The association between attending a grammar school and children's socio-emotional outcomes. New evidence from the Millennium Cohort Study.

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Academic selection of 11-year-old children into different secondary schools remains a prominent part of the education system within certain parts of the United Kingdom. A small number of studies have investigated how gaining access to the academically selective grammar school 'track' is associated with young people's subsequent educational achievement. Yet less attention has been paid to the impact grammar schools may have upon a wider range of outcomes, such as young people's self-confidence, academic self-esteem and aspirations for the future. We address this gap in the literature by considering the relationship between attending a grammar school and a wide range of outcomes, including young people's attitudes, behaviours and socio-emotional skills. Applying a propensity score matching approach to rich longitudinal data, we find that gaining access to a grammar school has very little impact upon young people's lives. This holds true across both England and Northern Ireland, and for a range of different socio-emotional outcomes.

Key Words: Grammar schools, socio-emotional outcomes.

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1. Introduction

A large number of countries, particularly within Europe, have an academically selective schooling system. At a relatively young age, sometimes at just 10 or 11 years old, children are placed into different types of secondary school based upon their measured academic potential. These children may then go on to have quite different experiences of secondary school and outcomes in later life. For instance, while those in the more academically focused tracks are typically being prepared for life at university, others are often encouraged to take a more vocational path (Chmielewski 2014). Academic selection therefore has the potential to have a dramatic effect upon a person's life course.

England is a somewhat unusual example of a country where academic selection still partially exists. Despite laws enacted more than 50 years ago to end the practise of separating children into different secondary schools based upon their academic ability, a number of selective 'grammar schools' continue to exist within certain parts of the country. Indeed, nine percent of secondary pupils in England attend school in what can be considered an academically-selective education area, with around five percent of secondary school pupils currently enrolled in a grammar school nationwide (Department for Education 2017). Likewise, the use of between-school academic selection remains the norm in some other parts of the United Kingdom – most notably Northern Ireland.

The impact grammar schools have upon young people's outcomes has recently received a lot of attention, due to increased policy interest in this area. Specifically, throughout 2016 and 2017 there was much discussion in England about repealing the current legislative ban upon the opening of new selective grammar schools (The Guardian 2016). Although such discussions have become more muted at present, and the ban upon new grammar schools opening remains in place, the Conservative government are introducing other ways to allow selective education in England to expand. For instance, at the time of writing, they have made an additional £50 million of funding available allowing existing grammar schools to expand (Department for Education 2018). Consequently, one way or another, the number of grammar school places in England seems destined to soon increase.

It is therefore unsurprising that the academic literature on the impact of grammar schools in England has had something of a renaissance (Cribb et al 2013; Burgess et al, 2014; Allen and Bartley 2017; Burgess et al 2017). One particular strand has considered whether children who attend grammar schools have superior educational and later lifetime outcomes than their peers

who attend a non-grammar state school. The general thrust of this literature is that gaining entry into a grammar school has non-trivial benefits for young people's educational and labour market outcomes. For instance, Clark and Del Bono (2014) found that grammar school attendance had a significant impact upon the amount of education completed for a cohort of children from Aberdeen in the 1960s. They also detected significant effects upon earnings and fertility, but only for women. Likewise, Sullivan and Heath (2002) found grammar school pupils achieved superior educational outcomes relative to their comprehensive school peers, after a range of pupil characteristics had been controlled for. Andrews et al (2016) also found that pupils who attend a grammar school do better than similar pupils in comprehensive schools, although the effect diminishes as the area becomes more selective.

We contribute to this relatively small literature by investigating the 'impact' gaining entry into grammar school has upon children's social and emotional skills, including school engagement, academic well-being, peer relationships, self-esteem, aspirations for the future and mental health. There are several reasons why one might anticipate attendance at a grammar school might influence such outcomes. First, grammar and non-grammar school pupils are likely to have rather different school peers. Previous work has illustrated how such peer effects can influence children's socio-economic competencies, such as the 'big five' personality traits (Comi, Origo and Pagani 2017). Second, relatedly, young people are likely to use their school peers as a reference point, and thus judge their own ability against individuals within the same school. Research from both psychology (e.g. Marsh and Parker 1984) and economics (Murphy and Weinhardt 2016) into 'Big Fish Little Pond' effects therefore suggests that grammar school pupils may actually develop *lower* levels of academic self-concept and self-efficacy, as their main reference point will be their high-achieving peers. Third, alternatively, it is possible that failure to get into grammar school has a long-term scarring effect upon young people's self-confidence, well-being and self-esteem. Specifically, they may internalise a feeling of failure from not gaining entry into an academically-selective school, which continues to affect them even a long time after such selection has taken place. Finally, grammar and non-grammar schools may have quite different environments, with bullying, peer-pressure, discipline and the provision of career advice and guidance likely to vary. This may, in turn, influence factors such as young people's expectations for the future and their mental health. Together, the combination of the factors above provide clear reasons to believe that gaining entry into a grammar school may have an impact upon young people's socio-emotional competencies, in addition to academic skills. We present the first contemporary evidence on this issue for two

parts of the UK – England and Northern Ireland – allowing us to consider whether the effect of grammar schools is similar across these different national settings.

To trail our key results, we find little evidence that attending a grammar school has a positive effect upon young people's socio-emotional outcomes at age 14. This holds true in both England and Northern Ireland, for a wide variety of measures (behavioural, socio-emotional, academic, aspirations) and is robust to the extensive sensitivity analyses we have conducted. We hence challenge the conventional wisdom that gaining access to a grammar schools is really the make or break turning point for children that it is often made out to be.

The paper now proceeds as follows. Section 2 provides a brief overview of the grammar school system in England and Northern Ireland. Section 3 outlines the Millennium Cohort Study (MCS) dataset, with our propensity score matching approach discussed in section 4. Results are then presented in section 5, with conclusions and potential directions for future research following in section 6.

2. The grammar schooling system in England and Northern Ireland

Academic selection in the United Kingdom refers to the grammar school system. At the start of their final year of primary school, at age 10 or 11, families have the option of entering their child for the grammar school entrance test. This is known as the 11-plus test in England and the 'transfer test' in Northern Ireland. These tests typically assess children's ability in three subjects (English, mathematics and reasoning skills) with a sufficiently high score required for the child to be allowed access to a grammar school. Those children who do not pass, or whose parents choose to not enter them for this test, do not have access to this academically selective track. Children who enter grammar school then typically remain in this track throughout secondary education (from ages 11 to 16); movement to and from a grammar to a non-grammar school is rare. By international standards, this form of academic selection is early (the average age of selection amongst OECD countries is 14) and binding in the sense that there is little opportunity to move into the grammar school track once in secondary school (OECD 2013).

This system of between-school academic selection is the norm across the whole of Northern Ireland. In England, however, the situation is more complex. Although the grammar school system was in place across the whole of England until the mid-1960s, the government then issued a directive encouraging local education authorities to move to a non-selective, comprehensive school system. Academic selection was quickly disbanded across large parts of the country, with only around 200 grammar schools remaining, educating around five percent

of England's pupils by the end of the 1970s (Andrews et al, 2016). Although opening new grammar schools was outlawed in 1998, they were never fully abolished by the central government. As a result, academically selective schools still remain in certain parts of the country. Specifically, there are ten Local Education Authorities (LEAs) in England where a fully academically selective schooling system remains[1]. Moreover, a number of 'isolated' grammar schools still exist in other parts of England (i.e. single grammar schools within a largely comprehensive area, with no other selective schools around). Figure 1 illustrates how England's 163 remaining grammar schools are distributed across the country (left-hand panel) along with the home location of the children who attend (right-hand panel). Darker shading indicates to more intense concentration of academic selection.

<< Figure 1 >>

The above has some important implications for our aim of comparing outcomes between grammar and non-grammar school pupils; particularly with regards to differences between England and Northern Ireland. For instance, in Northern Ireland, there is a clear counterfactual to not gaining access to the grammar school track; children enter the non-academic track which caters for lower-achieving pupils. However, given the geographic spread of grammar schools across England, attending a non-selective comprehensive school (or, indeed, paying to attend an independent school) is a viable alternative for many of those who fail to pass the 11-plus test. This means that our results for England and Northern Ireland should not be directly compared; rather, they are reflecting the 'impact' of attending a selective school in two quite different settings (with rather different counterfactuals). Figure 1 also highlights the importance of performing sensitivity analyses for our results in England, including restricting the sample to only those children who clearly live within selective education areas. The results from such sensitivity analysis are presented in the online supplementary material (see Appendix D and Appendix H).

3. Data

The Millennium Cohort Study (MCS) is a nationally representative longitudinal study of UK children (https://www.cls.ioe.ac.uk/page.aspx?sitesectionid=851). A stratified, clustered survey design was used, with geographic areas (electoral wards) selected as the primary sampling unit, and then households with newly born children randomly selected from within

[1] The 10 fully selective LEAs in England are Bexley, Buckinghamshire, Kent, Lincolnshire, Medway, Slough, Southend-on-Sea, Torbay, Trafford and Sutton.

sampled electoral wards (see Plewis 2004 for further details). Six sweeps have been conducted between 2000 and 2015, when children were 9 months, 3, 5, 7, 11 and 14 years old. Parents, children and their teachers have been interviewed within the various sweeps. Of the 18,819 cohort members who participated at nine months (11,695 in England and 1,955 in Northern Ireland), 11,726 remained in the study at age 14 (7,739 in England and 1,115 in Northern Ireland). This reflects attrition rates of 34 percent (England) and 43 percent (Northern Ireland) respectively.

Children and their parents completed the fifth wave of the MCS survey at age 11; when the majority of pupils were in Year 6 (i.e. the year before children enter grammar school). Most of the surveys were completed between February and July 2012, as children in England were completing Year 6, after children would have taken the eleven-plus test (typically between September 2011 and January 2012). Within the age 11 survey, parents of cohort members were asked:

"*Thinking about all of the schools you applied to, which of these types of schools did you apply to?"* with "Grammar school" being one of the response options.

Note that families typically only apply to grammar schools *after* the results of the entrance test are known. With respect to this paper, this would imply that families would only apply to a grammar school if their child has passed the entrance test. Consequently, parental reports of whether they applied to a grammar school should act as a good proxy for whether their child sat and passed this test. Therefore, throughout our analysis, we restrict the sample to only those pupils whose families applied for them to attend a grammar school. This should, in turn, help us to rule out potential confounding differences between grammar and non-grammar school pupils, and aid in our estimation of the average treatment effect on the treated (ATT). In doing so, the sample size available for analysis is restricted to 883 children in England and 733 in Northern Ireland. Approximately 40 percent of these children then went on to attend a grammar school in England, and 78 percent in Northern Ireland[2]. Appreciating that this restriction clearly reduces the pool of observations available to match grammar school pupils to, we also present

[2] Restricting the sample to applicants leads to a relatively small sample size for non-grammar school children in the case of Northern Ireland. We have therefore produced an alternative set of estimates for Northern Ireland where we do not make this sample restriction, and include both applicants and non-applicants within our matching models. This leads to a much larger pool of non-grammar school pupils that we can match grammar school pupils to. These alternative results are provided in the online supplementary material (see Appendix H). This alternative approach does not lead to substantial changes to the conclusions reached.

alternative results in the online supplementary material where this sample restriction is no longer made (see Appendix H).

Parental school preferences

When the MCS cohort were age 11, their parents were also asked a series of questions capturing their secondary school preferences. First, they were asked:

"Which of these factors were important in choosing a secondary school?" ticking all the following options that apply (as well as identifying the single most important factor): (a) Child wanted to go there; (b) School is near to home; (c) His/her friends intending to go there; (d) His/her brother/sister goes there; (e) Other relative goes there; (f) Academic reputation; (g) Strong discipline policy; (h) good extra-curricular activities; (i) school has specialist curriculum; (j) good facilities; (k) general good impression; (l) religious grounds.

They were then asked about the steps they took to get their child into their preferred school, including use of extra tuition:

"Which, if any, of the steps on this card did you take in order to help improve your child's chance of getting into a particular secondary school?" (a) Moved home; (b) Short-term renting; (c); Used the address of a relative or friend; (d) Got child into a particular primary school; (e) Arranged extra tuition or coaching for child; (f) Arranged for extra curricula activities for child; (g) Joined a church or place of worship; (h) Asked someone with influence in the process to recommend your child; (i) Other steps.

Together this means we have access to detailed information on the factors associated with parental school choice and the actions they have taken to try and get their children into their preferred secondary school. This information will play a critical role in our construction of an appropriate counterfactual within our propensity score matching models (see section 4 for further details).

