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The Heterogeneous Effect of Selection in Secondary Schools : Understanding the Changing Role of Ability

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The Heterogeneous Effect of Selection in Secondary Schools: Understanding the Changing Role of Ability

Fernando Galindo-Rueda
Anna Vignoles

August 2004

Forschungsinstitut
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Institute for the Study
of Labor

The Heterogeneous Effect of Selection in Secondary Schools: Understanding the Changing Role of Ability

Fernando Galindo-Rueda
CEP, CEE, London School of Economics, CeRiBA and IZA Bonn

Anna Vignoles
CEE, London School of Economics

Discussion Paper No. 1245
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IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
Email: iza@iza.org

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ABSTRACT

The Heterogeneous Effect of Selection in Secondary Schools: Understanding the Changing Role of Ability*

Previous work by the authors suggested that during the 1970s and 1980s, a person's early cognitive ability became a less important determinant of his or her eventual educational achievement. Furthermore, over the same time period, family background started to have a greater impact on a person's achievement. Given that this coincided with the gradual demise of the British selective grammar school system, it would seem that the role of selection (ability tracking) in the school system merits further investigation. This paper explores the inter-relationship between school selection, ability and educational achievement. Our regression and matching results indicate that the most able pupils in the selective school system did do better than those of similar ability in the mixed ability school system. We do not find evidence of significant negative effects of tracking for low/middle ability students.

JEL Classification: I2

Keywords: education reforms, selection, tracking, ability

Corresponding author:

Fernando Galindo-Rueda
Centre for Economic Performance
London School of Economics
Houghton St. WC2A 2AE
London
United Kingdom
Email: f.galindo-rueda@lse.ac.uk

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1. Introduction

There has been a substantial rise in British education levels in recent decades. Controversially, less able but wealthier children appear to have benefited most from this educational expansion, at least during the 1970s and 1980s (Galindo-Rueda and Vignoles, forthcoming).[1] Given that this particular period also coincided with the gradual demise of the UK's highly selective 'grammar school' system, it would seem that the changing role of selection in secondary schooling merits further investigation. This paper explores the inter-relationship between school selection, ability, family background and educational achievement using data from the UK in the 1970s.

Our paper is not, however, purely of historical interest. Certainly during the second half of the twentieth century several European countries abandoned their systems of selective schooling, whereby students of different levels of academic ability would attend separate schools with different curricula below the age of compulsory schooling. However, selection remains a topical issue. For example, a significant exception to this pattern has been Germany, where features of selective schooling from a relatively early age still remain in place. Furthermore, in the UK, as is the case in the US, there have been recent policy initiatives that have attempted to explicitly or implicitly increase selection in the school system.[2] For example, policies to increase parental choice of school, with the objective of increasing school competition, have put additional pressure on schools to get better academic results. This has, as far as we can tell, increased the socio-economic segregation of pupils between schools, both in the UK and in the US (Adnett (1998); Hoxby (2003)). Implicit selection of pupils according to either perceived ability or parental background is definitely a 'live' issue for many education systems, particularly those self-defined as comprehensive. Furthermore, in the UK there have been more

[1] During the 1970s and 1980s, a person's measure of her cognitive skills on entry into secondary school became a poorer predictor of how well she would do in terms of eventual educational achievement. This result was partly due to the performance of low ability children increasing substantially. Consistent with other research (Blanden, Gregg and Machin (2003)) however, we also found that parental income had become a somewhat more important determinant of educational achievement during this time.

[2] A summary of the developments in the UK can be found in West and Pennell (1997).

explicit moves towards reintroducing selection by ability, such as the formation of specialist schools that can select a proportion of their students on the basis of aptitude in a particular field, such as arts, technology, etc. (rather than on the basis of 'overall' academic ability). Policy makers tend to regard positively reforms such as this that can be carried out with "small" reorganization costs -compared to more "expensive" policies that seek quality improvements by increasing the level of school resources per student- yet little is known about their potential impact and its distribution across the population of students.

Our study of heterogeneity in the response to tracking features of an educational system addresses this particular question of who benefits most from such an institutional arrangement. Heterogeneity is relevant for the interpretation of instrumental variable estimates of earnings returns to schooling and has direct implications for the analysis of intergenerational mobility and income inequality. Certainly, the issue of selection and how it interacts with family background and pupil ability is of great research interest.

In this paper we attempt to understand and quantify the relationships between early cognitive ability, family background and school selection on the one hand, and educational achievement on the other. To do this we look at a cohort of children born in 1958 who went through secondary school during the 1970s, a period of uneven transition from the selective to the non-selective system. The details of this change in educational policy are discussed in section 2 We then proceed to describe our data in section 3. Crucially for our estimation strategy, our data reflects the period's geographical divide between areas with selective schools –grammar and secondary modern schools- and those with mixed ability comprehensives, enabling us to compare the outcomes from both types of system, as is explained in section 4. We present our key results in section 5, before concluding with a discussion of policy implications.

2. Background

2.1. The History of Selection in UK Secondary Schooling

During the 1960s and 1970s, the UK secondary education system underwent a period of quite radical institutional change, particularly in England and Wales.[3] Prior to the early 1960s, the system could perhaps be best characterized as 'elitist'. At the secondary level, students of differing abilities were sent to different types of school, receiving very different types of education. Essentially, there was a tri-partite system consisting of 'grammar', 'secondary modern' and a small and rapidly declining number of 'technical' schools. Grammar schools were academically oriented secondary schools, which catered for the top of the ability range, and entry into these schools was based on an ability test administered at the age of 11, although socio-economic factors were also important in determining attendance at a grammar school (Steedman, 1983). Grammar schools provided for the full age range (11 to 18) and these students were most likely to go on to higher education (HE). Secondary modern schools on the other hand, provided a lower level academic education for those who could not get into a grammar school. Secondary moderns generally only took pupils up to the compulsory minimum school leaving age of fifteen, in place until 1973, and sixteen afterwards.[4]

One important aspect of the selective grammar system is that it encouraged students to take very different curricula at an early age. In England and Wales, prior to the dismantling of the grammar school system in the 1970s, the student body was effectively divided at age 11. Those in secondary modern schools either left the education system at 16 with few or no qualifications (around 45% of the cohort)[5] or acquired a set of Certificates of Secondary Education or CSEs[6] at age 16. Grammar students generally

[3] During this period, the Scottish system was already fully comprehensive, whilst Northern Ireland remained fully selective. Our analysis is therefore restricted to England and Wales.
[4] A small number of technical schools provided a vocational orientated education (again generally up to the age of 16).
[5] Crowther Committee Report (1959).
[6] CSEs were examinations that broadly catered for the 60-80th percentiles of the ability range and students could take up to 10 examinations in different CSE subjects. Students with more than around 5 CSEs could

acquired Ordinary 'O' levels[7] at age 16 and many continued on until age 18 to take Advanced 'A' levels. Around one third of the full cohort left the education system at the end of their compulsory schooling with either CSEs or O levels. Of the remaining 20% that continued on to A level, around one half went on to higher education, i.e. one in ten of the cohort. Some students who attended a secondary modern did manage to switch to the higher academic stream and stay on past the age of 16, but this was not common.

This highly selective system was still in place during the 1960s and 1970s. However, in response to concerns about the inequity of this system and an increase in parental demand for education, policies were introduced in the mid 1960s, by the then Labour government, to move towards mixed ability schooling.[8] In particular, legislation was enacted to enable local education authorities (LEAs)[9] to establish mixed ability schools called 'comprehensives'. The institutional structure of the English and Welsh education systems meant, however, that the pace of change varied between and within LEAs (Kerckhoff *et al* (1996)). Certainly, central government was not able to dictate that all LEAs switched to non-selective schooling at a particular time.[10] Furthermore, the manner in which mixed ability schools were introduced varied from LEA to LEA. Very few of them switched all their schools into a non-selective system simultaneously and thus, within LEAs, there was also considerable variability in the pace at which particular areas and schools moved into the non-selective system.

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go onto the next stage of schooling (A levels) but CSE students tended to leave school at 16. However, many of them did go on to do some sort of vocational training at colleges of further education.

[7] O levels were more academically demanding than CSEs, and again, students could take up to 10-11 examinations in different subjects.

[8] Of course moving to mixed ability schools does not necessarily remove ability segregation within schools, as many schools tend to stream students into different classes on the basis of perceived ability.

[9] LEAs are somewhat akin to school districts in the US. They are under local government political control and during the 1960s and 1970s had relatively high levels of autonomy in determining educational policy on the ground. They were responsible for most educational spending on primary and secondary schooling in the UK, although the majority of the money for education came from central government. For instance, in the 1970s about 65% of total UK educational expenditure came from central government but was distributed via the LEAs, 15% of the education total was directly financed and administered by central government and LEAs raised the remainder via local taxation.

[10] Indeed selective grammar schools continue to exist today in certain LEAs, such as Kent. Local political resistance to their abolition has been extremely strong.

