Single-sex and co-educational schooling – life course consequences?

1. Project report

Background

There have been controversies about co-education at secondary level in Britain since the end of the nineteenth century. However, arguments for and against co-education have changed, while the number of single-sex schools has declined steadily.

- In the 1920s it was argued that co-education could help overcome ‘sex antagonisms’, improve the quality of marriage and help prevent homosexuality.

- In the 1960s and 70s, Dale reported (1969, 1971, 1974) that boys, girls and teachers were happier in co-educational secondary schools, and boys did better academically within them.

- In the same period, others continued to support single-sex schools for religious reasons and/or to control (mainly girls’) sexual behaviour.

- In the 1970s and 80s, feminists reasserted that, even if co-education might be better for boys, single-sex schools were better for girls. Girls got more attention from teachers and a fairer share of resources when boys were not present; and the Heads of girls’ schools suggested their schools encouraged girls’ ambitions.

- This was countered by arguments that the school sector (private, grammar or comprehensive) mattered most. If it seemed that girls did better in single-sex schools, this was because single-sex schools were likely to be longer established, academically selective and recruiting from higher socio-economic groups.

- Today the concern is more narrowly with examination results. Single-sex classes are now being tried in mixed schools to raise boys’ rather than girls’ performance.
OBJECTIVES

Deeply held opinions on single-sex and co-educational schooling continue to be articulated, but there is little rigorous research. Most available evidence is based on small scale, synchronous studies, or is anecdotal. In this project we aimed to make a long overdue assessment of the short and long-term effects of single- and mixed-sex schooling, using evidence from large longitudinal studies. These would enable us to control for crucial confounding variables (such as prior academic attainment and social class) and to provide information on the longer term impacts which have never previously been tested.

Our main questions were:

1. Who attended single-sex schools in the mid 1970s and ‘80s? Did they differ from students at co-educational schools in terms of key characteristics such as family background and entry test scores?

2. Was single-sex schooling linked to any of the following suggested life-course outcomes once confounding variables had been controlled?
   - During schooling: happiness/well-being at school, truancy or self-evaluation
   - Academic attainment: O-level, A-level and degree success, and gender typing of subjects studied
   - Occupational outcomes: labour market participation, occupational status, wages and/or occupational gender segregation
   - Social outcomes: attitudes to gender roles, marriage, parenthood and divorce, domestic division of labour, and mid-life well-being.

METHODS

The 1958 and 1970 birth cohort studies are nationally representative longitudinal data-sets. There were over 17,000 newborns in each cohort to start with, although there has been some attrition. However, Hawkes and Plewis’ (2006) examination of attrition and non-response in the 1958 National Child Development Study finds few significant predictors of attrition, wave non-response, and missing education data, supporting the assumption of ignorable non-response.

Information was collected from parents, schools and cohort members. The NCDS conducted interviews with parents when the child was 7, 11, and 16, and from cohort member also at 16, 23, 33, 42 (and since our study, 46). The 1970 cohort (BCS70) collected data at ages 5, 10, 16, 26, 30 (and most recently 34).

We had first to undertake remedial work to re-assign to the BCS70 sample information on the type of secondary school attended, since the dataset collected from the schools attended at 16 (Document M: the headteachers’ questionnaire) had been lost. It was also known to be incomplete because of a school strike at the time of data collection. We therefore cleaned the 1986 schools data and united it with the BCS dataset (see http://www.cls.ioe.ac.uk/core/documents/download.asp?id=726&log_stat=1). However, we had information on only about 1/3 of the total BCS70 sample and the small proportion attending single-sex schools by 1986 led to a problem with small cell sizes. We therefore focused most of our analyses on the 1958 cohort.
Results

(i) Who attended single-sex schools in 1974 and 1986?

We found a dramatic decline in single-sex schooling between 1974 (when the NCDS cohort members were aged 16) and 1986 (with the BCS70 cohort). (This decline and its link to comprehensivisation is discussed in the paper on “Whatever happened to single-sex schooling?”, see Section 3, Outputs.)

