1. Introduction

Within the education literature, there has been much debate about the pros and cons of segregating pupils into different schools based upon their prior academic achievement. Proponents of academic selection argue that it allows teachers to better tailor the content of their lessons to the academic needs of their pupils (see Coe et al., 2008), while potentially giving high-achieving pupils from disadvantaged backgrounds the chance of becoming upwardly socially mobile (Friedman & Friedman, 1980; Centre for Social Justice, 2016). On the other hand, opponents of selective education systems argue that they do little to improve average levels of academic achievement (Atkinson, Gregg & McConnell, 2006), unhelpfully label pupils as being either high or low achieving (Van Houtte & Stevens, 2009) and serve to exacerbate educational and economic inequalities (Hanushek & Wossmann, 2006; Burgess, Dickson & Macmillan, 2014). The mental health and well-being of young people may also suffer due to the stressful nature of the selection process.

Given the variation in education systems across countries, a great deal of empirical research in this area has taken a cross-national approach, comparing pupil outcomes in academically-selective education systems such as Germany, Austria and the Netherlands with non-selective education systems such as Finland, Australia and the United States (Hanushek & Wossmann, 2006; Chmielewski, Dumont, & Trautwein, 2013). Other researchers have exploited temporal variation in selectivity, evaluating the effects of reforms which have changed the level of selectivity of a given school system over time (e.g. Guyon, Maurin & McNally, 2012; Pekarinen, Uusitalo & Kerr, 2009; Boliver & Swift, 2011). A third strand of the literature has focused instead on regional variations within countries. For example, in England there is wide variation in the selectivity of schooling across different local education authorities, which has been exploited in several studies (Atkinson, Gregg & McConnell, 2006; Burgess, Dickson & Macmillan 2014; Andrews, Hutchinson & Johnes, 2016).

The primary focus of this literature has been the impact of academic-selection upon young people's educational achievement and labour market outcomes. However, rather less attention has been paid to the impact that selective schooling systems have upon pupil's non-cognitive skills or social-emotional competencies[1]. Understanding how selective schooling systems

[1] For a discussion of the various competing terms that have been used to describe personal qualities other than cognitive ability see Duckworth and Yeager (2015). Following Kraft (2017), we describe them as social-emotional competencies rather than non-cognitive skills, on the grounds that they are clearly cognitive in nature and many of them (such as aspirations) are clearly not skills.

affect pupil's personal qualities besides cognitive abilities is important for a number of reasons. For example, going through an academic selection process may influence the way that pupils' view their own abilities and the way they approach school (Ball, 1997; Ahmavaara & Houston, 2007). In addition, selective schooling changes the peer groups to which pupils are exposed, and this has been shown to affect their non-academic outcomes (Comi, Origo & Pagani, 2017; Marsh et al., 2008). Indeed, these social-emotional competencies may be important mechanisms by which selective-education systems influence young people's educational and economic attainment.

We provide new evidence on this point by using rich longitudinal data to study how regional variation in the academic selectivity of school systems across England affects young people's social-emotional skills, including their motivation and engagement with school work, aspirations to attend university and mental health, as well as their academic achievement. We consider the impact that selective school systems have just after children have taken the entrance test (during the final year of primary school) and three years after they have been selected into secondary schools. We look at the effect on the 'average' pupil, as well as whether there are differences by prior academic achievement, family income and whether pupils attended an academically selective grammar school or not. Together, this allows us to provide important new insights into the effect academic selection has upon multiple dimensions of young people's lives, and whether it increases or decreases socio-economic disparities in young people's academic and social-emotional skills.

The paper now proceeds as follows. In the next section we provide an overview of the theoretical background and outline our research questions. Section 3 describes the education system in England, including the stark differences in the amount of academically selectivity that occurs in different parts of the country. The Millennium Cohort Study (MCS) data are introduced in section 4, with a discussion of our empirical methodology in section 5. Results are then presented in section 6, before conclusions are drawn and policy recommendations made in section 7.

2. Theoretical Framework and Research Questions

Education has an important influence on individual's life chances (Card, 1999; Lance, 2011). By the same token, the type and quality of schools that pupils' are able to access has important implications for equity and social justice (Lynch & Baker , 2005). One feature of school systems which has a decisive impact on the distribution of adult outcomes is selective admissions (Gorard & Smith, 2004; Brunello & Checchi, 2007; Gorard, 2015; Burgess et al., 2014). It is no surprise then, that there has been a great deal of research examining how selective school systems affect educational achievement (e.g. Gorard & Siddiqui, 2018; Smith-Woolley *et al*., 2018). While examination results are no doubt important, recent research has drawn attention to competencies beyond academic achievement for determining pupil outcomes in later life (Brunello & Schlotter, 2011; Gutman & Schoon, 2013). For example, motivation and educational aspirations are important in determining how far pupils progress in education and the labour market (Beal & Crockett, 2010; Gregg & Washbrook, 2011; Chowdry, Crawford & Goodman, 2011). As well as having instrumental importance, socio-emotional outcomes such as mental health and wellbeing also have direct implications for pupils' quality of life. Failure to consider such outcomes will therefore give a partial and potentially misleading picture of the way in which selective education systems affects societal equity.

How might living in a selective schooling area affect pupils' socio-emotional outcomes? Perhaps the most clear-cut difference is that pupils in selective areas go through a selection process at age 11, consisting of an entrance exam. There has long been speculation about whether this high-stakes test is a source of stress and anxiety for primary school pupils. For example, a study by the British Psychological Society in 1957 concluded that it did produce "much emotional strain" for the majority of pupils (see Vernon, 2017). However, there has been surprisingly little research on the links between selection at an early age and mental health. In order to empirically investigate the effect of exposure to the selection process, it is necessary to compare pupils living in selective areas to pupils living in non-selective areas. Understanding the significance of this for pupils' also requires whether the entrance exam causes short-term acute stress or whether it has longer run impacts.

As well as the potential strain of taking the exam, the sharp pass/fail grading resulting from it plausibly has a direct impact upon pupils' academic self-concept, academic motivation and aspirations for the future, such as whether they expect to attend university (Ahmavaara &

Houston, 2007; Gallagher & Smith, 2000; Remedios, Ritchie & Lieberman, 2005). In Northern Ireland, for example, Byrne and Gallagher (2004, p.171) found that pupils who failed the entrance test were negatively affected in terms of: "their reluctance to speak in class; their lack of motivation and attitude to work; the low targets that they set for themselves; and, in many cases, the increased incidence of discipline problems." It is well-known that lower-income children within selective education areas are less likely to pass the grammar school entrance test, relative to their higher-achieving and more socio-economically advantaged peers (Cribb et al., 2014). Consequently, living in a selective education area could have different effects for high and low income groups, which would increase inequality in social-emotional outcomes compared to the counterfactual of living in a comprehensive part of the country. Building on this framework, our first research question is:

Research Question 1: How does living in an area with a selective school system affect the distribution of pupils' socio-emotional outcomes?

As well as being exposed to a selection process, living in a selective area also affects young peoples' peer groups. In selective areas, pupils who pass the test are exposed to relatively high achieving peers, whereas those who fail are not. In non-selective areas, the picture is more mixed. Psychologists have proposed two ways in which this might affect pupils' judgement of themselves.

On the one hand there may be an "assimilation effect" (Bless & Burger, 2016). Assimilation effects occur when exposure to a reference group result in an individual's attitudes moving closer to those of the reference group. By gaining entry to a selective-school, for example, individuals are likely to become exposed to a peer group that plans to attend university. Exposure to peers with higher educational aspirations may then lead an individual to adopt the norm of the group, either through a desire to fit in, or simply due to prolonged exposure (Taft, 1957). Assimilation effects would therefore have a positive impact for those who gain entry to high-achieving selective schools, as they come to be more like their higher-achieving, more-aspirational peers. Assimilation effects would have a negative impact on pupils in non-selective schools, as they become more like their lower-achieving, less-aspirational peers.

On the other hand, there may be a "contrast effect" (Bless & Burger, 2016). Contrast effects occur when exposure to a reference group result in an individual's attitudes moving further from those of the reference group. By gaining entry to a selective-school, for example, individuals are likely to become exposed to a peer group that that is more high-attaining.