Academic achievement measures

MCS cohort members have completed a number of cognitive tests at ages 3, 5, 7 and 11. Specifically, these tests are:

- Naming vocabulary (ages 3 and 5)
- Pattern construction (ages 5 and 7)
- Picture similarities (age 5)

- Word reading (age 7)
- Progress in Maths (age 7)
- Verbal similarities (age 11)
- Spatial working memory (age 11)

Together, these capture children's abilities in English, mathematics, verbal and non-verbal reasoning – all the areas typically assessed as part of the grammar school entrance exam (Allen, Bartley and Nye 2017). Hence, we are able to account for the key factors which determine entry into grammar schools, amongst the sub-set of children who apply. Moreover, by being able to control for children's performance on up to nine different tests, taken at four different ages, the scope for measurement error affecting our results is limited.

Social, behavioural and emotional skills measured at age 11

As part of the age 11 survey, young people were asked a battery of questions capturing their attitudes towards school, along with a number of modules designed to capture their social and emotional skills. This includes the following characteristics:

- *Academic self-concept*. A battery of three questions capturing children's views of how good they are at various school subjects. Example item: "*I am good at English*".
- *School motivation / engagement*. A series of five questions asking children about whether they try their best at school and find the work interesting. Example question: "*How often do you try your best at school*"
- *Well-being*. A battery of six questions capturing how positive children feel about various aspects of their life. Example question: "*How do you feel about the following parts of your life? Your friends*.
- *Academic well-being*. Children's responses to two questions capturing how positive children are about their school work and the school they go to. Example question: "*How do you feel about the following parts of your life? Your school work*.
- *Rosenberg self-esteem scale*. Example item: '*I am able to do things as well as most other people*.
- *Strengths and Difficulties Questionnaire*. A widely used scale capturing children's behavioural problems across five dimensions (see online supplementary materials - Appendix A - for further details).

The online supplementary materials (Appendix A) provides the full list of questions within each of our outcome scales. We include these scales within our matching models as they could potentially be associated with both the probability of gaining entry into grammar schools and children's social and emotional outcomes at age 14. For instance, children with lower self-esteem or academic self-concept in the final year of primary school may perform less well on the grammar school entrance test, over and above any potential difference in their actual

academic abilities. Moreover, as a number of these scales also serve as our age 14 outcome measures, accounting for 'pre-treatment' differences between children who gain entry into grammar school and those who do not is potentially important.

Age 14 outcome measures

A number outcome scales children completed at age 11 were also repeated in the age 14 survey, including the academic self-concept, well-being, academic well-being, self-esteem and SDQ scales. Hence for these specific measures we have information available in the final year of primary school, and again three years into secondary school. Moreover, we also have access to additional outcome measures within the age 14 survey. We group these into the five categories detailed below, all of which could be plausibly influenced by whether the child gains entry into a grammar school.

Parental aspirations for their offspring and continuing educational investments

If a child fails to get into a grammar school, then their parents may adjust their expectations for what their offspring will do in the future. For instance, as their child has failed to get into a grammar school, they may revise their beliefs about whether they are likely to continue in school beyond the compulsory leaving age, and whether they will go on to university. Parents may also adjust their willingness to continue certain educational investments in their offspring, such as paying for private tuition. We explore such possibilities through the following three age 14 outcome variables:

- *Parental post-16 expectations*. Parental responses to the question *'What would you like your child to do when he/she is 16 years of age?*' This has been converted into a binary variable, coded as 1 if they said continue their education, and 0 otherwise.
- *Parental university expectations*. Parental responses to the question: '*How likely or unlikely do you think it is that your child will attend university*?' This has been converted into a binary variable, coded as 0 if they do not think their child will attend university, and 1 if they do.
- *Receiving tutoring at age 14*. A binary variable based upon children's responses to whether they were receiving private tuition in either English or mathematics.

Young people's expectations and aspirations for the future

Children may also alter their aspirations and expectations for the future, depending upon whether they gain entry into a grammar school or not. For instance, the may start to believe

that they do not have the academic ability to gain entry at university, or to work in a professional job. This situation could be reinforced by peer effects, with their classmates less likely to expect to enter university, which has an impact upon their own beliefs. Likewise, they may receive less information about university from their school teachers, or receive different careers advice relative to their grammar school peers. We consider the impact of attending a grammar school upon the following variables:

- *Young person's university expectations*. Children's response to the question '*How likely do you think it is that you will go to university*?' This was reported on a continuous scale (ranging from 0 to 100%), which we have standardised to mean 0 and standard deviation 1.
- *Young person's aspirations towards a professional job*. Children were asked '*When you grow up what would you like to be*?' This has been recoded into occupational categories within the MCS dataset, which we have dichotomised into a binary variable. This takes the value of 1 if the child responded with a professional job (NS-SEC category 2, 3.1, 3.2, 3.3 or 3.4), and 0 otherwise (including if they gave a vague response or said that they do not know).

Young people's attitude towards school

Young people's attitudes towards school may be influenced by whether they attend a grammar school. For instance, by failing to gain entry into a grammar school, young people may become disengaged from education and put less effort into their school work. Likewise, it may lower their self-confidence in their academic ability, and they may become less happy with their school work (and, more generally, life at school). Alternatively, previous work on Big Fish Little Pond effects (Marsh and Parker 1984) suggests that children may reference their own ability against their peers, potentially implying that attending a grammar school could actually have a negative effect upon academic self-efficacy. More generally, previous work suggesting grammar schools have a positive effect educational achievement have been limited in terms of exploring potential mechanisms – including the role of school engagement. We therefore explore the association between grammar school entry and the following attitudinal variables:

- *Academic self-concept*. (Same scale as age 11 – see sub-section above)
- *School motivation / engagement*. (Same scale as age 11 – see sub-section above)
- *Academic well-being*. (Same scale as age 11 – see sub-section above)
- *Friends behaviour in school*. A scale based upon children's response to the following two question: '*How many of your close friends work hard at school?'* and '*How many*

of your close friends get into a lot of trouble at school?'. Responses are on a four-point scale – all of them, most of them, some of them and none of them.

- *Importance of qualifications*. Children's responses to the following question on a five-point scale: '*How much do you agree or disagree that nowadays you need qualifications in order to get a job worth having?'*
- *Truancy*. A binary variable, based upon children's responses to a question asking whether they have missed school at any point over the last 12 months without parental permission.

Mental health, well-being and self-esteem

A now extensive literature has highlighted the importance of socio-emotional outcomes to young people's future success (Blanden, Gregg and Macmillan 2007) with increased policy interest in areas such as children's well-being and mental health (May 2017). Likewise, in addition to educational achievement, the happiness and well-being of their offspring is extremely important to parents when selecting a secondary school. Yet, despite the importance of these wider outcomes, little previous research has considered whether they are influenced by attending a grammar school. For instance, children might be more likely to be bullied if they are a high-achiever in a non-grammar school or, alternatively, amongst the least able pupils in a grammar school. Likewise, it may impact upon the size and composition of their friendship groups, which may in turn impact upon their well-being, behaviour and mental health. Hence, due to both their importance and the credible mechanisms by which they may be impacted, we consider the relationship between grammar school attendance and the following socio-emotional outcomes:

- *Mental health scale*. A scale based upon children's response to 13 statements, all on a three point scale (not true, sometimes, true). For example '*I thought I could never be as good as other kids*'. See online supplementary materials (Appendix A) for further details.
- *Well-being*. (Same scale as age 11 – see sub-section above)
- *Rosenberg self-esteem scale*. (Same scale as age 11 – see sub-section above)
- *Bullying*. Children's responses on a six point scale to the two questions: '*How often do other children hurt you or pick on you on purpose?'* and *'How often have other children sent you unwanted or nasty emails, texts or messages or posted something nasty about you on a website?'*
- *The Strengths and Difficulties Questionnaire (SDQ) behavioural scale*. Children were asked to respond on a three-point scale (Not True, Somewhat True or Certainly True) to a set of 25 questions. Together, these questions capture children's emotional problems, conduct problems, hyperactivity, peer-problems and their social skills (see online supplementary materials Appendix A for further details). When combined, they provide a well-known and widely used aggregate measure of whether young people have behavioural issues.

Young people's academic achievement and skills

Several previous studies have suggested that attending a grammar school is positively related with academic achievement (Sullivan and Heath 2002; Atkinson et al 2006; Andrews et al 2016). A limitation of the MCS is that it currently only has a single measure of academic skills at age 14 – capturing pupils' achievement on a low-stakes English test – which only took four minutes to complete. Our analysis considers the association between grammar school entry and the following single academic achievement variable:

- *English vocabulary skills*. This captured children's ability to understand the meaning of words by choosing a word meaning the same or nearly the same from a list of five alternatives. Twenty words were included in the task and these got more difficult as the task progressed.

4. Methodology

We use propensity score matching (PSM) to estimate the impact of gaining entry into a grammar school upon children's outcomes. This method essentially matches each grammar school pupil to an equivalent non-grammar school pupil, who is similar in terms of a number of observable characteristics. The outcomes of 'treatment' (grammar) and 'control' (matched non-grammar) pupils are then compared to estimate the impact of attending grammar schools upon young people's lives.

When implementing this methodology, we first restrict the MCS sample to only those children whose families applied for them to attend a grammar school. This leaves a pre-matching sample of 883 children in England and 733 children in Northern Ireland. Nearest neighbour matching is then used, with a tight restriction set on the caliper to 0.005, to create the matched control group. Within the PSM model, we include a wide range of variables described in the previous section, including all parent and child responses up to the fifth MCS survey sweep (answered at age 11 – when children are in the final year of primary school). This includes numerous academic and cognitive achievement tests[3], parental school preferences, family background, strategies parents have used to get their child into their preferred school (including private tuition) and a selection of children's social, emotional and behavioural outcomes (e.g. engagement in school, SDQ scores). A full list of the variables included in our matching models

[3] Together these cover mathematics, English and non-verbal reasoning skills; all the areas covered in the 11-plus entrance examination.

can be found in Table 1 (England) and Table 2 (Northern Ireland). Formally, the logistic regression model underlying the PSM matching is specified as:

$$log\left(\frac{\pi(G)}{1-\pi(G)}\right) = \alpha + \beta_1.D + \beta_2.A^7 + \beta_3.S^7 + \beta_4.A^{11} + \beta_5.S^{11} + \beta_6.P + \beta_7.T$$

Where:

$\pi(G)$ = The probability of attending a grammar school (G = 1 grammar; G = 0 non-grammar)

D = A vector of demographic characteristics such as gender and parental income

A^7 = Measures of children's academic achievement up to age 7

S^7 = Children's socio-emotional measures at age 7

A^{11} = Measures of children's academic achievement up to age 11

S^{11} = Children's socio-emotional measures at age 11

P = Parental school preferences measured at age 11

T = Whether the child received tutoring at age 11

Multiple imputation by chained equations has been used to take into account of missing covariate data. These models are estimated separately for England and Northern Ireland. This means that grammar school children in England can only be matched to non-grammar school children in England (and likewise for Northern Ireland). The notes to Figure 2, along with the online supplementary materials (Appendix B and C), provides details about the number of children who are dropped due to not having a suitable match (e.g. treatment pupils for whom no control pupil with an estimated propensity score within 0.005 could be found) or because their propensity score was outside of the region of common support. The online supplementary materials (Appendix B and C) also show the final sample size for our different analyses, which are typically around 650 observations in England and 500 observations in Northern Ireland.

<< Figure 2 >>

It is standard in the PSM literature to present 'balance tests', comparing the characteristics of the two groups, after the matching has taken place. These are presented in Tables 1 (England) and 2 (Northern Ireland) below. As anticipated, before matching has taken place, grammar school pupils are rather different to their non-grammar school peers. Specifically, they tend to have higher levels of prior academic achievement, come from more advantaged socio-

economic backgrounds and have stronger socio-emotional skills. However, after matching upon the propensity score, the two groups are much more comparable, particularly in the case of England. For instance, as evidenced by the small and statistically insignificant effect size differences, the matched samples are very similar in terms of prior academic ability scores, parental school preferences and socio-economic background. Indeed, across the 50 variables considered, the only occasions where the two groups notably differ post-matching are self-esteem at age 11 (slight advantage for non-grammar pupils), whether the child's parents wanted them to go to a school with a specialist curriculum and whether the children received coaching for the entrance test (slight advantage for the grammar school groups). Notably, the two groups appear well-matched across a wide range of cognitive ability measures taken before entry into secondary school and across a range of socio-emotional outcomes measured at age 11. Consequently, our interpretation of Table 1 is that the matching process for England appears to have 'balanced' the grammar and non-grammar school groups reasonably well.

<< Table 1 >>

Although matching has undoubtedly improved the comparability of the grammar and non-grammar groups within the Northern Irish data, it is nevertheless clear that some differences do remain. For instance, after matching, the grammar school group continue to have higher levels of school engagement, parents who tend to help their children more with their homework and who placed more importance upon reputation when choosing a secondary school than their non-grammar school peers. On the other hand, the two groups are now reasonably well-balanced in terms of prior academic achievement results, with there actually being some small advantages on some of these to the non-grammar school group (e.g. age 7 maths and English scores). Together, our interpretation of Table 2 is that the matching process has worked satisfactorily in Northern Ireland, in that the two groups now appear reasonably similar across most of the key baseline characteristics. However, we note that some caution is required when interpreting our results using the Northern Irish data, given that some non-trivial differences between grammar and non-grammar school pupils remain.

