Disadvantage in early secondary school

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Executive summary

Aims and approach

This report details the findings from the Nuffield Foundation funded project 'The academic trajectory of disadvantaged pupils during Key Stage 3'. This project aimed to assess the latest evidence on the academic trajectory of disadvantaged[1] pupils during early secondary (ages 11-14) using literature reviews and data analysis. The project was split into four main parts.

1) A review of the academic and policy literature, assessing the evidence relating to patterns of academic achievement/progress for disadvantaged pupils in the early secondary years.

2) Analysis to explore how outcomes at the end of Key Stage 3 (age 14) are associated with family income, and whether any income gradients/gaps widen from the end of primary school (age 11) using data from the Millennium Cohort Study.

3) Analysis of school absence data to test whether economic disadvantage is associated with absence during early secondary school, and whether early secondary absence could predict attainment gaps at age 16 (GCSE).

4) Evaluation of three policies (described in the box below) targeted at the early secondary phase to test their impact on age 16 attainment.

Year 7 Catch-up programme and progress testing (2001-2007)

This policy consisted of the provision of materials and guidance for schools on catch up in English and maths for pupils that did not meet the expected standard at the end of primary school. A key feature of the policy was national standardised testing at the end of year 7. The purpose of the testing was to monitor whether the programme was having its intended effect, and to provide schools with data at the end of year 7 on who to target for further intervention to help ensure that pupils met the expected level of attainment in KS3 (age 14) tests.

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[1] Due to the analysis using data from different time periods and datasets, the definition of 'disadvantaged' varies slightly between the different parts of the project. The exact definitions used are indicated in the footnotes in this summary and further detailed in the report.

Gifted and Talented policy (2005-2010)

Under the Gifted and Talented policy, schools were required to identify Gifted and Talented pupils on entry into secondary school, partly on the basis of end of primary school test scores. Schools were expected to offer additional provision for those pupils identified as Gifted and Talented. How they did so was not nationally mandated, but guidance suggested monitoring, differentiation of learning and out of school opportunities.

Summer Schools for disadvantaged pupils (2012-2015)

This policy funded schools to open during the summer and provide activities for departing primary school pupils that would be joining them in the September of that year. The intended objective of the policy was to increase the attainment of disadvantaged pupils by improving their transition from primary to secondary.

Findings

The key findings from this research are as follows:

- There is a significant amount of evidence from the academic and policy literature to suggest that educational inequalities between disadvantaged pupils and their peers widen during the first three years of secondary school.

- Based on pupils' own self-reported outcomes, there is a gap in attitudes to school, perception of academic ability, occupational and university aspirations, peer behaviour and the home learning environment that widens significantly between pupils from richer and poorer households between the ages of 11 and 14. These gaps are present even when comparing pupils within the same school.

- Disadvantaged pupils[2] have a higher rate of absence at the end of primary school and this gap increases over the first three years of secondary school compared to other pupils. Pupil absence during this stage strongly predicts academic progress between the end of primary school and pupils' GCSEs; absence in early secondary school explains a fifth of the gap in pupils' academic progress between disadvantaged and other pupils.

[2] Eligible for free school meals at any point in the last six years on entry into secondary school

- We found no evidence that implementing the 'catch-up' programme in year 7 with standardised testing at the end of the year for pupils who did not make the expected attainment at the end of primary school had any effect on attainment at GCSE.

- Identifying and supporting high attaining disadvantaged[3] pupils on entry to secondary school was associated with higher GCSE attainment when compared to pupils who were not identified as Gifted and Talented but who had similar background characteristics, including similar prior attainment.

- Summer schools over the primary to secondary transition did not have any detectable impact on GCSE attainment or early secondary school attendance for disadvantaged pupils, although previous evaluation evidence points to beneficial non-cognitive outcomes.

Recommendations

Policy recommendations

- Catch up provision in the wake of the Covid-19 disruption needs to be carefully evaluated, and if possible designed so that the long-term impacts can be tracked. Findings from this research suggest that catch up provision such as additional classes and summer schools may not have the intended effect in the long term. Test based accountability of the effectiveness of catch up is unlikely to make a difference to long-term pupil outcomes.

- New school leaders should be better prepared to understand the relationship between learning in the primary and secondary phases. Understanding the different phases of schooling should be integrated into National Professional Qualifications and CPD courses at all levels of school leadership.

- To support the progress of high attaining disadvantaged pupils, packs could be sent out in year 7 to parents of pupils eligible for the Pupil Premium with high KS2 test scores to celebrate high attainment and provide support for maintaining high attainment in early secondary.

- OFSTED should produce a thematic review summarising and disseminating best practice in improving attendance during KS3.

[3] Defined as eligibility for free school meals on entry into secondary school

Implications for schools

- Local clusters of primary and secondary schools should consider transition 'bridging units', that is, projects/topics that are started at the end of primary school and resumed in secondary. School trusts and local authorities might also further enable cross phase visits/observations such that staff from feeder primaries and local secondaries have an opportunity to exchange ideas with each other. This might be particularly beneficial around familiarising primary school pupils and staff with the *language* used in early secondary academic work.

- Schools should enable teachers or form tutors of disadvantaged Year 7 pupils to have the kind of informal interactions with parents that are common in primary (such as brief conversations at the school gates at the beginning or end of the school day, coffee mornings, invitations to class presentations or celebrations). These could be used purposefully to suggest ways parents can help with schoolwork like, for example, setting boundaries and timings around homework.

- Absence in early secondary should be used as an indicator of future underachievement and as a trigger for targeted interventions, such as mentoring and text message prompting.

- Text-message based prompts to inform parents on how to engage with their child's learning has been found to encourage effective parental engagement in the early years and in post-16 education. Schools should consider whether such an approach might be effective in the early secondary phase.

- The results presented here suggest that schools play an important role in influencing early secondary pupils' academic confidence and future aspirations. Efforts to encourage participation in higher education should target pupils in early secondary school. Schools should also try to avoid segregation by socio-economic status within year groups.

Further research

- Researchers should consider further trials of a promising psychological intervention[4] from the USA, which helps pupils, understand and prepare for the emotional challenges of transition.

- Research should focus on understanding the causal mechanisms behind the growth in the *attendance* 'gap' that widens over early secondary. Interventions should be designed and evaluated that seek to close this gap.

[4] See https://www.pnas.org/content/116/33/16286.short

- Interventions at any phase of schooling should be designed with long term evaluation in mind, and long term evaluation of current practices that have been deemed to have ‘worked’ in the short term should be a priority for research.

Contents

1 Introduction

1.1 Disadvantage in early secondary – context

The socio-economic attainment gap in education has long been of concern, both for its effects on individual outcomes over the life course but also for its wider effects on society and the economy. The development of such educational inequality begins in the early years, but widens across schooling; by the time socio-economically disadvantaged children reach the end of primary school they are already 9 months behind their peers (Hutchinson et al. 2019). Despite significant policy attention devoted to the 'attainment gap', it remains stubbornly high.

Theoretically, the early secondary stage is a key point in determining trajectories due to a number of factors: the experience of mixing with unfamiliar peers; the move from being the oldest in a school to being the youngest; and the onset of puberty and the effect of this on peer and family relationships and attitudes to school. Early secondary is an age where pupils may become more aware of the opportunities that face them on leaving full time education. As a phase of schooling, early secondary, or Key Stage 3 (KS3 – please refer to appendix 10.1 for a list of acronyms used in this report)[5], is unusual in that since 2008 there have been no end of Key Stage national assessments. Possibly due to this and the context of high stakes accountability, this phase of schooling has been found to be a lower priority for schools (OFSTED, 2015).

In sum, KS3 could be a phase in schooling that is crucially important in determining disadvantaged pupils' long-term outcomes, yet at the same time schools and overall education policy pays less attention to it than the terminal phases of primary and secondary schools . This report examines these claims and concerns and considers what might be done during KS3 to improve pupils' longer-term outcomes. The over-arching research questions considered are:

i) What evidence is there that the early secondary years are an important influence on subsequent academic trajectories for disadvantaged pupils?

ii) What policies might 'work' in supporting disadvantaged pupils through this stage of schooling?

1.2 Structure of the report

The first part of the report (Section 2) reviews the existing evidence on the factors that affect outcomes during early secondary. Section 3 uses a nationally representative survey dataset to estimate how outcomes at age 14 differ by household income. Section 4 uses data from the National Pupil Database (NPD) to model what the relationships are between pupil, school and area level factors, and pupil

[5] In this report early secondary and KS3 are used interchangeably to refer to year 7 -9, although it is recognised that there has been a recent trend towards schools delivering a two year (years 7-8) KS3 curriculum.

absence during early secondary. Sections 4.4 , 6 and 7 then turn to assessing what might 'work' in countering some of the negative influences on academic trajectories during early secondary. Three past policies are evaluated: year 7 catch up for low attaining pupils, identification and support of gifted and talented pupils, and secondary school transition summer schools for disadvantaged children. Section 8 considers possible policy recommendations arising from the research.

1.3 Notes on the data analysis

The term 'disadvantaged' is not a fixed definition. A level of simplification is necessary for the purposes of the quantitative analysis. In the analysis of the Millennium Cohort Study (MCS) presented in this paper, disadvantage is based on household incomes; in the NPD analysis the definition varies based on data availability, but mainly uses eligibility for Free School Meals (FSM) as the main definition of disadvantage. Some of the data used in this project is relatively old and as such, some variables that are commonly used today are not available for the analysis, such as pupil premium eligibility and more detailed FSM groupings. The analysis using NPD is based on large sample sizes. Due to this, most variables will be identified as 'statistically significant'; it is important to note that this does not imply that the identified relationships are substantively significant. The analysis done on the MCS data applies (unless otherwise stated) to the UK, whereas the NPD data applies to England only.

2 Evidence Review

This review assesses the existing evidence around the effect of the secondary transition and the experience of early secondary on pupil outcomes, particularly with regard to pupil disadvantage. The focus of the review is on evidence from the UK produced since 2010. However, substantial research into early secondary in England was conducted during the 00's and there is also extensive literature from North America; where relevant such sources have been integrated into the review.

2.1 Introduction

The gap in attainment between disadvantaged pupils and their peers widens over schooling, both in England and in other developed economies (Caro et al. 2009). The inequality in outcomes is therefore most stark in secondary school (Shaw et al. 2017). On average, disadvantaged pupils make two months less progress every year than their peers at secondary school in England (Andrews et al. 2017). Comparing the progress at secondary school of pupils eligible for Free School Meals (FSM) with non-eligible pupils with the same Key Stage 2 (KS2) scores, FSM pupils make between 0.26 and 0.35 of a GCSE grade less progress in English and Maths respectively (Shaw et al. 2017).