Taking the NCDS sample as a whole, 76% of boys and 73% of girls aged 16 attended mixed schools. This varied greatly between school sectors (see Table 1). (All tables are in Appendices.) Within the private sector, single-sex schooling was the norm, with only 22% of students attending mixed schools. (We group the independent and direct grant schools together under the ‘private’ label as both fee-paying.) In the state sector, 33% of grammar school pupils against 74% of secondary modern and 89% of comprehensive school students went to mixed schools. There were also more boys than girls at mixed schools in the private, secondary modern, comprehensive and special sectors. More boys than girls attended special schools, and there were especially few girls-only special schools.

By 1986, the proportion of pupils attending single-sex schools had roughly halved, with the decline most marked in the case of boys – only 11% of boys went to boys’ schools and 16% of girls to girls’ schools, but single-sex schooling remained the norm within the private and grammar sectors.

There was also substantial regional variation in the extent of single-sex schooling (Tables 2 and 3). In 1974, single-sex schooling was most common in London and the South East, with 51% of girls and 46% of boys attending single-sex schools. Single-sex schooling was least common in Scotland, where only 6% of girls and 7% of boys attended such schools. By 1986, single-sex schooling had declined across all regions, but London and the South East retained the highest proportion of students in single-sex schools (26%). These regional variations in the extent of provision of single-sex schooling were not exclusively driven by the extent of comprehensivisation.

We modeled attendance at a single-sex school for each cohort in order to identify which children were more likely to attend single-sex schools. (Regression analyses are included in Appendix B. Here see Table B1.) Single-sex schools were more academically and socially selective than co-educational schools for both cohorts. Within each school sector, only modest differences between children in single-sex and co-educational schools were found, reducing concern about selection bias. School sector and region were the key predictors of individuals experiencing single-sex schooling.

(ii) Did single-sex schooling have any impact on liking for school, behaviour and well-being during adolescence?

Our second set of research questions related to the points concerning pupils’ supposed greater happiness and well-being in co-education. We address these and the following questions using only the NCDS cohort.

Whether pupils liked school

At age 16, the NCDS cohort members were asked to respond to the statement ‘I do not like school’. Table 4 shows a breakdown of responses to this statement according to
the student’s sex and whether they attended a single-sex or co-educational school. It suggests that students were happier in single-sex schools. However, this is misleading because students in private and grammar schools were more likely to say that they liked school.

Table 5 shows the proportions of students by type of school responding negatively to the statement ‘I do not like school’. Students at private and grammar schools were most likely to say that they liked school, and students at comprehensives were slightly less likely to like school than secondary modern students. Girls liked school more than boys at comprehensives, but not in private or grammar schools.

Within each school sector there was therefore a slight tendency for both boys and girls at co-ed schools to be positive about school. This is in line with Dale’s (1971) findings from his various surveys of grammar and former grammar school pupils. However, we found the differences to be slight in each sector and we did not find girls ‘decidedly happier’ in mixed schools.

Logistic regression analysis (Table B2) shows that, conditioning on background controls, the link between liking school and being at a single-sex school was statistically significant for boys, but not for girls. In addition, school sector showed statistically significant differences for boys (positive private, grammar and secondary modern parameters) but not for girls.

Truancy

Students were asked whether they had truanted at all during the past year. Both boys and girls were less likely to report truanting from private and grammar schools. Single-sex schooling too was significantly associated with a lower likelihood of reported truanting, conditioning on school sector and other background controls (Table B3).

Psycho-social adjustment

Both mothers and teachers reported on the child’s behavioural adjustment using the Rutter aggression and anxiety scales. We used the mother’s report as the teacher’s report may be conditioned by the school context. We found no impact of single-sex schooling on scores for either scale.

(iii) Was single-sex schooling linked to academic self-concept in different subject areas?

The cohort members were asked to rate their own academic abilities in a range of academic subjects. Tables 6 shows boys’ and girls’ evaluations of their own abilities in maths, English and science. Boys rated themselves more highly in maths and science, while girls rated themselves more highly in English. (The ‘never studied’ category is dealt with below, under question 4.)

These gender gaps in self-concept were moderated by single-sex schooling. Table 7 shows the proportion of students who said that they were above average (as opposed to average or below). For English, the students are subdivided according to whether they came into the top, middle or bottom third in the reading test at age 11. For maths and science, the students are categorised according to their maths test scores at age 11. Prior attainment was a key factor determining students’ self-concept for each subject, but the effect of gender was also substantial.
In English, looking at students in the top third of the test score distribution as 'above average', 43% of girls in co-educational schools classed themselves as above average, compared to 33% of boys. In single-sex schools the gender gap was actually reversed: 41% of boys classed themselves as 'above average' compared to 36% of girls. This pattern was repeated for the middle and bottom thirds of the ability distribution.

