities	5 Sport	6 Misc
1	ST27Q01	Feel an outsider Q27a	0.80	0.08	-0.01	-0.03	0.01	-0.10
6	ST27Q06	Feel lonely Q27f	0.77	0.04	0.00	-0.02	0.00	-0.08
4	ST27Q04	Feel awkward Q27d	0.77	0.08	0.00	0.01	0.02	-0.13
3	ST27Q03	Feel I belong Q27c	0.72	0.21	0.07	0.03	0.03	-0.05
2	ST27Q02	Make friends Q27b	0.69	0.05	0.07	0.05	0.08	0.07
5	ST27Q05	Think I'm liked Q27e	0.68	0.07	0.03	0.05	0.01	0.11
10	ST26Q03	Listen to me Q26c	0.10	0.78	0.04	0.05	0.04	-0.05
12	ST26Q05	Treat me fairly Q26e	0.06	0.77	0.02	0.03	-0.03	-0.07
9	ST26Q02	Interested in students Q26b	0.10	0.77	0.04	0.05	0.02	0.00
11	ST26Q04	Give extra help Q26d	0.11	0.72	0.03	0.05	-0.03	0.01
8	ST26Q01	Well with students Q26a	0.08	0.71	0.02	0.05	0.05	0.00
23	LAA035C	A35c Influence of school teachers	0.01	0.17	0.68	0.03	0.04	0.02
22	LAA035B	A35b Influence of friends	0.05	-0.03	0.65	0.01	0.02	-0.07
21	LAA035A	A35a Influence of family	0.02	0.03	0.63	-0.04	0.04	-0.04
24	LAA035E	A35e Influence of school career advisor	0.01	0.05	0.63	-0.02	0.07	-0.03
25	LAA035F	A35f Influence of work experience	0.05	0.01	0.52	0.01	0.00	0.14
26	LAA035D	A35d Influence of media	-0.02	-0.04	0.48	0.08	-0.09	-0.01

⁶ A false assumption was made about the size of the scale for the series of data items ST26Q01 to ST26Q05. This was found to have no material effect on the eigenvalues of the correlation matrix or subsequent analyses and, as a result, the analyses were not re-run.

Social capital data items			Factor					
Data item	Variable name	Variable label	1 School	2 Teacher	3 Influences	4 Activities	5 Sport	6 Misc
15	LAA031C	A31c Participation in debating	0.01	0.03	0.01	0.59	-0.02	0.02
19	LAA031F	A31f Participation in school-sponsored volunteer activities	-0.02	0.06	0.12	0.58	0.15	0.02
16	LAA031D	A31d Participation in drama	0.04	0.01	-0.02	0.58	-0.05	-0.02
18	LAA031E	A31e Participation in school/peer support	0.08	0.03	0.07	0.58	0.16	0.08
14	LAA031B	A31b Participation in music	-0.04	0.07	-0.07	0.55	-0.07	-0.05
17	HRS_SPO	Hours playing sport (Q29b_d)	0.09	0.02	0.03	-0.10	0.79	0.15
13	LAA031A	A31a Participation in sport	0.03	0.00	0.01	0.27	0.73	-0.16
20	HRS_UNPD	Hours doing unpaid/voluntary work (29b_f)	0.01	0.08	0.08	0.09	0.11	0.80
7	LAA028L	A28l You feel safe and secure	0.17	0.24	0.11	0.07	0.13	-0.54

Table A2 Eigenvalues of the correlation matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	4.18	1.70	0.16	0.16
2	2.47	0.32	0.10	0.26
3	2.16	0.40	0.08	0.34
4	1.76	0.59	0.07	0.41
5	1.17	0.13	0.04	0.45
6	1.04	0.11	0.04	0.49
7	0.93	0.04	0.04	0.53
8	0.89	0.01	0.03	0.56
9	0.88	0.01	0.03	0.60
10	0.87	0.03	0.03	0.63
11	0.83	0.05	0.03	0.66
12	0.79	0.01	0.03	0.69
13	0.78	0.02	0.03	0.72
14	0.76	0.04	0.03	0.75
15	0.72	0.03	0.03	0.78
16	0.69	0.03	0.03	0.80
17	0.65	0.02	0.03	0.83
18	0.63	0.05	0.02	0.85
19	0.58	0.05	0.02	0.88
20	0.54	0.04	0.02	0.90
21	0.50	0.01	0.02	0.92
22	0.49	0.01	0.02	0.93
23	0.47	0.03	0.02	0.95
24	0.44	0.04	0.02	0.97
25	0.40	0.03	0.02	0.99
26	0.37		0.01	1.00