<< Table 2 >>

The following section presents our results, where we compare age 14 outcomes between grammar school pupils and their matched controls. All continuous measures (e.g. WORD vocabulary scores, SDQ scores) have been standardised to mean 0 and standard deviation 1. The direction of each scale has also been changed, so that higher values refer to 'better'

outcomes. All estimates for continuous variables are therefore effect sizes. Results for binary outcomes are, on the other hand, presented in terms of proportional differences[4].

We have conducted a number of sensitivity analyses to investigate the robustness of our findings. In the following section, we present results when our matching models only include achievement controls up to age 7, rather than age 11. (The intuition being that, although all the age 11 measures are captured before children have entered secondary school, some may be potentially endogenous)[5]. We also illustrate how our estimates vary according to the specification of the matching model, such as altering the length of the caliper (resulting in greater or fewer observations being removed from the sample due to there being no sufficiently close match available) and the number of neighbours selected. Additionally, the online supplementary materials (Appendix D) investigates whether our estimates for England change once we restrict the sample to only those pupils living within selective-education areas. Likewise, online supplementary materials (Appendix E) explores the extent to which our conclusions change in England after removing pupils who failed to get into grammar school, but instead attended a fee-paying school, at age 14. An alternative statistical methodology (difference-in-differences) has been applied to a sub-set of outcomes in Appendix F as a check to whether this leads to similar results. The results from these various sensitivity analyses are summarised in the following section. Finally, as our main estimates use multiple imputation to handle missing covariate data, alternative results are also presented for which we implement a 'complete case' analysis. See the online supplementary materials Appendix G.

To conclude, we remind readers that all our estimates only capture causal effects if the (untestable) 'selection-upon-observables' assumption is met. This requires that when we are predicting the propensity (score) of an individual gaining a place at grammar school, we include as covariates in this model all the variables which are relevant to determining treatment assignment and this outcome. We argue that the extensive range of factors we are able to include in our PSM models, including nine measures of prior achievement, parental investment including private tuition, aspiration and attitudes toward education, and rich family background measures, means that such an assumption is more credible here than in most situations. Yet we

[4] For instance, a value of 0.05 for a binary measure would indicate that grammar school pupils are five percentage points more likely to experience the outcome in question than their matched non-grammar peers.

[5] For example, children and their families will already know whether they will be going to a grammar school by the time they sit their Key Stage 2 tests. If going to a grammar school has 'anticipatory effects' (e.g. parents deciding to continue investing in private tuition if their child gains entry to grammar school, but end it if they do not) then Key Stage 2 test scores may be potentially endogenous.

still cannot completely rule out the possibility that important factors which predict both grammar school entry and children's age 14 outcomes remain.

5. Results

Table 3 presents the results for England. Our discussion of this table focuses upon our preferred specification (model 1), which controls for a wide range of measures up to age 11. It highlights a clear and consistent message; across a wide range of outcomes there is little positive benefit of gaining entry into a grammar school. The vast majority of estimates are small in terms of magnitude, and do not reach statistical significance at conventional levels. For instance, there is no evidence that grammar school children are more engaged in their school work (effect size 0.01), are more likely to expect to go to university (effect size 0.01) or have superior English vocabulary skills (effect size 0.16) than the matched comparison group. Similar results hold for aspirations towards a professional job (-1 percentage point), academic self-concept (effect size -0.15) and SDQ scores (effect size 0.02). Indeed, the only outcome with a sizeable effect is teenagers' self-esteem, though this actually seems *worse* for grammar school pupils. Thus, against common perception, Table 3 therefore suggests that gaining access to a grammar school may not be as life-changing as many perhaps expect.

<< Table 3 >>

Analogous results for Northern Ireland can be found in Table 4. Again, most of the coefficients are close to zero, indicating that there is little difference between the two groups. Academic self-concept (i.e. children's responses to questions such as '*I am good at maths'*) is a notable exception, with grammar school pupils having *worse* outcomes than their matched peers (effect size = -0.38). This could be due to big-fish little-pond effects (Marsh and Parker 1984), with young people referencing their own ability against their school peers. On the other hand, Northern Irish parents are six percentage points more likely to continue to pay for their child to have private tuition (particularly in mathematics) than their matched comparators. Hence there is some suggestion that parents are somewhat more likely to continue to pay for educational investments for their offspring if they attend a grammar school. Yet the above should not distract from the central message of Table 4; similar to the results for England, attending a grammar school does not seem to offer substantial advantages to those young people who gain entry (at least in the short run).

<< Table 4 >>

The robustness of these results have been tested in several ways. First, we have varied the length of the caliper from 0.001 to 0.009, which subsequently varies the number of grammar school pupils for whom a comparable match can be found. These alternative results in the case of England can be found in Table 5 (see the online supplementary materials, Appendix I, for the equivalent results for Northern Ireland). For England, almost all estimates for all outcomes remain small in terms of magnitude, and are not statistically significant. The only exception is the Rosenberg self-esteem scale, where there continues to be a small negative effect of attending a grammar school. Similar results hold for Northern Ireland, where substantial positive effects of attending a grammar school are few and far between (with the exception of grammar school parents being more likely to continue to pay for private tutoring for their offspring). The results presented in Table 5 therefore provides support for our key substantive conclusion – for a wide array of outcomes, the advantage of gaining entry into a grammar school is minimal. This continues to hold true in further robustness tests we have conducted with the specification of the matching model, such as varying the number of neighbours that grammar school pupils have been matched to.

<< Table 5 >>

All estimates presented thus far have used multiple imputation to handle item non-response to the covariate data. The online supplementary materials (Appendix H) therefore considers whether our findings change when implementing a complete-case analysis. Overall, there is minimal change to our results in either country. Effect sizes are persistently small in terms of their magnitude, and rarely reach statistical significance at conventional thresholds. The finding that grammar schools actually have little positive impact upon a wide array of young people's outcomes therefore seems robust to potential challenges with missing covariate data.

Similar results hold for the other sensitivity analyses we have conducted (see the online supplementary materials for further details). When removing those children who go on to attend a private secondary school from the sample, we continue to find only very few statistically significant effects across our outcomes, and the majority of these favour attending non-grammar pupils (see online supplementary materials Appendix E)[6]. After restricting the sample in England to selective education areas only, most point estimates are reasonably similar, though with notably larger standard errors (see online supplementary materials

[6] The point estimate for the age 14 vocabulary test was slightly larger (effect size of 0.24), but not statistically significant in our preferred model specification.

Appendix D). For a sub-set of outcomes, where there are repeated measures over multiple time points, we have implemented a difference statistical approach (difference-in-differences), which conditions out a subset of unobservable variables which might bias our results. These results confirm our key findings, with attending a grammar school having no impact upon young people's English skills, well-being or behavioural outcomes (see online supplementary materials Appendix F for further details).

6. Conclusions

Although often characterised as having a 'comprehensive' secondary schooling system, in parts of the United Kingdom the education system remains highly selective. In Northern Ireland and certain parts of England, children are segregated into different schools at age 11 based upon their performance on a high-stakes test, which many believe to be a critical determinant of young people's future lives. But how much of an advantage does gaining entry into an academically-selective grammar school really bring? Although a number of previous studies have considered this issue (Sullivan and Heath 2002; Andrews et al 2016), their focus has been upon a rather narrow range of outcomes. Little consideration has thus far been paid to the impact upon wider aspects of young people's lives that are of great importance to children and parents when they are choosing a secondary school. Moreover, most contemporary research into the impact of modern day grammar schools has been conducted using national administrative data, which are limited in terms of the amount of variables which can be controlled to account for self-selection into grammar schools. For instance, most recent research using the national pupil database has been unable to account for differences between grammar and non-grammar pupils in terms of parental school preferences, application decisions and the measures they have taken to get their child into their chosen school (private tuition being an obvious example). Selection bias hence remains a significant challenge in most research into the impact of modern day grammar schools.

We attempt to overcome these issues within this paper. Specifically, rather than focusing upon a narrow range of academic achievement measures alone, we explore the association between grammar school attendance and a wide range of children's outcomes, including their attitudes towards schools, aspirations and expectations for the future, as well as their socio-emotional skills , along with a key academic competency (e.g. English vocabulary skills). Moreover, by using the rich data available within the Millennium Cohort Study (MCS), including detailed information on parental school preferences and multiple measures of children's achievement, our results are likely to be less susceptible to issues surrounding selection bias than most other

recent studies in this line of research. Together, we believe that this adds new and important detail to the on-going debates about the merits of grammar schools, and the pros and cons of academically-selective education systems more generally.

Against the conventional wisdom, we find little evidence that gaining entry into a grammar school has a positive impact upon most aspects of young people's lives. For instance, three years into their time at secondary school, grammar pupils seem to have similar levels of engagement and self-confidence in school, aspirations and expectations for the future, and socio-emotional outcomes as their matched (non-grammar) peers. This holds true across two rather different settings (England and Northern Ireland), with quite different counterfactuals, and is robust to the wide array of sensitivity analyses we have conducted. This leads us to an important conclusion: gaining entry into a grammar school may actually not be as important as many assume.

Why do our results differ from the general thrust of the grammar schools literature, which has typically identified a positive effect upon young people's outcomes? One possibility is methodological differences, with our estimates based upon the MCS (a sample survey) while other recent work has used the National Pupil Database (administrative records). This could mean we are better able to control for selection into grammar schools than other recent studies, due to the range of observable potential confounders available in the MCS, though with more uncertainty with respect to sampling and representivity. Yet we believe the much more likely explanation rests in the constructs being measured. The socio-emotional competencies we focus upon are quite different to the academic achievement measures typically studied in this literature, with different mechanisms likely to influence such outcomes. Consequently, it is entirely possible that grammar schools may influence young people's academic achievement, while having little impact upon their wider outcomes. At the time of writing, only a single, low-stakes and potentially low-quality academic outcome measure is available (English vocabulary based upon the age 14 WORD score), meaning we are unable to consider the academic impact of grammar schools in more detail.

These findings do, of course, need to be considered in light of the limitations of this research. First, despite the many important advantages of the MCS dataset, the sample size available for our analysis is limited. However, the fact that we have produced similar results using two separate samples (England and Northern Ireland), and with most point estimates around zero or even negative, we do not believe it likely that an increase in statistical power would alter our

substantive conclusions. Second, at the time of writing, data is only available upon short-run outcomes (measured at age 14) and for a low-stakes (and potentially low-quality) measure of children's academic skills. An important direction for future research is for longer-term outcomes to also be considered, including higher-quality and higher-stakes academic measures (e.g. GCSE grades, university entry), labour market outcomes, as well as the key socio-emotional competencies investigated in this paper. Finally, the limited sample size available for certain sub-groups (e.g. low-income pupils who attend a grammar school) means we have been unable to explore potential heterogeneous effects. Although this is clearly an important and policy-relevant issue, we unfortunately cannot provide a credible investigation into such effects due to the MCS sample size.

Despite these limitations, we nevertheless believe this paper has helped to further the debate upon the impact of grammar schools. Many parents and families place great emphasis upon their child getting a place at a grammar school, in the belief that this will have a substantial impact upon their future well-being. However, our analysis has shown how many of the things parents hold most dear (their children's well-being, aspirations and behaviour) are largely unaffected by going to a grammar. Consequently, getting your child into a grammar school may not be the make or break outcome that so many believe.