In Maths, boys had higher self-concepts than girls in both the single-sex and the co-educational sector. The gap was smaller in the single-sex schools. In the top third of the test-score distribution, 23% of girls at co-educational schools and 29% of girls at single-sex schools rated themselves as above average, while 41% of boys rated themselves as above average in both sectors.

The pattern for Science was similar to that for Maths. In the top third of the test score distribution, 15% of girls at co-educational schools and 21% of girls at single-sex schools rated themselves as above average. The figures for boys were 32% and 30% respectively.

This pattern of results was confirmed by regression analyses conditioning on background controls, including verbal and non-verbal test scores at ages 7 and 11 (Table B4). It confirms feminist arguments of the 1970s: gender stereotypes are exacerbated in mixed schools. The gender gap in self-confidence is less in the single-sex sector (see 'Academic self-concept, gender and single-sex schooling' in Section 3, Outputs).

These analyses were replicated for BCS70. The results are available as a CLS working paper at: http://www.cls.ioe.ac.uk/publications.asp?section=0001000100060009.

(iv) Did boys and/or girls get better overall academic results in single-sex schools?

Academic attainment is the one area in which the cohort studies have previously been used to look at differences between single sex and co-educational schooling, although Steedman's (1983) analyses were limited to exam results at age 16. We include A-level, but, like Steedman, we only cover England and Wales since Scotland has different qualifications.

O-level/CSE 1 passes

The raw figures suggest an enormous advantage for single-sex schools in examination attainment at 16+ in 1974 (Table 8). 15% of co-educated boys achieved 5 or more passes, compared to 37% of single-sex boys. For girls, the gap was even wider: 14% of co-educated girls achieved 5 or more passes, compared to 42% at girls' schools.

However, these raw differences are extremely misleading, given the concentration of single-sex schools within the private and selective sectors. Within sector, the difference in exam results between single-sex and co-educational schools appears generally more modest (Table 9).

It is of course crucial also to control for a range of possible confounding variables, such as prior attainment and socio-economic background, as well as school sector. The results of a logistic regression analysis controlling for a standard set of controls (specified in detail in Table B5) are reported in Table B6. This shows an advantage
for girls at single-sex schools, but no statistically-significant effect of single-sex schooling for boys.

**O-level subject passes**

We examined whether single-sex schooling was associated with the likelihood of gaining passes in specific subjects. In general, a higher proportion of girls achieved passes in English and modern languages, while a higher proportion of boys achieved passes in maths, physics and chemistry in single-sex schools.

Table 10 shows the number of exam passes in maths, physics and chemistry gained by the subset of boys and girls who gained at least one pass at O-level/CSE, at co-ed and single-sex schools. Girls at girls' schools were more likely to get O-levels in all three subjects, and less likely to get O-levels in none of them. Boys at boys' schools were no more likely than co-ed boys to get three passes, but were more likely to get one pass, and correspondingly less likely to get none.

Table 11 shows the number of passes in English, French, and an additional modern language gained by boys and girls at co-ed and single-sex schools. Boys at boys' schools were more likely than co-educated boys to get two or three passes in these subjects, while girls at single-sex schools were more likely to get two passes, but no more likely to get three.

We modeled these outcomes using multinomial logistic regression (available on request). Once appropriate controls are included in the model, we find

- A positive girls’ school ‘effect’ and a negative boys’ school ‘effect’ on the number of passes gained in maths, physics and chemistry.

- Positive differentials of single-sex schooling for English and modern languages for both boys and girls.

Overall, the results confirm that girls did better in maths and science, and boys did better in languages, at single sex schools. In other words, co-education was again associated with increased gender differentiation.

**Curriculum studied**

The information about the curriculum which was available to the cohort members is limited, but at age 16 they were asked to report on whether they had ‘ever studied’ a range of subjects: maths, science, English, art, music, practical subjects and sports.

Conditioning on background controls (see Table B7),

- Girls were more likely to report never having studied maths and science, but single-sex schooling made no difference to their chance of ever studying these subjects.