Appendix B: Distribution of social capital

The following charts provide an illustration of the distribution of the social capital factor scores.

Figure B1 Distribution of school connectedness (factor 1 scores)

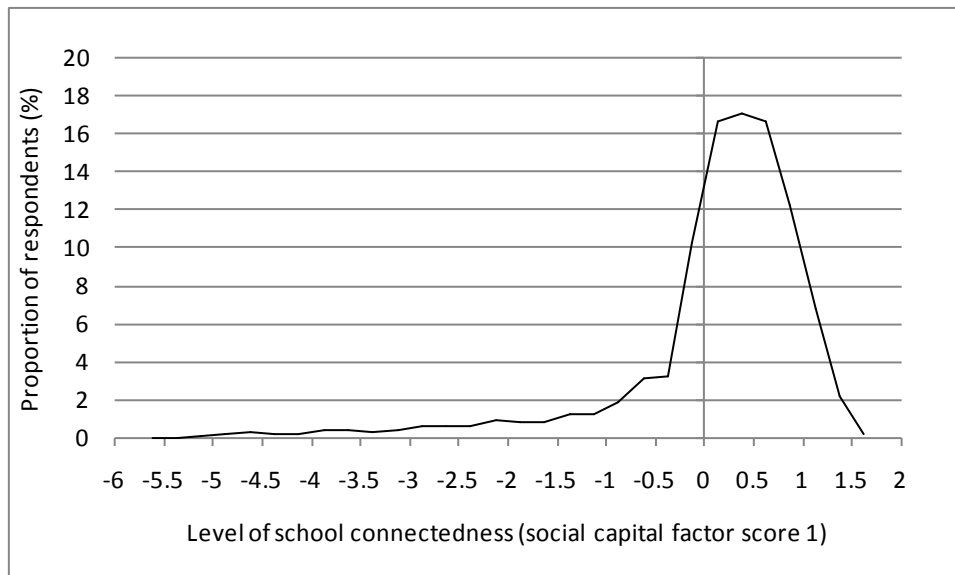


Figure B2 Distribution of student-teacher relations (factor 2 scores)

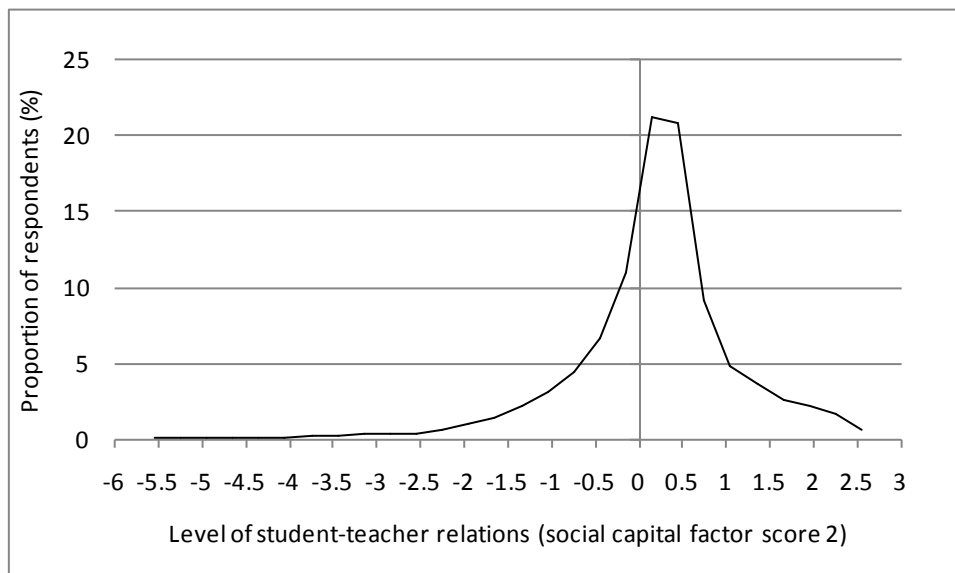


Figure B3 Distribution of peer influences (factor 3 scores)