What is also important to remember is that in some LEAs secondary moderns became comprehensives but nearby grammar schools preserved their selective entry policy. This meant that the comprehensives in these areas did not necessarily teach the full ability range; rather they continued to attract only students from the bottom 80% of the ability distribution (or thereabouts). In other words, they could not attract the most able students who continued to go to nearby grammar schools. Furthermore, secondary moderns that changed into comprehensives often could not accommodate students up to the age of 18. Students wishing to stay on past the age of 16 would then have had to change school altogether, as compared to grammar students who could continue in their school up to the age of 18. In other LEAs, change was more radical with the introduction of wholly new schools, designed specifically as comprehensives.

So what determined the pace of change and the nature of the re-organisation in secondary schools across different LEAs? Kerckhoff *et al.* (1996) showed that the political orientation of the LEA was crucially important. Specifically, LEAs that had Conservative political control experienced slower change towards mixed ability schooling than LEAs under Labour control. Furthermore, LEAs under Labour control initially but that then switched to Conservative control, appeared to have been able to reverse or slow plans to move towards comprehensive schooling. Of course it was not quite as clear-cut as a simple political dichotomy. Examples of LEAs under Conservative control that moved swiftly towards comprehensivisation can be found, e.g. Leicestershire (Kerckhoff *et al.* (1996)). However, as will be discussed in detail below, from an empirical perspective, we can use these political differences to our advantage. As part of one of our estimation strategies, we use the political affiliation of the child's constituency (an area that is geographically smaller than the LEA) as an instrument for whether a child attended a selective or non-selective school system on the grounds that even within LEAs it is likely that Conservative dominated constituencies preserved their local grammar schools longer than Labour or Liberal dominated constituencies.

Of course one might have expected that other factors would determine whether an LEA or schools within an LEA shifted quickly to mixed-ability schooling, such as the level of

educational funding in that school or LEA, or indeed other characteristics of the neighbourhood of the school. Kerckhoff *et al.* (1996) concluded, however, that most community characteristics of the LEA were not major determinants of the extent of comprehensivisation within the LEA. For example, the proportion of the workforce in the LEA in agriculture, mining or manufacturing, the proportion in non-manual jobs, the proportion who owned their own houses and the level of educational resourcing in that LEA could collectively only explain less than 5% of the variation in the proportion of LEA state supported schools that were comprehensive. Only the resourcing level in the LEA (measured by the pupil teacher ratio) is significant in some specifications, with better resourced LEAs making the shift towards mixed ability schooling more rapidly. The determinants of whether a child was educated in a selective or non-selective school system are discussed extensively from an empirical perspective in section 3.

2.2. Related literature.

Before we discuss our data, it is worth noting that following the shift to mixed ability schooling in England and Wales, there commenced an ongoing and vitriolic debate about the perceived failure or success of the 'comprehensive experiment'. Many commentators have blamed the apparent decline in the quality of the UK education system since the 1970s on the abolition of the selective system described above, with equally robust criticism of the elitism of grammar schools (Cox and Dyson (1969); Cox and Boyson (1975, 1977); Marks (1983); Reynolds et al. (1987)). Good quantitative empirical evidence on this issue is sparser, and somewhat mixed in its results (Fogelman (1984); Kerckhoff (1986); Harmon and Walker (2000); Jesson (2000) and Dearden, Ferri and Meghir (2003)). We should emphasize that, in this paper, we are not directly interested in assessing the impact of specific school types, such as grammar schools, on educational achievement. Dearden, Ferri and Meghir (2003) define selective school treatment based on whether individuals attend schools that can decide on their student intake (grammar and private), thus referring to schools in the upper end of the selective system. Their estimates thus inform us about the effect of assigning a particular individual to a grammar

school, but this ignores that within a selective system, an individual's treatment is not independent of all others'.

Instead, we try to establish the *ex-ante* impact of being part of a selective school system (whether in a secondary modern or a grammar school) on outcomes, and in particular how the impact on their educational achievement is distributed across pupils with diverse family backgrounds and ability. We thus focus on a "school system treatment" on a population, as opposed to a "school type treatment", by comparing individuals across different areas that experienced different degrees of "selectiveness". Only then can we begin to understand how dismantling the selection system may have impacted on the relationship between ability, family background and outcomes in the long term.

As has been said already, this paper builds on our previous study of the changing role of ability in determining educational outcomes (Galindo-Rueda and Vignoles (forthcoming)). It also links to a broader literature relating cognitive ability to various socio-economic outcomes (see Chevalier and Lanot (2002) for the UK and Cawley *et al.* (1996) for the US), as well as empirical evidence on the role of family background factors (e.g. parental income and social class) in determining educational attainment (Haveman and Wolfe (1995)).

Our paper is also related to earlier evaluations of experiments on organizational changes and/or additional resources to education programs, as well as research that uses such changes to estimates returns to educational attainment. For example, Meghir and Palme (2003) investigate the educational and wage impact of a social experiment in Sweden, which simultaneously involved the abolition of the existing selective system, whilst raising the school leaving age. Our comprehensive reform shares some features with this Swedish case, in that change was not implemented at once and that geographical differences in the pace of change involved political decisions at a local level. However, we can abstract from the role played by changes in the compulsory schooling leaving age, since the cohort that we analyse was subject to a common school leaving age of 16.[11]

[11] In fact, this cohort was the first to be subject to the current compulsory schooling age of 16.

Our use of political affiliation measures at an area level also relate to a paper by Benabou, Kramarz and Prost (2003), which estimated the effect of particular areas in France becoming priority education zones and thereby receiving higher levels of resources per student. In our case however, we can abstract from the issue of how selective areas may differ from comprehensive ones in terms of the level of school resources, by controlling for educational resource levels. A paper more closely related to ours is that by Figlio and Page (2000), which deals with the school-level policy of classroom-based ability tracking. They criticize previous studies on the effects of tracking on the grounds that track placement –as specific school type attended in the UK- can be endogenous with respect to outcomes. Contrary to previous research, they show that ability tracking has no negative effect on low ability children, rather the opposite once school choice is taken into account. A critical difference between our paper and there is that we address a type of ability tracking which is resolved by allocating students to schools, whilst not considering the issue of within-school tracking which might have remained in place in some comprehensive schools in England and Wales. The form of tracking we investigate is likely to be stronger as it also reduces the extent of out-of-classroom interactions between students of different academic ability.

3. Data

For this paper we use a particularly unique longitudinal data set, the National Child Development Study of 1958 (NCDS)[12], a rich data source for a complete cohort of individuals as they went through the education system. This data is ideal for our purposes since it neatly spans the time period during which the selective system was being phased out and replaced by a comprehensive system, as discussed in the previous section.

[12] The data used in this paper have been applied to other aspects of the relationship between socio-economic background, cognitive ability and socio-economic outcomes (Breen and Goldthorpe (1999, 2001); Currie and Thomas (1999); Dearden (1999); Dearden et al. (1997); Feinstein and Symons (1997); Harmon and Walker (2000); McCulloch and Joshi (2000); Saunders (1997). Blanden *et al.* (2002) have also considered intergenerational mobility in these data. There is also a related literature on social mobility: Erikson and Goldthorpe (1985), Saunders (1997) and Schoon et al. (2002), to cite just a few.

The NCDS is a longitudinal study of the cohort born in Britain in the week starting on the 3rd of March 1958, with follow ups on these children, their families and school environment at the ages of 7, 11 and 16. Further follow up studies were undertaken in 1981 (age 23), 1991 (age 33) and 2000 (age 42). A major advantage of our data is that we have measures of each cohort member's early ability, with sets of ability test scores at the ages of 7 and 11. We also have information on the children's family background, details of the school they attended and measures of their subsequent educational attainment. Our data are a valuable resource in that they contain ability information not only prior to the experience of secondary schooling, but also prior to reasonable expectations to the system being phased out. Cognitive ability information is available from tests taken at age 7, well in advance the so-called '11+ examination', which was the test used to determine entry into grammar or secondary modern school in the selective system. Using the alternative set of ability controls at age 11 is likely to distort estimates because the presence or absence of selection will have some impact upon these measures and will thus be an outcome of the process we are studying, rather than a simple covariate.

This screening examination at the age of 11 was highly controversial. Indeed an important concern was that the results of this examination, rather than reflecting any real innate ability, reflected socio-economic status. It was suggested that the higher scores for children from a higher socioeconomic background were as a result of coaching and better resources. As a result of this, poor children of high potential ability would have been unfairly denied a grammar school education.

Since the 1958 cohort experienced secondary school in the early 1970s, they lived through the big shift from selective to non-selective schooling. We know whether at the age of sixteen they were being educated in a selective system (tracking) school (either in a grammar school or in its counterpart, a secondary modern) and for how long their school had been non-selective if comprehensive. This enabled us to construct two selection variables. Firstly, we created an indicator for whether the individual was in a selective system school (grammar or secondary modern) in 1974 (age 16) or not

(comprehensive). Secondly, we constructed a variable measuring the years spent in a selective school system between the ages of 11 and 16.[13] The proportions in the different schooling types are shown, along with other key descriptive statistics in Table 1 below.