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Table 1. Covariate balance before and after matching in England

	Before matching			After matching		
	Grammar	Non-grammar	Effect size difference	Grammar	Non-grammar	Effect size difference
Age 11 SWM strategy	32.08	34.22	**-0.36****	32.45	32.54	-0.01
Age 11 SWM total errors	24.53	32.68	**-0.43****	25.92	25.68	0.01
Age 7 English vocabulary	133.83	123.02	**0.36****	133.27	132.70	0.02
Age 7 pattern construction	125.85	115.71	**0.60****	124.19	125.67	-0.09
Age 7 maths scores	109.22	102.09	**0.46****	108.63	108.38	0.02
Age 5 picture similarities	86.77	83.20	**0.31****	86.54	87.06	-0.05
Age 5 naming vocabulary	115.23	106.89	**0.51****	114.10	116.05	-0.12
Age 5 pattern construction	96.41	89.09	**0.38****	95.53	97.32	-0.09
Age 3 Bracken school readiness	114.18	106.41	**0.48****	112.76	112.61	0.01
Age 3 naming vocabulary	80.36	69.47	**0.62****	78.19	79.13	-0.05
Coaching for entrance test age 11	0.59	0.30	**1.24****	0.54	0.45	**0.39****
Other steps taken to get into chosen school	0.10	0.16	**-0.18****	0.12	0.11	0.01
Parental help with homework age 11	2.77	2.52	**0.27****	2.72	2.69	0.03
Homework a priority age 11	1.67	1.59	0.08	1.70	1.71	-0.01
Home tutor in English age 11	0.34	0.37	-0.09	0.35	0.33	0.06
Home tutor in maths age 11	0.33	0.40	**-0.18****	0.35	0.32	0.06
School choice: Child wanted to attend	0.76	0.62	**0.29****	0.74	0.74	0.00
School choice: Close to home	0.30	0.38	**-0.16****	0.32	0.30	0.02
School choice: Child's friends attending	0.15	0.17	-0.05	0.17	0.18	-0.02
School choice: Siblings attend	0.15	0.23	**-0.17****	0.18	0.12	0.12
School choice: Relative attend	0.05	0.06	-0.03	0.06	0.05	0.04
School choice: Reputation	0.90	0.78	**0.25****	0.89	0.87	0.04
School choice: Discipline	0.21	0.23	-0.04	0.22	0.24	-0.06
School choice: Extra-curricula activities	0.37	0.38	-0.02	0.39	0.41	-0.04
School choice: Specialist curriculum	0.19	0.15	0.12	0.20	0.13	**0.20****
School choice: Facilities	0.48	0.45	0.05	0.50	0.50	0.00
School choice: Good impression	0.75	0.61	**0.28****	0.71	0.71	-0.01
School choice: Religion	0.05	0.09	**-0.16****	0.05	0.04	0.06
School engagement scale age 11	0.25	0.20	0.05	0.26	0.36	-0.10
Academic self-concept scale age 11	0.54	0.24	**0.30****	0.47	0.57	-0.10
Well-being scale age 11	0.19	0.03	**0.17****	0.19	0.25	-0.06
Academic well-being scale age 11	0.33	0.10	**0.22****	0.31	0.38	-0.07
Self-esteem scale age 11	0.26	0.10	**0.15****	0.22	0.39	**-0.17**
SDQ total scores age 11	-0.44	-0.19	**-0.24****	-0.42	-0.46	0.04
Academic enjoyment age 7	1.51	1.49	0.03	1.51	1.52	-0.01
Well-being age 7	1.16	1.23	**-0.24****	1.17	1.15	0.07
School-engagement age 7	2.38	2.38	0.01	2.39	2.39	-0.02
SDQ total scores age 7	5.38	7.13	**-0.31****	5.57	5.43	0.03
Verbal similarities score age 11	129.66	124.36	**0.32****	129.07	129.15	0.00
Equivilised household income	4.97	3.91	**0.52****	4.77	4.97	-0.10
Mother NVQ level 1	0.03	0.04	-0.04	0.03	0.02	0.02

Mother NVQ level 2	0.22	0.21	0.01	0.22	0.26	-0.08
Mother NVQ level 3	0.09	0.10	-0.02	0.08	0.08	-0.01
Mother NVQ level 4	0.45	0.33	**0.26****	0.43	0.39	0.10
Mother NVQ level 5	0.16	0.11	**0.22****	0.18	0.19	-0.07
Gender	0.49	0.49	0.01	0.50	0.57	-0.13
Ethnicity: Mixed	0.06	0.05	0.04	0.07	0.05	0.08
Ethnicity: Indian	0.07	0.13	**-0.43****	0.09	0.08	0.08
Ethnicity: Pakistani or Bangladeshi	0.05	0.14	**-0.39****	0.05	0.05	0.00
Ethnicity: Black	0.02	0.09	**-0.41****	0.02	0.03	-0.03
Ethnicity: Other	0.09	0.12	-0.15	0.09	0.08	0.03

Notes: Figures based upon our model preferred specification. This is using 'model 1', the sample having been restricted to families who applied for their child to attend a grammar school, the caliper set at 0.005, with the two nearest neighbours chosen. Standard deviation used in the effect size calculation is based upon all MCS children in England. ** indicates statistical significance at the 5 percent level.

Table 2. Covariate balance before and after matching in Northern Ireland

	Before matching			After matching		
	Grammar	Non-grammar	Effect size difference	Grammar	Non-grammar	Effect size difference
Age 11 SWM strategy	34.43	35.90	**-0.26****	34.62	34.95	-0.06
Age 11 SWM total errors	33.16	44.49	**-0.59****	34.15	34.93	-0.04
Age 7 English vocabulary	113.30	97.11	**0.50****	111.87	116.91	**-0.16****
Age 7 pattern construction	123.02	116.66	**0.34****	122.74	123.03	-0.02
Age 7 maths scores	105.37	99.12	**0.40****	104.98	107.98	**-0.19****
Age 5 picture similarities	88.00	85.03	**0.22****	87.73	86.57	0.08
Age 5 naming vocabulary	115.01	109.63	**0.32****	113.95	113.17	0.05
Age 5 pattern construction	94.17	88.09	**0.30****	94.11	92.27	0.09
Age 3 Bracken school readiness	108.43	102.60	**0.37****	107.95	107.00	0.06
Age 3 naming vocabulary	82.18	77.55	**0.30****	81.62	83.57	-0.13
Coaching for entrance test age 11	0.25	0.13	**0.36****	0.24	0.20	0.13
Other steps taken to get into chosen school	0.13	0.13	0.00	0.13	0.11	0.05
Parental help with homework age 11	2.73	2.44	**0.29****	2.71	2.49	**0.21****
Homework a priority age 11	1.26	1.18	0.13	1.26	1.20	0.10
Home tutor in English age 11	0.31	0.18	**0.35****	0.30	0.24	0.16
Home tutor in maths age 11	0.32	0.22	**0.24****	0.30	0.24	0.16
School choice: Child wanted to attend	0.86	0.88	-0.03	0.89	0.84	0.12
School choice: Close to home	0.32	0.31	0.01	0.30	0.39	**-0.19****
School choice: Child's friends attending	0.32	0.36	-0.08	0.31	0.37	-0.12
School choice: Siblings attend	0.35	0.31	0.09	0.34	0.29	0.11
School choice: Relative attend	0.26	0.20	0.13	0.25	0.23	0.04
School choice: Reputation	0.82	0.67	**0.32****	0.79	0.69	**0.21****
School choice: Discipline	0.24	0.28	-0.08	0.25	0.24	0.02
School choice: Extra-curricula activities	0.49	0.47	0.04	0.48	0.37	**0.24****
School choice: Specialist curriculum	0.11	0.14	-0.11	0.11	0.07	0.13
School choice: Facilities	0.50	0.56	-0.11	0.50	0.47	0.07
School choice: Good impression	0.66	0.66	0.00	0.67	0.62	0.09
School choice: Religion	0.20	0.13	0.20	0.20	0.15	0.14
School engagement scale age 11	0.23	0.16	0.06	0.18	-0.01	**0.18****
Academic self-concept scale age 11	0.06	-0.15	**0.20****	0.02	-0.05	0.07
Well-being scale age 11	0.25	0.22	0.03	0.23	0.13	0.10
Academic well-being scale age 11	0.26	0.06	**0.20****	0.24	0.13	0.11
Self-esteem scale age 11	0.15	0.10	0.05	0.15	0.12	0.04
SDQ total scores age 11	-0.48	-0.13	**-0.36****	-0.47	-0.40	-0.07
Academic enjoyment age 7	1.61	1.59	0.04	1.61	1.63	-0.04
Well-being age 7	1.16	1.21	**-0.18****	1.15	1.17	-0.07
School-engagement age 7	2.39	2.37	0.04	2.38	2.39	-0.02
SDQ total scores age 7	5.16	7.27	**-0.38****	5.23	5.31	-0.01
Verbal similarities score age 11	129.40	123.53	**0.36****	128.79	130.41	-0.10
Equivilised household income	4.04	2.95	**0.70****	3.88	3.80	0.05
Mother NVQ level 1	0.03	0.10	**-0.27****	0.04	0.02	0.07
Mother NVQ level 2	0.24	0.33	-0.18	0.25	0.23	0.03
Mother NVQ level 3	0.09	0.09	0.02	0.09	0.10	-0.07
Mother NVQ level 4	0.41	0.23	**0.43****	0.38	0.39	0.00
Mother NVQ level 5	0.16	0.08	**0.30****	0.16	0.19	-0.10
Gender	0.50	0.55	-0.09	0.50	0.44	0.12
Index of multiple deprivation	6.11	4.94	**0.41****	5.99	5.61	0.13
Main parental respondent Catholic	0.41	0.43	-0.04	0.44	0.42	0.04
Partner Catholic	0.32	0.24	0.19	0.34	0.37	-0.06

Notes: Figures based upon our model preferred specification. This is using 'model 1', the sample having been restricted to families who applied for their child to attend a grammar school, the caliper set at 0.005, with the two nearest neighbours chosen.

Table 3. The association between attending a grammar school and children's outcomes in England

	Model 1		Model 2	
Outcome	**Beta**	**SE**	**Beta**	**SE**
Attitudes towards school				
Academic self-concept scale	-0.15	0.12	-0.05	0.10
School engagement scale	0.01	0.11	0.02	0.09
Academic well-being	-0.01	0.11	0.06	0.09
Friends behaviour at school	-0.06	0.12	0.01	0.10
Believe qualification needed to get a good job (Ref: No)	-0.05	0.04	-0.06	0.03
Played truant (Ref: No)	-0.04	0.03	-0.02	0.02
Mental health, well-being and self-esteem				
Mental health scale	-0.10	0.12	-0.02	0.10
Well-being scale	-0.04	0.12	-0.01	0.10
Self-esteem scale	**-0.20***	0.12	-0.11	0.10
Bullied	-0.08	0.11	-0.06	0.09
SDQ scale	0.02	0.10	0.01	0.09
Young people's aspirations and expectations				
Go to university scale	0.01	0.08	0.01	0.07
Aspire to work in a professional job (Ref: No)	-0.01	0.07	0.01	0.06
Parental aspirations and investments				
Parent thinks will stay in school post 16 (Ref: No)	0.02	0.02	0.03	0.02
Parent thinks will go to university (Ref: No)	-0.01	0.05	0.03	0.05
Receives tutoring (Ref: No)	0.00	0.04	0.00	0.04
Receives English tutoring (Ref: No)	0.01	0.03	0.00	0.03
Receives maths tutoring (Ref: No)	0.02	0.04	0.02	0.03
Academic achievement				
English vocabulary scale	0.16	0.13	**0.26****	0.11
Controls				
Demographic characteristics	Yes		Yes	
Achievement measures age 7	Yes		Yes	
Socio-emotional measures age 7	Yes		Yes	
Achievement measures age 11	Yes		-	
Parental school preferences age 11	Yes		-	
Tutoring and homework help age 11	Yes		-	
Socio-emotional measures age 11	Yes		-	

Notes: Effect for binary variables refers to a proportional increase. Effect for continuous outcome variables refer to effect sizes. Negative coefficient indicate worse outcomes for grammar school pupils than their matched non-grammar school peers. * and ** indicate statistical significance at the 10 and 5 percent levels respectively. Model 1 refers to our preferred specification, with the PSM model including all covariates measured up to age 11, caliper set to 0.05, and matching to the two nearest neighbours. See online supplementary materials (Appendix B) for details on number of observations on and off common support.

Table 4. The association between attending a grammar school and children's outcomes in Northern Ireland (main specification)

	Model 1		Model 2	
Outcome	**Beta**	**SE**	**Beta**	**SE**
Attitudes towards school				
Academic self-concept scale	**-0.38****	0.17	-0.05	0.15
School engagement scale	-0.28	0.18	-0.10	0.15
Academic well-being	-0.25	0.18	-0.08	0.15
Friends behaviour at school	-0.07	0.21	0.10	0.17
Believe qualification needed to get a good job (Ref: No)	-0.03	0.07	-0.01	0.06
Played truant (Ref: No)	0.00	0.04	-0.01	0.03
Mental health, well-being and self-esteem				
Mental health scale	-0.25	0.19	-0.15	0.17
Well-being scale	-0.14	0.17	-0.11	0.15
Self-esteem scale	-0.24	0.18	-0.19	0.16
Bullied	0.07	0.17	-0.08	0.14
SDQ scale	-0.11	0.15	-0.14	0.13
Young people's aspirations and expectations				
Go to university scale	0.00	0.17	0.20	0.14
Aspire to work in a professional job (Ref: No)	-0.19	0.12	-0.04	0.09
Parental aspirations and investments				
Parent thinks will stay in school post 16 (Ref: No)	0.00	0.05	0.05	0.04
Parent thinks will go to university (Ref: No)	0.13	0.10	**0.16****	0.08
Receives tutoring (Ref: No)	**0.06****	0.02	**0.06****	0.02
Receives English tutoring (Ref: No)	0.00	0.01	0.00	0.01
Receives maths tutoring (Ref: No)	**0.06****	0.01	**0.06****	0.01
Academic achievement				
English vocabulary scale	-0.11	0.17	**0.34****	0.14
Controls				
Demographic characteristics	Yes		Yes	
Achievement measures age 7	Yes		Yes	
Socio-emotional measures age 7	Yes		Yes	
Achievement measures age 11	Yes		-	
Parental school preferences age 11	Yes		-	
Tutoring and homework help age 11	Yes		-	
Socio-emotional measures age 11	Yes		-	

Notes: Effect for binary variables refers to a proportional increase. Effect for continuous outcome variables refer to effect sizes. Negative coefficient indicate worse outcomes for grammar school pupils than their matched non-grammar school peers. * and ** indicate statistical significance at the 10 and 5 percent levels respectively. Model 1 refers to our preferred specification, with the PSM model including all covariates measured up to age 11.