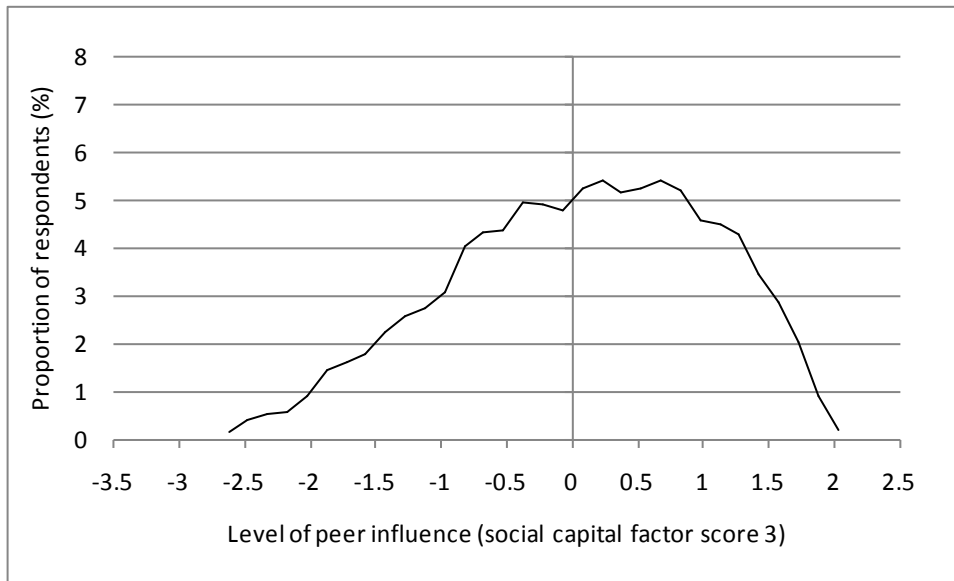


Figure B4 Distribution of participation in activities (factor 4 scores)