Because people tend to evaluate themselves with reference to a salient comparison group (Higgins & Stangor, 1988), this may lead individuals to evaluate their own abilities more negatively, by comparison (Marsh, Kong & Hau, 2000; Marsh, Koller & Baumert, 2001; Trautwein, Ludtke, Marsh, Koller, & Baumert, 2006; Chmielewski et al., 2013). Contrast effects would therefore be expected to have a negative impact for those who gain entry to high-achieving selective schools. Conversely, contrast effects would have a positive impact on pupils in non-selective schools, as they evaluate their abilities more favourably by comparison with their low-achieving peers. Building on this framework, our second research question is:

Research Question 2: How does attending either a selective or non-selective school, in a selective area, affect the distribution of pupils' socio-emotional outcomes?

3. Selective Education in England

Academic selection in England refers to the grammar school system. At the start of the final year of primary school (Year 6) parents can choose to apply for their child to attend a grammar school. These children must then sit the eleven-plus entrance test[2]. Only those who pass this test gain access to the academically-selective grammar secondary schools. Those who fail the test attend non-selective secondary schools. Movement into and out of grammar schools during secondary education is relatively rare, with the vast majority remaining in their allocated school until the end of Year 11 (age 15/16). By international standards, this form of academic selection is early (the average age of selection among OECD countries is 14). It also binding, in the sense that there is little opportunity to move into the academic grammar school track once in secondary school (OECD, 2013).

Selective schooling in England dates back to the 1944 Education Act, which established a three-track education system consisting of academically selective grammar schools, non-selective secondary moderns and technical (vocational) colleges. At that time, there were around 1,200 grammar schools operating in all areas of the country, educating just over a third of pupils in England and Wales (Bolton, 2015). In 1965, the government issued a directive encouraging local education authorities to move to non-selective, comprehensive school systems. By the end of the 1970s there were only around 200 grammar schools left in England, educating just under 5 percent of pupils. Although opening new grammar schools was outlawed

[2] For further details on the grammar school selection process, see Allen, Bartley and Nye (2017).

in 1998, Grammar schools were never abolished by 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[3]. 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). This effectively means that there is an element of academic selectivity affecting some local education areas, even within supposedly 'comprehensive' parts of the country.

To illustrate the academic selectivity of certain local education authorities in England, we draw upon the example of Kent; a county in the South East corner of the country where the grammar school system has been maintained. In 2015, there were 15,594 primary school pupils living within Kent (Kent Independent Education Advice 2018). Of these, 9,887 (63 percent) sat the grammar school entrance test, with 4,042 passing and gaining entry to a grammar school (26 percent of all primary age pupils and 41 percent of those who took the test). Accompanied by the early point in young people's lives that they take this test (age 10) this illustrates how there is extensive between-school stratification occurring within certain parts of England.

Figure 1 illustrates how England's 163 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 refers to more intense concentration of academic selection. (The county of Kent, described in the paragraph above, is the dark shaded area in the South East corner). These maps further demonstrate how academic selection in England continues to be prominent in a non-trivial proportion of the country. Indeed, nine percent of all secondary pupils in England attend school in what can be considered an academically-selective education area and five percent of secondary school pupils are currently enrolled in a grammar school nationwide[4]. In addition, the right-hand panel shows that roughly one-in-five children who attend a grammar school travel across a local education authority (LEA) boundary to do so (Allen, 2016). Thus, there is evidence of contamination between selective and non-selective education areas in England.

<< Figure 1 >>

[3] The 10 fully selective LEAs in England are Bexley, Buckinghamshire, Kent, Lincolnshire, Medway, Slough, Southend-on-Sea, Torbay, Trafford and Sutton.
[4] Schools, Pupils and Their Characteristics – Local Authority Tables. SFR 28/17.

This pattern has important implications for our analysis and, in particular, how we define 'selective' versus 'comprehensive' education areas. We do this in two ways. Method 1 defines selective areas in England as simply the 10 fully-selective LEAs where the vast majority of England's grammar schools are located. Comprehensive areas are, on the other hand, specified as those Middle Super Output Areas (MSOA)[5] where no child has attended a grammar school in the past five years. In other words, under this definition we are comparing the dark red shaded areas in Figure 1 to those that are completely white. In method 2 we widen the definition of 'selective areas' to include (a) all children living within the 10 fully selective LEAs and (b) those MSOAs where at least 10 percent of children have attended a grammar school over the last five years. The advantage of this second definition is that it captures children who cross over LEA boundaries to attend a selective school, while also including those who are affected by the 'isolated' grammar schools spread across the country. Results following definition 2 will be presented in the main body of the paper, while estimates produced under definition 1 are provided in Appendix A[6].

To conclude this section, Table 1 provides some descriptive statistics about how 'comprehensive' and 'selective' education areas in England compare. Overall, selective areas are generally more affluent, with higher levels of parental education and income. There are also notable differences in area-level crime, health and deprivation. In terms of children's characteristics before entering secondary school, those who live in selective parts of the country tend to have slightly stronger cognitive skills, and fewer behavioural problems. It is hence clear that the distribution of young people and their families across these areas is not random, and that these potential sources of confounding will need to be accounted for within our analysis. We return to this issue in section 5 (methodology).

<< Table 1 >>

[5] Middle Super Output Areas (MSOAs) are small geographic areas within England. The minimum population within an MSOA is 5,000 individuals, maximum of 15,000 individuals, with a mean of 7,200. In total, there are 6,781 MSOAs in England.

[6] We define whether a child lives in a selective area based upon where they were living in the age 11 survey sweep. Approximately 85 percent of children who live in a selective area (under the loose definition) at age 11 also lived in a selective education area at ages 7 and 5 (authors' calculations using the MCS data).

4. Data

The Millennium Cohort Study (MCS)

The Millennium Cohort Study (MCS) is a rich, nationally-representative longitudinal study of UK children. 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 these households (see Plewis, 2004). Six sweeps have been conducted between 2000 and 2015, when children were nine 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), 11,726 remained in the study at age 14 (7,739 in England). This reflects an attrition rate of 34 percent. After restricting the data to only those pupils who live in selective and comprehensive areas (see section 3), our final sample size is 4,785. Of these, 1,095 children live within a 'selective' part of the country and 3,690 in a 'comprehensive' area[7]. We apply the MCS survey weights where appropriate within our analyses, which adjust for the complex survey design and participant non-response. Huber-White adjustments are made to the estimated standard errors to take the clustered survey design into account (i.e. standard errors are clustered at the electoral ward level).

Academic achievement measures.

MCS cohort members have completed a number of cognitive tests throughout childhood. In our models we control for prior achievement using the tests taken at ages 3, 5 and 7. These early prior-attainment measures are particularly useful for our analysis, since private tutoring in the run up to the eleven-plus test is common in selective areas (<author, forthcoming>). This, in turn, may make attainment measures taken towards the end of primary school (e.g. Key Stage 2 tests) endogenous to living in a selective area. Specifically, the tests we use 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)

[7] When using the narrower definition of a selective area, the sample size falls to 4,365 (3,690 children in a comprehensive area and 675 in a selective area). See appendix A for further details.

We are therefore able to control for children's performance on five tests, taken at three different ages, within our analyses.

Parental characteristics.

Within a number of models, we include controls for children's demographics along with parental characteristics. This selection of variables includes children's gender and ethnicity, maternal education, whether mother and father are present in the household and family income (measured as an average across MCS waves).

Local area characteristics.

Information about the local neighbourhood in which cohort members live has been linked into the MCS by the survey organisers. This includes the Index of Multiple Deprivation (IMD) which is a small-area-level measure of neighbourhood affluence across seven dimensions: income, employment, health, education and skills, housing, crime and living environment. Within our analysis we are consequently able to compare children across selective and comprehensive education areas who live in otherwise 'similar' types of neighbourhoods (in terms of these IMD characteristics). Throughout our analysis, we use the IMD measures according to the neighbourhood the child was living in at age 11.

Age 11 outcomes.