This approach to measuring the local conditions of selection/comprehensiveness in the education system has obvious limitations given the scope of our study, as it basically infers local selection conditions from the actual school attended. Two main problems can arise: Firstly, areas were not hermetically defined to assign children to either type of system and, moreover, there was substantial and genuine variation within LEAs regarding the existence of tracking in particular areas. Secondly, as noted before, many comprehensive schools were located close to grammar schools that managed to preserve their selective status. This implies that we risk misclassifying individuals as experiencing a comprehensive education system (different from an education in a comprehensive school) whilst they were actually ability-tracked or "deselected" from the *surviving* local grammar school. Students in these schools are likely to be of lower ability than the average student in fully comprehensive areas.

We have information on the proportion of the local education authority that was comprehensive in 1974. Table 1 shows that the average local comprehensive share for students attending comprehensive schools was 73 percent, below 100 percent for both of the aforementioned reasons. For students classified as in the selective system, the share of comprehensives is evidently lower, 48 percent, but well above zero. If we look at this share by the specific type of school attended, we see that the comprehensive local share

[13] Limitations in our data do not allow us to know every secondary school attended by each individual prior to 1974. We are thus forced to introduce the simplifying assumption that no changes have taken place. This is likely to bias our results to the extent that school changes across selective and non-selective areas are driven by potential gains, but Meghir and Palme (2003) suggest this is not an important problem in their Swedish data. Attenuation bias is possible as a result of classical measurement error. We also exclude from our analysis the small percentage of students in private (4%) and other schools (2%) such as those catering for children with special educational needs. In the absence of a larger sample, we cannot model the decision to attend private school as a function of the type of system. We acknowledge that omitting private students can bias our results (over-estimating of the effect of selection by social class) because the population of upper class students in the state system under a comprehensive system may differ from that in the selective one. However, this criticism is much less likely to apply to our analysis of interactions with early ability. Moreover, we do not find evidence of a higher density of comprehensive schools surrounding public school students relative to selective system schools.

for students in grammar schools (51 percent) is slightly higher than that for students in secondary moderns (47 percent). This difference is consistent with the existence of areas with both comprehensive and grammar schools that in fact operate the initial selective system. The fact that the local comprehensive share for secondary modern schools is well above zero and fairly close to that of grammars indicates that there is genuine variation in systems within local authorities. As a result, using this local-level measure of comprehensivisation will tend to produced attenuated estimates.

In the absence of detailed geospatial data on the precise residential location of cohort members and all schools across the country, coupled with information on each school's denomination and catchment area, our analysis draws results based on both the individual-based classification of systems and the more aggregate local comprehensive share.

Our major emphasis is on the role of selection for differing ability children, thereby implicitly assessing the educational value added of the tracking system. Our cognitive ability variables therefore merit further discussion. Using a similar methodology to that of Cawley *et al.* (1996), we constructed a cognitive ability measure based on test scores obtained at the age of 7 for the 1958 NCDS cohort. We undertook a principal components analysis on the age 7 test scores (arithmetic, reading, copying designs and 'man-drawing' tests) to construct an index of cognitive ability, using the first principal component extracted.[14]

In the psychometric literature, this measure has been frequently associated with the construct *g*, described as the underlying general ability or intelligence factor (Cawley *et al.* (1996)). Our interpretation of this variable is that of an index that allows us to rank each individual in terms of cognitive ability or early human capital. From a practical point of view, reducing the dimension of the available ability information at age 7 allows

[14] Specification tests suggest that the first principal component is sufficient to control for the outcomes of interest in this paper. Further information about the process of extracting this index is in Galindo-Rueda and Vignoles (2003).

us to simplify considerably the analysis of interactions between ability and selective schooling which is central to our paper.

Additional controls used in this paper include: father's social class, parental schooling, household composition and other measures of financial wellbeing such as income. We also supplemented the data with information on the educational resources at the secondary school level in the child's LEA in 1974, in particular the number of secondary school pupils per full time equivalent teacher, total secondary costs per student and the teacher salary costs per pupil in secondary school, together with the number of secondary school students per 1000 head of population in the local authority. We also merged in data from the 1971 census on the child's community or neighbourhood –census enumeration district-, including the proportion of unemployed, as well as the proportion working in agricultural, professional/managerial/ non-manual/ manual/ semi-skilled jobs in the district, the proportion of owner occupiers, the proportion of council tenants and the proportion of recent Commonwealth immigrants in the district.

[Table 1 near here]

Given the *elitist* nature of this selective system, it is no surprise that more academically able and wealthier children were more likely to be educated in grammar schools. *A priori*, it is not clear whether this would apply to the totality of students in the selective system (grammar and secondary) *vis à vis* students in the comprehensive system. Descriptive statistics in Table 1 show that children allocated to the selective system do appear to have higher ability levels and come from wealthier backgrounds, being brought up in more prosperous neighbourhoods. Other household characteristics also point to observable differences that are usually found to influence educational attainment. This suggests that the shift from selective to non-selective schooling may not have been necessarily random. Wealthier areas appear to have been slower to shift towards comprehensive schooling and hence whether or not a particular child was educated in a selective or non-selective school system would have been potentially endogenous. This potential endogeneity, and the empirical strategy we adopt to overcome the problem, is discussed in the next section.

4. Empirical Strategy

In this paper, our objective is to assess the impact of selection (school-based ability tracking) in secondary education on an individual's educational outcomes. To simplify the framework as much as possible, we can think of a school system as "treatment" consisting of a set of rules. If the treatment is a selective secondary school system, parents are aware that at the end of primary schooling the 11-plus examination will sort students by measures of academic aptitude and assign them to either grammar or secondary modern schools, with different peers, curricula, etc. Under the alternative comprehensive system, all students attend the same type of school, their peers' background is representative of their local community and the curriculum is a common one.[15]

With this stylised framework in mind, we can denote Y_1 as the potential educational outcome for an individual if living under a system of selective schooling. Under an alternative system in which everything else, including peers and area characteristics, is identical, we can denote the potential outcome as Y_0.[16] The impact of the selective schooling for an individual is thus $Y_1 - Y_0$. A policy relevant question is the average impact of selection for the population of individuals in areas who are still subject to selection, namely $E[Y_1 - Y_0 \mid S = 1]$, which would be useful to decide –abstracting from general equilibrium effects- whether to proceed with a full comprehensivisation of the system when the reform has only been partially implemented.

[15] The option of attending a private school is certainly open in either system to parents with sufficient economic resources to afford it. Although the curriculum is common to all students in a comprehensive, there may be instances of explicit or implicit class streaming by aptitude.

[16] There is a substantial difference between our system effects question and the potential effect of picking an individual from a selective area and putting her into a comprehensive one. The latter is of relatively marginal policy relevance compared to the former. In practical terms, the distinction is slightly blurred because selectivity changes in specific areas may have an effect on adjacent ones.

The typical evaluation problem is of course to construct a valid counterfactual; providing a measure of what would have been the educational outcome for individuals who were not educated under a selective system had they been subject to selective schooling. Indeed, the descriptive statistics in Table 1 suggest that individuals who experienced comprehensive schooling are likely to differ from those in selective areas in many ways, some potentially correlated with the educational impact. One possible approach to overcome this problem is to control for a sufficiently wide set of characteristics *W*, so that the expected educational outcome associated with comprehensive schooling is identical across groups of individuals that experienced either type of schooling: $E[Y_0 \mid S = 1, W] = E[Y_0 \mid S = 0, W]$.

A standard regression framework provides a simple way of capturing this impact under linearity assumptions, by regressing educational outcome Y on a set of controls W and a variable indicating whether or not the child was subject to selective schooling S. Since the impact of selection is likely to vary according to values of *W*, interacting W and S will provide a richer description of the data and help us understand who benefits more and less from selective schooling. Within the standard regression framework, such effects can be captured by estimating $Y_i = Wa + Sb + S'Wg + e_i$ through ordinary least squares. We are particularly interested in the impact of selective and non-selective schooling systems for differing ability children so our models also control for the ability of the child, as well as interactions between the ability and selection variables.