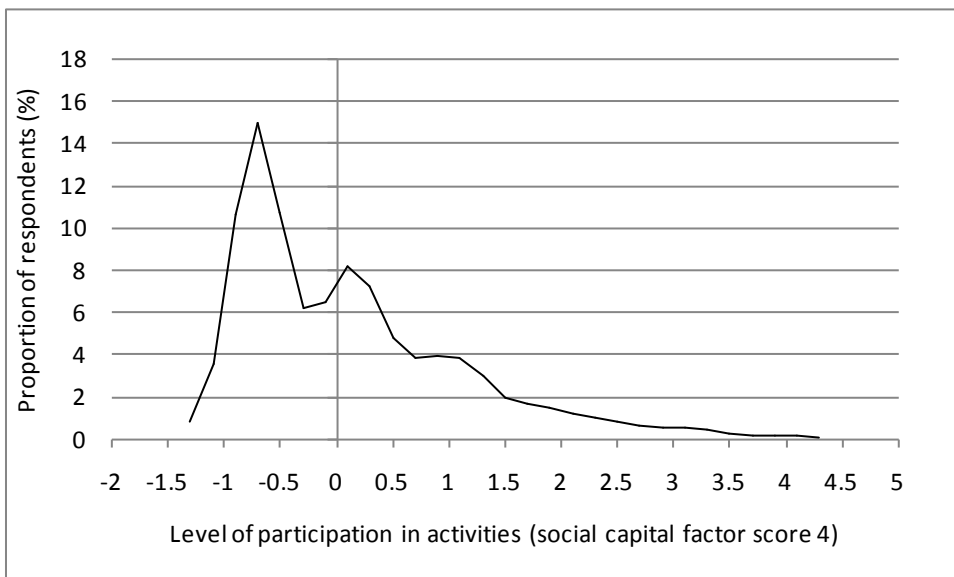
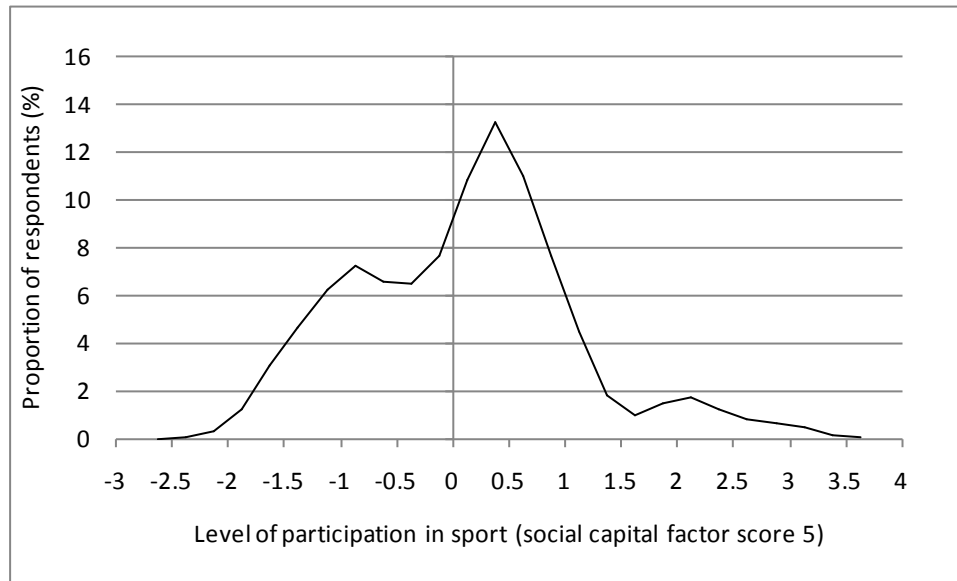


Figure B5 Distribution of participation in sport (factor 1 scores)



Appendix C: Logistic regression (1)

We use the social capital factors outlined in appendix A: Factor analysis to determine whether having (higher levels of) social capital can influence a student's future participation in education and training.

Background effects were controlled for by modelling the social capital factor scores as a function of the background variables and using the factor score residuals obtained to model participation in education and training.

Estimating propensity scores of participation in education or training using logistic regression:

Let $p = \Pr(Y = 1 | x)$, then

$$\ln\left(\frac{p_i}{1 - p_i}\right) = \alpha_i + \beta_i x_i + \varepsilon$$

$$p_i = \frac{\exp(\alpha_i + \beta_i x_i)}{1 + \exp(\alpha_i + \beta_i x_i)}$$

where

Y is the binary response variable where $Y = 1$ if individual participated in education and training, and 0 otherwise

p_i is the predicted probability of participating in education and training, given the response variable $Y = 1$. The predicted probabilities are the estimated propensity scores.

α_i is the intercept parameter

β_i is the vector of regression coefficients for the explanatory variables

x_i is the vector of explanatory variables

ε is the vector of residuals

The regression analyses were carried out using SAS v9.1 and the results are presented in the main body of the paper.

Appendix D: Logistic regression (2)

The academic orientation scores are obtained by modelling the probability of participation in education and training at age 17 against a series of background variables that are known predictors of educational retention. These include a respondent's Indigenous status, parental education and occupation, school sector, school location, immigration status and student achievement. The academic orientation scores are obtained using logistic regression:

Let $p = \Pr(Y = 1 | x)$, then

$$\ln\left(\frac{p_i}{1 - p_i}\right) = \alpha_i + \beta_i x_i + \varepsilon$$

$$p_i = \frac{\exp(\alpha_i + \beta_i x_i)}{1 + \exp(\alpha_i + \beta_i x_i)}$$

where

Y is the binary response variable where $Y = 1$ if individual participated in education and training, and 0 otherwise

p_i is the predicted probability of participating in education and training, given the response variable $Y = 1$. The predicted probabilities are the estimated propensity scores.