Table 5. Robustness of estimates for each outcome variable to choice to caliper length in England

Caliper	Academic self-concept	Go to university	Mental Health	Parent expects stay in school	Parent thinks university	Self-esteem	SDQ	School engagement	Receives tutoring	Well-being	Vocab skills
0.001	-0.17	-0.03	-0.09	0.02	-0.05	-0.22	-0.02	-0.03	0.02	-0.06	0.10
0.002	-0.17	-0.01	-0.07	0.02	-0.03	**-0.21***	-0.01	-0.02	0.01	-0.06	0.14
0.003	-0.17	0.00	-0.06	0.02	-0.02	-0.18	0.00	0.01	0.00	-0.03	0.16
0.004	-0.16	0.01	-0.08	0.02	-0.02	-0.18	0.02	0.02	0.00	-0.03	0.17
0.005	-0.15	0.01	-0.10	0.02	-0.01	**-0.20***	0.02	0.01	0.00	-0.04	0.16
0.006	-0.15	0.02	-0.11	0.01	0.00	**-0.21***	0.02	0.01	0.00	-0.04	0.18
0.007	-0.13	0.02	-0.11	0.01	0.00	**-0.21***	0.02	0.00	0.00	-0.04	0.17
0.008	-0.13	0.02	-0.11	0.01	0.01	**-0.22***	0.02	0.00	0.00	-0.03	0.18
0.009	-0.11	0.02	-0.11	0.01	0.01	**-0.22***	0.02	0.00	0.00	-0.03	0.19

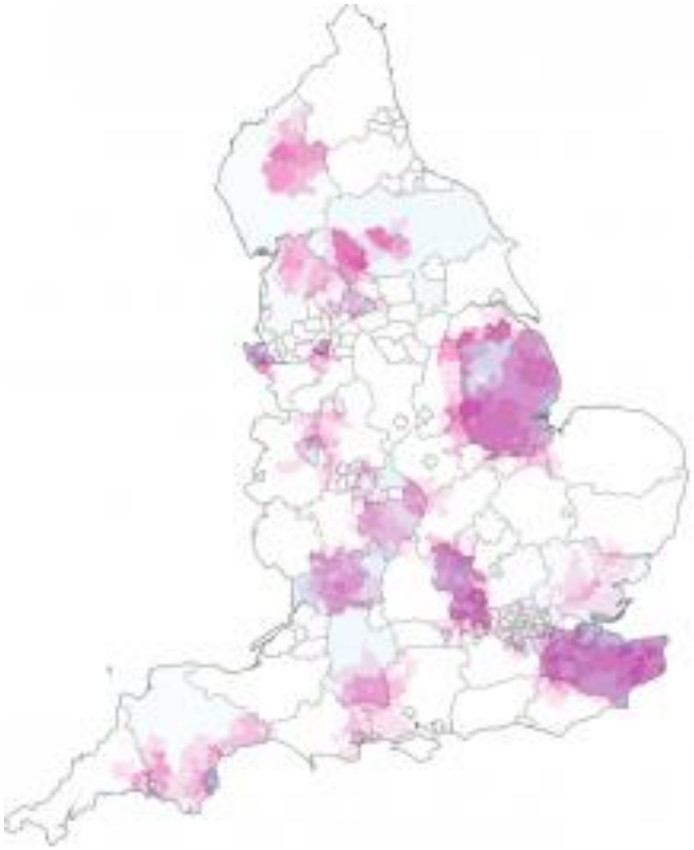
Caliper	Academic well-being	Bullied	Friends behaviour at school	Aspire to professional job	Need qualifications	Played Truant	Approx # of grammar pupils on support
0.001	-0.01	-0.07	0.02	0.00	-0.03	-0.04	107
0.002	-0.02	-0.04	0.00	0.00	-0.04	-0.04	166
0.003	0.00	-0.06	-0.04	0.00	-0.04	-0.04	202
0.004	0.00	-0.08	-0.05	-0.01	-0.05	-0.04	222
0.005	-0.01	-0.08	-0.06	-0.01	-0.05	-0.04	236
0.006	-0.01	-0.09	-0.06	-0.01	-0.05	-0.04	249
0.007	-0.01	-0.10	-0.06	-0.01	-0.05	-0.03	258
0.008	-0.01	-0.10	-0.07	-0.01	-0.06	-0.03	263
0.009	0.00	-0.09	-0.07	-0.01	-0.06	-0.03	266

Notes: Approximate number of grammar school pupils on support refers to the average number of on-support observations taken across the outcomes. Estimates refer to effect sizes for continuous variables and proportion differences for binary outcomes. * and ** refer to statistical significance at the 5 and 10 percent levels respectively. Negative coefficient indicate worse outcomes for grammar school pupils than their matched non-grammar school peers.

Figure 1. The location of grammar schools in England and where their pupils live

(a) Location of grammar schools

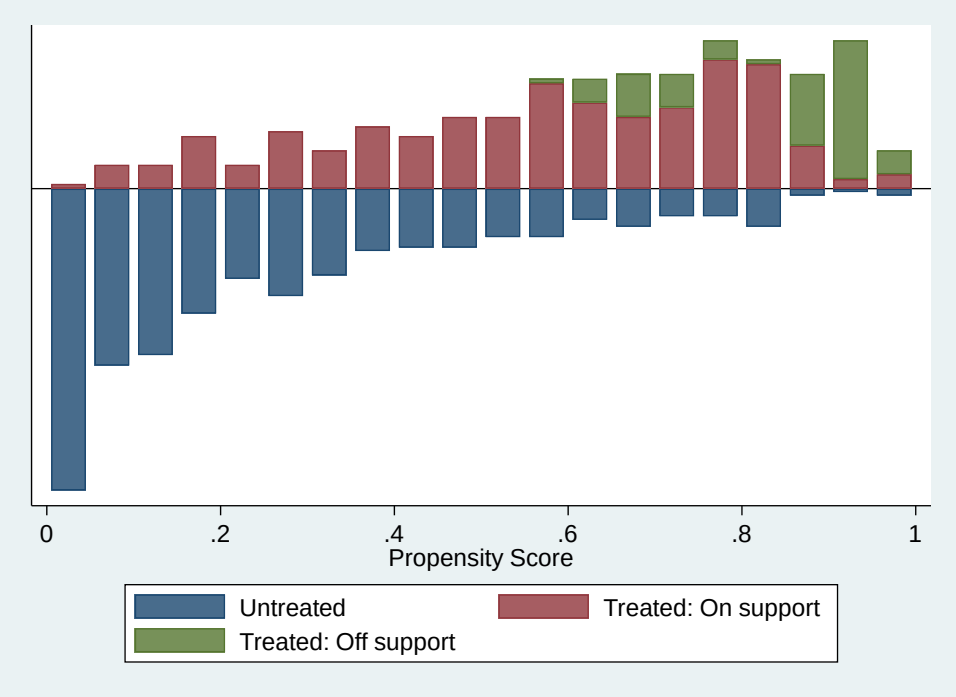
(b) Where grammar school pupils live



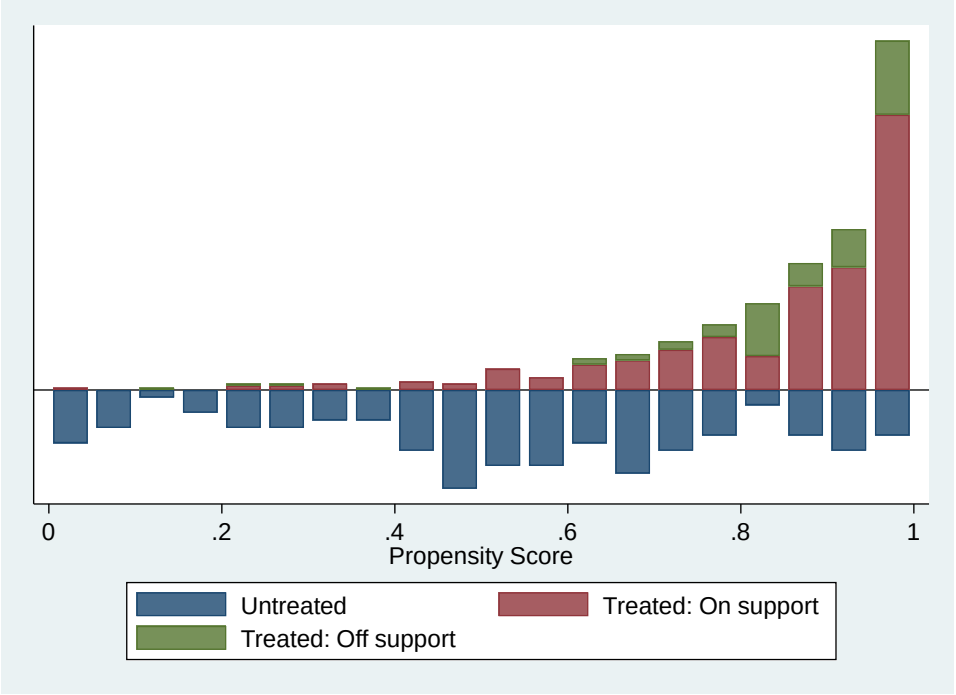
Notes: Based upon Allen (2016). Darker shading refers to a greater concentration of grammar schools (panel a) or proportion of pupils who attend a grammar school.

Figure 2. A comparison of estimated propensity scores across treatment and control groups (preferred specification)

(a) England



(b) Northern Ireland



Notes: Graphs based upon first multiply imputed dataset, with caliper set to 0.005 and two nearest neighbours. Matching model includes all MCS cognitive tests taken up to age 11. See the online supplementary materials, Appendix B and Appendix C, for further details.

Appendix A. The questions included within each of the age 11 and age 14 outcome scales

Academic self-concept. How much do you agree or disagree with each of the following statements about you? (Responses to each statement on a four point scale from strongly agree to strongly disagree).

- I am good at English
- I am good at Maths
- I am good at Science

School motivation / engagement. (Responses to each statement on a four point scale from 'all of the time' to 'never')

- How often do you try your best at school?
- How often do you find school interesting?
- How often do you feel unhappy at school?
- How often do you get tired at school?
- How often do you find it difficult to keep your mind on your work at school?

Well-being scale. On a scale of 1 to 7 where '1' means completely happy and '7' means not at all happy, how do you feel about the following parts of your life?

- Your school work?
- The way you look?
- Your family?
- Your friends?
- The school you go to?
- Your life as a whole?

Academic well-being scale. On a scale of 1 to 7 where '1' means completely happy and '7' means not at all happy, how do you feel about the following parts of your life?

- Your school work?
- The school you go to?

Rosenberg self-esteem scale. How much do you agree or disagree with the following statements about you? (Responses to each statement on a four point scale from strongly agree to strongly disagree).

- On the whole, I am satisfied with myself
- I feel I have a number of good qualities
- I am able to do things as well as most other people
- I am a person of value
- I feel good about myself

Mental Health scale. The next few questions are about how you have been feeling or acting recently. For each question please select the answer which reflects how you have been feeling or acting in the past two weeks. (Responses to each statement on a three point scale: not true; sometimes; true).

- I felt miserable or unhappy
- I didn't enjoy anything at all
- I felt so tired I just sat around and did nothing
- I was very restless
- I felt I was no good any more
- I cried a lot
- I found it hard to think properly or concentrate
- I hated myself
- I was a bad person
- I felt lonely
- I thought nobody really loved me
- I thought I could never be as good as other kids
- I did everything wrong

Strengths and Difficulties questionnaire. For each item, please mark the box for Not True, Somewhat True or Certainly True. Please give your answers on the basis of the child's behaviour over the last six months or this school year.