- Girls at single-sex schools were more likely than girls at mixed schools to have studied art and music, suggesting that girls’ schools sought to cater to girls’ (perceived) interests, rather than trying to provide access to a gender atypical curriculum. In contrast, boys at single-sex schools were more likely never to have studied practical subjects and sports.
A-level attainment

Logistic regression analyses (Table B8) revealed no statistically significant difference in the likelihood of passing one or more A-levels at a single-sex or co-educational school, for either boys or girls. But there were substantial differences in the subjects that boys and girls passed at A-level at single-sex and co-educational schools.

Girls at single-sex schools were more likely than co-educated girls to get at least one A-level in maths, physics or chemistry (Tables 12 & 13). Boys at single-sex schools were slightly less likely than co-educated boys to get any A-levels in these subjects. Girls at either type of school had similar chances of getting an A-level in English or a modern language. Boys at boys’ schools were more likely than co-ed boys to get an A-level in these subjects.

The pattern shown in these tables is confirmed by the results of logistic regression analyses (Table B9). Boys were significantly more likely to get an English or a modern language A-level if they went to a boys-only school. Girls were significantly more likely, and boys significantly less likely, to get an A-level in maths, physics or chemistry if they attended a single-sex school.

(v) Was there an impact of single-sex schooling on post-school qualifications?

Here we again use the whole sample, including Scotland.

Highest qualification by men and women by age 33

Single-sex schooling was not significantly associated with either the chance of having no qualifications or of having gained a degree by the age of 33, once school sector had been controlled. These analyses are available on request.

Academic subjects of the qualifications gained by age 33

The subject area of the highest qualification gained was significantly related to single-sex schooling.

Because the cell sizes for each individual subject area are small, we grouped subjects according to whether they were ‘male-dominated’, ‘female-dominated’ or ‘integrated’, using the coding frame developed by Dale and Egerton (1997) (see Table 14), where ‘integrated’ disciplines have no more than 60% of one sex. Table 15 shows that women who had attended girls’ schools were more likely than co-educated women to have ‘male-typed’ highest qualifications; and men who went to boys’ schools were more likely than co-educated men to have ‘female-typed’ qualifications.

Regression analyses (Table B10) confirm that, other things being equal, girls were significantly more likely to study ‘male-dominated’ subjects, and less likely to study ‘female-dominated’ subjects, if they had attended single-sex schools.

So, having been to a single-sex school was not linked, except through selective schooling, to the chances of an individual getting a degree or other post-school qualification, but it did influence the subject area of that qualification.
(vi) Did single-sex schooling have any impact on aspects of personal well-being in adult life?

To assess mental health and general well-being, we looked at the responses given at age 42 to the 'malaise inventory' – a 24-item scale designed to assess tendency to depression.

Regression analysis (Table B11) showed that, conditioning on background controls, there was a significant interaction between school sector and single-sex schooling. The mean scores on the scale (which ranges from 0-24) were around 4 for women; but for men:

- in comprehensives, 3.1 for co-educated men and 2.7 for single-sex men;
- in private schools, 2.4 and 3.0; and
- in grammar schools, 2.4 and 2.7 respectively.

I.e. men who had attended boys’ schools in the private and grammar sectors suffered from slight but statistically significantly higher levels of malaise in mid-life than their peers from comprehensive schools.

(vii) Did single-sex schooling have any impact on adult domestic life and views on gender equality?

Marriage

In the 1958 cohort, the vast majority of those who formed any partnership eventually married. We found no link between single-sex schooling and the chances of marriage by the ages of 33 or 42.

We looked for evidence of same-sex relationships in household composition, but such cases were far too rare - only 21 men and 22 women reported living with same-sex partners at age 42 - to be a reliable indicator of sexual preference, let alone a basis for analysis. We are therefore unable to comment on whether co-education did provide the ‘clean, healthy natural atmosphere’ so commended by its early advocates.

Partnership quality

Cohort members who were married or cohabiting were asked to rate the quality of their relationship from 1 (extremely happy) to 7 (extremely unhappy). They were also asked whether they ever regretted marrying/cohabiting with their partner, and whether they would marry/cohabit with the same person if they could have their time again. There was no link in the responses given at 42 between single-sex schooling and the quality of partnerships as measured in this way - hence no support on this measure for co-education improving relationships between spouses.