α_i is the intercept parameter

β_i is the vector of regression coefficients for the explanatory variables

x_i is the vector of explanatory variables

ε is the vector of residuals

The regression analyses were carried out using SAS v9.1 and the results are presented in table D1.

Table D1 Logistic regression results for modelling academic orientation for males and females, LSAY 2003 cohort

Parameter		Males		Females	
		Coeff.	Pr > Chi Sq	Coeff.	Pr > Chi Sq
Intercept		-0.842	0.180	-0.964	0.107
Indigenous status	0 Non-Indigenous	0.601	0.024	0.339	0.156
Indigenous status	1 Indigenous	-	-	-	-
Immigration status	1 Native students	-0.427	0.007	-0.129	0.373
Immigration status	2 First-Generation students	-0.385	0.047	0.116	0.530
Immigration status	3 Non-native students	-	-	-	-
Parental education	1 University	0.522	<.0001	0.470	<.0001
Parental education	2 Upper secondary/VET qualification	0.174	0.077	0.252	0.007
Parental education	3 Lower secondary/VET certificate	-	-	-	-
Parental occupation	1 White collar high skilled	0.338	0.005	0.007	0.950
Parental occupation	2 White collar low skilled	0.183	0.254	-0.040	0.790
Parental occupation	3 Blue collar high skilled	0.065	0.596	-0.082	0.497
Parental occupation	4 Blue collar low skilled	-	-	-	-
School sector	1 Government	-0.349	0.012	-0.305	0.018
School sector	2 Catholic	0.236	0.148	0.079	0.601
School sector	3 Independent	-	-	-	-
School location	1 Metro	0.017	0.972	0.093	0.837
School location	2 Provincial	-0.105	0.830	-0.085	0.853
School location	3 Rural	-	-	-	-
Maths achievement		0.001	0.445	0.002	0.112
Reading achievement		0.001	0.217	0.001	0.411
Science achievement		0.001	0.294	0.003	0.006
Problem-solving achievement		0.001	0.567	-0.001	0.301

Appendix E: Distribution of social capital by academic orientation

We summarise the background characteristics by modelling the probability of participation in education and training at age 17 years against background variables. This produces a score for each respondent that is representative of educational orientation. The distributions of those with high and low educational orientation scores are then compared for each of the social capital constructs. This allows us to investigate the relationships between the social capital constructs and socioeconomic status and the other control variables.

Figure E1 Student—teacher relations (factor 2 scores) by low and high academic orientation, males

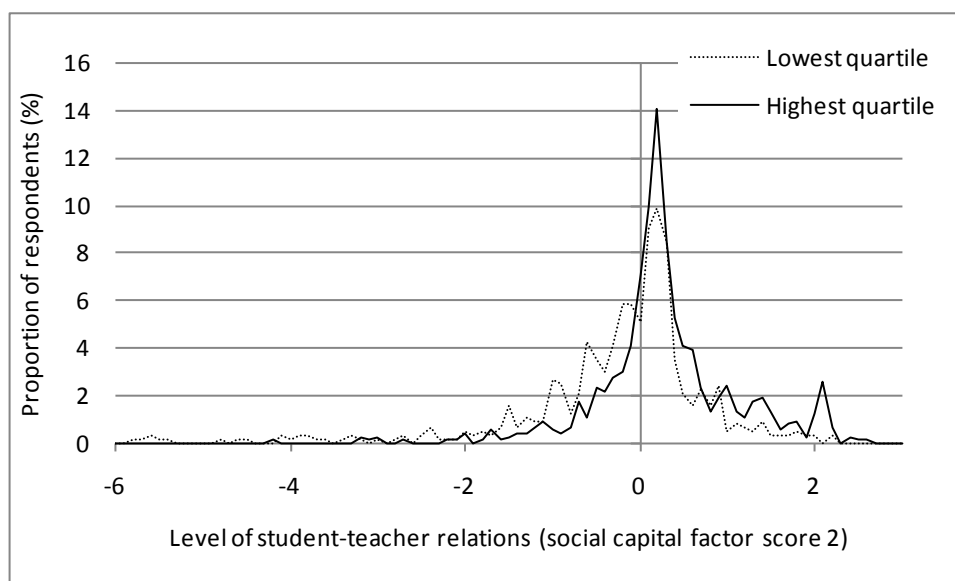


Figure E2 Participation in activities (factor 4 scores) by low and high academic orientation, males