Emotional problems subscale

- Often complains of headaches, stomach-aches or sickness
- Many worries, often seems worried
- Often unhappy, down-hearted or tearful
- Nervous or clingy in new situations, easily loses confidence
- Many fears, easily scared

Conduct problems subscale

- Often has temper tantrums or hot tempers
- Generally obedient, usually does what adults request
- Often fights with other children or bullies them
- Often lies or cheats
- Steals from home, school or elsewhere

Hyper-activity subscale

- Restless, overactive, cannot stay still for long
- Constantly fidgeting or squirming
- Easily distracted, concentration wanders
- Thinks things out before acting
- Sees tasks through to the end, good attention span

Peer-problems subscale

- Rather solitary, tends to play alone
- Has at least one good friend
- Generally liked by other children
- Picked on or bullied by other children
- Gets on better with adults than with other children

Pro-social subscale

- Considerate of other people's feelings
- Shares readily with other children (treats, toys, pencils etc.)
- Helpful if someone is hurt, upset or feeling ill
- Kind to younger children
- Often volunteers to help others (parents, teachers, other children)

Appendix B. Number of observations in the estimation models in England

(a) Model 1

Outcome variable	All observations	On support	Off support	Non-grammar	Grammar
Academic self-concept	752	676	76	436	240
Go to university scale	738	672	66	430	242
Mental health scale	752	676	76	436	240
Parent thinks will stay in school post 16	761	701	60	441	260
Parent thinks will go to university	761	701	60	441	260
Self-esteem scale	752	676	76	436	240
SDQ scale	746	690	56	431	259
School engagement scale	752	676	76	436	240
Receives tutoring	721	655	66	422	233
Receives English tutoring	721	655	66	422	233
Receives maths tutoring	721	655	66	422	233
Wellbeing scale	752	676	76	436	240
English vocabulary scale	718	650	68	414	236
Academic wellbeing scale	752	676	76	436	240
Bullying scale	752	676	76	436	240
Friends behaviour at school scale	656	578	78	375	203
Aspire to work in a professional job	574	505	69	344	161
Believe qualification needed to get a good job	752	676	76	436	240
Played truant	752	676	76	436	240

(b) Model 2

Outcome variable	All observations	On support	Off support	Non-grammar	Grammar
Academic self-concept	752	732	20	436	296
Go to university scale	738	721	17	430	291
Mental health scale	752	732	20	436	296
Parent thinks will stay in school post 16	761	733	28	441	292
Parent thinks will go to university	761	733	28	441	292
Self-esteem scale	752	732	20	436	296
SDQ scale	746	736	10	431	305
School engagement scale	752	732	20	436	296
Receives tutoring	721	701	20	422	279
Receives English tutoring	721	701	20	422	279
Receives maths tutoring	721	701	20	422	279
Wellbeing scale	752	732	20	436	296
English vocabulary scale	718	701	17	414	287
Academic wellbeing scale	752	732	20	436	296
Bullying scale	752	732	20	436	296
Friends behaviour at school scale	656	644	12	375	269
Aspire to work in a professional job	574	563	11	344	219
Believe qualification needed to get a good job	752	732	20	436	296
Played truant	752	732	20	436	296

Appendix C. Number of observations in the estimation models in Northern Ireland

(a) Model 1

Outcome variable	All observations	On support	Off support	Non-grammar	Grammar
Academic self-concept	592	470	122	129	341
Go to university scale	578	496	82	124	372
Mental health scale	592	470	122	129	341
Parent thinks will stay in school post 16	601	509	92	129	380
Parent thinks will go to university	601	509	92	129	380
Self-esteem scale	592	470	122	129	341
SDQ scale	577	432	145	120	312
School engagement scale	592	470	122	129	341
Receives tutoring	578	490	88	127	363
Receives English tutoring	578	490	88	127	363
Receives maths tutoring	578	490	88	127	363
Wellbeing scale	592	470	122	129	341
English vocabulary scale	572	407	165	124	283

(b) Model 2

Outcome variable	All observations	On support	Off support	Non-grammar	Grammar
Academic self-concept	592	479	113	129	350
Go to university scale	578	442	136	124	318
Mental health scale	592	479	113	129	350
Parent thinks will stay in school post 16	601	470	131	129	341
Parent thinks will go to university	601	470	131	129	341
Self-esteem scale	592	479	113	129	350
SDQ scale	577	448	129	120	328
School engagement scale	592	479	113	129	350
Receives tutoring	578	448	130	127	321
Receives English tutoring	578	448	130	127	321
Receives maths tutoring	578	448	130	127	321
Wellbeing scale	592	479	113	129	350
English vocabulary scale	572	442	130	124	318

Appendix D. Alternative results for England. Sample further restricted to only those pupils who live within a selective education area.

In this appendix we restrict the MCS data for England to only those pupils who lived in a 'selection education area' in the fifth wave (i.e. at age 11). We define a selective education area as living in one of the ten local education authorities in England where academic selection is still permissible (these are Bexley, Buckinghamshire, Kent, Lincolnshire, Medway, Slough, Southend-on-Sea, Torbay, Trafford and Sutton), plus any child who lives in a Middle Super Output Area (MSOAs) where at least 10 percent of children have attended a grammar school over the last five years. See Jerrim and Sims (2018) for further discussion of this definition.

We then proceed by re-estimating all of our analysis using this restricted sample only. These alternative results can be found in Table D1 below. Note that we have allowed for a slightly more relaxed length of the caliper in our matching models to increase the number of observations included (on-support) in our analysis.

Appendix Table D1. Alternative estimates for the association between attending a grammar school and pupils outcomes in England. Sample restricted to children living in selective education areas only.

	Model 1		Model 2	
Outcome	**Beta**	**SE**	**Beta**	**SE**
Attitudes towards school				
Academic self-concept scale	-0.311	0.209	-0.114	0.143
School engagement scale	-0.117	0.231	0.03	0.152
Academic well-being	-0.208	0.268	0.058	0.169
Friends behaviour at school	0.215	0.236	0.252	0.162
Believe qualification needed to get a good job (Ref: No)	-0.05	0.073	-0.027	0.05
Played truant (Ref: No)	-0.031	0.068	-0.04	0.043
Mental health, well-being and self-esteem				
Mental health scale	-0.177	0.254	-0.026	0.17
Well-being scale	-0.165	0.289	0.076	0.176
Self-esteem scale	-0.017	0.264	0.04	0.161
Bullied	0.008	0.256	0.064	0.166
SDQ scale	-0.259	0.22	-0.115	0.147
Young people's aspirations and expectations				
Go to university scale	-0.037	0.183	0.096	0.123
Aspire to work in a professional job (Ref: No)	0.18	0.141	0.152	0.1
Parental aspirations and investments				
Parent thinks will stay in school post 16 (Ref: No)	0.009	0.059	0.048	0.039
Parent thinks will go to university (Ref: No)	0.076	0.122	0.022	0.083
Receives tutoring (Ref: No)	0.023	0.093	0.008	0.057
Receives English tutoring (Ref: No)	0.03	0.057	0.028	0.039
Receives maths tutoring (Ref: No)	0.041	0.081	0.016	0.051
Academic achievement				
English vocabulary scale	0.226	0.243	0.261	0.159
Controls				
Demographic characteristics	Yes		Yes	
Achievement measures age 7	Yes		Yes	
Socio-emotional measures age 7	Yes		Yes	
Achievement measures age 11	Yes		-	
Parental school preferences age 11	Yes		-	
Tutoring and homework help age 11	Yes		-	

Socio-emotional measures age 11	Yes	-

Notes: Effect for binary variables refers to a proportional increase. Effect for continuous outcome variables refer to effect sizes. Negative coefficient indicate worse outcomes for grammar school pupils. * and ** indicate significance at the 10 and 5 percent levels. Caliper has been set to 0.09, with matching to the two nearest neighbours. Sample size for most outcomes around 130 control observations and 150 treatment observations.

Appendix E. Alternative results dropping fee-paying school pupils at age 14 (England)

	Model 1		Model 2	
Outcome	**Beta**	**SE**	**Beta**	**SE**
Attitudes towards school				
Academic self-concept scale	-0.12	0.15	-0.06	0.12
School engagement scale	0.00	0.13	0.02	0.1
Academic well-being	-0.06	0.14	0.02	0.11
Friends behaviour at school	-0.04	0.15	-0.06	0.11
Believe qualification needed to get a good job (Ref: No)	**-0.08****	0.04	**-0.07****	0.03
Played truant (Ref: No)	-0.05	0.04	-0.02	0.03
Mental health, well-being and self-esteem				
Mental health scale	-0.05	0.13	0.06	0.11
Well-being scale	-0.10	0.15	-0.01	0.12
Self-esteem scale	-0.14	0.14	-0.05	0.11
Bullied	-0.14	0.12	-0.14	0.10
SDQ scale	0.10	0.12	0.00	0.09
Young people's aspirations and expectations				
Go to university scale	0.04	0.10	0.06	0.08
Aspire to work in a professional job (Ref: No)	-0.03	0.09	0.04	0.07
Parental aspirations and investments				
Parent thinks will stay in school post 16 (Ref: No)	0.02	0.03	0.02	0.02
Parent thinks will go to university (Ref: No)	0.01	0.06	0.03	0.05
Receives tutoring (Ref: No)	0.00	0.05	-0.01	0.04
Receives English tutoring (Ref: No)	-0.01	0.04	0.00	0.03
Receives maths tutoring (Ref: No)	0.03	0.05	0.01	0.04
Academic achievement				
English vocabulary scale	0.24	0.15	**0.24****	0.12
Controls				
Demographic characteristics	Yes		Yes	
Achievement measures age 7	Yes		Yes	
Socio-emotional measures age 7	Yes		Yes	
Achievement measures age 11	Yes		-	
Parental school preferences age 11	Yes		-	
Tutoring and homework help age 11	Yes		-	
Socio-emotional measures age 11	Yes		-	

Appendix F. Alternative estimates using a difference-in-difference approach

The main statistical approach used within this paper is propensity score matching (PSM). Within this appendix, we consider whether our findings continue to hold for a sub-set of outcomes using an alternative statistical methodology - difference-in-differences (DiD) regression. This methodology utilises the fact that for some variables we have repeated measures over several time points (e.g. English skills, SDQ scores, well-being, school engagement). The intuition behind DiD is that, although the *trend* in these outcomes between grammar and non-grammar school pupils may be similar during primary school, the trends will start to diverge in secondary school (as grammar schools start to have a positive effect). We provide a visual representation of the intuition behind this approach in Figure I1.

<< Figure F1 >>

There are some notable advantages to DiD over PSM. Most notably, whereas PSM relies upon a 'selection-upon-observables' assumption, DiD implicitly controls for all time-invariant unobservable characteristics and all time-varying unobservable characteristics which are common between the grammar and non-grammar groups. Hence the assumptions one needs to make to interpret the estimates as causal are somewhat weaker than under PSM. A limitation, however, is that we can consider fewer outcomes; only those where the MCS includes repeated-measures over time.

The DiD method relies on the 'common trends' assumption: that the outcomes for grammar and non-grammar pupils would have moved along common trends during the treatment period, in the absence of any pupils attending a grammar. This assumption is not empirically verifiable. However, in order to provide some confidence that it is justified we can test whether the outcomes for grammar and non-grammar pupils move along common trends during primary school. See Figure I1.

When applying our DiD analysis, we first restrict the sample to applicants only. Then, for each outcome we consider, we standardise the scale to mean zero and standard deviation one within each MCS wave[7]. Hence all estimates can be interpreted in terms of an effect size. We then plot the mean score for grammar and non-grammar school pupils for each wave where data is available, allowing us to check whether the common trends assumption holds, at least in the period prior to treatment. The following difference-in-difference regression model is then estimated:

$$O_{iW} = \alpha + \beta.Grammar_i * W_6 + \delta.W + \mu_i + \varepsilon_{iw} \quad \text{(I1)}$$

Where:

O_{iW} = The standardised outcome of child I in MCS wave W.

$Grammar_i$ = Whether the child attends a grammar (1) or non-grammar (0) secondary school

[7] For children's English skills, we use their vocabulary scores at ages 3 and 5, word reading test at age 7, and word test at age 14.

W = A vector of dummy variables capturing the MCS wave

$Grammar_i * W_6$ = The DiD interaction term. This will be equal to 1 for children who attend a grammar school in wave 6 (age 14) of the MCS survey and zero otherwise.

μ_i = Child fixed-effect

ε_{iw} = Time-varying error term

The β parameter on the interaction term in model I1 thus provides the DiD estimate of the effect of attending a grammar school. All standard errors are clustered within pupils.

Our results from this analysis are presented in Figures I2 (English skills), I3 (SDQ scores), I4 (school engagement) to I5 (well-being). These illustrate the trend in the scale scores between grammar and non-grammar school children, with the formal DiD estimate provided in the table notes. For brevity, our focus is upon the results for England only.

<< Figures F2 to F5 >>

Consistent with our PSM results, all effects are small in terms of magnitude and are not statistically significant. This holds true for our measure of children's academic skills (English test scores), school engagement and SDQ scores. Moreover, for these three outcomes, 'common trends' seems a reasonable assumption to make. (This is clearly not the case for well-being in Figure I5, where the common-trends assumption does not hold). Consequently, our overall interpretation is that the difference-in-difference approach leads us to similar substantive conclusions as our PSM analysis. That is, the impact of grammar schools upon pupils' outcomes at age 14 seems to be minimal.