Children and their parents completed the fifth wave of the MCS survey at age 11, at which point the children would have been in the final year of primary education. For those children who live in selective education areas, this is also the point at which they would be applying to grammar schools, having just taken the eleven-plus exam and found out the results. Although children have not entered secondary school by this age, we nevertheless believe it is more appropriate to treat the age 11 measures as 'outcomes' rather than as an additional set of covariates. This is because the grammar school entrance process involves a pressurised high-stakes test, which in itself could have an impact upon children's socio-emotional outcomes at age 11. For instance, their well-being, academic self-concept and school motivation could all be affected by such an environment. Moreover, passing or failing this test could have a significant impact upon young people's self-esteem. We believe the above factors together mean the age 11 data are most appropriately treated as outcome measures.

As part of the 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

competencies. Participants' responses have been combined into summative scales, which have then been standardised to mean 0 and standard deviation of 1. We have also changed the 'direction' of some of these scales, so that higher scores always refer to better outcomes. The scales are (see Appendix D for further details on each):

- Academic self-concept (e.g. I am good at English).
- Well-being (e.g. How do you feel about the following parts of your life? Your friends)
- Academic well-being (e.g. How do you feel about the following parts of your life? Your school work).
- Rosenberg self-esteem scale (e.g. 'I am able to do things as well as most other people')
- Strengths and Difficulties Questionnaire.

Age 14 outcome measures.

A number of the 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 both as children are being selected, and after having spent three years in secondary school. Moreover, we also have access to the following additional outcome measures from the age 14 survey:

- School-motivation (e.g. How often do you try your best at school?)
- Mental health scale (e.g. 'I thought I could never be as good as other kids')
- English vocabulary skills as measured by the WORD test. This captures 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.
- Young person's university expectations (e.g. How likely do you think it is that you will go to university? Measured on 0 to 100% scale)
- Parental aspirations for their child to attend university, measured on a binary yes/no scale.

5. Methodology

Table 1 illustrated how comprehensive and selective areas in England differ in terms of parent, child and local area characteristics. These differences need to be accounted for in our analysis to reduce the potential impact of confounding upon our results. We approach this in the three ways described below.

Regression Modelling

Our first approach is to estimate a series of OLS regression models. These will include a rich set of controls, adjusting for differences in parent, child and local area characteristics between selective and comprehensive areas. Given the rich array of data available within the MCS (including a wide array of child, parent and local area characteristics), we believe that the 'section-upon-observables' assumption underpinning this methodology is unusually well justified in this case. All control variables are measured at or before age 7 (three years before children take the grammar school entrance test) and hence prior to when the impacts of living within a selective system are likely to have been felt. Specifically, we estimate the following model:

$$Y_i = \alpha + \beta.S_i + \gamma.D_i + \delta.P_i + \tau.IMD_i + \theta.Age3_i + \rho.Age5_i\,\theta + \sigma.Age7_i + \varepsilon_i$$

Where:

Y_i = The age 11 or age 14 outcome measure of interest (see section 3 for further details)

S_i = A binary indicator of whether the child lives within a comprehensive (0) or selective (1) area in England.

D_i = A vector of child demographic characteristics (e.g. gender).

P_i = A vector of parental characteristics (e.g. maternal education, family income).

IMD_i = A vector of local neighbourhood characteristics measured when children are age 11

$Age3_i$ = A vector capturing children's academic and socio-emotional competencies at age 3

$Age5_i$ = A vector capturing children's academic and socio-emotional competencies at age 5

$Age7_i$ = A vector capturing children's academic and socio-emotional competencies at age 7

ε_i = Random error term.

i = Child i

To test the robustness of our results, three versions of this model will be estimated. Specification 1 includes only child demographics, parental and local area characteristics as controls (i.e. the Age3, Age5 and Age7 variables will be excluded). Specification 2 will then add controls for children's outcomes up to age 5 (i.e. all measures before children have entered school), while specification 3 additionally controls children's outcomes up to age 7. This

approach allows us to investigate whether our substantive conclusions remain intact regardless of the age at which parent/child attitudes/outcomes become endogenous with respect to the type of schooling system to which they are exposed.

Finally, because previous research has consistently found that the presence of selective schools in an area increases inequality in academic and labour market outcomes (Atkinson, Gregg & McConnell, 2006; Burgess, Dickson & Macmillan. 2014), we also investigate the effects of living in a selective area among (a) low and high-income pupils and (b) low and high achieving pupils.

Multiple Imputation by Chained Equations (MICE) is used to account for missing covariate data. As the continuous outcome variables described in section 3 have been standardised, all estimates refer to the association between selective education and each outcome in terms of an effect size.

Propensity score matching

Propensity Score Matching (PSM) attempts to match each child in the 'treatment' group (selective area) to an equivalent child in the 'control' group (comprehensive area). Average outcomes are then compared between each child living within a selective area and their matched pair. Like regression analysis, PSM invokes a 'selection-upon-observables' assumption: that we are able to include all relevant variables that account for important pre-treatment differences between children living in selective and comprehensive parts of the country. An additional advantage of PSM is that we can enforce "common support" on our data by dropping any observation which cannot be matched to a comparable observation in the control area. This helps to address concerns about parents and pupils selecting (moving house) into areas with grammar schools, because it ensures that we are comparing observationally similar sets of pupils across selective and non-selective areas – including (importantly) local area characteristics such as level of deprivation.

Our PSM models use single nearest-neighbour matching with the caliper set to a length of 0.05. In practice, the nearest neighbour approach means that if some control group observations are the nearest neighbour for multiple treatment observations then they will act as the match for multiple treatment observations. This approach reduces the bias of our estimates at the cost of increased variance. The effect of the caliper is that if a nearest neighbour of a treatment observation is not sufficiently near, then the treatment observation is dropped from the analysis.

Again, this reduces bias at the cost of inflated variance. As per our regression analysis, three different sets of matching variables will be used:

(a) Parent, child demographic and local area characteristics only
(b) Parent, child demographic and local area characteristics + child outcomes up to age 5
(c) Parent, child demographic and local area characteristics + child outcomes up to age 7

The matching and analysis will take place after imputation has been applied to account for missing covariate data. All PSM analysis is conducted using the Stata psmatch2 package (Leuven & Sianesi, 2003).

Difference-in-Differences

One of our outcome measures (the SDQ) has been collected in every MCS sweep between ages 3 (wave 2) and age 14 (wave 6). We exploit this fact to estimate a difference-in-difference model for the SDQ outcome measure and each of its sub-scales (see Appendix D for further details of the SDQ). By using the panel structure of the data, we are additionally able to eliminate unobserved differences between pupils who live in selective and comprehensive education areas that are *constant over time*. For instance, say that families who choose to live in grammar school areas are generally stricter or more ambitious for their children. OLS and PSM, which rely upon us being able to observe and accurately measure such parental attitudes within questionnaires, may only partially capture the effect of this upon young people's socio-emotional outcomes. However, assuming that this difference in parental attitudes between areas remains stable over time, our difference-in-difference estimates will fully account for this (and other similar) time-constant unobservable factors that differ between selective and comprehensive education areas.

To implement this approach, we compare how SDQ total and sub-scale scores change over time depending upon the education system children are exposed to. Our focus is upon differences in the trend between the selective and comprehensive groups after age 7, the point at which we assume between-school academic selection starts to have an effect upon children's academic and socio-emotional outcomes. Formally, the difference-in-difference model is specified as[8]:

$$SDQ_{iw} = \alpha + \beta.Select_i * Post7_A + \gamma.Wave \quad + \delta.u_i + \varepsilon_w$$

[8] Note that the main effects for the 'select' and 'post' variables fall out of the mode due to the inclusion of wave and child fixed-effects.

Where:

SDQ_{iW} = SDQ score of child i in wave w.

$Select_i$ = Whether the child lives in a comprehensive (0) or selective (1) education area.

$Post7_A$ = A dummy variable equal to one at ages 11 and 14 for the selective group (and zero otherwise).

Wave = Survey wave of the MCS

u_i = Child fixed-effects

ε_w = Time-varying error term

The parameter of interest from this model is β. This reveals whether there are differences in the risk of children developing behavioural problems if they live within a selective education area in England.

Most of our analyses compare outcomes of children living in selective and non-selective areas. In some of our analysis, however, we restrict the sample to children living within selective education areas and compare outcomes between children who attend grammar school to those who do not. We do this using the same three methods outlined above (OLS, matching, difference-in-difference). These outcomes are measured at age 11 (as children in selective areas are going through the selection process and just received the results) and at age 14 (when children have been in secondary school for three years). Within this particular analysis, we also investigate how controlling for academic achievement at age 11 influences the results.