A less restrictive approach is to compute the non-parametric impact by means of matching, by pairing individuals with S=1 and S=0 with very similar values of *W*. Rosenbaum and Rubin (1983) suggest matching based on propensity scores, that is, comparing individuals with the same probability $p(W) = \Pr[S = 1 \mid W]$ of being subject to selective schooling, so as to calculate:

$$E[Y_1 - Y_0 \mid S = 1] = E[Y_1 \mid S = 1] - E[E[Y_0 \mid S = 0, p]].$$

From the earlier discussion, it is clear that the success of this estimation strategy depends on the quality of the set of controls in W. Given that the treatment is "theoretically" area-based, the focus should be on area-level characteristics. These can affect the probability of experiencing a selective system in a number of ways. First, LEAs decide whether to switch to a comprehensive structure, but then a complex political and educational process follows, which determines the nature and the pace of the switch to a comprehensive system. We thus include census-based characteristics at the level of the individual's enumeration district, reflecting the socioeconomic group distribution, proportion of immigrants, share of agricultural labour, etc. Educational characteristics at the level of an LEA are also considered in the analysis, as explained before. This way we control for factors that can affect the LEA-level choice and for the role of LEA educational resources in determining outcomes. The set of political variables is defined at the constituency level and allows us not only to approximate the political nature of the decision at the LEA-level, but also to predict, within LEAs, which areas were more likely to oppose resistance to higher level decisions.

One should not understate the role played by individual characteristics. First, there may be differences in individuals' characteristics between selective and non-selective areas, which are not accounted for by Census or related variables. For example, areas still subject to selective schooling are likely to have a higher proportion of more able students if more able students are likely to lose most from going to a mixed ability school. Individual ability controls would be essential if such type sorting occurred. Although we would like to capture the distribution of ability at the area-level and individual ability, our data is not sufficiently dense so as to measure accurately the relevant area level moments from our individual data. This argument applies to many other characteristics in our microdata. The second reason for introducing individual level variables into the model determining the likelihood of experiencing a selective school system relates to the heterogeneous nature of the shift to the comprehensive system. This gives room for families with different attitudes and motivation to pursue an education for their child that differs from that which she would have been allocated to on the basis of residence status. We therefore also control for family social class and related variables. The heterogeneity

of systems within local authorities does also justify the use of individual characteristics since we have no information about these lower level boundaries. Finally, individual characteristics play an important role in determining educational outcomes; hence if families have some flexibility in their schooling choices, these characteristics should also be included in the first stage model of whether or not the child experienced selective schooling.

Despite our efforts to compare like with like by means of regression analysis or matching, endogeneity may still bias our results. This will be the case if there are still unobserved characteristics which both relate to the type of schooling experienced and the potential educational outcomes, either through the common educational outcome (the intercept) or the individual-specific gains that an individual may receive from receiving a specific type of schooling. The instrumental variable estimation approach we follow in this paper is specifically intended to deal with the first of these problems, whereby unobserved heterogeneity in selective schooling can be correlated with "the intercept" of potential educational outcomes. The required assumption is that there is a variable Z that determines the type of schooling experienced but does not directly influence outcomes. By observing changes in Z it is possible to infer changes in the number of years of selective schooling undergone by the individual that can be used for identification of the underlying parameter of interest. We use the political affiliation of each individual's constituency as the instrument, arguing that within LEAs political affiliations partly determined when schools (reluctantly or otherwise) shifted towards mixed ability schooling. In that case, estimation will impose the sample analogue of the moment condition $E[Y - W\alpha - S\beta - S'W\gamma \mid Z, W]$. The easiest way to implement this is to compute the IV estimates using Z and $Z'W$ as instruments for S and $S'W$ respectively.[17]

[17] Another problem we have mentioned is that individuals, their families or entire communities may self-select into different types of schooling on the basis of their potential gains from each schooling type. IV estimation, in this circumstance, would not necessarily provide a consistent estimate of the causal effect of selection and much stronger assumptions would have to be imposed on Z. We do not consider here choices based on potential gains mainly because we believe that this can be sufficiently explained by observable characteristics, which in our data includes family background and early ability.

With our chosen instrument, we must make the assumption that differences in political preferences between parliamentary constituencies with a very similar socioeconomic composition have no direct relationship with existing differences in potential educational outcomes of their children. By using more aggregate election results from the general parliamentary election, we also preclude the possibility that our instrument reflects the fact that individuals vote for a specific party to influence the LEA-level decision on selection. Local and general election results are obviously correlated, but the former is also subject to much higher levels of absenteeism in the UK, also suggesting that using the general election results is a preferable option.[18]

The other problem we must address is one of treatment specification. Our first measure of treatment is based on an individual's experience of schooling, which may bias our results because of the existing margin of choice for certain families in the data and the pseudo-reform in areas where selection remained in place even in the presence of comprehensive schools. Our second measure is an aggregate for the local authority detailing its share of comprehensive schooling. This would be our ideal variable for treatment, were it not for the fact that this is too coarse to capture the genuine within-LEA variation in systems. It is fairly easy to see that each choice of treatment measure is likely to bias the results in opposite directions, the individual-based one penalising results in comprehensives and the aggregate measure attenuating any potential impacts. We provide evidence on these effects and report instrumental variables of the effect of the individual-based treatment as driven by variations in the aggregate measure, which is also used as an instrument. Though the aggregation problem persists, this strategy allows us to provide a range for the plausible estimates of the true effect of selection/tracking, comparing OLS/matching estimates with alternative IV results that use local comprehensive share alone or in conjunction with constituency-level election results. In addition to this, we also present estimates of the effect of the individual-based treatment on educational outcomes that

[18] We were forced to use general election results for 1974 because we do not have the required information to assign individuals to pre-1974 constituencies. Constituency boundaries were subject over the period to considerable changes. We checked the constituencies whose names did not change and found evidence of very few changes in the winning party between the 1966 and 1974 elections, in which Labour was the winning side. The 1969 election saw a minority of seats switching to Conservative, leading to a change in government.

control for local authority fixed effects. We argue these estimates provide an upper bound of the actual effects we are trying to estimate.

5. Results

5.1. Selective schooling in the 1958 cohort.

As discussed, we have two individual-based measures of whether the child experienced selective schooling, the years spent in the selective school system and a simple indicator of whether the child was in a selective school at age 16. We first report results on the determinants of selective schooling using the number of years of secondary schooling that NCDS cohort members spent in a selective school, either grammar or secondary modern.[19] Selected coefficients from a regression of years in the selective system on our set of controls are presented in Table 2.

[Table 2 near here]

The key control variables are the political affiliation of the child's constituency area in 1974. We also control for the ability of the child, the parents' social class, parental schooling, number of siblings and number of older siblings, LEA educational resource level and other characteristics of the child's neighbourhood (as discussed earlier) or community.

Relatively few of the explanatory variables are individually significant. For example, none of the individual community variables are individually significant, although we always reject the null of insignificant effects from the joint set of variables. However, our instruments, i.e. the political affiliation of the child's constituency, are generally signed as expected and significant. The base case is a child in a Labour-held constituency.

[19] Probit estimation results on the selection dummy, based on the type of school at the age of 16 provide qualitatively identical results and are available from the authors on request.

Children in a Conservative constituency experienced on average 0.7 more years of selective schooling, confirming our hypothesis.

Other significant variables are whether the child is in the top quintile of the ability distribution, the level of social adjustment problems of the child, the level of father's schooling, the number of secondary school pupils per full-time teacher in the LEA and secondary school costs per pupil. Students from the top quintile of the ability distribution spent a significantly higher expected number of years in the selective system, particularly for women. Recall that our variable is not measuring attendance at a grammar school; these children could be attending either the lower level secondary moderns or grammar schools. The point is that more able children are somehow being sorted into areas that retained their selective systems for longer, likewise, for children with more educated fathers. The same applies for the social adjustment index, with less socially adjusted students more likely to be in the comprehensive system. Pupils in LEAs with more secondary school students per 1000 people were somewhat less likely to be educated in a selective school. This might be picking up an urban/age composition effect, i.e. more urban areas shifted to non-selective school systems earlier.

Pupils in LEAs that spent more per pupil were less likely to be in selective schooling, providing very tentative evidence that better resourced LEAs may have shifted to non-selective schooling sooner as suggested by Kerckhoff et al (1996). Given the costs of a major reorganisation of a school system this may be unsurprising. An alternative explanation is that resources per student just tend to be higher in less privileged areas, where the selective system appears to be slightly less common.

5.2. The impact of selective schooling on educational attainment

Our data provide us with the opportunity of testing the impact of selective school systems on a remarkable range of educational outcomes, from ability scores at age 11 to lifelong educational attainment. Obviously the age 11 test scores actually precede the child's

entry into secondary school. However, they are still a useful outcome to consider, given the arguments made previously in the paper about wealthier parents 'coaching' their children to perform better on the age 11 exam that was used to determine entry into grammar school. Of the other outcomes considered, age 16 test scores have the great advantage over, for example years of schooling, that the scores are based on identical tests administered to all students and are clear measures of cognitive outcomes. We concentrate most of our analysis on mathematics results because the reading test at age 16 was the same as the one carried out at age 11, making reading scores somewhat less reliable.

[Table 3 near here]

We report in Table 3 a wide set of matching estimates for the impact of selective schooling on various outcomes. We find no evidence of any significant effect from selective schooling for individuals in the lowest ability quintile, the data only suggesting some impact for men on maths scores at 16 and general ability at 11. For the top ability quintile, a more robust pattern emerges, with significant positive effects from selective schooling in most of the outcomes considered, particularly for women. For example, a high ability woman would stay on average an extra two thirds of a year in school in the selective system compared to the comprehensive one. For a low ability woman, this effect would have been close to nil and statistically insignificant.