Figure F1. A hypothetical representation of the intuition behind the difference-in-difference approach

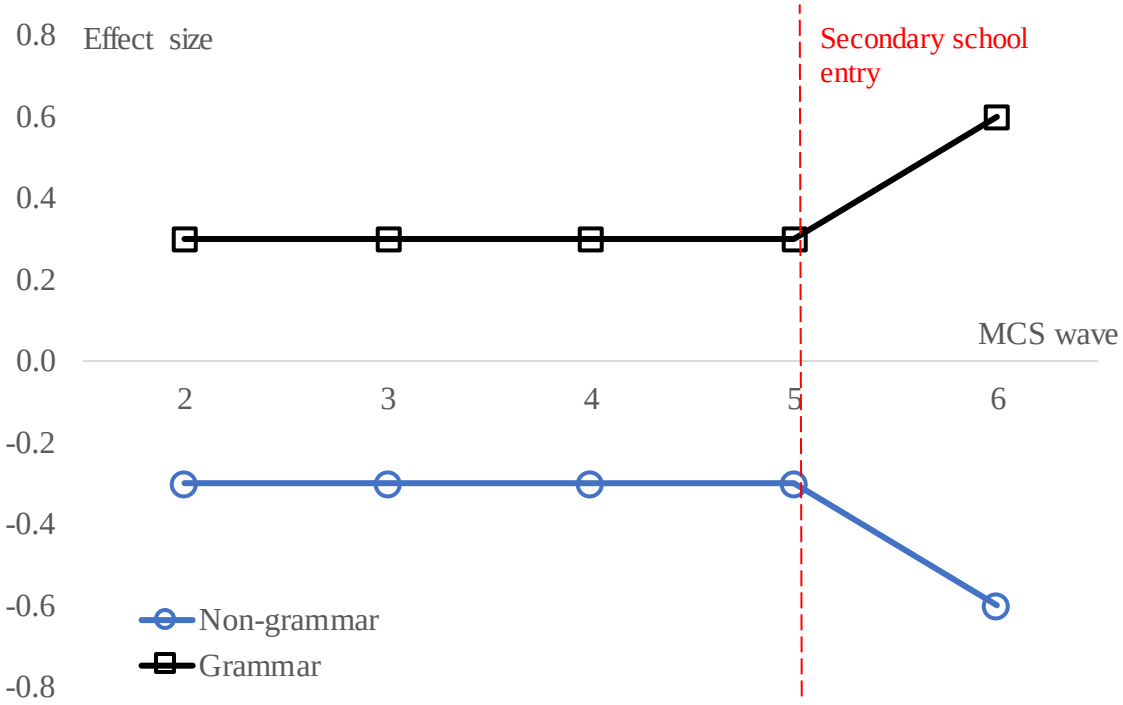
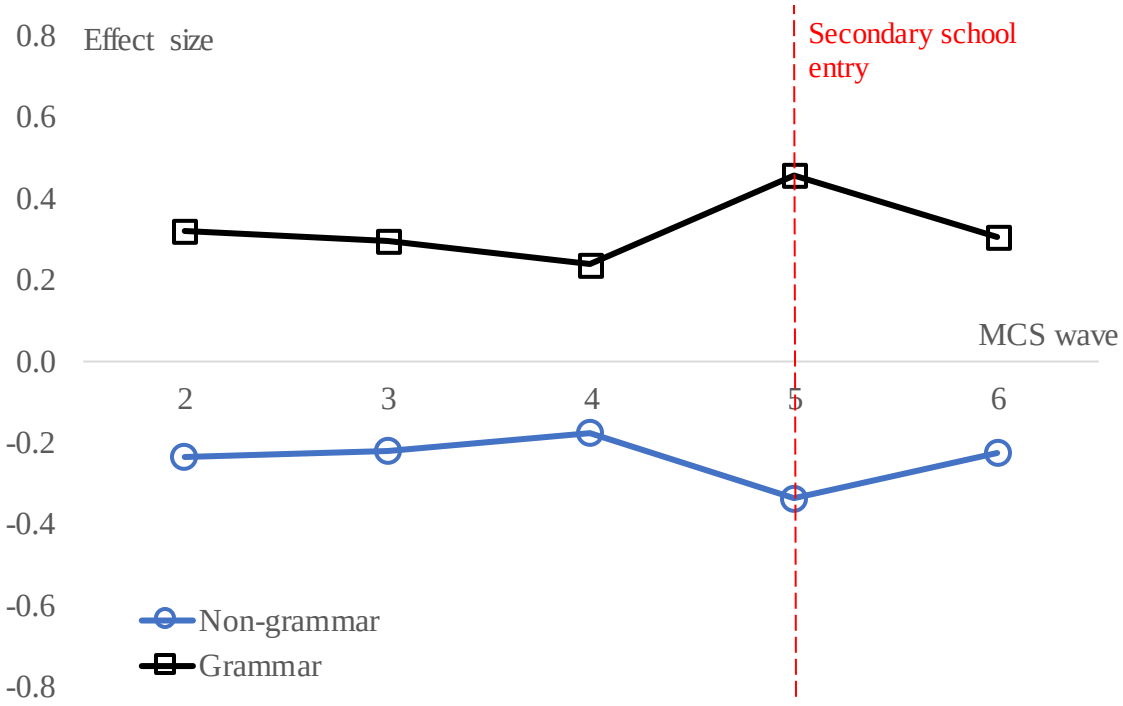
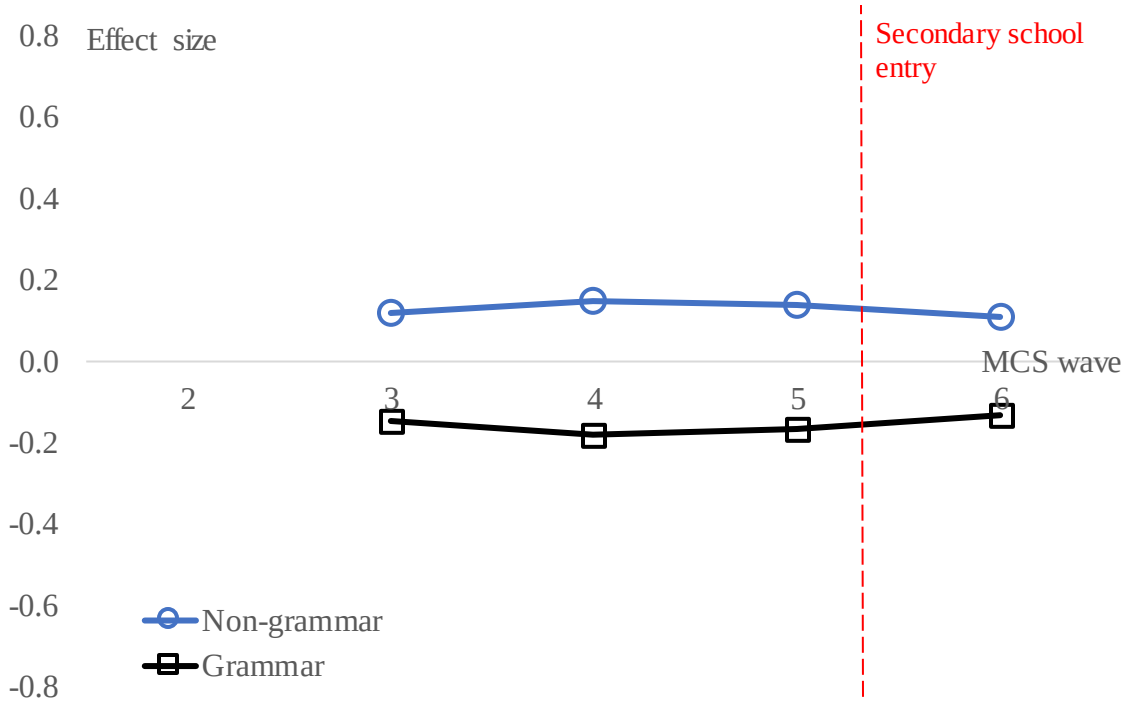


Figure F2. DiD estimates of the impact of grammar schools upon children's English skills



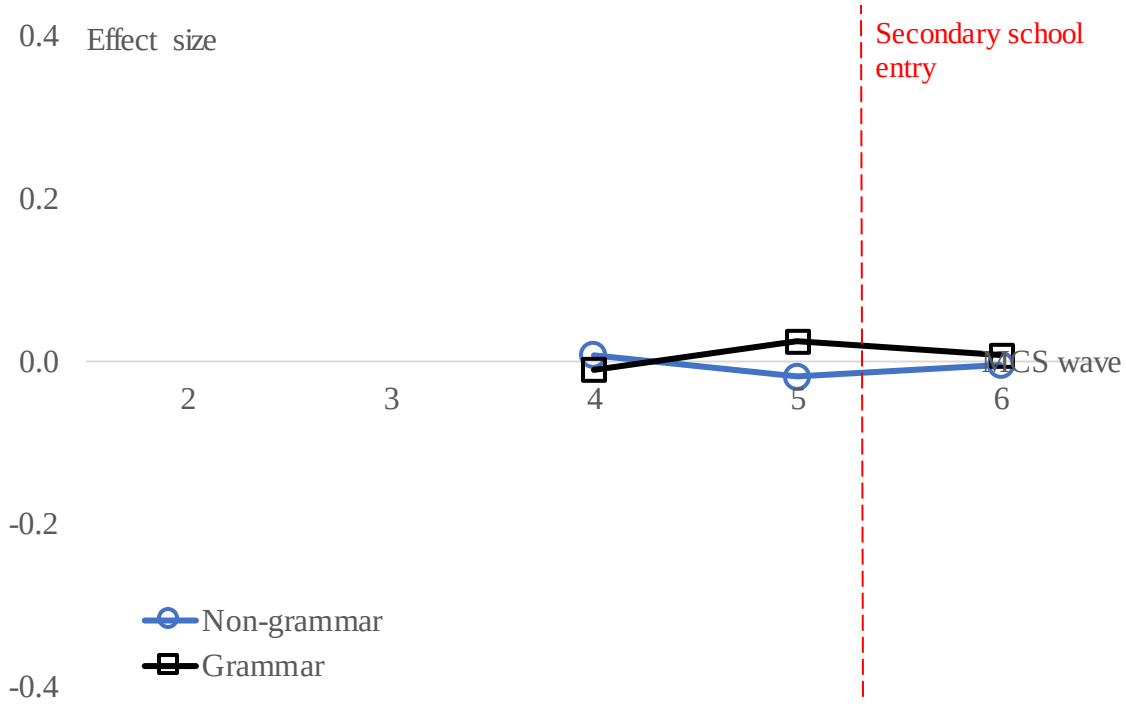
Notes: The DiD model parameter estimates are and effect size of 0.036 with standard error 0.069.

Figure F3. DiD estimates of the impact of grammar schools upon children's SDQ scores



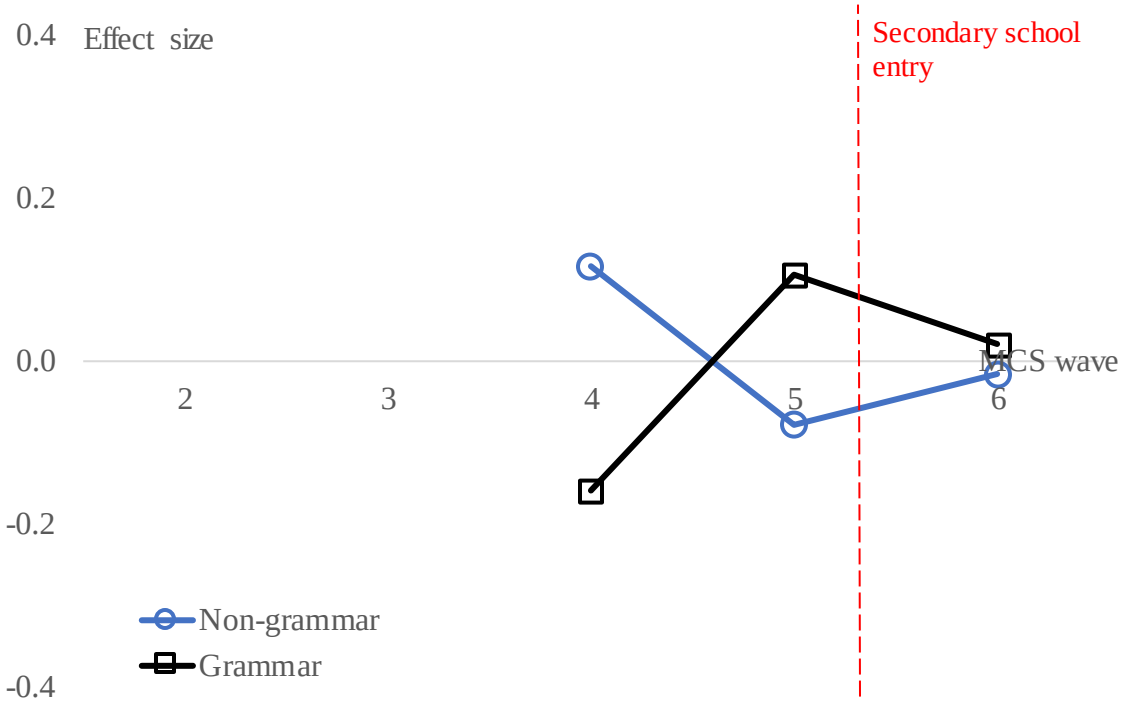
Notes: The DiD model parameter estimates are and effect size of -0.060 with standard error 0.063.