6. Results

Research Question 1: How does living in an area with a selective admissions process affect the distribution of pupils' socio-emotional outcomes?

We begin by presenting the results from comparisons of selective and non-selective areas. Table 2 presents the OLS results for outcomes on average across all children. Positive figures indicate 'better' outcomes for children in selective areas than comprehensive areas. Across all three models, effect sizes for all outcomes are small (around 0.1 standard deviations or less) and do not generally reach statistical significance at conventional thresholds. Indeed, by the

time we reach our preferred model specification (M3), none of the outcomes at age 11 and only one of our twelve outcomes at age 14 - self-esteem - reach statistical significance at the five percent level. The effect size for self-esteem at age 14 is small (0.08). This suggests that there is very little difference in the socio-emotional outcomes of children who live in selective and non-selective areas.

<< Table 2 >>

Figure 2 presents the difference-in-differences estimates for total SDQ (panel a) and English language (panel b) scores. Recall that this allows us to control for differences in time-varying unobservable characteristics which are common between the selective and comprehensive groups. Overall, Figure 2 further confirms our aforementioned conclusion of little or no effect. The two lines in this graph are almost completely parallel from age 3 through to age 14. The formal difference-in-difference effect size estimates for both SDQ scores (effect size 0.01) and English scores (effect size = -0.045) are small. In other words, there is essentially no association between living in a selective education area (and hence being subject to the selection process) and children's risk of developing behavioural problems or higher/lower English skills.

<< Figure 2 >>

Various robustness tests confirm these findings. We reach similar substantive conclusions using a narrower definition of selective education areas (see section 3 and Appendix A), implementing propensity score matching rather than OLS regression (Appendix B) and performing a matched difference-in-difference analysis (Appendix C). Neither of the two statistically significant effects from Table 2 are reproduced across these alternative methods, which casts doubt on their robustness. Together, this provides strong evidence that living within a selective education area in England has minimal impact on average upon children's academic, social, emotional and behavioural outcomes.

Although living in a selective area may have no impact on average, it could affect the outcomes of particular sub-groups. Table 3 explores this possibility by considering heterogeneity in the effect by income. All results refer to estimates from model specification 3, which includes parent, local area and child outcomes up to age 7 as controls.

<< Table 3 >>

At age 11, as the selection process is taking place, we find there to be a modest interaction between family income and living in a selective education area with respect to academic self-

concept (effect size = 0.19). This is driven by a combination of low-income children in selective areas having slightly lower levels of academic self-concept than their peers in comprehensive areas (effect size = –0.13) and the opposite for the high-income group (effect size = 0.06). As low-income children in selective areas are disproportionately likely to not take or not pass the selection test, the fact they have lower academic self-concept shortly after the selection process makes sense. Evidence of interaction effects for the other age 11 outcomes is limited.

Turning to the results at age 14, we find some evidence that selective education areas have higher levels of socio-economic inequality in socio-emotional outcomes. The gap in school engagement between high and low-income children is 0.27 standard deviations greater in selective education areas than comprehensive areas. Similarly, there is a difference of 0.25 in terms of academic well-being, 0.18 for well-being and 0.20 for mental health. On the other hand, there are also null effects for several of the outcomes we consider at age 14, including English vocabulary skills, educational expectations, SDQ scores and self-esteem[9]. It is also notable how there is no effect for academic self-concept.

We have tested the robustness of these results in two ways. First, rather than dividing children into two groups (low/high income) we have entered income into our models (including within the interaction term) as a continuous linear variable. Second, we have investigated how our results change if children are divided into income quartiles instead. On both occasions, we do not see substantial changes to our results, with most estimates modest in terms of effect size and not reaching statistical significance at the five percent level. These robustness tests reaffirm our conclusion that evidence of selective education systems increasing educational inequalities in socio-emotional outcomes remains mixed.

Table 4 turns to investigate the distribution of outcomes by prior achievement, as measured by performance in the age 7 mathematics test. For low-achievers (below median mathematics scores), there are some modest effects of living in a selective education area at age 11. This includes a small positive impact upon school engagement (0.13 standard deviations), well-being (0.15 standard deviations) and academic well-being (0.11 standard deviations). These effects are not, however, sustained through to age 14. For high-achievers, there is no statistically significant effect upon any outcome, with all estimates below 0.10 standard deviations. Bringing these findings together, it is unsurprising that the vast majority of the

[9] The difference-in-difference results for different sub-groups are presented in appendix C (SDQ scores) and appendix E (English scores). They also suggest that living in a selective education area has little effect upon these outcomes for low/high income pupils and low/high achieving pupils.

interaction terms reported in the final two columns are small and not statistically significant. The only exceptions are the age 14 self-esteem and total SDQ score measures, where the gap between high and low achieving pupils is slightly smaller in selective than comprehensive education areas (effect sizes of 0.19 and 0.14 respectively).

Research Question 2: How does attending either a selective or non-selective school, in a selective area, affect the distribution of pupils' socio-emotional outcomes?

Table 5 presents a selection of results from our propensity score matching models. Specifically, pupils who go on to attend a grammar school in a selective education area have been matched to a comparable pupil in a comprehensive area, and their results compared (middle columns of Table 5). Likewise, pupils who live in a selective area but do not make it into grammar school have also been matched to comparable children in comprehensive areas, and their results compared (left-hand columns of Table 5). The right-hand most columns then considers the difference, illustrating whether living in a selective area leads to greater inequality between these groups.

<< Table 5 >>

For most outcomes, the effect sizes are small and statistically insignificant. There are, however, some notable exceptions. The most prominent is with respect to educational expectations. The 'gap' in educational expectations between grammar and non-grammar pupils who live in a selective education area is around 0.2 standard deviations greater than for comparable children within a comprehensive area. This is being driven by the fact that children who attend a grammar school are around 0.15 standard deviations more likely to expect to stay in school and go to university than a comparable pupil living within a non-selective area. This is consistent with assimilation effects dominating contrast effects. We also find some evidence that the gap in English vocabulary skills between grammar and non-grammar pupils is greater than the analogous gap in non-selective parts of England (0.26 standard deviations, significant at the 10 percent level).

Our final set of results come from comparing children *within* selective education areas. Specifically, outcomes are compared for young people who gain entry into a grammar school to those who do not. Table 6 presents our OLS results (the analogous matching results can be found in Appendix F). The results from model 3 are presented, which include demographic characteristics, family background, local area controls and child outcomes up to age 7, along

with results from a model which additionally includes academic achievement at age 11 as a control (model 4).

<< Table 6 >>

At age 11 – just after children have been through the selection but *before* they have actually entered grammar school – there are some positive effects upon pupils' socio-emotional outcomes. The most substantial and robust finding is for academic self-concept (i.e. children's responses to questions such as 'I am good at maths') where the effect size is around 0.2 to 0.3 (depending upon whether one controls for academic achievement at age 11 or not). As these children would have recently passed the academic selection test, a boost to academic self-concept (compared to children living in a selective area who did not take or did not pass the test) would be expected. Although Table 6 also suggests that there is a positive association between passing the selection test and well-being/academic well-being at age 11, these findings are not replicated when we use a propensity score matching approach (see Appendix F). We therefore do not consider the results for these specific outcomes to be particularly robust. We consistently find little association between passing the selection test and other socio-emotional skills, such as school engagement, SDQ scores and self-esteem.

Turning to the age 14 results – three years after children have entered secondary school – there are few positive effects of attending a grammar school. Effect sizes are typically small and not statistically significant. This includes for academic self-concept, suggesting that any positive effect at age 11 was short-lived. The main exception is with respect to educational expectations, with children more likely to believe that they will stay in school and attend university if they attend a selective school (their parents are also more likely to believe that this will be the case as well). There is some attenuation of these effects once we control for academic achievement at age 11 (the end of primary school) in model 4. This suggests that this result is partially driven by differences in measured academic ability shortly after the grammar school selection test has taken place.