Divorce

However, when we examined the risk of divorce or separation by age 42 for those who had ever been married, men who had been to single-sex schools were somewhat more likely to have divorced or separated (except in the private sector), see Table 16.

Regression analyses (Table B12) conditioning on background controls show that there was a statistically significant increased risk of dissolution for men from single-sex schools. For women, however, there was no significant link.

Division of labour in the home and attitudes to women’s employment
At age 33, cohort members who were married or cohabiting were asked which partner most often carried out a range of household tasks: cooking the main meal, laundry, cleaning, shopping, etc. We found no link between single-sex schooling and later domestic division of labour.

At this age they also responded to a series of Likert items on gender and work, such as 'there should be more women bosses', 'men and women should do the same jobs', and 'where both partners work full-time, housework should be shared equally'. We again found no link between single-sex schooling and attitudes to gender roles on these measures.

**Childbearing**

Regression analyses on outcomes for men and women show no link between single-sex schooling and either the chance of having a child by age 42, or age of first childbearing. In particular, despite the concerns of religious opponents of mixed schooling for adolescents, we found no significant deterrent effect of single-sex schooling on teenage parenthood for either girls or boys.

**(viii) Was single-sex schooling associated with any labour-market outcomes at age 42 (in 2000)?**

**Women's labour market participation: whether they were working, and whether jobs were full or part-time**

Table 17 shows that 45% of women born in 1958 were in full-time employment at age 42, 34% were in part-time employment, and 13% were at home looking after their families. (88% of men were in full-time work.)

We modelled women's likelihood of being in (i) full-time employment, (ii) part-time employment and (iii) being at home with the family. Conditioning on relevant background controls, single-sex schooling was not significantly associated with any of these outcomes.

**Socio-economic status**

Table 18 shows the socio-economic class of the cohort members' current or most recent occupation at age 42. Women were under-represented among employers, managers and professionals, as well as skilled manual and own-account workers. Women were over-represented among junior non-manual and personal service workers and ancillary professionals (including teachers and nurses).

Although this occupational classification (NSEC) cannot be viewed as a straightforward hierarchy, the first three categories, comprising employers, managers and professionals, are generally seen as relatively high status, and often referred to as the 'service class' or 'salariat'. We modeled entry to the salariat by age 42, conditioning on controls for prior characteristics, but found no significant link between single-sex schooling and access to the salariat for either men or women.

**Gender segregation of occupations**

Many occupations are highly sex-segregated. In Hakim's classification of occupational segregation (1998), those which are 25% to 54% women are described as 'integrated'.

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Table 19 shows the proportions of men and women from single-sex and co-educational schools who were in women-dominated, men-dominated or integrated jobs at age 42. This classification was derived from the NCDS Standard Occupational Classification variable by Elliott (2005). This gives the impression that men and women who went to single-sex schools went on to have a less sex-segregated experience of the labour market, as single-sex educated men and women were relatively likely to be found in ‘integrated’ occupations. However, the integrated occupations also tended to be higher status than the sex-segregated occupations. Thus, the fact that the single-sex schools were found disproportionately in the private and grammar sectors largely accounts for the association with single-sex schooling (Table 20).

In regressions controlling for students’ background characteristics, no significant effect of single-sex schooling on occupational segregation at age 42 was found. We modelled the likelihood of men and women separately being in: (i) integrated, (ii) male dominated, and (iii) female dominated occupations.

Wages

Table 21 shows the mean hourly wages of men and women in paid employment, according to type and sector of schools. Women were paid substantially less than men; but across school sectors, women who had attended single-sex schools gained higher wages.

Regression analyses (Table B13) confirm that, conditioning on background controls, there was a statistically significant positive association between single-sex schooling and wages for women, but not for men. Private schooling was positive for men. For women, private and grammar schooling were positive and secondary modern schooling negative. We have not yet investigated whether the effect on wages is mediated by qualifications, their subject area, or work experience.

It may seem surprising that single-sex schooling should have had a positive impact on women’s wages, despite having no statistically significant impact on access to the salariat or on access to integrated or male-dominated occupations. It is likely that these variables are too crude to pick up the effect identified by the more fine-grained wages variable.