The first few years of secondary school – Key Stage 3 (KS3) – might be particularly important in shaping the progress trajectory of all pupils. On average, pupils experience a slow down or stagnation in their educational progress during the early years of secondary school: more progress has been found to be made per year in KS2 than KS3, especially in reading and writing (DfE 2011). For disadvantaged pupils in particular, KS3 presents a real barrier to progress. In England, many disadvantaged pupils do not appear to make any progress in their attainment during KS3 (DfE 2011). Early secondary is "a crucial time to ensure that higher-achieving pupils from poor backgrounds remain on a high achievement trajectory" (Crawford et al. 2014). It is the key point at which high achieving disadvantaged pupils start to converge in their attainment trajectory with pupils from more affluent background with lower initial attainment (Crawford et al. 2017, Allen & Parameshwaran, 2016; Shaw et al. 2017).

This apparent deceleration in disadvantaged pupils' educational progress at KS3 contributes to inequalities at GCSE that affect pupils' opportunities in Further Education, Higher Education and the labour market. Although the evidence for widening socio-economic inequalities in educational outcomes in secondary school is well established, less is known about the reasons why KS3 might be particularly challenging for disadvantaged pupils. The literature summarised below sets out what is known about why the progress of disadvantaged pupils drops off at KS3, drawing on evidence from England and other English-speaking, high-income countries.

We focus on:

- Transitions between primary and secondary schools
- Pupil level factors in early secondary
- School policies and practices
- The out of school context

2.2 The primary-secondary transition

2.2.1 Effects of the transition

Right at the start of KS3, the transition from primary to secondary school derails many pupils. Evans et al. (2018) conducted a review of international literature into the impact of transitions to secondary schooling on pupils' academic attainment and psychological outcomes, and found that the transition is among the most stressful events young people experience. Their findings suggest that the transition leads to a negative impact on emotional well-being, which in turn affects academic performance, although the authors were not able to establish a causal relationship between these variables (Evans et al. 2018).

It is challenging to separate out the effects of the transition from the negative effects of starting adolescence; however, there is some evidence that the transition independently affects pupil outcomes. In a systematic review of the consequences of transition in the USA, Gordon et al. (2011) identify that the transition from primary school at age 11 is associated with negative impacts on attainment and wellbeing in comparison to pupils that transition later, suggesting that there is an independent effect of transition. This finding has been supported by subsequent studies (Malone, Cornell and Shukla 2019, Goldstein, Boxer and Rudolph 2015, Rockoff and Lockwood 2010). The negative impact of transition on pupils' academic outcomes is borne out by DfE data. The probability of a pupil (whether disadvantaged or otherwise) being assessed as having gone backwards in terms of their attainment is greatest between the summer of year 6 and the autumn of year 7 (DfE 2011), a finding that echoed previous research into academic trajectories over the transition (Sainsbury et al. 1998). Practice around transition varies between schools and can be ineffective, untimely and ad hoc (Jindal-Snape and Cantali 2019).

The effects of transition are not evenly distributed; a review by (Topping 2011) finds that the initial years of secondary school are difficult for almost all pupils; most recover, but those from poorer backgrounds and from ethnic minorities had particular difficulty in adjusting. A common theme is that such pupils are particularly reliant on external support – home, school, families and neighbourhoods, in making a successful transition into secondary education (Kim et al. 2014). Possibly due to this, disadvantaged pupils are most affected by transition and more likely to encounter problems (Evangelou et al. 2008) as well as experience stagnation in their progress (Brown et al. 2008: cited in EEF 2017) .

2.2.2 Segregation

The transition from primary to secondary schools has been found to be the point at which poorer pupils separate out from their more affluent peers by sorting into different schools (Harris 2013; Burgess et al. 2008). This may in part contribute to the widening of socio-economic gaps during KS3. Pupils' attainment at KS3 has been found to be strongly affected by the proportion of peers from the lower end of the KS2 attainment distribution (Lavy, Silva and Weinhardt 2012) and vary positively with the average KS2 attainment of a pupil's peer group (Gibbons and Telhaj 2016) . While such peer effects are only slightly stronger for disadvantaged (FSM) pupils, as disadvantaged pupils are more likely to attend schools with lower attaining peers, it suggests that the peer 'shock' after the transition may contribute to the attainment gap. Evidence from the US suggests that greater mixing of pupils by socio-economic status decreases the attainment gap in early secondary (Lessard and Juvonen 2019).

2.3 Pupil level factors at early secondary

2.3.1 Psychological factors

The difficulties of transition between primary and secondary school and the early secondary phase may also be associated with pupils' own social and psychological development. Transition to secondary school takes place as pupils enter adolescence and coincides with an increase in the prevalence of psychological problems , especially amongst disadvantaged pupils (The Children's Society & Barnardo's 2018; Evans et al. 2018). This may be exacerbated by the transition, where pupils may internalise their difficulties with adjusting to the new school environment by interpreting these difficulties as problems with themselves rather than problems caused by the transition (Borman et al. 2019) . A significant amount of research finds that concerns about social status amongst pupils' peer group peaks during early adolescence, with the likely effect that attention to learning suffers (LaFontana and Cillessen 2010).

Pupils' ability to learn independently drops once they arrive at secondary school, partly as a result of the more complex learning environment, and partly as a result of decreasing self-confidence, especially amongst the most vulnerable (Sutherland et al. 2010). School engagement and belonging also declines during early secondary and this is linked to decreased attainment (Riglin et al. 2013). A contributory factor in declining engagement with school after the transition is not having a single teacher across the school day (Finning et al. 2019), as this inhibits the ability for pupils to build relationships with teaching staff (Borman et al. 2019) . Sutherland et al. suggest that pupil-level factors such as these may be better addressed by making more use of multi-agency professionals to support vulnerable pupils through transition, and by schools maximising the extent to which they help parents support their children at this point in their school lives (ibid.).

2.3.2 Behaviour

Schools appear to have more problems with pupil behaviour affecting learning in KS3 than KS2. DfE exclusion statistics show that most exclusions take place in secondary school, and 25% of exclusions occur when pupils are aged 14 (Year 9 /10) (DfE 2016a). Conduct leading to the point of exclusion, such as behaviour during KS3, is likely to have affected negatively on educational progress well before the point of exclusion. Disadvantaged pupils are far more likely to be excluded (ibid.), whilst low socio-economic status is associated with a variety of negative social-behavioural outcomes, such as anti-social behaviour or hyperactivity (Sammons et al. 2012). Risky behaviour outside school may also begin to have a disproportionate impact on disadvantaged pupils during KS3. Sammons et al. (2014) found that whilst pupils are at primary school, there is no correlation between the deprivation or crime levels of a pupil's home postcode and progress at school, whereas in secondary school the link becomes significant (albeit weak).

2.3.3 Mental health and well being

The link between mental ill health and stagnating academic achievement and engagement with school amongst adolescents is well established (Deighton et al. 2018). Mental ill health is far more prevalent amongst disadvantaged pupils, and socioeconomic inequalities in mental health outcomes grow as pupils progress through school (Richards et al. 2016), with the early teenage years bringing particular social pressures associated with mental ill health in young people (Menzies et al. 2018). However, difficulties in mental health are not exclusive to pupils in the early stages of secondary school. Exam stress in 15-16 year olds is often cited as a driver of mental ill-health (Menzies et al. 2018), and causes of mental ill-health are often rooted earlier in life, even if they begin to manifest during early adolescence. (Gutman et al. 2003; The Children's Society & Barnardo's 2018).

Pupils with SEND are the most vulnerable group of pupils in terms of the impact of transition on their educational and psychological outcomes (Evans et al. 2018). For pupils with SEND, moving from a (generally) smaller school environment, where they interact with a limited number of adults who spend most of the day with the pupil, into an environment which is physically larger, contains more pupils, and where their day is spent with numerous different adults, can be problematic (Black and Norwich 2012). Additionally, pupils with SEND report greater levels of bullying and lower levels of social support after transition to secondary school (Evans et al. 2018).

2.3.4 Aspirations

The literature is unclear regarding the role that disadvantaged pupils' aspirations play in their poorer trajectories at KS3. (Baker et al. 2014) use EPPSE data[6] to show that all pupils, disadvantaged or otherwise, usually hold high educational aspirations, such as attending Higher Education, at the end of KS3. As it is known that disadvantaged pupils are less likely to attend higher education, this suggests that they lack information that keeps them on a path toward Higher Education attendance (Delavande and Fumagalli, 2019) rather than a lack of aspirations in early secondary. Importantly, expectations of educational success appear to interact with aspiration in a way that may affect attainment. For example, even when pupils hold high aspirations at KS3, if they do not also hold high expectations of attainment they are less likely to convert those aspirations into high attainment at KS4 (Khattab 2015). Meanwhile, pupils who hold low educational aspirations and expectations at KS3 are least likely to achieve five or more A*-C grades at GCSE (ibid.). It is difficult to decipher the precise causal interplay between aspirations, expectations and attainment, as pupils may modify their plans, dreams and choices in light of their progress at KS3 (Shaw et al. 2017).

2.4 School practices in KS3

2.4.1 Information sharing

Existing literature identifies that schools' own practices can contribute to the stalling progress of all pupils, and disadvantaged pupils in particular, immediately after their transition to secondary school: Teachers do not typically work well together across primary and secondary phases, particularly around pupil assessment. In particular, there is a lack of trust between phases, a failure to establish pupils' levels of attainment and knowledge (Ofsted 2015) and a lack of a common language, for example around assessment (Millard et al. 2017). Detailed knowledge and understanding that primary teachers have built up about pupils is under-utilised. (Sutherland et al. 2010).

2.4.2 Literacy for the KS3 curriculum

One of the reasons why transition might be difficult is that language used in learning and teaching in KS2 differs markedly from that used in KS3. This not only will affect progress in English language, but across the curriculum too. This step up in academic language is likely to be more challenging for pupils from lower socio-economic groups (Candarli et al. 2019a) and a significant proportion of pupils at KS3 are found to not be able to use basic academic vocabulary (Candarli et al. 2019b).

[6] Effective Pre-School, Primary and Secondary Education Project - https://www.ucl.ac.uk/ioe/research-projects/2019/mar/effective-pre-school-primary-and-secondary-education-project-eppse

A related issue is that disadvantaged pupils enter secondary school with disproportionately low literacy skills. At the end of KS2, disadvantaged pupils who fall behind in reading are more likely than non-disadvantaged pupils who fall behind in reading to be a year or more behind the expected standard (Higgins et al. 2014).