<< Figure 3 >>

Figure 3 provides further evidence to support these results, presenting the difference-in-difference estimates of the effect of gaining entry into grammar school upon children's SDQ scores. The common trends assumption seems to hold, with little evidence of any difference in the trajectory of the line between grammar and non-grammar pupils between ages 3 and 14. Unfortunately, the common-trends assumption between grammar and non-grammar pupils

does not hold for English skills. We consequently do not believe it is appropriate to provide a substantive interpretation of these results, and more generally believe the results presented in this sub-section with respect to the impact of grammar schools upon children's English language skills should be treated with some caution. Indeed, previous research (using more robust achievement measures) has found gaining entry into a grammar school has relatively little impact upon secondary school grades (Clark, 2010; Gorard & Siddiqui, 2018). Nevertheless, in conjunction with Table 6, we believe Figure 3 provides further evidence that the impact of attending a selective school has limited influence upon young people's socio-emotional development.

7. Discussion

Selective education systems use exam results, often at a young age, to determine which pupils get access to which schools. Academic selection therefore sets pupils on different paths in life, with important potential implications for the distribution and equity of educational and economic outcomes (Lynch & Baker, 2005). Yet while a substantial body of research has accumulated on the impact of grammar schools on academic and labour market outcomes, less attention has been paid to the potential impact upon children's social and emotional skills. The present study set out to address this gap in the literature by exploiting differences in the academic selectivity of school systems across different regions in England.

If exposure to the academic selection process affects pupils' mental states, then we would expect to see an association between living in a selective area and pupils' socio-emotional outcomes at the time they take the test. In fact, we observed no such overall relationship. We did however, find a significant interactions between pupils' socio-economic background and academic self-concept, such that more affluent pupils in selective areas have higher academic self-concept, and less affluent pupils have lower self-concept. When comparing observationally similar pupils who do and do not gain entry within selective areas, we find a similar result. This is plausibly explained by the fact that more affluent pupils are more likely to both take and pass the entrance exam (Cribb et al., 2013). Having said that, the interaction between socio-economic status and living in a grammar area is no longer detectible at age 14. Further, we found little (if any) effect of being exposed to the academic selection process across a wide range of other socio-emotional outcomes. Interestingly, we did not replicate previous findings that selection increases emotional strain (Vernon, 2017) or reduces the academic

commitment of certain pupils (Byrne & Gallagher, 2004). It is worth noting that this is the first study to use representative data on such outcomes, which may explain why our findings differ.

Selective education systems may also affect pupil's socio-emotional outcomes by changing the peer group to which they are exposed. If the assimilation effect dominates then pupils who gain entry to selective schools will benefit by becoming more like their high-achieving peers. If contrast effects dominate then pupils who gain entry to selective schools may be negatively affected, by comparing themselves less favourably with their high-achieving peers. The overall impact will depend on which effect is strongest. In fact, we find few relationships in either direction, at age 11 or age 14. Contrary to much existing research (e.g. Marsh, Koller & Baumert, 2001; Trautwein et al., 2006) we did not find any overall effect of selectivity on academic self-concept.

The one exception to our general pattern of null findings is in relation to educational aspirations, such as whether a pupil intends to go to university. We found that selective education areas have wider socio-economic differences in the extent to which parents and children expect to stay on at school and continue to university. We also found differences between observationally similar grammar and non-grammar pupils, within selective areas. This association is materially significant: an effect size of 0.15. Interestingly, these associations are not visible at age 11, emerging only in our age 14 measures. This suggests that it is exposure to selective schools, rather than the selection process itself, which is behind the results. The increase in inequality is driven mostly by an increase in educational aspirations among grammar school attendees, but also in part by reduced aspirations among non-attendees. We interpret this result as the assimilation effect dominating the contrast effect with respect to educational aspirations. This is consistent with existing research on the links between school composition and educational aspirations (Dupriez, Monseur, Van Campenhoudt, & Lafontaine, 2012; Buchmann & Park, 2009) and research which finds that grammar school pupils are more likely to attend university (Anders, 2012; Clark, 2010).

These findings do, of course, need to be interpreted with respect to the limitations of this research. First, it should be noted that even the comprehensive education areas in England employ within-school academic selection, sorting children into different classes based upon ability. Hence, our estimates are capturing the effect of between school tracking versus the counterfactual effect of within-school streaming, rather than a truly non-selective system. A second limitation of our paper relates to recent criticisms of propensity score matching (King

& Nielsen, 2016). However, our OLS estimates are not subject to the same criticisms and, in almost all cases, provide similar results. Finally, most of our estimates rely on a selection-on-observables assumption. Our data allow us to control for an unusually wide set of covariates and it is reassuring that our difference-in-difference estimates corroborate our OLS and PSM findings. Nevertheless, we cannot rule out unobserved confounders affecting our results. For instance, when looking at differences in outcomes between grammar and non-grammar pupils within selective areas, an even stronger design would restrict the study sample to just to those pupils who took the entrance test (which has not been possible in the present study as the relevant data are not observed within our dataset). In the eventuality that selective education is expanded in England in the coming years, future research should look to exploit these changes in order to provide further evidence on the effect of grammar schools upon young people's socio-emotional and academic outcomes.

Despite these limitations, our findings in relation to academic aspirations have implications for educational equity and policy. It is well known that there is already a strong socioeconomic gradient in university attendance, which is explained in part by lower application rates among disadvantaged pupils (Anders, 2012). The results of this study suggest that expanding academic selection at age 11 may further widen the socio-economic gap in pupils' aspirations to continue to university. Given the substantial returns to degree-level qualifications (Blundell, Dearden, Goodman & Reed, 2000; Bratti, Naylor & Smith, 2008) this could also widen earnings gaps. Indeed, this is consistent with existing empirical evidence on earnings dispersion in selective school systems (Burgess et al., 2014). In short, our results are consistent with, and help explain, a wider body of research which shows that selection at age 11 has far-reaching effects on young peoples' aspirations and choices, which propagate into later stages of education and on into the labour market. As Lynch & Baker (2005, p. 132) put it, this highlights the "deeply integrated relationship that exists between education and the economic, political, socio-cultural and affective systems in society."

Besides England, there are currently five other OECD countries, as well as schools in certain areas of the US, which apply academic selection at the age of 11 (Goodman & Rucinski, 2018; OECD, 2013). Policymakers in these countries looking to improve higher education access for disadvantaged pupils, or indeed educational equity in general, should reduce academic selection in these countries. This could be achieved by abolishing academic selection outright, reducing the proportion of places in such schools that are allocated based on test results, or by adjusting scores on the admissions tests to account for socio-economic background. Our

findings on the importance of assimilation effects for educational aspirations also have implications for non-selective schools. In particular, they suggest that we should avoid highly homogenous school intakes. This could be achieved by changing the admissions codes in non-selective schools, for example by moving away from admission-by-distance criteria (Allen, Burgess & Key, 2010). In any case, our results suggest that the educational progression of disadvantaged pupils would benefit from increased exposure to highly aspirant peers.

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Table 1. Descriptive statistics comparing characteristics of children who live in selective and comprehensive areas within England

	Selective		Comprehensive		Difference	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SE**
Parental characteristics						
Mothers education	2.4	1.5	2.0	1.5	**0.4***	0.10
Permanent income	383.7	204	308	186	**76***	18
Local area characteristics						
Overall IMD	6.6	2.4	4.8	2.9	**1.8***	0.29
Income IMD	6.4	2.5	4.8	2.8	**1.6***	0.27
Employment IMD	6.7	2.4	4.8	2.9	**1.8***	0.30
Health IMD	6.8	2.3	4.9	3.0	**1.9***	0.32
Education IMD	5.5	2.9	5.6	2.9	-0.1	0.34
Housing IMD	6.0	2.8	4.3	2.9	**1.6***	0.33
Crime IMD	6.6	2.5	5.3	2.8	**1.3***	0.27
Environment IMD	6.5	2.4	5.8	2.8	**0.7***	0.27
Children's pre-school outcomes						
SDQ total score (age 5)	6.9	4.7	7.9	5.2	**-1.0***	0.25
Picture similarities (age 5)	82.3	10.2	81.3	11.8	**1.1***	0.51
Naming vocabulary (age 5)	110.5	14.5	107.3	15.6	**3.2***	1.0
Pattern construction (age 5)	88.2	17.7	86.9	19.0	1.3	1.0
Bracken school readiness (age 3)	107.3	15.0	102.7	15.9	**4.6***	0.9
Naming vocabulary (age 3)	75.6	15.3	72.8	17.4	**2.8***	0.97

Notes: Authors' calculations using the MCS database. See section 2 for the definition of selective and comprehensive areas. Complete case analysis (missing data excluded). SD refers to the standard deviation and SE to the standard error. Bold font with a star indicates a statistically significant difference between selective and comprehensive areas at the five percent level.