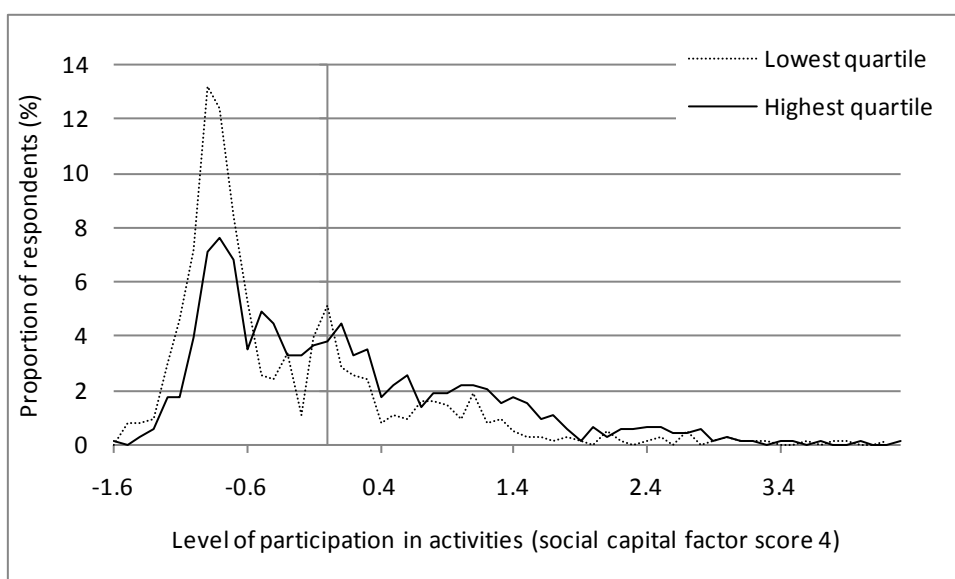


Figure E3 Student—teacher relations (factor 2 scores) by low and high academic orientation, females

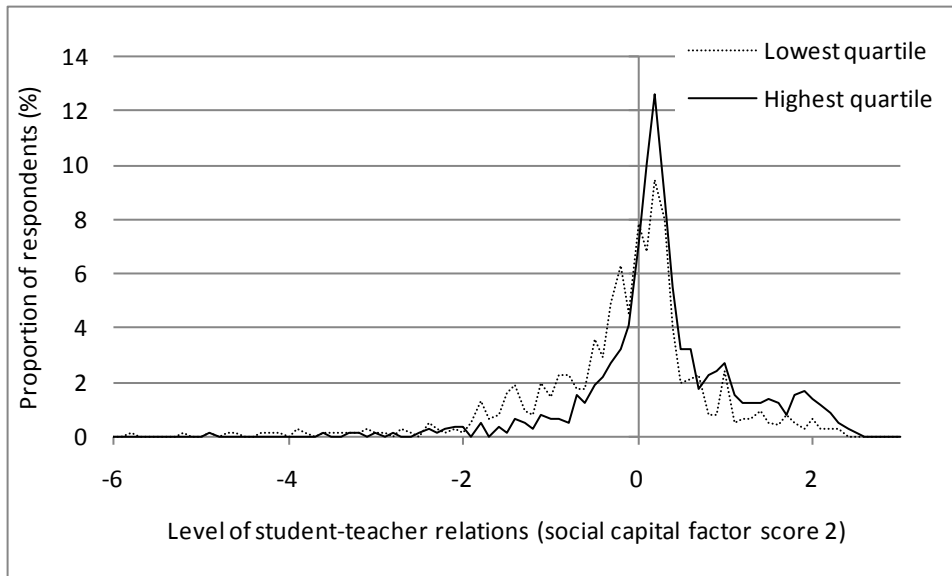


Figure E4 Participation in activities (factor 4 scores) by low and high academic orientation, females