2.4.3 Setting, streaming and tiering

For many pupils, KS3 is their first experience of being separated from their peers based on ability. Streaming and setting is commonly used at secondary school, especially in subjects such as maths (Atkinson et al. 2008). Such practices create classroom peer effects that influence pupil progress through a combination of limiting expectations, being taught by lower qualified teachers and being entered for exams that do not allow access to the top grades (Atkinson et al. 2008). Broadly speaking, grouping pupils by prior attainment does not raise achievement overall; while high prior attainers make more progress when they are grouped, low prior attainers make less progress than they otherwise would have done – and the deficit in their progress outweighs the additional progress made by high attainers (EEF 2018). Low attainers are more likely to be disadvantaged, thus widening socioeconomic based attainment gaps. (Higgins et al. 2018).

2.4.4 Resourcing

Key Stage 3 is sometimes regarded as being of secondary importance to Key Stages 4 and 5 within secondary schools. Practitioners within schools argue that the school accountability system in England, placing central importance on GCSE results, encourages secondary schools to focus their attention on Key Stage 4 (Campbell 2018). As a result, weaker teaching is sometimes found in KS3, with split classes and non-specialist teachers, weaknesses in tracking pupil progress, and the diverting of pupil premium funding away from disadvantaged pupils while they are in KS3 towards those in KS4 (Ofsted 2015). In addition when the pupil premium was introduced it was typically allocated to support lower attaining pupils, rather than high attainers (OFSTED, 2013) despite evidence that high attaining disadvantaged pupils are at a high risk of underachieving over secondary school (Allen and Parameshwaran 2016; Crawford et al. 2017).

Teacher recruitment and retention is a national concern (DfE, 2017a), with teacher retention presenting a particular problem at Key Stage 3, as schools use specialist teachers for KS4 subjects, and plug gaps with non-specialists at KS3 (Ofsted 2015). Across most subjects, pupils spend more time during KS3 in lessons taught by teachers without an A-Level in the relevant subject compared to KS4 (DfE 2016b). Disadvantaged pupils have been found to be more likely to be taught by less experienced and non-specialist staff in maths, with this inequality particularly acute in

KS3 (Allen and Sims, 2018). However, there is limited evidence that non-specialist teachers have a negative impact on pupil attainment (DfE 2016b). Teacher supply issues may disproportionately affect disadvantaged pupils, as recruitment and retention is more difficult for schools in areas of high deprivation (White et al. 2014). This is particularly likely to be the case outside London (White et al. 2014; Shaw et al. 2017).

2.5 Out of school context

2.5.1 Home learning environment

Away from school, pupils' educational attainment is strongly influenced by the learning they experience at home, and their parents'/carers' attitudes to and engagement with pupils' learning. The literature suggests that the Home Learning Environment (HLE) can be a key driver of the attainment gap between disadvantaged pupils and non-disadvantaged pupils.

One way in which the HLE may affect disadvantaged pupils' educational trajectories at KS3 is through parental or carers' influences over pupils' *attitudes* to learning (Sylva et al. 2014). For example, parents or carers of disadvantaged pupils are less likely to provide opportunities for academically enhancing trips or visits, either through a lack of material capital (such as financial resources to cover transport and entry costs), being time-poor, or holding forms of cultural capital that make some types of cultural opportunity seem inaccessible (Richards et al. 2016). Homework is another important factor influencing the educational trajectories of disadvantaged pupils at KS3 (Sammons et al. 2012). The extent of parental support with homework decreases in early secondary school for most pupils, especially disadvantaged pupils, with parents providing less direct help as work becomes more challenging and less regulation of homework in terms of time or routines (ibid.). Aside from parental influence, siblings also influence pupil outcomes. Primary school pupils with older siblings who are already in secondary school are less likely to perceive and ultimately experience problems during early secondary (Jindal-Snape and Cantali 2019), however, the influence of having a sibling in secondary school on attainment can go either way. (Nicoletti and Rabe 2019) find that higher attaining siblings exert a positive effect on pupils' attainment and vice versa. As disadvantaged pupils are more likely to have a lower attaining older sibling, negative spillover effects from older siblings contribute to the attainment gap (Nicoletti and Rabe 2019). An implication of this is that raising the attainment of elder siblings will have positive effects on their younger siblings.

Mayo & Siraj (2015) found that for disadvantaged pupils who had achieved beyond expectations at KS3, support at home was markedly different from that experienced by other disadvantaged pupils. This support involved frequent conversations about school, regulations and routines around homework and leisure, and positive feedback not just on achievements but also behaviour that was perceived to

demonstrate a positive attitude to learning. Disadvantaged pupils who were high achievers at KS2 were more likely to get better GCSE and A-level results if they were found to have 'the experience of a better home learning environment during adolescence in Key Stage 3 in terms of academic enrichment activities' (Sammons et al. 2015). However parents of such high achieving pupils may find it difficult to know how to support their child's education and guidance from school is often lacking (Koshy et al. 2013). .

Unequal access to private tuition outside school may also hold back disadvantaged pupils at KS3. Uptake of private tuition increases in early secondary school, and, combined with the fact that disadvantaged secondary school pupils are much less likely than others to be tutored, particularly outside of London (Kirby 2016; Francis & Hutchings 2013), this disparity in uptake may further contribute to diverging trajectories at KS3.

2.5.2 Place

Gaps in educational achievement between disadvantaged and non-disadvantaged pupils at KS3 may also be influenced by factors relating to their geographical location, although the literature is unclear about the extent to which location plays a particular role at KS3. Two aspects of the interaction between location, disadvantage and educational outcomes at KS3 do, however, appear to be clear. First, schools in rural areas exhibit larger gaps between disadvantaged and non-disadvantaged pupils at KS3 (and KS4) (Andrews et al. 2017) and pupils that transition from primary to secondary schools located in more densely populated areas tend to perform better at KS4 (Gibbons and Silva 2008) . Second there is a pronounced "London effect", consistent with other key stages, in which disadvantaged pupils in the capital outperform those outside London. The literature is undecided about the reasons for this effect. Some attribute disadvantaged pupils' greater progress in the capital to ethnic and migration factors (e.g. Burgess 2014) whereas others cite a wide range of factors including improvements to schools, policy context and the opportunities in the capital's labour market (Allison 2018; Baars et al. 2014).

2.5.3 Summary

Overall, there exists considerable evidence that the early secondary stage is a period where there are changes at home and at school that have the potential to make a large impact on an individual's academic trajectory. The subsequent section takes the general findings from the evidence review and tests them against recent nationally representative data.

3 Household income and outcomes at age 14

3.1 Introduction

This section of the report uses the most recent wave of the Millennium Cohort Study to estimate the household income gradient of the outcomes of pupils at age 14. The outcomes considered are vocabulary, academic perceptions, attitudes to school, peer behaviour and the home learning environment. .Whilst many of the outcomes are important in their own right, they are also variables that have been shown in other research (e.g. Lessof et al. 2018; Goodman and Gregg, 2010; Sammons et al 2014; (Riglin et al. 2013)) to be influential on KS4 and longer term educational outcomes. Of specific interest is the extent to which the differences in outcomes at age 14 between income groups arise or widen after leaving primary school.

3.2 Data and method

3.2.1 Data

The Millennium Cohort Study (MCS) [7] is a longitudinal survey of a sample of individuals born in the UK in 2000-2001. So far, data has been collected on individuals in six waves, every 2-3 years since birth. The analysis presented here makes use of the wave 6 survey when respondents were aged 14, linked to variables in prior waves. The analysis is based on an analytical sample of 11,245[8] from an overall sample at wave 6 of 11,657. Cases with missing data on covariates are included in the modelling by using dummy variables for missing values; these mostly derive from missing data on the cognitive assessments at age 7 and ethnicity. The remaining cases are excluded due to a missing value for the school ID variable. The analysis results remain similar when the models are run on a complete case sample and the conclusions do not change.

3.2.2 Method

The main method by which the association between household income and age 14 outcomes is analysed is by estimating school fixed effects models with controls for pupil characteristics. These models also control for all factors common within a particular school, such that inequalities in age 14 outcomes can be identified between poorer and richer pupils who attend the same school.

The models estimated are of the form:

[7] The original sample of the MCS was 18,818 individuals. The sample oversampled children from deprived backgrounds and those from areas with relatively high ethnic minority concentration. Sample weights are used to account for the sampling strategy and sample attrition. For further details of the sample design please refer to https://cls.ucl.ac.uk/cls-studies/millennium-cohort-study/

[8] Sample size varies from model to model due to missing data on the dependent variable.

$$y_{is} = \alpha_0 + \sum_{q=1}^{q=4} \gamma_q INCQ_{is} + \beta X_{is} + \phi_s + \epsilon_{is} \quad (3.1)$$

Where y_{is} is the outcome of pupil i in school s, INCQ is a set of dummy variables indicating the household income quintile of the pupil with the richest household, quintile 5, being the reference category. X is a vector of control variables[9], including the corresponding age 11 measurement of the outcome variable[10]; ϕ represents school fixed effects[11] and ϵ is s pupil level error term. The models are weighted to reflect the sampling strategy of the MCS and survey non-response. Standard errors are clustered at the level of the primary sampling unit of the survey, which is the neighbourhood within which the pupil resides. The models produce a set of estimates,γ that reveal the estimated associations between each household income quintile group relative to the top income quintile (i.e. quintile 5; the richest fifth of households).

Outcome measures and their descriptions are shown in Appendix 10.2 along with the details of the corresponding wave 5 (age 11) variable that is included as a control in the modelling. The inclusion of these variables means that the estimates of γ reflect the income gradient in outcomes that arises between the ages of 11 and 14, rather than the absolute income gradient.

The household income quintile is calculated based on OECD equivalised income as measured at wave 6 in the MCS in terms of the UK income distribution. The effect of low household income on childhood outcomes is likely to be a cumulative effect of the varying levels of income over childhood and therefore measuring household income at a single point in time may not capture the effects of household income fully. However, it is unclear how household income quintiles over childhood could be constructed and therefore the contemporaneous household income was used. To check whether this is a particular concern for the results presented here, the models were estimated with the household income quintile at birth and at wave 5 used; the results remained broadly similar.