Table 4 shows the impact of selection again by quintiles, this time decomposing the effect into specific effects for students who attend grammar and secondary modern schools.[20] This allows us to see what happens when a given ability individual is apparently 'misclassified' within the selective system. We concentrate on two outcomes, mathematics scores at 16 and years of schooling. Grammar school is always conducive to

[20] A full analysis of every school type would require a trivariate analysis of the school type to feed into the matching propensity score. Multinomial logit, although easy to implement, imposes the uncomfortable property of independence of irrelevant alternatives. A trivariate probit model would be preferable, although computationally more demand. This type of analysis exceeds the scope of this paper. We provide in appendix A.1 a set of multinomial logit estimates of the probability of attending either type of school in the selective system relative to a comprehensive school, emphasizing the role of ability and social class.

better outcomes than comprehensive schooling, but we can also see how unusual it is to find low ability individuals attending this type of school. On the other hand, misclassification for high ability individuals into secondary moderns leads to worse educational results. Although a small group, it is certainly not negligible and it is likely that this phenomenon led many to advocate in favour of a comprehensive reform, on the basis of this perceived risk. This negative effect is not found amongst individuals of low or intermediate ability, i.e. the group theoretically intended to attend this type of school. We do find significant, positive effects of selective schooling for mid-ability individuals, entirely driven by the large positive impact amongst those 'fortunate' enough to attend grammar schools.

[Table 4 near here]

Our key regression results are summarised in Table 5. We consider the treatment effect of our two selection variables, the selection dummy and years of selective schooling. The coefficients displayed represent the difference between the coefficient on the top ability quintile interaction with selection and its bottom ability counterpart. This reflects how the effect of selection changes as one moves from the bottom to the top of the ability distribution. Our OLS estimates broadly confirm the results obtained through matching, with selection being particularly beneficial at the top of the distribution.[21] Instrumental variable estimates are generally larger but quite imprecise, largely due to the moderate predictive power and restricted variation of our political instrument, which is homogeneous within constituencies. Our clustering at an even larger, LEA-level, tends to boost standard errors. For men, this leads to insignificant effects of the selective schooling variables on basically all outcomes. Nevertheless, we find that the differential impact of selection for high ability women is significant for years of schooling and

[21] OLS estimates did not provide evidence supporting statistically significant effects at the bottom. Higher ability children attain more years of education (at least for women), as do those from a higher social class background. Children with more educated parents and from smaller families also attain more education. Birth order also matters. Children with a larger number of older siblings achieve less. The OLS models have reasonable explanatory power, with an R-squared of between 0.25 and 0.33. Full results can be obtained from the authors on request.

educational qualifications. We find no IV-based heterogeneous impact for maths scores at the age of sixteen.

[Table 5 near here]

In summary, we do not find a systematic significant selection effect, either positive or negative. However when the selection variables are interacted with variables measuring the individual's ability we find significant effects. Children, especially girls, in the top of the ability distribution did attain better educational outcomes if they were in a selective school system. This result holds for both measures of selection and is largely robust to the choice of estimation method.

5.3. Alternative specifications

LEA share of comprehensive schooling

As previously anticipated, we complement our analysis of the effects of selective schooling with information on the extent of comprehensivisation at the broad level of the local education authority. In Table 6 we provide estimates of the probability of being classified "in the selective system", conditional on the share of comprehensive schooling in the area in 1974 and our set of controls. This variable is strongly significant for both men and women, as one would expect. For example, for men, a hundred percent change in the local share is estimated to increase the probability of experiencing schooling in a selective school by 101 percentage points, that is, from zero to basically one. Further results not reported here are quite supportive of this linear specification. The election results, being defined at the smaller constituency level are thus identified and are found to be marginally significant. Interestingly, individual ability and socioeconomic features of the enumeration district are strongly significant whilst individual family background controls do not appear to influence the probability of experiencing selective schooling.

[Table 6 near here]

Using the comprehensive local area share allows us to identify the effect of selective schooling for those individuals induced into this type of schooling by the local options. This is quite helpful because it reduces the bias from counting comprehensive school students in areas with grammar schools as within the comprehensive sector.[22] We present our estimation results in Table 7, looking at overall effects on mathematics results in Panel A and effects that vary by ability in Panel B. For each gender, we report coefficients obtained through ordinary least squares and instrumental variables, the latter under two alternative specifications. The first one (IV/A) excludes election results and local comprehensive share whereas the other (IV/B) only excludes the local share in comprehensives.

[Table 7 near here]

Focusing first on the estimated homogenous effects, the positive effects found for men with OLS disappear when we use instrumental variables. This is mostly due to a reduction in the point estimates and we cannot reject the overidentification of the model. The point estimates are further reduced when instrumenting only with local comprehensive share. For women, IV also reduces the estimated effect but by a much smaller magnitude. In this case, it appears that election results should not be excluded from the second stage, as suggested by a regression of the estimated residuals on the exogenous variables and chosen instruments.[23] When we only instrument with the local comprehensive share the effect becomes marginally insignificant, suggesting this is the lower bound we previously referred to.

Our analysis of interactions with early ability for men appear to provide some marginal support for positive effects at the high ability levels, rejecting the presence of positive

[22] Appendix A.2 shows the reduced form estimates of the effect of local non-comprehensive share on mathematics results. These suggest positive effects of selection being restricted to high ability men and all women except those at the bottom of the ability distribution.
[23] Detailed results are available on request.

effects across the full ability range. Regarding the effects on women, IV estimates are fairly close to OLS with the exception of women in the second ability quintile, which are quite negative and almost statistically significant, whilst there are traces of positive baseline effects.

LEA fixed effect estimates

In this paper we also investigate the variation in the experience of selective schooling that is found within local education authorities. We have earlier argued that within LEA variation can be due to genuine exogenous differences across smaller areas but can also be the outcome of either endogenous mobility of students or comprehensive schools which are *de facto* secondary modern schools in their section of the LEA. Given the magnitudes reported in the descriptive statistics, we are confident that the largest share of variation is due to exogenous variation and our results in the previous section suggest that a potential bias is fairly small, mostly concentrated on low ability individuals.

[Table 8 near here]

Table 8 provides the regression results for the effect of (individual-measured) selection on mathematics scores controlling for 104 LEA-fixed effects. The broad effects for both men and women are positive and significant, slightly larger than our previous OLS estimates. Ability interactions suggest that such estimated gains from selection are not such for low ability students in both gender groups, whilst they persist for higher ability students. In columns (3) and (6) we also test for differences in the impact of selection by parental socioeconomic status (SES). We find no variation across SES groups to be somewhere near attaining statistical significance, which suggests that we are not capturing mobility decisions by better-off parents.

Progression through primary schooling

To conclude the presentation of results in this paper, we test whether the disappearance of the selective system had any impact on the progression that students experienced throughout the primary school period. A possible effect of selection that might benefit all students is that it increases the level of effort prior to the age of selection and thereby improves academic results. Whilst such test score gains may be short lived or of little use further in life unless a student attends a "grammar" school, it is worthwhile to explore this issue as to identify whether this type of incentives can influence school attainment and progression at early ages.

We thus estimate –see results in Table 9- whether students for whom selection was in place at the point of entry into secondary schooling experienced a higher increase in a measure of ability from the age of 7 to the age of 11. Once more, we do not have information on this particular point but, amongst those students in a comprehensive school, we know when their school turned comprehensive. We take this as indication of when reforms took place in the student's area. The variable subject to analysis is the change in the index of cognitive ability at both stages derived from the battery of test results. Although these are different, they provide us with a useful ranking of individuals within their cohort at a point in time and differences over the period indicate movements across the distribution of ability.

[Table 9 near here]

Our results, restricted to students in comprehensive schools, clearly suggest a cutoff point around 1969. In this year, students in our sample were 11-years-old and entering secondary education. For those whose school turned comprehensive *afterwards*, we see that the ability growth was significantly higher. Schools that appear to have been comprehensives prior to entry into secondary schooling robustly indicate lower ability growth. There is one remarkable exception to this pattern: we find schools that became comprehensive before all the others are associated with significantly higher ability growth than for the other schools shifting their status prior to 1969. This might be

explained by the fact that areas that made up the first wave of comprehensives may have had a different type of student intake and other unobserved resources.