Table 2. The association between selective education systems and children's outcomes at ages 11 and 14. OLS regression results including all children.

	Model M1		Model M2		Model M3	
	Effect	**SE**	**Effect**	**SE**	**Effect**	**SE**
Age 11 outcomes						
Academic motivation and beliefs						
School engagement	0.09	0.05	0.08	0.05	0.08	0.04
Academic self-concept	0.03	0.04	0.02	0.05	0.01	0.05
Academic well-being	0.08	0.04	0.07	0.04	0.06	0.04
Behaviour and well-being						
Wellbeing	0.08	0.04	0.06	0.04	0.05	0.04
Rosenberg self-esteem	0.05	0.04	0.04	0.04	0.03	0.04
SDQ total score	0.04	0.04	0.02	0.04	0.01	0.03
Age 14 outcomes						
Academic motivation and beliefs						
School engagement	0.07	0.05	0.06	0.05	0.05	0.05
Academic self-concept	0.00	0.04	-0.01	0.04	-0.02	0.04
Academic well-being	0.04	0.05	0.03	0.05	0.03	0.05
Behaviour and well-being						
Wellbeing	0.05	0.05	0.05	0.05	0.05	0.05
Rosenberg self-esteem	0.08	0.04	0.08	0.04	0.08	0.04
SDQ total score	0.04	0.04	0.02	0.04	0.01	0.04
Mental Health	0.01	0.04	0.01	0.04	0.01	0.04
Academic achievement						
English vocabulary skills	0.05	0.04	0.03	0.04	0.01	0.04
Educational expectations						
Child expects to stay in school post-16	-0.01	0.05	-0.02	0.05	-0.02	0.05
Child expects to go to university	-0.02	0.04	-0.04	0.04	-0.04	0.04
Parent expects child to stay in school post-16	0.01	0.02	0.01	0.02	0.00	0.02
Parent expects child to go to university	-0.02	0.02	-0.03	0.02	-0.03	0.02
Controls						
Child demographics	Y		Y		Y	
Parental characteristics	Y		Y		Y	
Local area characteristics	Y		Y		Y	
Child outcomes up to age 5	-		Y		Y	
Child outcomes up to age 7	-		-		Y	

Notes: All outcome measures have been re-scaled so that higher values indicate a better outcome. Effect sizes refer to the impact of living in a selective education area, relative to a comprehensive area. Child demographics includes gender and ethnicity. Parental characteristics includes permanent household income, mother's education and family structure. Local area characteristics includes the seven Index of Multiple Deprivation domains: income, employment, health, education, housing, crime and environment. Child outcomes up to age 5 includes all cognitive achievement tests at ages 3 and 5 (see section 3), SDQ sub-domain scores at age 5, and measures of self-regulation at age 5.Child outcomes up to age 7 includes SDQ sub-domain scores at age 7, includes all cognitive achievement tests (see section 3), and their self-reported school-engagement, academic enjoyment, well-being and parental reports of whether the child has academic difficulties. * indicates statistical significance at the 5 percent level.

Table 3. The association between selective education systems and children's outcomes at ages 11 and 14. OLS regression results by income group.

	Low-income		High-income		Interaction	
	Effect	**SE**	**Effect**	**SE**	**Effect**	**SE**
Age 11 outcomes						
Academic motivation and beliefs						
School engagement	-0.01	0.09	**0.10***	**0.05**	0.08	0.09
Academic self-concept	-0.13	0.09	0.06	0.04	**0.19***	**0.08**
Academic well-being	**0.19***	**0.08**	0.03	0.04	-0.15	0.09
Behaviour and well-being						
Wellbeing	**0.14***	**0.07**	0.02	0.05	-0.11	0.08
Rosenberg self-esteem	0.00	0.08	0.03	0.05	0.02	0.08
SDQ total score	0.07	0.06	0.02	0.03	-0.04	0.07
Age 14 outcomes						
Academic motivation and beliefs						
School engagement	-0.08	0.09	**0.12***	**0.05**	**0.27***	**0.08**
Academic self-concept	-0.07	0.07	0.01	0.05	0.08	0.09
Academic well-being	-0.08	0.09	0.09	0.06	**0.25***	**0.11**
Behaviour and well-being						
Wellbeing	-0.03	0.09	0.10	0.05	0.18	0.10
Rosenberg self-esteem	-0.03	0.08	**0.11***	**0.05**	0.12	0.10
SDQ total score	0.00	0.07	0.04	0.04	0.08	0.08
Mental Health	-0.08	0.08	0.07	0.05	**0.20***	**0.10**
Academic achievement						
English vocabulary skills	0.01	0.07	0.03	0.05	0.08	0.09
Educational expectations						
Child expects to stay in school post-16	-0.01	0.09	-0.02	0.01	-0.03	0.09
Child expects to go to university	-0.08	0.08	-0.03	0.02	0.08	0.10
Parent expects child to stay in school post-16	0.00	0.03	0.01	0.01	0.02	0.04
Parent expects child to go to university	-0.03	0.03	-0.04	0.02	-0.03	0.04
Controls						
Child demographics	Y		Y		Y	
Parental characteristics	Y		Y		Y	
Local area characteristics	Y		Y		Y	
Child outcomes up to age 5	Y		Y		Y	
Child outcomes up to age 7	Y		Y		Y	

Notes: See notes to Table 2 for a full list of control variables included in the model. Low/high income defined as below/above median. Separate models estimated for low-income and high-income group. Results from a pooled model, including an income*selective area interaction, are provided in the final column.

Table 4. The association between selective education systems and children's outcomes at ages 11 and 14. OLS regression results by prior achievement group.

	Low-achievers		High-achievers		Interaction	
	Effect	**SE**	**Effect**	**SE**	**Effect**	**SE**
Age 11 outcomes						
Academic motivation and beliefs						
School engagement	**0.13***	**0.06**	-0.03	0.06	-0.12	0.07
Academic self-concept	0.02	0.06	-0.05	0.05	-0.08	0.07
Academic well-being	0.11	0.06	0.03	0.05	-0.03	0.08
Behaviour and well-being						
Wellbeing	**0.15***	**0.06**	-0.03	0.05	-0.11	0.08
Rosenberg self-esteem	0.07	0.06	-0.04	0.06	-0.11	0.07
SDQ total score	0.06	0.04	-0.02	0.04	-0.06	0.06
Age 14 outcomes						
Academic motivation and beliefs						
School engagement	0.09	0.07	-0.01	0.06	-0.08	0.09
Academic self-concept	0.05	0.06	-0.09	0.06	-0.13	0.08
Academic well-being	0.03	0.07	-0.04	0.07	-0.04	0.10
Behaviour and well-being						
Wellbeing	0.07	0.06	-0.03	0.07	-0.06	0.09
Rosenberg self-esteem	**0.18***	**0.06**	-0.04	0.06	**-0.19***	**0.08**
SDQ total score	0.07	0.04	-0.09	0.05	**-0.14***	**0.06**
Mental Health	0.03	0.05	-0.03	0.06	-0.08	0.08
Academic achievement						
English vocabulary skills	0.04	0.05	0.03	0.05	0.05	0.08
Educational expectations						
Child expects to stay in school post-16	0.00	0.08	-0.04	0.05	-0.02	0.08
Child expects to go to university	-0.10	0.06	-0.03	0.05	0.09	0.08
Parent expects child to stay in school post-16	0.00	0.02	0.00	0.02	0.00	0.03
Parent expects child to go to university	-0.04	0.02	-0.04	0.03	0.02	0.03
Controls						
Child demographics	Y		Y		Y	
Parental characteristics	Y		Y		Y	
Local area characteristics	Y		Y		Y	
Child outcomes up to age 5	Y		Y		Y	
Child outcomes up to age 7	Y		Y		Y	

Notes: See notes to Table 2 for a full list of control variables included in the model. Low/high achievers defined as those scoring below/above median in the age 7 mathematics test. Separate models estimated for low-achieving and high-achieving group. Results from a pooled model, including an age 7 achievement*selective area interaction, are provided in the final column.