The analysis proceeds as follows: for each of the age 14 outcome variables three sets of models are estimated, the first includes simply the household income quintile with no control variables, estimating the unadjusted differentials between income groups. The second set of models introduces controls for pupil level characteristics such as ethnicity and gender and the scores on cognitive assessments at ages 7 and 11. Where available, we also include the corresponding outcome measure at age 11 as a control variable in order to estimate the income gradient in outcomes at age 14, over and above that which is

[9] Pupil characteristics include: gender, month of birth, ethnicity, age 7 cognitive assessment scores in maths, word ability and pattern construction, age 11 assessment of verbal ability.
[10] These are not strictly lags of the outcome variable as in many cases the wave 5 variable definition and or measurement does not correspond exactly with the wave 6 variable – see appendix 10.2.
[11] There are approximately 4 pupils per school on average in the sample

observed at age 11. In the final set of models, school fixed effects are added to control for all common variables between pupils within the same school – this gives us an estimate of the income gradient in outcomes that develops over early secondary amongst pupils within the same school. The coefficient estimates provided in the tables for each household income quintile (note: Quintile 1= the poorest 5th of UK households, Quintile 2 is the second poorest 5th of UK households, and so on) estimate the differential between that household income quintile and the richest quintile (i.e. the top 20%)

3.3 Results

3.3.1 The household income gradient of age 14 outcomes

Table 3.1 displays the estimates of γ from equation 3.1. for each outcome. The results for the vocabulary test outcome[12] show a large raw income differential; children from the lowest income households score on average 0.7S.D. units lower on this test than those from the highest income quintile. Though a limited measure, it is potentially important as vocabulary is strongly related to reading comprehension ability amongst pupils from low socioeconomic groups (Oslund et al. 2016). This differential reduces with the addition of controls, but remains sizeable. Including school fixed effects halves the estimated differential between the highest and lowest income households, suggesting that schools may be particularly influential in the vocabulary of age 14 pupils, though this may be due to differential sorting into schools based on factors not included in the model. The difference in the estimates between the 1st and 2nd quintile is negligible once pupil level controls are included; indeed, in subsequent models a common finding is that pupils from households in the 2nd quintile have outcomes that are more adverse compared those in the poorest quintile. This pattern is reflected when considering the next outcome, perceptions of academic ability. The estimates find that pupils in the 1st and 2nd income quintiles have academic perceptions of their own ability 0.2S.D. units lower than the highest income households. This may be important in explaining KS4 attainment gaps; recent research points to a causal relationship between confidence in one's academic ability at age 14 and KS4 outcomes (Murphy and Weinhardt 2020) .

The household income gradients for 'aspiration' related variables[13] follow a similar pattern. For both the university and 'staying on after 16' aspiration outcomes, the inclusion of school fixed effects reduces the differentials more than the inclusion of pupil level controls. Although this could be due to school level sorting, it is consistent with, other research that suggests that schools are a key factor influencing these aspirations for children from low-income households (Campbell et al. 2019).

[12] Please refer to appendix 10.2 for details of each outcome variable and its corresponding wave 5 control variable.
[13] University and staying on in school intentions, aspirations for a managerial or professional occupation.

Further estimates of the household income gradient for school attitude variables are shown in appendix 10.3, the story from these is clear: between the ages of 11 and 14, the gap in school attitudes between pupils in the lowest and the highest income households grows. For example, at age 14 pupils from the poorest households are 10 percentage points less likely to say they are interested in school compared to pupils in the richest households, even after controlling for school interest at age 11 and age 7 cognitive test scores.

Table 3.1 Income gradients of outcomes at age 14

Outcome		I		II		III	
Word activity (standardised)							
	Quintile 1	-0.71	(0.04)**	-0.27	(0.04)**	-0.13	(0.06)*
	Quintile 2	-0.58	(0.05)**	-0.27	(0.04)**	-0.14	(0.05)**
	Quintile 3	-0.40	(0.04)**	-0.18	(0.04)**	-0.08	(0.05)
	Quintile 4	-0.25	(0.04)**	-0.12	(0.03)**	-0.05	(0.04)
Academic perceptions							
	Quintile 1	-0.34	(0.04)**	-0.11	(0.05)*	-0.19	(0.06)**
	Quintile 2	-0.36	(0.04)**	-0.20	(0.04)**	-0.24	(0.06)**
	Quintile 3	-0.28	(0.04)**	-0.14	(0.03)**	-0.13	(0.05)**
	Quintile 4	-0.14	(0.03)**	-0.06	(0.03)	-0.08	(0.04)*
Stay on after 16							
	Quintile 1	-9.21	(0.95)**	-6.15	(1.01)**	-5.43	(1.61)**
	Quintile 2	-9.78	(0.82)**	-7.42	(0.86)**	-5.12	(1.24)**
	Quintile 3	-7.16	(0.79)**	-5.29	(0.78)**	-3.73	(1.09)**
	Quintile 4	-3.04	(0.58)**	-1.57	(0.57*	-0.65	(0.90)
University							
	Quintile 1	-16.74	(1.75)**	-10.62	(1.43)**	-10.41	(2.17)**
	Quintile 2	-15.89	(1.33)**	-10.58	(1.16)**	-10.74	(1.78)**
	Quintile 3	-10.62	(1.06)**	-5.56	(1.91)**	-5.47	(1.41)**
	Quintile 4	-7.15	(1.11)**	-3.14	(0.97)**	-2.77	(1.34)*
Prof./Man. Aspiration							
	Quintile 1	-0.09	(0.03)*	-0.04	(0.19)	-0.07	(0.09)
	Quintile 2	-0.02	(0.02)*	-0.01	(0.58)	-0.02	(0.53)
	Quintile 3	-0.02	(0.02)*	-0.02	(0.32)	-0.02	(0.55)
	Quintile 4	-0.01	(0.01)	0.01	(0.45)	0.03	(0.38)

Notes: Robust SE clustered at the neighbourhood level in parentheses; **p<0.01; *p<0.05; Model I contains no controls; Model II controls for Month of birth, age at time of survey, sex, ethnicity, age 7 maths test score, age 7 word reading test score, age 7 pattern construction test scores, age 11 verbal ability score. Model III additionally controls for schools fixed effects.

Table 3.2 shows the estimates from fixed effects models on factors in school and at home that are likely to affect a pupil's attainment. Pupils in the poorest households are less likely to report that they have peers that behave at school and less likely to have friends that work hard. They are also 11 percentage points more likely to never read books outside of school, 7 percentage points less likely to do 3 or more hours of homework a week and 1 percentage points less likely to get help from their parents with homework. These are large differences and it is worth repeating that the analysis controls for corresponding measures at age 11: these are gaps that are opening up over early secondary and are present even when comparing pupils within the same school with similar cognitive abilities (as measured at aged 7 and 11).

Table 3.2 Income gradients of school and HLE outcomes at age 14

Outcome			
Others- misbehave	*Quintile 1*	0.10	(0.03)**
	Quintile 2	0.06	(0.03)
	Quintile 3	0.07	(0.02)**
	Quintile 4	0.01	(0.02)
Friends –work hard	*Quintile 1*	-0.14	(0.04)**
	Quintile 2	-0.11	(0.04)**
	Quintile 3	-0.03	(0.03)
	Quintile 4	-0.04	(0.02)
Read-never	*Quintile 1*	0.11	(0.03)**
	Quintile 2	0.10	(0.03)**
	Quintile 3	0.07	(0.02)**
	Quintile 4	0.02	(0.02)
Homework help	*Quintile 1*	-0.20	(0.03)**
	Quintile 2	-0.16	(0.03)**
	Quintile 3	-0.05	(0.03)*
	Quintile 4	-0.03	(0.02)
Hours of homework	*Quintile 1*	-0.07	(0.03)**
	Quintile 2	-0.06	(0.02)**
	Quintile 3	-0.08	(0.02)**
	Quintile 4	-0.03	(0.02)

Notes: As per table 3.1., only school fixed effects estimates shown.

3.4 Summary

The association between household income and educational outcomes is an extensively researched area. This research adds to this large body of knowledge by assessing how outcomes relating to future academic attainment change during early secondary. Significant differentials on outcomes at 14 compared to the richest fifth of households are found at both 1st and 2nd income quintile; sometimes the disadvantage of being in the 2nd quintile is greater than that of being in the 1st. It is difficult to identify why this might be the case, but exposes a weakness in initiatives aiming to tackle educational inequality by targeting those based on FSM status, who tend to be concentrated within the bottom 25% of the income distribution (Hobbs and Vignoles, 2010). The finding that the gap in parental support increases substantially during this period is particularly concerning given that studies have found that parental engagement during this period is particularly important to pupils' later outcomes (Topping, 2011; Sammons et al. 2014; Goodman and Gregg, 2010) . Within the same school, lower income pupils are more likely to report that they have peers that do not work hard, nor behave, compared to higher income pupils, suggesting that *within* school segregation may be a factor in generating lower academic outcomes. Sammons et al (2014) find that the 'behaviour climate' of a school as perceived by pupils in year 9 has a significant effect on GCSE outcomes, again suggesting that the misbehaviour of peers that has been identified here may be part of the cause of the attainment gap at KS4.

The analysis finds that almost on every measure, gaps between pupils from richer and poorer households increase over this period. Many of these outcomes have been found in other studies to be predictive of KS4 attainment. Therefore, it is highly plausible that the gaps that open up relating to the outcomes studied here are contributory factors in the KS4 attainment gap between richer and poorer pupils.

4 Disadvantage and Absence during early secondary

4.1 Background

School absence is mainly due to illness (DfE, 2019); however, it is not the only factor that gives rise to variations in absences between pupils. As shown in this section, pupil deprivation is strongly associated with pupil absence, but other studies have found important roles for schools, teachers and peers in affecting whether a pupil attends school (Liu and Loeb, 2019; Kearney, 2008)

Linking school absences to lower attainment is challenging due to many potential factors that are likely to drive both. The analysis presented here does not attempt to identify the causal relationship between KS3 absence and KS4 attainment. However, a few studies from the US have used quasi-experimental methods to estimate the causal effects of absence on attainment. Liu et al (2019) find that school absence has long lasting as well as immediate effects on attainment and Goodman (2014) estimates that differences in school absence can causally explain a quarter of the equivalent of the disadvantage gap in maths. Goodman (2014) provides an important insight into how absence affects attainment: it is not the missed school time that necessarily affects attainment; it is more that absence disrupts the co-ordination of learning over the course of the school year.

Claymore (2019) analyses the NPD in a similar way to this project and finds that KS4 absence is a strong predictor of KS4 attainment, though KS3 absence appears to have little influence. In contrast, the results presented here indicate that KS3 absence is strongly related to KS4 attainment. The reason for this discrepancy is that Claymore (2019) includes KS4 absence as variable in their model, a variable that will be highly correlated with KS3 absence. The analysis presented here differs from the Claymore (2019) in two important ways; the model estimating the association between absence and attainment includes controls for late primary school absence and does not include KS4 absence in the model. As such, the modelled association between absence and attainment presented here are intended to reveal whether KS3 absence carries any information about future KS4 attainment, i.e. is KS3 absence an 'early warning' of underachievement at KS4 beyond what is known about pupils from primary school? Linked to this, school absence has been found to be an indicator of how a pupil is feeling about school (DfE, 2011) and thus a potential flag for the point at which pupils become disengaged with school during KS3.