Figure F4. DiD estimates of the impact of grammar schools upon children's school engagement



Notes: The DiD model parameter estimates are and effect size of -0.002 with standard error 0.082.

Figure F5. DiD estimates of the impact of grammar schools upon children's well-being



Notes: The DiD model parameter estimates are and effect size of 0.083 with standard error 0.083. However, the common trends assumption for this outcome is clearly problematic.

Appendix G. Complete case results

(a) England

	Model 1		Model 2	
Outcome	**Beta**	**SE**	**Beta**	**SE**
Attitudes towards school				
Academic self-concept scale	-0.15	0.14	-0.06	0.11
School engagement scale	-0.01	0.14	0.05	0.10
Academic well-being	0.03	0.14	0.04	0.10
Friends behaviour at school	-0.04	0.14	-0.02	0.11
Believe qualification needed to get a good job (Ref: No)	-0.07	0.04	**-0.07****	0.03
Played truant (Ref: No)	-0.06	0.04	-0.02	0.03
Mental health, well-being and self-esteem				
Mental health scale	-0.07	0.14	0.02	0.12
Well-being scale	0.04	0.15	0.01	0.11
Self-esteem scale	**-0.28***	0.15	-0.14	0.12
Bullied	0.07	0.15	0.05	0.11
SDQ scale	0.03	0.12	0.06	0.10
Young people's aspirations and expectations				
Go to university scale	-0.04	0.09	-0.05	0.07
Aspire to work in a professional job (Ref: No)	0.00	0.09	0.03	0.07
Parental aspirations and investments				
Parent thinks will stay in school post 16 (Ref: No)	0.02	0.03	**0.04***	0.02
Parent thinks will go to university (Ref: No)	-0.01	0.07	0.000	0.05
Receives tutoring (Ref: No)	0.02	0.05	0.04	0.04
Receives English tutoring (Ref: No)	-0.01	0.04	0.00	0.03
Receives maths tutoring (Ref: No)	0.04	0.04	0.05	0.03
Academic achievement				
English vocabulary scale	0.19	0.17	0.20	0.13
Controls				
Demographic characteristics	Yes		Yes	
Achievement measures age 7	Yes		Yes	
Socio-emotional measures age 7	Yes		Yes	
Achievement measures age 11	Yes		-	
Parental school preferences age 11	Yes		-	
Tutoring and homework help age 11	Yes		-	
Socio-emotional measures age 11	Yes		-	

Notes: Figures based on our preferred model specification, with grammar school pupils matched to their two nearest neighbours, and caliper length set to 0.005.

(b) Northern Ireland

	Model 1		Model 2	
Outcome	**Beta**	**SE**	**Beta**	**SE**
Attitudes towards school				
Academic self-concept scale	-0.33	0.24	0.1	0.16
School engagement scale	-0.16	0.24	-0.03	0.16
Academic well-being	-0.04	0.23	-0.23	0.16
Friends behaviour at school	-0.29	0.29	-0.18	0.2
Believe qualification needed to get a good job (Ref: No)	-0.06	0.09	-0.02	0.06
Played truant (Ref: No)	-0.03	0.07	-0.02	0.04
Mental health, well-being and self-esteem				
Mental health scale	-0.26	0.27	-0.29	0.18
Well-being scale	-0.16	0.19	**-0.32****	**0.15**
Self-esteem scale	-0.29	0.23	**-0.36****	**0.17**
Bullied	-0.1	0.22	-0.22	0.15
SDQ scale	-0.25	0.22	-0.12	0.14
Young people's aspirations and expectations				
Go to university scale	-0.04	0.24	0.17	0.17
Aspire to work in a professional job (Ref: No)	-0.12	0.15	-0.05	0.11
Parental aspirations and investments				
Parent thinks will stay in school post 16 (Ref: No)	-0.01	0.04	0.02	0.05
Parent thinks will go to university (Ref: No)	0.12	0.13	**0.26****	**0.09**
Receives tutoring (Ref: No)	**0.08****	0.02	**0.07****	**0.02**
Receives English tutoring (Ref: No)	0.01	0.01	0.01	0.01
Receives maths tutoring (Ref: No)	**0.08****	0.02	**0.06****	**0.02**
Academic achievement				
English vocabulary scale	-0.08	0.2	0.23	0.16
Controls				
Demographic characteristics	Yes		Yes	
Achievement measures age 7	Yes		Yes	
Socio-emotional measures age 7	Yes		Yes	
Achievement measures age 11	Yes		-	
Parental school preferences age 11	Yes		-	
Tutoring and homework help age 11	Yes		-	
Socio-emotional measures age 11	Yes		-	

Notes: Figures based on our preferred model specification, with grammar school pupils matched to their two nearest neighbours, and caliper length set to 0.005.

Appendix H. Alternative estimates without restricting sample to applicants only.

(a) England

Outcome	Model 1 Effect	Model 1 SE	Model 2 Effect	Model 2 SE	Non-grammar N	Grammar N
Academic self-concept	-0.16	0.17	0.02	0.11	677	166
University aspirations	0.06	0.13	0.25	0.09	645	170
Mental health	-0.09	0.16	-0.08	0.11	657	170
Parent thinks child will stay in school	0.03	0.04	0.06	0.03	685	162
Parent thinks child will go to uni	0.04	0.08	0.09	0.05	684	163
Self-esteem scale	-0.03	0.16	-0.09	0.11	656	171
SDQ behavioural scale	0.12	0.15	0.08	0.09	656	166
School engagement scale	0.05	0.15	-0.01	0.10	677	166
Child receives tutoring age 14	0.02	0.05	0.03	0.03	647	149
Child receives tutoring age 14 (English)	0.04	0.03	0.03	0.03	647	149
Child receives tutoring age 14 (Maths)	0.05	0.05	0.03	0.03	647	149
Well-being scale	0.03	0.17	0.00	0.11	656	170
English vocabulary scale	0.16	0.16	0.35	0.11	649	156
Well-being scale	0.04	0.16	0.10	0.11	656	170
Bullied scale	-0.10	0.16	-0.04	0.11	657	170
Friends behaviour at school	0.19	0.15	0.18	0.11	572	151
Aspire to a professional job	0.13	0.08	0.14	0.06	538	113
Believes good qualifications needed	-0.02	0.05	0.01	0.04	678	166
School truancy	-0.03	0.04	-0.03	0.03	677	166

Notes: Sample restricted to selective education areas in England only (see Appendix D for further details).

(b) Northern Ireland

	Model 1		Model 2	
Outcome	**Beta**	**SE**	**Beta**	**SE**
Attitudes towards school				
Academic self-concept scale	**-0.26****	0.12	**-0.17***	0.10
School engagement scale	-0.05	0.12	-0.04	0.10
Academic well-being	-0.07	0.12	-0.10	0.11
Friends behaviour at school	-0.04	0.14	0.01	0.12
Believe qualification needed to get a good job (Ref: No)	-0.03	0.04	-0.03	0.04
Played truant (Ref: No)	0.03	0.03	0.03	0.02
Mental health, well-being and self-esteem				
Mental health scale	-0.1	0.12	-0.07	0.11
Well-being scale	0.00	0.13	-0.08	0.10
Self-esteem scale	-0.07	0.13	-0.11	0.11
Bullied	0.14	0.13	0.07	0.11
SDQ scale	-0.10	0.12	-0.14	0.10
Young people's aspirations and expectations				
Go to university scale	0.08	0.12	**0.19***	0.11
Aspire to work in a professional job (Ref: No)	0.00	0.07	0.02	0.06
Parental aspirations and investments				
Parent thinks will stay in school post 16 (Ref: No)	0.02	0.04	0.05	0.03
Parent thinks will go to university (Ref: No)	**0.21****	**0.06**	**0.18****	**0.05**
Receives tutoring (Ref: No)	**0.05****	0.02	**0.05****	0.02
Receives English tutoring (Ref: No)	-0.01	0.02	0.00	0.01
Receives maths tutoring (Ref: No)	**0.05****	0.02	**0.05****	0.02
Academic achievement				
English vocabulary scale	0.07	0.13	0.12	0.11
Controls				
Demographic characteristics	Yes		Yes	
Achievement measures age 7	Yes		Yes	
Socio-emotional measures age 7	Yes		Yes	
Achievement measures age 11	Yes		-	
Parental school preferences age 11	Yes		-	
Tutoring and homework help age 11	Yes		-	
Socio-emotional measures age 11	Yes		-	

	All observations	On support	Off support	Non-grammar	Grammar
Academic self-concept scale	956	833	123	490	343
Go to university scale	918	837	81	461	376
Mental health scale	947	836	111	481	355
Parent thinks will stay in school post 16 (REF: No)	975	868	107	500	368
Parent thinks will go to university (REF: No)	975	868	107	500	368
Self-esteem scale	945	835	110	479	356
SDQ scale	934	840	94	474	366
School engagement scale	956	833	123	490	343
Receives tutoring (REF: No)	949	838	111	495	343
Receives English tutoring (REF: No)	949	838	111	495	343
Receives maths tutoring (REF: No)	949	838	111	495	343
Well-being scale	947	836	111	481	355
English vocabulary scale	917	819	98	466	353
Academic well-being	946	811	135	481	330
Bullied	945	855	90	480	375
Friends behaviour at school	767	673	94	382	291
Aspire to work in a professional job	760	628	132	399	229
Believe qualification needed to get a good job	956	833	123	490	343
Played truant	956	833	123	490	343

Notes: Alternative estimates for Northern Ireland. These estimates do *not* restrict the sample to only those children whose parents applied for them to attend a grammar school. This increases the sample size, particularly within the non-grammar group. These results can be cross-referenced against Table 4 for comparison.

Appendix I. Robustness of estimates to choice to caliper length in Northern Ireland

Caliper	Academic self-concept	Go to university	Mental Health	Parent expects stay in school	Parent thinks university	Self-esteem	SDQ	School engagement	Receives tutoring	Well-being	Vocab skills
0.001	**-0.40****	-0.01	-0.19	0.00	0.13	-0.23	-0.09	-0.23	**0.06****	-0.10	-0.02
0.002	**-0.37****	0.00	-0.22	0.00	0.12	-0.21	-0.10	-0.27	**0.05****	-0.11	-0.04
0.003	**-0.38****	0.01	-0.23	0.00	0.13	-0.22	-0.11	-0.27	**0.05****	-0.11	-0.07
0.004	**-0.36****	0.01	-0.24	0.00	0.13	-0.22	-0.11	-0.27	**0.06****	-0.13	-0.09
0.005	**-0.38****	0.00	-0.25	0.00	0.13	-0.24	-0.11	-0.28	**0.06****	-0.14	-0.11
0.006	**-0.39****	0.00	-0.28	0.00	0.13	-0.25	-0.10	**-0.30***	**0.06****	-0.14	-0.14
0.007	**-0.39****	0.01	-0.27	0.00	0.13	-0.24	-0.10	**-0.30***	**0.06****	-0.13	-0.15
0.008	**-0.39****	0.02	-0.27	0.00	0.13	-0.24	-0.09	-0.30	**0.06****	-0.14	-0.15
0.009	**-0.40****	0.02	-0.29	0.00	0.13	-0.26	-0.10	**-0.30***	**0.06****	-0.14	-0.15

Caliper	Academic well-being	Bullied	Friends behaviour at school	Aspire to professional job	Need qualifications	Played Truant	Approx # of grammar pupils on support
0.001	-0.28	0.06	-0.02	-0.16	-0.04	-0.01	108
0.002	-0.25	0.07	-0.06	-0.16	-0.04	0.00	183
0.003	-0.24	0.09	-0.05	-0.17	-0.04	0.00	239
0.004	-0.25	0.09	-0.06	-0.18	-0.03	0.00	290
0.005	-0.25	0.07	-0.07	-0.19	-0.03	0.00	329
0.006	-0.24	0.06	-0.06	**-0.19***	-0.04	-0.01	358
0.007	-0.23	0.07	-0.07	**-0.19***	-0.04	-0.01	377
0.008	-0.24	0.07	-0.06	**-0.20***	-0.04	-0.01	396
0.009	-0.24	0.07	-0.06	**-0.20***	-0.04	-0.01	407