Table 5. The association between selective education systems and children's outcomes at ages 11 and 14. Propensity score matching results by whether the child attends a grammar school.

	Non-grammar		Grammar		Difference	
	Effect	**SE**	**Effect**	**SE**	**Effect**	**SE**
Age 11 outcomes						
Academic motivation and beliefs						
School engagement	0.09	0.06	0.14	0.08	0.04	0.10
Academic self-concept	0.06	0.06	-0.06	0.10	-0.11	0.12
Academic well-being	0.10	0.06	0.17	0.09	0.07	0.11
Behaviour and well-being						
Wellbeing	0.06	0.06	0.04	0.09	-0.01	0.11
Rosenberg self-esteem	-0.01	0.06	0.08	0.10	0.08	0.12
SDQ total score	0.00	0.06	-0.06	0.07	-0.06	0.09
Age 14 outcomes						
Academic motivation and beliefs						
School engagement	0.08	0.06	0.00	0.10	-0.08	0.11
Academic self-concept	0.06	0.06	-0.06	0.10	-0.11	0.12
Academic well-being	0.04	0.06	0.00	0.10	-0.04	0.11
Behaviour and well-being						
Wellbeing	0.07	0.07	-0.04	0.10	-0.12	0.12
Rosenberg self-esteem	0.08	0.06	-0.09	0.11	-0.17	0.12
SDQ total score	-0.03	0.06	0.02	0.08	0.05	0.10
Mental Health	0.04	0.06	-0.02	0.10	-0.06	0.12
Academic achievement						
English vocabulary skills	-0.08	0.06	0.19	0.12	0.26	0.14
Educational expectations						
Child expects to stay in school post-16	-0.07	0.06	**0.15***	0.07	**0.22***	0.09
Child expects to go to university	-0.05	0.06	**0.17***	0.08	**0.22***	0.10
Parent expects child to stay in school post-16	-0.01	0.02	0.04	0.02	0.05	0.03
Parent expects child to go to university	-0.05	0.03	0.05	0.05	0.11	0.06
Controls						
Child demographics	Y		Y		Y	
Parental characteristics	Y		Y		Y	
Local area characteristics	Y		Y		Y	
Child outcomes up to age 5	Y		Y		Y	
Child outcomes up to age 7	Y		Y		Y	

Notes: Figures based upon propensity score matching models. Pupils who attend a grammar school in a selective education area have been matched to a comparable pupil in a comprehensive area. Similarly, non-grammar school pupils living in selective areas have been matched to a comparable pupil in a comprehensive area. See notes to Table 2 for a full list of control variables included in the matching model. 'Difference' based upon a two-sample t-test assuming independence between groups. * indicates statistical significance at the 5 percent level.

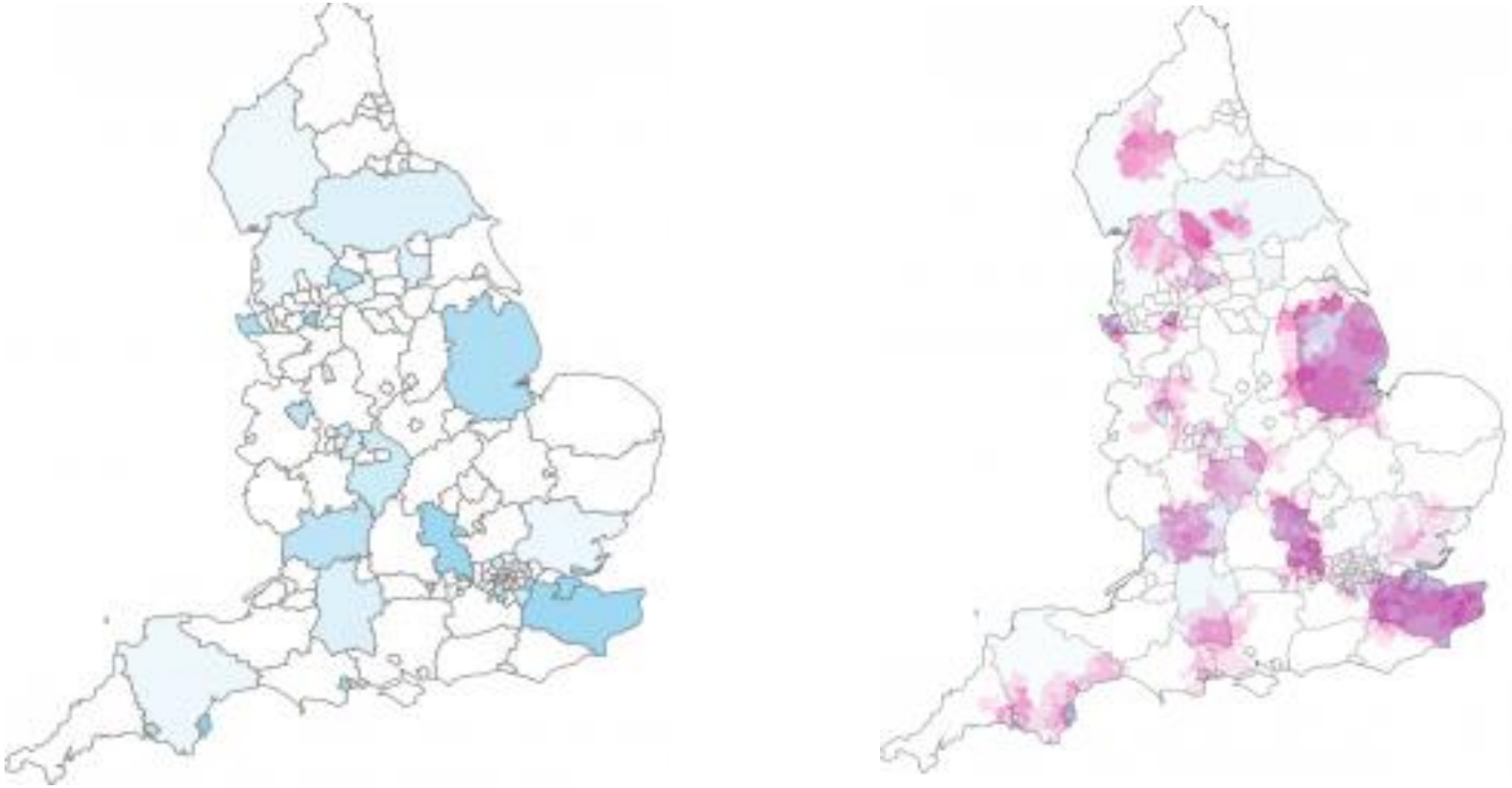
Table 6. Estimated difference in outcomes between grammar and non-grammar children who live within selective education areas

	Model 3		Model 4	
	Effect	**SE**	**Effect**	**SE**
Age 11 outcomes				
Academic motivations and beliefs				
School engagement	0.102	0.072	-0.028	0.09
Academic self-concept	**0.296***	0.083	0.189	0.104
Academic well-being	**0.192***	0.087	**0.185***	0.084
Behaviour and well-being				
Wellbeing	0.150	0.083	0.160	0.083
Rosenburg self-esteem	0.104	0.082	0.097	0.092
SDQ total score	0.086	0.057	0.064	0.083
Age 14 outcomes				
School engagement	-0.015	0.083	0.002	0.098
Academic self-concept	0.008	0.099	-0.099	0.096
Academic well-being	0.026	0.077	0.057	0.101
Behaviour and well-being				
Well-being	0.003	0.079	0.104	0.106
Rosenburg self-esteem	-0.07	0.077	0.082	0.1
SDQ total score	0.002	0.083	-0.035	0.106
Mental health	-0.061	0.094	0.139	0.126
Academic achievement				
English vocab skills	**0.320***	0.089	0.158	0.109
Educational expectations				
Child expects to stay in school post-16	**0.320***	0.069	0.154	0.082
Child expects to go to university	**0.301***	0.073	0.065	0.093
Parent expects child to stay in school post-16	**0.102***	0.026	**0.076***	0.036
Parent expects child to go to university	**0.163***	0.037	0.032	0.055
Controls				
Child demographics	Yes		Yes	
Parental characteristics	Yes		Yes	
Local area controls	Yes		Yes	
Child outcomes up to age 5	Yes		Yes	
Child outcomes up to age 7	Yes		Yes	
Applied to grammar school	Yes		Yes	
Academic achievement at age 11	No		Yes	

Notes: See notes to Table 2 for a full list of control variables included in the model (model 3 controls). Sample restricted to only those children who live within selective education areas and who do not attend a private (independent) secondary school. The number of observations is between 800 and 900 depending upon the outcome variable used.