4.2 Data and method

This analysis uses individual pupil level data from the National Pupil Database. Absence rates are calculated as the number of sessions (half days) recorded as absent, divided by the number of sessions possible for each pupil. The data does split out the data into authorised and unauthorised absences, however for analysis purposes the focus is on the total absence rate. This is because the distinction between authorised and unauthorised absence is in part at the discretion of the school and research has

found that officially 'authorised' absence is likely to contain significant amounts of 'voluntary' absence where the pupil is choosing to stay off school when they do not have a good reason to (Malcom et al. 2003). The data used comprises three cohorts; those that entered secondary school in 2012, 2013 and 2014, and uses data on pupils' absence rates from year 5 to year 9.

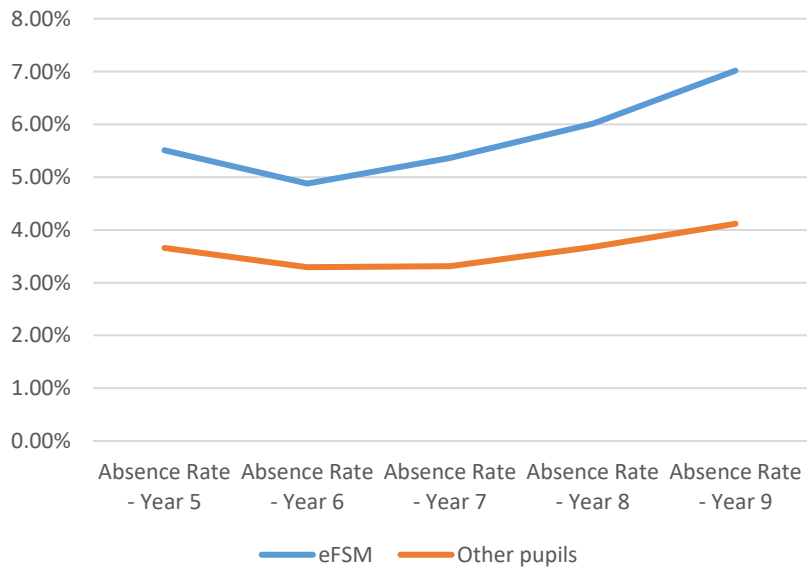
The first set of models estimates the relative relationships between different variables and a pupil's KS3 absence, after controlling for their absence rate in late primary, splitting the sample by pupil disadvantage[14]. The second set of models estimates the relationship between KS3 absence and KS4 Progress 8 attainment. Descriptive statistics of the sample are provide in appendix 10.4. All models are multilevel models with the pupil and school level random effects.

4.3 Results

4.3.1 Absence trajectories by pupil

Chart 4.1 displays average absence rates by pupil disadvantage. Disadvantaged pupils have a higher rate of absence going in to secondary school and this gap grows over early secondary. Indeed, it appears that almost the entire observed rise in pupil absence during secondary school for the pupil population as whole is due to disadvantaged pupils; the absence rate for other pupils barely rises from its level at the end of primary school. By year 9 the average disadvantaged pupil has missed 33 days, a month and a half of schooling, compared to 20 days for other pupils.

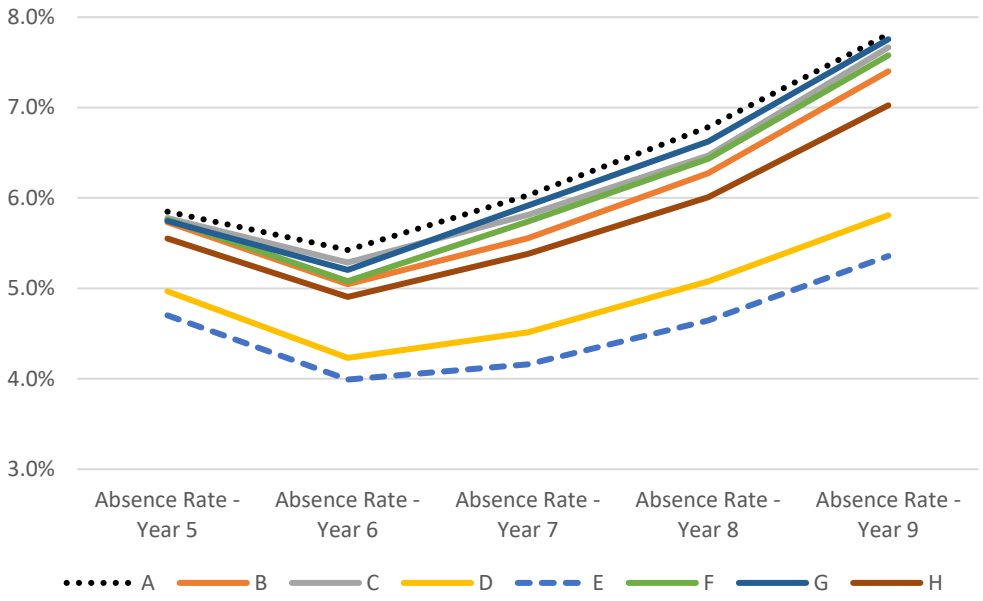
Chart 4.1 Absence trajectories – disadvantaged (ever-FSM) and other pupils



[14] Using whether a pupil has ever claimed FSM (eFSM) as the disadvantage indicator

Chart 4.2. displays absence trajectories for disadvantaged pupils by ONS area classification (See https://www.ons.gov.uk/methodology/geography/geographicalproducts/areaclassifications/2011areaclassifications/penportraitsandradialplots for detailed descriptions of these categories) of the local authority district of the pupil's school.

Chart 4.2 Absence rates of disadvantaged pupils by ONS area classification



A- Affluent England; B- Business, Education and Heritage Cent..; C- Countryside Living; D- Ethnically Diverse Metropolitan Living; E- London Cosmopolitan; F- Services and Industrial Legacy; G- Town and Country Living; H- Urban Settlements

It is clear that those pupils that reside in London and the major cities experience noticeably lower rates of absence. However, these gaps largely disappear in the modelling in subsequent sections, suggesting that these differentials are due to differences in pupil composition (particularly ethnicity) rather than area level effects.

4.3.2 Influences on absence during KS3

Table 4.1 displays the coefficient estimates of multilevel models with the KS3 absence rate as the dependent variable. The models are split between disadvantaged pupils and all other pupils. The results show that in general the associations between each factor and absence are stronger and more precisely estimated for disadvantaged pupils, despite the sample size being a third the size of all other pupils. Individual level factors that are associated with increased absence during KS3 for disadvantaged pupils include (in order of importance): living in a deprived neighbourhood (+1.7% for a 1SD change in deprivation), being of White ethnicity (+1%), SEND (+0.8%), non-EAL (+0.7%), older in the year

group[15], being female, and being low attaining at KS2. School level variables appear to be of minimal importance, apart from whether the school has a sixth form, which may relate to unobserved qualities of such schools such as an academic ethos[16], a finding that would be in line with Sylva et al. (2014). Wider area effects beyond neighbourhood deprivation do not seem to play a role in pupil absence, though disadvantaged pupils living in areas categorised as 'Affluent England' appear to have the highest absence rates, after controlling for the pupil and school level factors in the model. These areas are disproportionately made up of high income and wealthy families, with employment mainly based in service industries; this grouping is mostly made up of counties that surround London such as Buckinghamshire and Surrey.

After accounting for all these factors, the model suggests that around half of the remaining unexplained variation in absences between pupils is at the level of the school. This could suggest that there are important school level factors that determine absence that are not included in the model, for example, attendance policy. It is possible however that this finding reflects sorting of pupils into schools based on unobserved pupil level factors (e.g. parental interest in education).

[15] Indicating that absence increase with age as well as with school year group.
[16] In the sense that pupils may have clearer routes post GCSE and thus there may be more of a norm of continuing in education. Thomson (2018) for instance finds that pupils at schools with 6th forms are more likely to achieve 2 A-Levels and complete a degree.

Table 4.1. Multilevel model of pupil absence (Dependent Variable: Absence rate)

Variable	Sample = eFSM		Sample= other pupils	
Prior Absence				
Absence Rate - Year 6	0.4543	(0.0048)**	0.3918	(0.0032)**
Absence Rate - Year 5	0.2566	(0.0039)**	0.2604	(0.0024)**
Pupil level variables				
Spring term birth	-0.0012	(0.0002)**	-0.0006	(0.0001)**
Summer term birth	-0.0032	(0.0002)**	-0.0013	(0.0001)**
Female	0.0012	(0.0002)**	0.0006	(0.0001)**
Any other ethnic group (ref. White)	-0.0107	(0.0005)**	-0.0047	(0.0003)**
Asian (ref. White)	-0.0081	(0.0004)**	-0.0031	(0.0002)**
Black (ref. White)	-0.0127	(0.0004)**	-0.0068	(0.0002)**
Chinese (ref. White)	-0.0190	(0.001)**	-0.0097	(0.0004)**
Mixed (ref. White)	-0.0037	(0.0004)**	-0.0015	(0.0002)**
Unclassified (ref. White)	-0.0021	(0.0008)**	0.0001	(0.0004)
EAL	-0.0071	(0.0003)**	-0.0034	(0.0001)**
SEND	0.0089	(0.0003)**	0.0056	(0.0002)**
IDACI (standardised)	0.0174	(0.0008)**	0.0157	(0.0004)**
KS2 Maths -Below Expected Level	0.0010	(0.0003)**	0.0025	(0.0002)**
KS2 English-Below Expected Level	0.0002	(0.0003)	0.0010	(0.0002)**
School level variables (standardised)				
School FSM %	0.0015	(0.0004)**	0.0001	(0.0003)
School Female %	-0.0014	(0.0004)**	-0.0001	(0.0002)
School Absence	0.0013	(0.0004)**	0.0005	(0.0002)*
School Size	-0.0001	(0.0004)	0.0002	(0.0002)
School with 6th form (ref. no 6th form)	-0.0134	(0.0013)**	-0.0087	(0.0012)**
ONS Area Classifications (ref. E)				
A	0.0057	(0.0027)*	-0.0006	(0.0035)
B	0.0015	(0.0028)	0.0031	(0.0039)
C	-0.0011	(0.0025)	-0.0013	(0.0037)
D	0.0025	(0.0026)	0.0010	(0.0036)
F	0.0018	(0.0029)	-0.0009	(0.0038)
G	0.0032	(0.0026)	-0.0008	(0.0037)
H	0.0032	(0.0026)	-0.0018	(0.0035)
Year=2016	-0.0004	(0.0003)	-0.0014	(0.0001)**
Year=2017	0.0045	(0.0003)**	0.0012	(0.0001)**
Constant	0.0313	(0.0024)**	0.0217	(0.0038)**
N(pupils)	344,962		939,842	
N(Schools)	3,970		3,860	
R2	0.3108		0.3074	
School level variance	0.045		0.038	
Pupil level variance	0.049		0.030	

Notes: Robust standard errors clustered by year 9 school in parentheses; **p<0.01; *p<0.05.