6. Policy Discussion and Conclusions

Our results confirm some existing findings in the literature and also shed new light on the issue of the effectiveness of selective school systems. Many commentators have argued that the shift to mixed ability schooling in England and Wales[24], the 'comprehensive experiment', failed, whereas others suggest it did not go far enough. Mixed ability schooling, the former claim, has reduced educational achievement, particularly of the most able. If this is true, how do we explain the remarkable expansion of educational achievement since the 1960s in England and Wales? Have the standards achieved fallen even while the average years spent in education rises? Evidence from our previous paper (Galindo-Rueda and Vignoles (forthcoming)) indicated that, over time, early ability has started to play a lesser role in determining how well someone does at school, whilst family background appears to have become more important. In other words, the expansion of the education system appears to have disproportionately benefited less able (but wealthier) students. Can the dismantling of the selective grammar school system explain these apparently contradictory trends? A plausible hypothesis is that, coupled with an increasing trend in educational attainment, the shift to mixed ability schooling may have reduced the gap in educational achievement between the most able and least able students. One way to address this issue is to estimate the direct impact of selective and non-selective schooling. This paper does precisely that using a period in English and Welsh educational history during which mixed and selective school systems co-existed.

Our results indicate that the most able pupils in the selective school system did do somewhat better than those of similar ability in mixed ability school systems. Of course this result may be spurious if pupils are systematically sorted into mixed ability and

[24] See Gamoran (1996) for a sociological discussion of these issues and the effect of curriculum change in Scotland.

selective school systems, particularly if more able and motivated students are disproportionately educated in selective school systems. We therefore use regression, matching and instrumental variable methods to control for such differences. We study the political affiliation of the individual's constituency during the period in which they were in secondary school as a possible instrument. When we use this IV specification our results become more imprecise but higher, suggesting that the most able (top 20%), particularly the most able women, did do better in a selective school system. We did not find significant selection effects on attainment for lesser ability pupils, although point estimates did often indicate a negative impact of selection for the low ability group.

We investigated the extent to which our estimates could be simply explained by the possibility of inferring selective status on the basis of the individual's school affiliation, which would in theory penalise comprehensive school students in areas where selection is still in place. We therefore instrumented the individual measure of selective schooling with the share of comprehensive schooling in the wide local education authority and still found evidence of positive effects of tracking for high ability students, but with more moderate point estimates. We learnt from this "instrument" that estimated effects of selective schooling were fairly sensitive to the instrument choice. We further pursued the analysis of different sources of variation by estimating within-area specifications and found an identical qualitative result, with slightly higher estimates than obtained through OLS.

From this picture, we can conclude therefore that the shift to comprehensivisation may have compressed the distribution of education achievement, by reducing the performance of the most able students relative to the performance of the rest. We do not claim that this particular system change can fully explain the various trends in educational attainment. Our research does however at least partly explain why the role of early cognitive ability in determining educational outcomes appears to have been reduced immediately after the abolition of the selective grammar school system.

It is difficult to predict what the educational attainment trends would have been had the comprehensive reform not taken place in the way it did. What we can be quite certain of is that rising demand for educational qualifications created a considerable political pressure from middle class-middle ability families constrained by the high standards of attainment –at a certainly very young age- required to make it into a grammar school. To the extent that parents still *perceive* secondary schools to be of different "quality" after the comprehensive reform, the housing market might have taken the place of the 11-plus examination in granting parents the right to send their child to schools where demand went on to exceed the supply of places, many of them former grammar schools.

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Table 1. Descriptive statistics: NCDS members by schooling status in 1974 (age 16)

	In comprehensive school in 1974			In either grammar or secondary modern school in 1974: (Selective)		
	Mean	St.Dev	Obs	Mean	St.Dev	Obs
Schooling characteristics						
Years of pre16 selective schooling	1.952	1.938	4715	5.000	-	3198
Comprehensive	1.000	-	4715	-	-	3198
Grammar	0.000	-	4715	0.330	-	3198
Secondary modern	0.000	-	4715	0.670	-	3198
Proportion LEA comprehensive: 74	0.735	0.219	4643	0.488	0.209	2734
"Grammar" School				0.512	0.220	1764
"Secondary Modern" School				0.474	0.210	970
Individual characteristics						
Female	0.491	0.499	4715	0.521	0.499	3198
Ability index at 7 (missing baseline)						
Ability age 7 quintile=1	0.169	0.375	4715	0.134	0.341	3198
Ability age 7 quintile=2	0.165	0.371	4715	0.152	0.359	3198
Ability age 7 quintile=3	0.158	0.365	4715	0.157	0.364	3198
Ability age 7 quintile=4	0.160	0.367	4715	0.168	0.374	3198
Ability age 7 quintile=5	0.146	0.353	4715	0.206	0.405	3198
Father's social class (unskilled baseline)						
Semi-skilled manual	0.172	0.377	4715	0.151	0.358	3198
Skilled manual	0.454	0.498	4715	0.436	0.496	3198
Skilled non manual	0.095	0.294	4715	0.098	0.298	3198
Intermediate prof, managerial	0.138	0.345	4715	0.179	0.384	3198
Professional	0.038	0.190	4715	0.054	0.227	3198
Missing social class	0.041	0.197	4715	0.033	0.177	3198
Bristol social adjustment index	8.733	8.653	4212	7.721	7.995	2873
Healthy at 16	0.429	0.495	4715	0.468	0.499	3198
No parental information in 1974	0.187	0.390	4715	0.160	0.367	3198
Natural father	0.898	0.301	4715	0.906	0.291	3198
Natural mother	0.959	0.197	4715	0.960	0.194	3198
Father unemployed	0.045	0.208	4715	0.041	0.199	3198
Mother unemployed	0.254	0.435	4715	0.265	0.442	3198
Father's schooling	14.624	1.527	4715	14.855	1.767	3198
Father's schooling missing	0.224	0.417	4715	0.195	0.396	3198
Mother's schooling	14.696	1.350	4715	14.830	1.451	3198
Mother's schooling missing	0.206	0.404	4715	0.173	0.379	3198
Log household income 1974	3.825	0.319	4715	3.833	0.342	3198
Bad financial situation 1974	0.111	0.315	4715	0.106	0.308	3198
Number older siblings	0.940	1.333	4715	0.919	1.364	3198
Number younger siblings	0.997	1.261	4715	0.994	1.230	3198
No mother figure	0.015	0.123	4715	0.015	0.123	3198
No father figure	0.054	0.226	4715	0.054	0.226	3198
Born in British Isles	0.912	0.284	4715	0.929	0.257	3198
Mother born overseas	0.059	0.235	4715	0.068	0.253	3198
Father born overseas	0.068	0.252	4715	0.069	0.254	3198

Continues next page

Table 1 (Continued)

	Comprehensive			Selective		
	Mean	St.Dev	Obs	Mean	St.Dev	Obs
1971 Census features at Enumeration District level						
% unemployed in ED-1971	5.064	6.190	4708	4.617	5.674	3193
% agric. Workers in ED-1971	2.071	7.606	4708	2.477	8.343	3193
% professionals in ED	11.773	12.233	4708	13.810	13.312	3193
% skilled non-manual	27.483	14.240	4708	28.810	14.471	3193
% skilled manual	30.050	13.411	4708	28.061	13.520	3193
% semi-skilled manual	19.393	11.080	4708	19.074	11.772	3193
% owner occupiers	43.943	34.219	4685	50.227	32.943	3187
% council tenants	38.292	39.142	4633	31.126	36.340	3147
% commonwealth immigrants	1.905	5.910	4708	1.857	6.316	3193
LEA secondry education features						
LEA sec. school exp.per student	1412.4	130.2	4697	1383.0	124.3	3192
LEA teacher salaries per student	835.1	66.3	4697	823.4	59.6	3192
LEA sec. pupils per teacher	17.194	1.083	4697	17.464	0.845	3192
LEA sec. pupils*1000/population	78.448	7.777	4697	76.823	7.933	3192
General Election results						
Conservative win MP 1974	0.411	0.492	4715	0.577	0.494	3198
Liberal win MP 1974	0.022	0.148	4715	0.009	0.096	3198
Other win MP 1974	0.010	0.097	4715	0.009	0.095	3198
(Baseline: Labour victory)						
Dependent variables						
Reading score at 11	15.643	5.948	4154	17.101	6.125	2792
Maths score at 11	15.822	9.817	4153	18.553	10.513	2791
General ability score at 11	42.221	15.293	4156	46.618	15.758	2792
Social adjustment index at 11	8.070	8.702	4154	7.390	8.158	2788
Maths score at 16	11.960	6.379	4392	13.779	7.155	3061
Reading score at 16	25.080	6.711	4407	26.371	6.615	3070
In full time education at 17	0.221	0.415	4710	0.313	0.464	3195
Years of schooling/education	11.859	1.723	3594	12.293	2.071	2448
Highest school qual. Index	1.666	1.149	3334	1.997	1.262	2222
Academic qual. Higher than A-level	0.190	0.392	3732	0.278	0.448	2524
Highest qualification index	3.237	2.475	3723	3.814	2.628	2512

Notes:

1. Sample of individuals used in estimation.
2. Bristol social adjustment guide score gives higher value to individual with larger number of items revealing low levels of social adjustment.
3. Parental education imputed to cohort's median when missing.

Table 2. The determinants of selective schooling.

Dependent variable: Number of years in selective system school. OLS regression.