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

(a) Location of grammar schools **(b) Where grammar school pupils live**

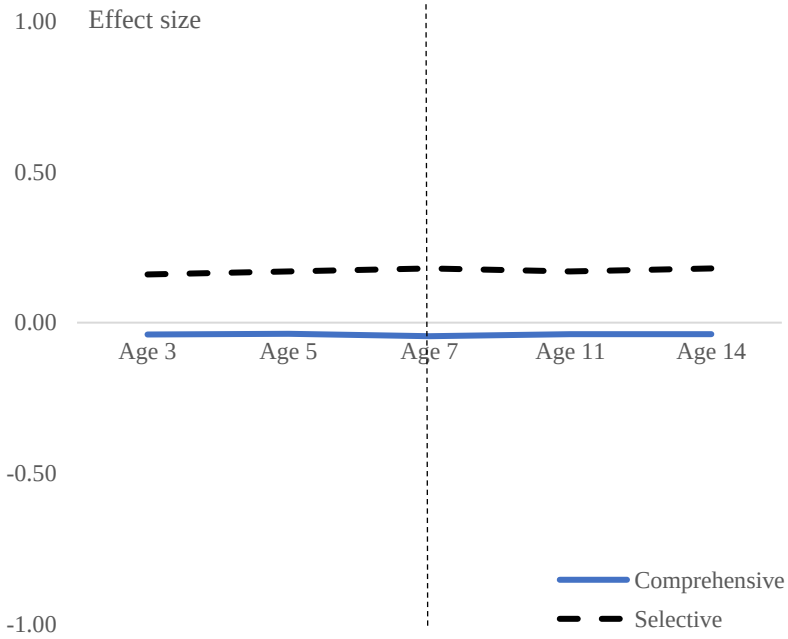


Source: Allen (2016).

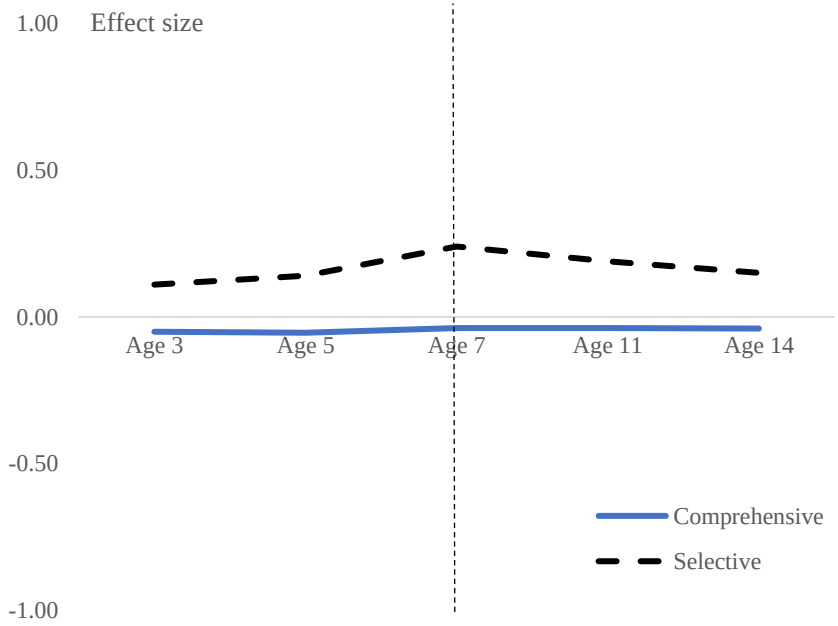
Notes: Darker shading refers to a greater concentration of grammar schools (panel a) or proportion of pupils who attend a grammar school.

Figure 2. Difference-in-difference estimate of the effect of living in a selective education area upon children's English and SDQ scores

(a) SDQ scores

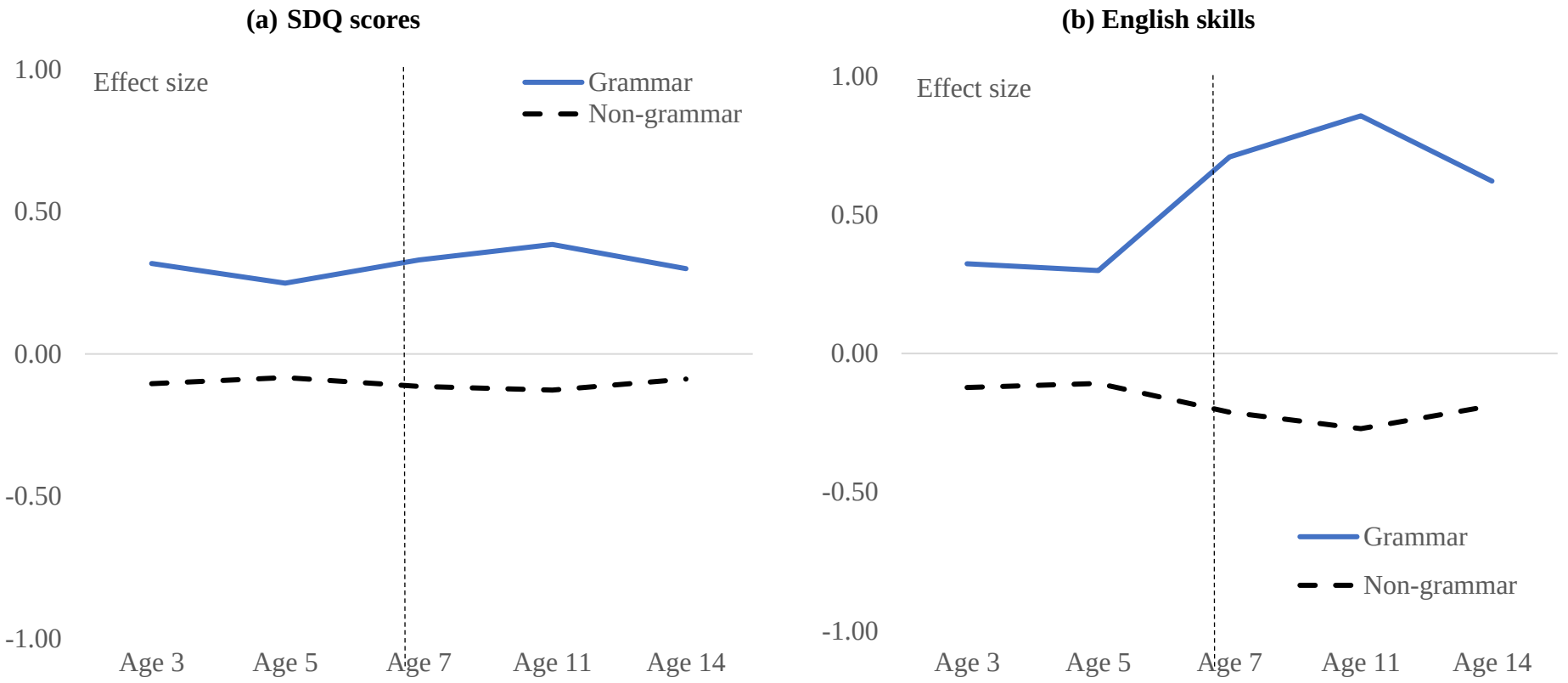


(b) English scores



Notes: The formal difference-in-difference estimates are 0.01 (standard error = 0.02) for SDQ scores and -0.045 (standard error = 0.024) for English scores.

Figure 3. Difference-in-difference estimates of the effects of attending a grammar school



Notes: Sample restricted to children living in selective education areas (broadly defined) only. Children who go on to attend private secondary schools have been excluded. The formal difference-in-difference estimates are -0.0345 (standard error = 0.0576) for SDQ scores and 0.337 (standard error = 0.0549) for English scores.