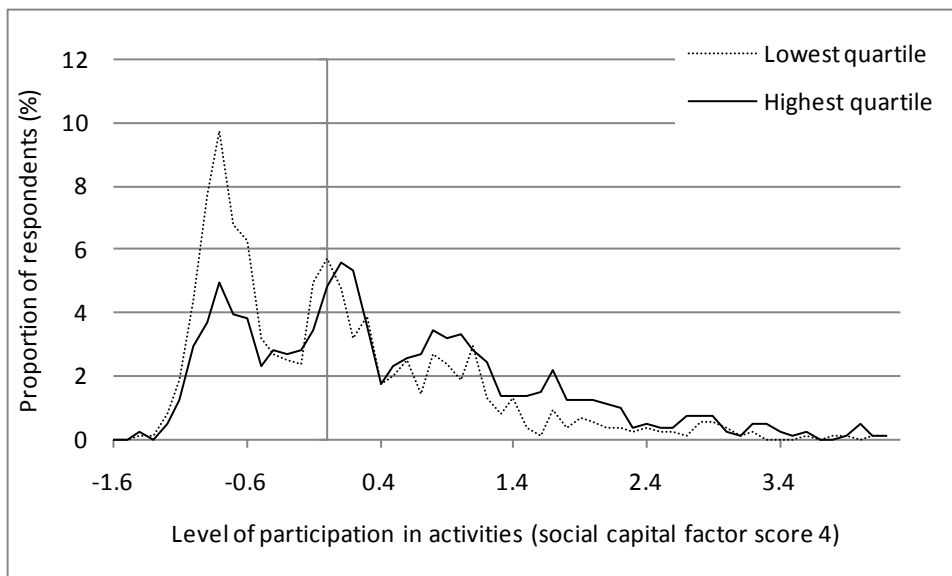
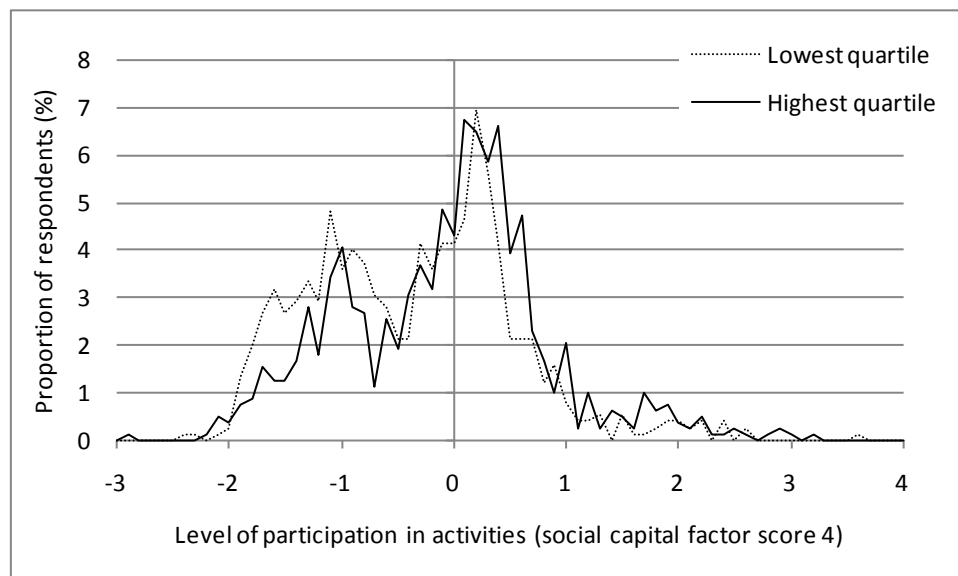


Figure E5 Participation in sport (factor 5 scores) by low and high academic orientation, females





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