Conclusions

Twice as many graduates in the 1958 cohort had been to single sex schools as the rest of the cohort (46% versus 22%). This tells us that a co-educational background is less common for the currently middle-aged elite than for many other people. However, this reflects the socially selective nature of the single-sex schools, rather than their single-sexness in itself. It confirms the importance of controlling adequately for selection, something which previous studies of single-sex education have rarely done.

We found that single-sex schooling had a positive impact on academic outcomes at 16+ for girls, and no impact at all for boys. Single-sex schooling was not independently linked to the likelihood of gaining A-level or degree level qualifications.

However, we did find that single-sex schooling was related to girls getting qualifications in maths and sciences and to boys getting qualifications in English and modern languages. Also, girls at girls’ schools were more confident in their abilities in
maths and sciences than co-educated girls, while boys at boys’ schools were relatively confident in their abilities in English. So, single-sex schooling moderated the effect of gender-stereotyping in terms of choice of field-of-study and self-concept.

For boys, single-sex schooling was also linked to a dislike of school, and a greater chance of divorce by age 42. For girls, the picture was more positive, as single-sex schooling was linked to higher wages by 42. For both sexes, many outcomes were not related to single-sex schooling. Perhaps most surprisingly, there was no link between coeducation and attitudes towards gender roles.

References


2. Activities

Presentations at conferences and seminars based on this research


“Single-sex schooling”, presented as open lecture at Fatima Jinnah Women University, Rawalpindi, December 2005 and as keynote address to All-Russian Conference on Gender Education in Teachers’ Training, Tomsk State Pedagogical University, Russian Federation, June 2006.


“Equal Opportunities and Gender” Workshop for PGCE students, Institute of Education, October 2006.

3. Outputs

Datasets

The enhanced version of the BCS70 dataset (1986 Headteacher data) has been deposited at the Data Archive, Serial Number 5225.

Publications


“Single-sex and co-educational schooling: Lifecourse consequences?” Kohort (June 2006) DL

“Single-sex schooling”, ch 14 in C Skelton, L Smulyan and B Francis (eds), Sage Handbook on Gender and Education, November 2006, DL


“Whatever happened to single-sex schooling?” To be submitted to History of Education. DL AS. HJ

We are also in the process of drafting papers on the academic and employment outcomes.
Press interest

We had a substantial response to a press release on 22nd September 2006. This included coverage by 5 national and 8 local UK newspapers, the BBC News, 5 overseas newspapers, 5 press services and 3 professional journals.

For details see Appendix C.

4. Potential impacts on Policy and Practice

A great deal of recent discussion has focused on the possibility that boys and girls have different ‘learning styles’ and may therefore do better in single-sex groupings – if not in single-sex schools, then in single-sex classes for some subjects within mixed schools. This has particularly been put forward as a strategy for tackling ‘underachievement’ among boys.

However, our research emphatically does not support the suggestion that achievement is higher overall in single sex schools. Once crucial confounding variables have been controlled for, single-sex schooling has only a modest positive impact on academic outcomes at 16+ for girls, and no impact at all for boys.

On the other hand, we found support for previous studies which suggest that single-sex schooling moderates the effect of gender-stereotyping in terms of choice of field of study and self-concept. This suggests that co-educational schools need to examine the ways in which they, rather than single-sex schools, are probably (one of a number of institutions) increasing the impact of powerful gender stereotypes on both girls and boys; that is to say, reproducing social inequalities through education.

The Department for Education and Skills recently produced a Working Paper (as yet unpublished) on single-sex teaching. They expressed interest in the work we presented to BERA in 2005 and we shall send them, and the Equalities group at the Qualifications and Curriculum Authority, copies of this Report.

5. Future research priorities

As mentioned previously, information on the type of school attended at age 16 was only available for about a third of the BCS70 cohort. We plan to submit a proposal to further repair the BCS70 dataset by looking for the name of the school in the newly scanned archive of questionnaires returned at 16 and patching in missing information regarding the school attended at age 16 from administrative data. We will access information on the name and address of the school attended, and then link this to administrative data from the Schools Census (available from the National Data Archive).

We will then be able to assess the life-course consequences of the type of school attended also for the BCS70 cohort and to make comparisons over time. We hope also to further interrogate the links between schooling and outcomes other than exam results, such as well-being, divorce and wages.