	(1) All	(2) Men	(3) Women
Individual characteristics/background			
Ability at age 7 (missing is baseline)			
Ability quintile=1	0.0333	-0.0990	0.1813
	(0.1265)	(0.1572)	(0.1814)
Ability quintile=2	-0.0099	-0.0506	0.0331
	(0.1248)	(0.1597)	(0.1499)
Ability quintile=3	0.0757	0.0104	0.1470
	(0.1173)	(0.1388)	(0.1704)
Ability quintile=4	0.1731	0.0051	0.3367
	(0.1150)	(0.1411)	(0.1526)*
Ability quintile=5	0.2727	0.1222	0.4134
	(0.1127)*	(0.1553)	(0.1341)**
Bristol social adjustment guide index	-0.0043	-0.0124	0.0066
	(0.0032)	(0.0043)**	(0.0045)
Father's age left schooling	0.0638	0.0904	0.0372
	(0.0167)**	(0.0257)**	(0.0224)
General Election results: 1974			
(Constituency Labour win is default)			
Conservative win	0.6808	0.7042	0.6570
	(0.1841)**	(0.1916)**	(0.1911)**
Liberal win	-0.0344	-0.0735	-0.0203
	(0.5034)	(0.5366)	(0.5399)
Other win	-0.0547	-0.3059	0.0697
	(0.4294)	(0.4955)	(0.4346)
LEA secondary education features			
All Secondary school costs per pupil	-0.0034	-0.0041	-0.0028
	(0.0017)*	(0.0017)*	(0.0016)
Secondary school teachers salaries-cost per pupil	0.0009	0.0011	0.0007
	(0.0037)	(0.0037)	(0.0039)
Secondary pupils per FT teacher	0.1467	0.1195	0.1727
	(0.1226)	(0.1166)	(0.1415)
Secondary studs/1000 population	-0.0254	-0.0303	-0.0202
	(0.0150)	(0.0156)	(0.0152)
Female	0.0498		
	(0.0490)		
Observations	6916	3403	3513
R-squared	0.095	0.109	0.100

Notes:

1. Robust standard errors, adjusted for LEA clustering. * significant at 5%; ** significant at 1%
2. Other controls include full set of individual and household characteristics, Census 71 enumeration district composition as described in summary statistics table.

Table 3. Matching estimates of the effect of selective schooling.

Highest (Q5) and lowest (Q1) ability quintiles.

	Men		Women	
Dept. variable	Ability Q=1	Ability Q=5	Ability Q=1	Ability Q=5
Maths score 16	0.973	1.916	-0.203	3.016
	(0.524)	(0.725)	(0.545)	(0.691)
Reading score 16	0.102	0.733	-0.307	0.847
	(0.922)	(0.402)	(0.896)	(0.403)
Years of schooling	0.041	0.587	0.045	0.666
	(0.093)	(0.309)	(0.118)	(0.293)
A-level or higher academic qualification.	0.013	0.143	-0.054	0.129
	(0.029)	(0.065)	(0.032)	(0.063)
Reading score 11	0.603	1.381	0.469	1.052
	(0.700)	(0.564)	(0.649)	(0.543)
Maths score 11	0.517	2.573	0.119	2.851
	(0.799)	(0.913)	(0.885)	(0.940)
General ability score 11	3.104	1.859	0.664	2.011
	(1.577)	(1.272)	(1.699)	(1.244)

Note: Matching estimates using Stata's *psmatch* command, matching on estimated predicted probability of being subject to selective schooling (either in grammar or secondary modern vs comprehensive). Caliper=0.005. Standard errors in parentheses.

Table 4. Matching estimates of the effect of selective schooling.

Decomposition by ability quintiles and selective school type.

	Men			Women		
	Ability Q=1	**Ability Q=3**	**Ability Q=5**	**Ability Q=1**	**Ability Q=3**	**Ability Q=5**
Maths scores at 16						
Selective vs comprehensive	0.973	1.189	1.916	-0.203	1.328	3.016
	(0.524)	(0.725)	(0.725)	(0.545)	(0.667)	(0.691)
Secondary modern vs compr	0.627	-0.424	-4.052	-0.537	-1.018	-3.379
	(0.505)	(0.747)	(1.155)	(0.525)	(0.663)	(1.028)
No. in secondary modern	215	181	89	184	189	90
Grammar vs comprehensive	13.800	6.638	4.403	9.166	7.205	5.066
	(3.860)	(1.153)	(0.747)	(3.986)	(0.970)	(0.682)
No. of individuals in grammars	5	51	200	6	70	265
Years of schooling						
Selective vs comprehensive	0.041	0.555	0.587	0.045	0.415	0.666
	(0.093)	(0.252)	(0.309)	(0.118	(0.213)	(0.293)
Secondary modern vs compr	-0.008	0.125	-1.157	-0.032	-0.033	-0.704
	(0.085)	(0.251)	(0.465)	(0.11)	(0.188)	(0.381)
No. in secondary modern	215	181	89	184	189	90
Grammar vs comprehensive	1.771	1.881	1.248	1.749	1.572	1.095
	(1.230)	(0.487)	(0.328)	(0.892)	(0.428)	(0.324)
No. of individuals in grammars	5	51	200	6	70	265

Note: Matching estimates using Stata's *psmatch* command, matching on estimated predicted probability of being subject to selective schooling. Caliper=0.005. Standard errors in parentheses.

Table 5. OLS and IV estimates of the effect of selective schooling.

Differences in the effect of selective schooling, top vs bottom ability quintiles.

	Selective vs non-selective		Years of pre16 selective schooling		
Men	OLS	IV	OLS	IV	Obs
Math score at 16	0.879 (0.604)	1.359 (4.331)	0.206 (0.113)	0.568 (0.747)	3222
Years of schooling	0.427 (0.179)	2.462 (1.662)	0.091 (0.045)	0.364 (0.291)	2530
A-level or higher	0.105 (0.042)	0.361 (0.307)	0.019 (0.012)	0.039 (0.053)	2633
Highest qual. Index	0.625 (0.271)	1.404 (2.337)	0.152 (0.059)	0.122 (0.375)	2624
Women	OLS	IV	OLS	IV	Obs
Math score at 16	1.731 (0.684)	2.574 (4.387)	0.441 (0.165)	0.658 (0.712)	3312
Years of schooling	0.755 (0.214)	2.515 (1.379)	0.172 (0.054)	0.481 (0.258)	2793
A-level or higher	0.139 (0.041)	0.751 (0.325)	0.030 (0.010)	0.133 (0.062)	2880
Highest qual. Index	0.672 (0.283)	3.982 (2.204)	0.162 (0.064)	0.674 (0.406)	2868

Note: Difference in estimated coefficients for selective*ability quintile interaction. (Top versus bottom ability quintiles). Robust standard errors reported within parentheses, corrected for LEA clustering. OLS regressions include political variables (statistically insignificant). Instruments in IV regressions are election results winning party dummies. F-statistic for first stage regression on joint significance of political variables always higher than 5.

Table 6. Probability of attending a school in selective system conditional on comprehensive school density

	Men		Women	
Instruments	Marginal effect	Standard Error	Marginal effect	Standard Error
Share comprehensive schooling in locality	-1.0192	0.0680	-1.0905	0.0685
Conservative	0.0619	0.0292	0.0420	0.0385
Liberal	-0.1616	0.0920	-0.1821	0.0940
Other	-0.0909	0.1168	0.0858	0.0638
Significance test results (degrees of freedom)	Chi-Square	p-value	Chi-Square	p-value
All instruments (dof=4)	228.19	0.0000	320.37	0.0000
Election results only (dof=3)	7.95	0.0470	6.95	0.0735
Ability controls (dof=6)	21.08	0.0018	17.83	0.0067
Family composition, parental SES measures (dof=20)	25.10	0.1977	19.87	0.4661
Local characteristics (dof=12)	25.63	0.0121	31.00	0.0020
Observations	3598		3623	
Pseudo-R2	0.2185		0.2234	
Log-likelihood	-1831.21		-1877.66	
Observed proportion	0.36		0.38	
Predicted proportion	0.32		0.35	

Notes: Probit estimates of the probability of attending a school within the selective system (grammar or secondary modern). Marginal effects reported, with standard errors adjusted for LEA-level clustering. Standard set of controls included.