4.3.3 Absence patterns in KS3, an early indicator of KS4 performance?

Table 4.2 displays estimates of the relationship between a pupil's (standardised) progress 8[17] score and KS3 absence over a series of models. The relationship between KS3 absence and attainment is remarkably stable over the specifications; it changes little with the addition of controls suggesting that KS3 absence contains a lot of hitherto unused information in explaining pupil attainment at KS4. The estimated relationship between KS3 absence (using model IV) is that for each additional day of absence during KS3, a pupils progress 8 score declines on average by 1% of an SD unit.

The relationship between KS3 absence and KS4 attainment is weaker for eFSM pupils compared to other pupils, however, we know that eFSM pupils have a higher absence rate at KS3. Further calculations reveal that KS3 absence can 'explain' a third of the unadjusted gap in progress 8 scores between eFSM and other pupils, and a fifth of this gap when adjusted for pupil characteristics. This estimated relationship between absence and attainment is remarkably similar to the estimated effect of absence on the attainment gap (between FSM and non-FSM) in the US as estimated by Goodman (2014). Pupils with higher attainment at KS2 show the strongest relationship between KS3 absence and KS4 performance, suggesting that KS3 absence might be a good indicator for when high attaining pupils fall off track.

[17] 'Progress 8' is a valued added style measure and is currently the headline measure of school performance in England. It aims to capture the progress a pupil makes from the end of primary school to the end of secondary school on the basis of performance in 8 qualifications at KS4 adjusted for a pupil's KS2 attainment. Further details can be found here: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/561021/Progress_8_and_Attainment_8_how_measures_are_calculated.pdf

Table 4.2. Pupil KS3 Absence and Progress 8 score (Dependent variable: standardised P8 score)

	I	II	III	IV	V	VI	VII
Coefficient	-5.96	-6.638	-5.823	-5.807	-5.194	-6.523	-4.535
SE	(0.053)**	(0.067)**	(0.062)**	(0.062)**	(0.09)**	(0.192)**	(0.108)**
N(Pupils)	409316	409316	409316	409316	104495	65769	123789
N(Schools)	3131	3131	3131	3131	3110	3034	3086
Sample	Full	Full	Full	Full	eFSM	High Att.	Low Att.
Prior absence	0	Yes	Yes	Yes	Yes	Yes	Yes
Pupil Characteristics	0	0	Yes	Yes	Yes	Yes	Yes
School Fixed Effects	0	0	0	Yes	Yes	Yes	Yes

Notes: Robust standard errors clustered by year 9 school in parentheses; **p<0.01; *p<0.05.

4.4 Summary

This section analyses the factors that are associated with absence during KS3. Disadvantaged pupils have a higher rate of absence going in to secondary school and this gap widens during early secondary. Individual level factors appear to be the strongest influence on a pupil's absence rate, with FSM status, ethnicity (White) and SEND status having relatively large associations with absence during KS3. The consistent and relatively large association between White ethnicity and absence reflects research that finds that White ethnicity is associated with poorer attitudes to school (Strand, 2011). School and area level factors (beyond the small level neighbourhood deprivation of a pupil's residence) appear to have little impact on absence. However, the modelling suggests that there may be school level factors that are not measured in the NPD that may significantly affect absence, for instance, attendance policy and pupil enjoyment of school.

The modelling of the relationship between KS3 absence and KS4 attainment finds that KS3 absence is strongly related to KS4 attainment and contains additional predictive power of KS4 underperformance beyond KS2 attainment and primary school absence. This can be interpreted in two ways. First, KS3 absence acts as an 'early warning system' for KS4 underperformance and is possibly reflecting the changes in motivation, school attachment and home support identified in section 3. This finding concurs with (Balfanz, Herzog and Mac Iver 2007) who find that early secondary indicators including attendance in 6th grade (year 7) predict 60% of those that do not graduate from high school in the US. The second interpretation is that missing school in early secondary has a causal effect on KS4 performance. This cannot be inferred from the data available, but would be consistent with studies from the USA that have considered this issue.

5 Does catch up in year 7 for low attaining pupils increase KS4 attainment?

5.1 Introduction

Low attainment at the end of primary school going into secondary school is strongly related to economic disadvantage with 53% of FSM pupils not reaching the expected standard in reading, writing and mathematics at the end of primary school, compared to 32% of all other pupils (DfE, 2019). As outlined in section 1.1. early secondary is also associated with a 'dip' in academic progress. A potential policy response is remedial provision during Year 7 for those that did not achieve to an adequate standard in the primary phase. This section tests whether a policy of standardised 'catch-up' testing in maths and English at the end of year 7 that operated from 2001-2007 in England delivered the objective that it intended of higher achievement at KS4. This policy was proposed for reintroduction in 2020 but was cancelled as part of the government's teacher workload review. Exploiting the fact that eligibility for the testing was based discontinuously on a pupil's KS2 test score and that there was a clear point at which the policy started and stopped, the results presented here suggest the policy had no effect on KS4 outcomes.

A number of similar policies in the USA provide some existing evidence on the effectiveness of such strategies. (Taylor 2014) evaluates a remedial education programme in Miami that targeted pupils in 6th grade (equivalent of year 7) who did not achieve the expected level in maths in 5th grade. It was found that remedial provision for these pupils increased test scores initially but that this effect faded away as the pupils progressed through school. (Dougherty 2015) finds mixed results of a literacy catch up program in 6th grade in Iowa, with strong *negative* effects on Black students, a result partially attributed to the negative consequence of labelling pupils as 'underachieving'.

5.2 Institutional background

The year 7 catch up tests were designed to help secondary schools assess whether pupils who had not reached the expected national curriculum level in the Maths or English tests at the end of primary school (i.e. below level 4 in the Key Stage 2 test) had done so by the end of Year 7. The policy was initially introduced as a means of tracking whether the 'catch-up' element of the KS3 national strategy[18] was having its intended effect, and also to provide schools with data at the end of year 7 on who to target for further intervention to ensure that pupils met the expected level of attainment in KS3 (age 14) tests.

[18] As part of the new KS3 National Strategy, schools were provided with materials that they were expected to follow on how to structure the KS3 curriculum in English and Mathematics, with a focussed provision on pupils that did not achieve level 4 at KS2. 'Catch-up' materials for use in the classroom were provided by the then Department for Education and Skills (DfES).

The stated objective of the policy was to 'arrest the decline in standards that takes place the year after children leave primary school for state comprehensives' (The Independent, 2000). The intended effects of the policy were twofold, i) to encourage schools to focus on low attaining pupils during early secondary to avoid them falling further behind, ii) to provide better information on pupils at the end of year 7 so as to better target provision in subsequent years. However, school leaders expressed concern about the potential for the tests to hold back pupils on entry to secondary school (The Times, 2000)[19].

Schools had to register for the tests; initially there was a strong expectation that all schools would do so, though this became less stringent in later years. The tests were externally marked and results reported to pupils, DfE, local authorities, schools and OFSTED. It was intended for the test results to become part of the public league table accountability framework, though beyond an emphasis on the tests by OFSTED, this did not occur. Despite schools expecting the majority of those taking the tests to pass, in fact, the majority of those taking the test failed to achieve the expected level (OFSTED, 2002); the pass rate in the first year of operation was 11% for maths and 31% for English. These pass rates had risen in the final participating cohort but were still low, at 29% and 45% respectively[20].

5.3 Data and Method

Four cohorts of data from the National Pupil Database are used; the first cohort that was able to take the tests (completed year 7 in 2001) and the preceding cohort (2000), and; the final cohort that was able to take the tests (completed year 7 in 2007) and the succeeding cohort (2008). This allows for two approaches to testing for the policy – i) whether the policy improved outcomes for eligible pupils on implementation and ii) whether these outcomes declined (or improved) once the policy was removed. Eligibility for the catch up test was based on whether a pupil scored within the range of national curriculum level 3 in the KS2 test. Therefore, the sample is restricted to pupils that achieved level 3 or level 4 (as the control group). As participation in the testing was on an opt-in basis, the sample is restricted to schools that participated in the policy.

Eligibility for the catch up test changed discontinuously at the level 3 – level 4 marks threshold. Therefore, the approach to testing whether the policy had any effect on KS4 outcomes is to test for whether KS4 outcomes 'jump' for pupils that just failed to achieve level 4 compared to those that just achieved level 4. However, due to a marking practice that existed in KS2 test prior to 2008 known as 'borderlining' whereby marks close to a level threshold were systematically marked upwards, this discontinuity cannot be exploited in a standard regression discontinuity framework[21]. Appendix 10.6

[19] These concerns centred around the idea that pupils would spend year 7 repeating KS2 material rather than starting the KS3 curriculum, even when they may have only just missed out on reaching the expected level.
[20] Based on NPD analysis as part of this project
[21] Regression discontinuity is a quasi experimental method where the outcomes of pupils just above and below the marks threshold can be compared as if the policy had been randomised.

shows the density of cases around the level 3 threshold that clearly shows an excess of pupils who just scored over the level 4 threshold.

To account for this manipulation of marks around the threshold, the analytical approach exploits the fact that data is available for the pre-policy year, 1999/2000. As such, the manipulation around the threshold can be controlled for by using a comparison of outcomes between the policy 'on' year and the pre policy year (as the manipulation around the marks threshold occurs in both years). The effect of the policy can be estimated as the 'jump' in outcomes at the level 3 threshold in the policy year minus the corresponding jump in outcomes in the policy 'off' year. This approach is the "difference- in-discontinuities" design as described in (Grembi, Nannicini and Troiano 2016) and is suggested as a way of dealing with the threshold manipulation in regression discontinuity type models by (Eggers et al. 2018)[22]. A graphical demonstration of this method can be found in appendix 10.7. The model estimated is of the form:

$$y_{ist} = \alpha_0 + \gamma_1 D_{ist} + \eta_1 KS2_{ist} + \lambda_1 (D_{ist} * KS2_{ist}) + Policy\_ON_t[(\alpha_2 + \gamma_2 D_{ist} + \eta_2 KS2_{ist}) + \lambda_2 (D_{ist} * KS2_{ist})] + \beta X_{ist} + \theta S_{st} + \epsilon_{ist} \quad (5.1)$$

Where y is a measure of KS4 attainment[23]. D is an indicator variable of whether a pupil attained level 3 in their KS2 tests (and thus were eligible for the catch up tests in the policy 'on' year); KS2 is the KS2 score in the relevant KS2 test[24] that determined the KS2 level. The Policy_ON variable is an indicator variable for whether the cohort was included in the policy: for testing the introduction of the policy this tis the cohort that completed year 7 in 2001; for testing the effect ending the policy this is the cohort that completed year 7 in 2007. X and S are a set of pupil and school level controls respectively. The interaction of D and KS2 allows for the slope of the relationship between the outcome and the KS2 to vary either side of the level 3 cutoff. The causal effect of the catch up test is estimated by the coefficient on the interaction of Policy_ON and the level 3 indicator, γ_2. Compliance with the test in 2001 (2007) was 73% (89%) in maths and 77 %(88%) in English, with those eligible but not taking the test either being absent or mobile pupils. As such, the effect γ_2 is an intent-to-treat effect. The interpretation of this value being a causal effect relies on the borderlining effect remaining constant between the policy on and policy off periods; on inspection, the changes in the frequency distributions

[22] The approach also controls for another potential issue (the 'compound treatment' issue) in implementing the standard regression discontinuity framework: that being designated level 3 or level 4 may have other effects on KS4 outcomes that are not due to the catch up testing.

[23] I) The capped GCSE points score - calculated by awarding points for each GCSE grade and totalling up the best 8 GCSEs, this is standardised for this purposes of the modelling; ii) A binary outcome of whether a pupil achieved 5A*-C GCSE grade or equivalents including English and Maths.

[24] i.e. Maths or English; for the purposes of the analysis this variable has been zero centred and sign reversed, to ensure that a positive effect on the outcome would be estimated as a positive coefficient.

of cases around the thresholds (see appendix 10.6) is similar in the policy on and policy off years, indicating that this assumption is met.

5.4 Results

Appendix 10.8 display scatterplots of KS2 test scores and the corresponding means of KS4 outcomes for the policy on and off cohorts. Graphically it is clear that i) there is no discernible discontinuity in outcomes at the level 3/4 thresholds in the treatment years, and; ii) there is no discernible change in the relationships between the assignment variable (the subject KS2 mark) and the outcome between the policy 'off' year and the policy 'on' year. In short, we do not observe a shift in the KS4 outcomes of level 3 pupils in the implementation year (2001) compared to the year before (2000). This suggests that the catch up policy had no discernible effect on KS4 outcomes. This finding is confirmed by the statistical analysis. Table 5.1 shows the estimated effects of the introduction of the policy. Three specifications of the model are estimated, the first is on the full sample, the second is on a sample restricted to pupils scoring within 15 marks either side of the level 3 threshold ('restricted bandwidth') and the third includes the squared value of the relevant KS2 test score (including these values within the interactions). For the binary outcome, 5A*-C including English and Maths, a logit model is also estimated. The estimates are mainly very small for all specifications (e.g. the estimated effect on the GCSE capped points score of the English catch up test is – 1.1% of an SD unit), not statistically significant and vary in sign between the two outcome measures. The estimated effect of the English test on the probability of attaining 5A*- C including English and maths (Panel A, models IV and V) appears to be positive and statistically significant, however this estimated effect is not robust to the quadratic and logit specifications , suggesting that this is just an artefact of fitting a linear relationship in estimating the discontinuity.

Similar results are found for testing the effect of ending the testing policy (Table 5.2); in this case, all the estimates of the effect of the English catch up test are negative, though all are small and not statistically significant. The estimates of the effect of the maths catch up test are small, inconsistently signed and not statistically significant. We also tested for any effects in the intervening years between implementation and the end of the policy in case the policy took some time to become established, but no effects could be identified. Overall, the results suggests that pupils did not benefit from the introduction of the catch up provision and tests, nor did they lose out when the tests were ended.

Table 5.1 The effect of catch up testing (Implementation of policy: 2000-01)

A: English catch up	I	II	III	IV	V	VI	VII
Coefficient	-0.011	-0.009	-0.006	0.012	0.01	0.004	0.035
SE	(0.009)	(0.01)	(0.013)	(0.004)**	(0.004)*	(0.005)	(0.046)
N(Pupils)	441371	338817	441371	441371	338817	441371	441371
N(Schools)	1856	1856	1856	1856	1856	1856	1856
Outcome	Capped points (Std.)	Capped points (Std.)	Capped points(Std.)	5A*-C inc. E&M	5A*-C inc. E&M	5A*-C inc. E&M	5A*-C inc. E&M
Specification	Full	Restricted bw	Quadratic	Full	Restricted bw	Quadratic	Logit

B: Maths catch up	I	II	III	IV	V	VI	VII
Coefficient	0.003	0.004	0.005	-0.003	-0.006	-0.001	-0.036
SE	(0.008)	(0.011)	(0.012)	(0.004)	(0.005)	(0.006)	(0.041)
N(Pupils)	459003	259057	459003	459003	259057	459003	459003
N(Schools)	1893	1891	1893	1893	1891	1893	1893
Outcome	Capped points(Std.)	Capped points(Std.)	Capped points(Std.)	5A*-C inc. E&M	5A*-C inc. E&M	5A*-C inc. E&M	5A*-C inc. E&M
Specification	Main	Restricted bw	Quadratic	Main	Restricted bw	Quadratic	Logit

Notes: Robust standard errors clustered by year 9 school in parentheses; **p<0.01; *p<0.05.Controls include gender, FSM eligibility, EAL, SEND status, Deprivation index (IDACI) of home postcode and KS2 test score in Maths and English (zero centred).

Table 5.2 – The effect of catch up testing (Termination of policy: 2007-08)

i) English catch up

	I	II	III	IV	V	VI	VII
Coefficient	-0.013	-0.004	-0.013	-0.013	-0.014	-0.013	-0.080
SE	(0.017)	(0.019)	(0.023)	(0.008)	(0.01)	(0.012)	(0.059)
N(Pupils)	186398	114648	186398	186398	114648	186398	186398
N(Schools)	3304	3058	3304	3304	3058	3304	3304
Outcome	Capped points(Std.)	Capped points(Std.)	Capped points(Std.)	5A*-C inc. E&M	5A*-C inc. E&M	5A*-C inc. E&M	5A*-C inc. E&M
Specification	Full	Restricted bw	Quadratic	Full	Restricted bw	Quadratic	Logit

ii) Maths catch up

	I	II	III	IV	V	VI	VII
Coefficient	-0.014	-0.022	-0.041	0.001	-0.006	-0.010	0.013
SE	(0.015)	(0.021)	(0.023)	(0.008)	(0.012)	(0.013)	(0.051)
N(Pupils)	174474	85843	174474	174474	85843	174474	174474
N(Schools)	3274	2912	3274	3274	2912	3274	3274
Outcome	Capped points(Std.)	Capped points(Std.)	Capped points(Std.)	5A*-C inc. E&M	5A*-C inc. E&M	5A*-C inc. E&M	5A*-C inc. E&M
Specification	Main	Restricted bw	Quadratic	Main	Restricted bw	Quadratic	Logit

Notes: As per table 5.1.

5.5 Conclusion

The results presented here suggest that the catch up policy and progress tests did not achieve their objective of increasing academic progress during KS3 and increase attainment at the end of KS4. Although it is not possible to test directly, schools at the time did object to the tests on the basis that the tests were demotivating for low attaining pupils and that the preparation for the tests diverted pupils away from gaining a grounding in other KS3 subjects.

6 Identifying highly able disadvantaged pupils in early secondary – does this increase GCSE performance?

6.1 Background

This section attempts to assess the effect of identifying pupils as 'Gifted and Talented' (G&T) in year 7, a policy that ran in England from 2006-2011. This policy grew from an earlier program for high attaining pupils in inner city areas that ran as part of the 'Excellence in Cities' initiative. The intended effect of the policy was to encourage schools to maintain the high academic trajectory of such pupils throughout their secondary schooling. The results presented here suggest that pupils identified as G&T in year 7 obtained higher GCSE grades compared to similar pupils who were not identified as G&T. However, it was not possible to implement methods that estimate robust causal relationships, so these results are tentative.

6.1.1 Existing work

Evidence on the effectiveness of providing for 'gifted' pupils derives mainly from North America and for the equivalent of our primary phase. (Adelson, McCoach and Gavin 2012) find that there is no effect overall of gifted programs in the USA during the primary stage. (Card and Giuliano 2014) however find that gifted provision from 4th grade (year 5) increased attainment in the subsequent year, with the largest effects for lower income pupils, though the program they study involves identified pupils being taught separately rather than simply additional provision. In the only study that could be located on gifted programs in early secondary, Bui et al (2014) find no effects of a gifted program for 6th grade (year 7) pupils on test outcomes in 7th grade (year 8).

In England, there is limited evidence of the effectiveness of gifted programs. The forerunner to the G&T policy evaluated here was the G&T strand that was part of the 'Excellence in Cities' area based initiative that ran between 1999 and 2006. An evaluation of the Excellence in Cities program found that the program was most effective in raising KS3 attainment for high ability pupils in the most disadvantaged schools (Machin, McNally and Meghir 2010). This possibly suggests that disadvantaged students do benefit from G&T programs. Qualitative evidence from England suggests that the G&T policy was popular with the parents of disadvantaged G&T pupils and was seen as supporting their academic confidence (Koshy, Smith and Brown 2014) .

6.1.2 Institutional background

This analysis tests for whether identifying pupils on entry to secondary school as 'Gifted and Talented' had any effect on GCSE outcomes. Under the Gifted and Talented policy that ran from 2005/06-2010/11, schools were required to identify G&T pupils on entry into secondary school and submit this

information in their pupil census returns. It was up to schools as to how to identify such pupils, however G&T identification was supposed to include, though not exclusively, the top 5% of pupils based on KS2 marks nationally, and schools were sent lists of pupils whose marks were above this threshold. Schools were expected to provide for those pupils identified as G&T. How they did so was not nationally mandated, but guidance suggested monitoring, differentiation of learning and out of school opportunities (Casey and Koshy 2013) . There was little enthusiasm for the policy amongst schools and it was seen as low priority compared to league tables and other government initiatives (Brady and Koshy 2013) . As a result, not all schools complied with the policy, and the implementation of G&T identification varied between schools.