Table 7. Instrumental variable estimates of the effect of attending a school in the selective system

Dependent variable: Mathematics test results at age 16

	Men			Women		
	OLS	**IV/A**	**IV/B**	**OLS**	**IV/A**	**IV/B**
Panel A: ***Homogeneous effects***						
Selective	0.931	0.360	0.301	1.089	0.842	0.691
	(0.236)**	(0.526)	(0.538)	(0.263)**	(0.375)*	(0.394)
Excluded instruments						
Election results	-	Yes	No	-	Yes	No
Local authority density of comprehensive schools	-	Yes	Yes	-	Yes	Yes
Overidentification p-value	-	0.8939	-	-	0.1131	-
Panel B: ***Heterogeneous effects by ability***						
Selective	1.492	-0.758	-0.826	1.236	1.849	1.544
	(0.641)*	(1.259)	(1.292)	(0.630)	(0.817)*	(0.841)
(Ability quintile=1)*Selective	-1.188	0.118	0.149	-1.408	-1.963	-1.900
	(0.832)	(1.648)	(1.657)	(0.739)	(1.143)	(1.140)
(Ability quintile=2)*Selective	-1.129	1.018	1.051	-1.173	-2.882	-2.811
	(0.757)	(1.773)	(1.783)	(0.706)	(1.499)	(1.503)
(Ability quintile=3)*Selective	-0.643	1.406	1.390	0.160	-0.570	-0.234
	(0.871)	(1.682)	(1.669)	(0.734)	(1.007)	(0.998)
(Ability quintile=4)*Selective	-0.256	1.655	1.662	0.569	-0.825	-0.582
	(0.890)	(1.653)	(1.656)	(0.636)	(1.128)	(1.136)
(Ability quintile=5)*Selective	-0.295	2.338	2.395	0.467	-0.346	-0.230
	(0.679)	(1.414)	(1.425)	(0.743)	(1.217)	(1.215)
Excluded instruments						
Election results	-	Yes	No	-	Yes	No
Local authority density of comprehensive schooling	-	Yes	Yes	-	Yes	Yes
Overidentification p-value	-	0.8935	-	-	0.0708	-
Observations	3593	3395	3395	3621	3408	3408

Notes:

1. Robust standard errors within parentheses. * significant at 5%; ** significant at 1%. Standard set of controls included in all specifications.
2. IV/C includes election results in second stage specification. See main text for further details.

Table 8.

The effect of attending a school in the selective system on mathematics test scores: Area-level fixed effects

	Men			Women		
	(1)	(2)	(3)	(4)	(5)	(6)
Selection	1.039	1.623	1.595	1.211	1.334	1.915
	(0.225)**	(0.521)**	(0.896)	(0.213)**	(0.471)**	(0.859)*
Ability interactions (missing ability omitted)						
Selection*Q1		-1.006	-0.901		-1.369	-1.347
(Low ability)		(0.635)	(0.645)		(0.610)*	(0.623)*
Selection*Q2		-1.272	-1.269		-1.008	-1.004
		(0.672)	(0.680)		(0.622)	(0.630)
Selection*Q3		-0.613	-0.608		0.217	0.186
		(0.699)	(0.710)		(0.640)	(0.648)
Selection*Q4		-0.366	-0.415		0.567	0.469
		(0.740)	(0.748)		(0.656)	(0.664)
Selection*Q5		-0.473	-0.547		0.384	0.238
(High ability)		(0.706)	(0.717)		(0.649)	(0.662)
Parental SES interactions (unskilled omitted)						
Selection*			-0.762			-0.768
Semi-skill manual			(0.902)			(0.854)
Selection*			-0.011			-0.831
Semi kill nonmanual			(0.814)			(0.782)
Selection*			1.547			-0.831
Skill manual			(1.010)			(0.979)
Selection*			0.202			0.485
Skill non-manual			(0.942)			(0.866)
Selection*			-0.592			-0.536
Intermed/manager.			(1.181)			(1.168)
Selection*			-0.029			-0.766
Professional			(1.396)			(1.332)
Observations	3593	3593	3593	3621	3621	3621
R-squared	0.41	0.41	0.42	0.39	0.39	0.39

Notes:

1. All specifications include 104 area-level fixed effects. (Statistically significant)
2. Robust standard errors within parentheses. * significant at 5%; ** significant at 1%
3. Standard set of controls included in all specifications.

Table 9.

The effect of a selective secondary education system on changes in measured ability throughout primary schooling

Dependent variable: Change in cognitive ability index: Age 7 (1965) to Age 11 (1969)

	Men		Women	
	(1)	(2)	(3)	(4)
Year school attended in 1974 became comprehensive				
1965	0.130	0.155	0.183	0.119
	(0.108)	(0.104)	(0.060)**	(0.057)*
1966	-0.051	-0.045	0.079	0.030
	(0.124)	(0.118)	(0.147)	(0.104)
1967	0.055	0.033	0.062	0.078
	(0.089)	(0.095)	(0.094)	(0.081)
1968	-0.008	-0.021	0.075	0.040
	(0.076)	(0.069)	(0.082)	(0.063)
1969 (omitted)				
1970	0.088	0.077	0.202	0.139
	(0.078)	(0.072)	(0.082)*	(0.065)*
1971	0.195	0.223	0.212	0.122
	(0.081)*	(0.087)*	(0.082)*	(0.071)
1972	0.255	0.258	0.301	0.232
	(0.100)*	(0.080)**	(0.088)**	(0.067)**
1973	0.328	0.297	0.190	0.162
	(0.084)**	(0.080)**	(0.070)**	(0.063)*
1974	0.127	0.124	0.214	0.152
	(0.074)	(0.077)	(0.074)**	(0.058)*
Standard controls	No	Yes	No	Yes
Observations	1676	1676	1635	1635
R-squared	0.02	0.23	0.01	0.28

Notes:

1. OLS regression of growth in cognitive ability index: age 7 to age 11.
2. Sample of individuals in a comprehensive school in 1974. Set of controls as specified in previous tables.
3. Robust standard errors in parentheses, adjusted for area-level clustering. * significant at 5%; ** significant at 1%
4. Additional information: Higher ability growth is found amongst those students with lower initial ability and from higher social class.

Table A.1.

Probability of attending a school in selective system conditional on comprehensive school density

	Men				Women			
	Secondary modern vs Comprehensive		Grammar vs Comprehensive		Secondary modern vs Comprehensive		Grammar vs Comprehensive	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Share comprehensive	-4.9658	0.3666	-4.3611	0.4833	-5.2640	0.3313	-4.2952	0.4857
Conservative	0.4648	0.1720	-0.0500	0.1375	0.3248	0.1797	-0.0789	0.2211
Liberal	-0.6228	0.6817	-2.8755	1.3423	-0.9420	0.8377	-1.0109	0.4988
Other	-0.4916	0.9760	-0.4162	0.5209	0.3700	0.2527	0.2311	0.4195
Ability								
Q1: Ability (Lowest)	0.2691	0.1640	-2.1173	0.6033	-0.1716	0.1872	-2.4926	0.4799
Q2: Ability	0.2340	0.1733	-0.8605	0.2793	0.2026	0.1571	-0.9898	0.2451
Q3: Ability	0.2757	0.1566	-0.4292	0.2245	-0.0184	0.1840	-0.4196	0.1908
Q4 Ability	-0.0162	0.1974	0.1938	0.2251	-0.1094	0.1655	0.3597	0.1699
Q5: Ability (High)	-0.3589	0.2057	0.9368	0.2531	-0.5967	0.1593	0.8357	0.1395
Father's social class								
Semi-skill manual	-0.1782	0.2512	0.5283	0.4604	-0.0672	0.2590	0.4399	0.5286
Skilled manual	-0.1552	0.2096	0.7848	0.4720	-0.1477	0.2730	0.5237	0.5643
Skilled non-manual	-0.7650	0.2953	1.1292	0.4655	-0.3936	0.2907	0.8999	0.4871
Intermediate manager	-0.4983	0.2282	0.9966	0.4774	-0.1341	0.2534	1.1467	0.5376
Professional	-0.6630	0.4636	1.1849	0.5108	-0.4196	0.2996	1.1154	0.5336
Log-likelihood	-2364.73				-2509.21			
Pseudo R-Squared	0.2511				0.2513			
Observations	3598				3624			

Notes: Multinomial logit estimates of probability of attending a given school type at 16. Reference group is comprehensive. Coefficients and standard errors reported, adjusted for clustering at the level of local authority.

Table A.2.

Reduced form effects of local authority share in non-comprehensive schools

Dependent variable: Age 16 mathematics test scores

	Men		Women	
	(1)	(2)	(3)	(4)
Local authority share	0.027	-0.067	*0.063*	*0.147*
in non-comprehensive	(0.048)	(0.103)	*(0.036)*	*(0.079)*
Ability Q1*Share		0.003		*-0.179*
		(0.142)		*(0.107)*
Ability Q2*Share		0.089		*-0.269*
		(0.157)		*(0.146)*
Ability Q3*Share		0.121		-0.016
		(0.142)		(0.099)
Ability Q4*Share		0.148		-0.058
		(0.150)		(0.108)
Ability Q5*Share		*0.210*		-0.024
		(0.122)		(0.119)
Observations	3395	3395	3408	3408
R-squared	0.38	0.39	0.36	0.36

Notes:

1. OLS regression estimates reported, with robust standard errors within parentheses, adjusted for area-level clustering.
2. Italicized coefficients and standard errors for coefficients significant at less than 10 percent.
3. Specification includes standard set of controls .