6.2 Method

6.2.1 Overview

Initial analysis of the NPD found that while pupils identified in the NPD as G&T were mainly drawn from the top 5% of the attainment distribution, there was not a strong enough discontinuity to implement a regression discontinuity approach that would have offered the possibility of robustly estimating the causal effect of the policy. Therefore the effect of G&T identification is estimated using i) OLS models with controls for potentially confounding factors (particularly KS2 marks) and; ii) OLS models on a matched sample of G&T FSM pupils and non-G&T FSM pupils using propensity score matching to generate the matched sample. The analysis concentrates on the effect of the policy on Free School Meals (FSM) pupils, as the original intention of the policy was to increase the attainment of highly able disadvantaged pupils. The sample used in the analysis is drawn from the National Pupil Database and comprises the cohorts that entered year 7 in the first three years of the policy (i.e. 2005/06 – 2007/08); these were the three cohorts whose secondary schooling spanned the operation of the policy. The outcome variables analysed are i) a binary indicator of whether a pupil attained five or more A*-A grades at GCSE, and ii) standardised capped GCSE points score.

6.2.2 Modelling

The main model estimated is as follows:

$$y_{ist} = \alpha_0 + \gamma GANDT_{ist} + \beta X_{ist} + \theta S_{st} + \tau T_t + \epsilon_{ist} \quad (6.1)$$

Where y is one of the outcome variables, GANDT is an indicator of whether a pupil was identified as G&T in year 7 of secondary school in the NPD. X and S are pupil and school level controls (the same set of variables as the matching variables listed below plus an indicator variable of whether a school identified G&T pupils in year 7). T is a set of cohort dummies. The coefficient of interest is γ , the differential between G&T and non G&T pupils.

The model is first estimated on the full sample of data and the sub-sample of FSM pupils. Then the sample is restricted to FSM pupils identified as G&T matched to similar pupils in schools that did not identify G&T pupils[25]. Matching is done using nearest neighbour propensity score matching[26] to generate a single match for each FSM G&T pupil. The matching variables are KS2 test scores, KS2 test scores squared, gender, index of deprivation, ethnicity, English as an Additional Language, Special Educational Needs, % School FSM, Average School KS2 scores. This generates a matched sample of (22498 pupils - i.e. 11,249 pairs). Model 6.1 is then run on the matched sample[27].

6.3 Results

Descriptive statistics comparing G&T and non-G&T pupils over the full sample are provided in appendix 10.9. These clearly show the much higher attainment at both KS2 and KS4 for G&T pupils compared to others. Table 6.1 shows the model estimates of the associations between G&T identification and KS4 outcomes using the non-matched sample. Models without controls reflect the large difference in KS4 attainment between G&T and non G&T pupils; these differentials lessen significantly with the addition of controls. They do however remain sizeable: for FSM pupils, the group of interest, being identified as G&T is associated with a 5% higher probability of attaining 5A*-A grades (model VII) and an increase in the overall GCSE capped points score of 0.1 SD units (Model VIII). Models V-VIII include an indicator variable of whether a school identified any G&T pupils (along with other pupil and school level controls), with the estimates for the coefficient for this variable shown in the table. The estimates for the relationship between school G&T policy and attainment are small and negative suggesting that the estimated effects of individual pupil level G&T identification in this model are not due to selection bias in terms of the types of schools that identified G&T pupils.

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[25] A substantial proportion of schools did not identify any pupils as G&T
[26] No replacement with caliper of 0.001
[27] This is done to account for the clustering in the data, which cannot be accounted for using standard PSM techniques.

Table 6.1 Estimated effects of G&T identification on pupils' KS4 outcomes

Variable		I	II	III	IV	V	VI	VII	VIII
G&T	Coefficient	0.304	0.603	0.174	0.698	0.069	0.092	0.050	0.103
	SE	(0.005)**	(0.005)**	(0.006)**	(0.01)**	(0.002)**	(0.003)**	(0.004)**	(0.009)**
School G&T	Coefficient	-	-	-	-	-0.011	-0.018	-0.003	-0.007
	SE					(0.001)**	(0.005)**	(0.001)**	(0.009)
	N(Pupils)	1512712	1511881	221860	221491	1512667	1511837	221849	221480
	N(Schools)	3882	3879	3842	3842	3879	3879	3842	3842
	Outcome	5A*-A	Capped Points (Std.)	5A*-A	Capped Points (Std.)	5A*-A	Capped Points (Std.)	5A*-A	Capped Points (Std.)
	Sample	All	All	FSM	FSM	All	All	FSM	FSM
	Controls?	N	N	N	N	Y	Y	Y	Y

Notes: Robust standard errors clustered by school in parentheses; **p<0.01; *p<0.05. Controls include gender, FSM eligibility, EAL, SEND status, Deprivation index (IDACI) of home postcode, ethnic group, KS2 test score in Maths, English and Science, KS2 test scores squared, KS2 teacher assessments in Maths, English and Science, composite KS2 score of school-cohort, FSM% of school-cohort, year fixed effects.

Turning to the matched sample analysis - Appendix 10.10 shows a comparison of the 'treatment' (i.e. G&T) and 'control' (non-G&T). This shows that the G&T and non G&T pupils in the matched sample are very similar in terms of observed characteristics and that the matching exercise has been successful in generating a sample of similar pupils pairs. The estimated effect of G&T using the matched sample generated in this way are shown in table 6.2.

Table 6.2. Estimated effect of G&T identification on FSM pupils' KS4 outcomes – matched sample

	I	II
Coefficient	0.023	0.084
SE	(0.005**	(0.013)**
N(Pupils)	22498	22498
N(Schools)	3257	3257
Outcome	5A*-A	Capped Points (Std.)
Sample	FSM-PSM	FSM-PSM
Controls?	Y	Y

Notes: as per table 6.1.

These results show that in the matched sample, pupils identified as G&T were 2.3% more likely to obtain 5A*-A grades (compared to the overall rate of 19% for matched controls) and had overall GCSE capped point scores that were 0.084 SD units higher.

6.4 Conclusion

The results from this section imply that identification of FSM pupils as Gifted and Talented in year 7 did have a positive effect on their KS4 performance. However, these findings are only tentative. Due to the nature of the mechanism for identifying G&T pupils, it was not possible to estimate a regression discontinuity model as has been implemented in other studies of gifted programs. As such, the analysis relies on methods that attempt to estimate the effect of Gifted and Talented identification based on taking account of differences in outcomes between pupils that are related to observed variables. There are possibly unobserved variables that may account for the differences in outcomes observed here, the main candidate being cognitive ability test results conducted by schools themselves on entry into secondary. There is however extremely limited evidence on the efficacy of gifted and talented programs in England, despite these being a part of education policy for a decade. Moreover, there is a lack of evidence around how high achieving disadvantaged pupils might be best supported to maintain their trajectory through school. The evidence presented here suggests that identifying and providing for highly able disadvantaged pupils early on in secondary school may help in this regard.

7 Summer schools for disadvantaged pupils – effects on GCSE attainment and early secondary school absence.

7.1 Introduction

This section of the report evaluates the implementation of summer schools for disadvantaged children in the summer of 2012. This policy funded schools to open during the summer and provide activities for pupils that would be joining them in year 7 in the September of that year. The intended objective of the policy was to increase the attainment of disadvantaged pupils by improving their transition from primary to secondary. Schools were expected to deliver literacy and numeracy catch up classes as well as sessions to familiarise them with secondary school life (Gov.uk, 2012). The budget allocated for the policy for the summer of 2012 was £50m. Using a difference in difference approach, this section tests whether pupils who were eligible to attend the summer school ended up with higher attainment at the end of secondary school and higher school attendance in early secondary compared to similar pupils in schools that did not hold summer schools. The results find no evidence that the summer schools policy had any effect on these outcomes.

7.1.1 Existing literature

Though there are numerous studies of summer school provision, few have considered the impact of summer schools that are focussed on departing year 6 pupils. (Gorard, Siddiqui and See, 2015) evaluated a small-scale programme to provide maths and literacy summer schools for disadvantaged children in years 5 and 6, finding no significant benefits in terms of academic attainment. (Sainsbury et al. 1998) found no effects from a government pilot of a transition summer school for literacy on participants. The summer schools policy evaluated here was formally evaluated after a year by NFER, this evaluation found that participation in a summer school was associated with small improvements in survey measures of attitudes to school and had a positive impact according to schools that delivered them (Sharp et al. 2013; Martin et al. 2013). Both (Gorard et al. 2015) and (Sharp et al. 2013) note that summer schools were popular with participants and that their effects might be on non-academic outcomes.

7.1.2 Institutional background

Schools were invited to bid for funding to run a summer school in 2012. 1,976 schools were awarded funding, though 15% of these withdrew from the programme before the summer. Pupils who were eligible for the pupil premium (i.e. FSM or those who had been in care for at least 6 months) were the target group for the summer schools and funding was based on the number of these pupils; however other pupils could and did attend. Over half of all pupils who were invited to the summer school attended at least once. However, attendance and retention was seen as a key problem with the policy (Sharp et al. 2013) as such the estimates effects in this section are intent-to-treat estimates.

7.2 Data and methods

7.2.1 The effect of summer schools on attainment

The method for testing the effect of summer schools on GCSE attainment is an implementation of the difference-in-difference (DiD) method. The approach follows similar studies of school level interventions such as the evaluation of the national Literacy hour (Machin and McNally 2008) and a campaign to improve the quality of school meals in a local authority (Belot and James 2011). Under this method, the effect on KS4 attainment is modelled as follows:

$$y_{ist} = \alpha_0 + \delta_0 SSCH_s * PolicyOn_t + \beta X_{ist} + \tau T_t + \theta_s + \epsilon_{ist} \quad (7.1)$$

Where y is either a binary outcome of whether a pupil obtained a grade A*-C (models estimated separately for Maths and English) or the pupil's capped GCSE score, for pupil i who attended school s in year 7 of secondary school and who completed KS4 in year t (t=2016, 2017). SSCH is an indicator variable of whether a school delivered a summer school, PolicyOn is an indicator variable for the cohort that transferred from primary school to secondary school in 2012 (i.e. completed KS4 in 2017). X is a vector of pupil characteristics, T is a time dummy and ϵ represents the pupil level error. θ represents school fixed effects that account for all time invariant school effects[28].

The data used draws from three cohorts of pupils (those completing KS4 in 2015, 2016 & 2017) from the National Pupil Database. The 2015 cohort is used to test for whether the treatment and comparison groups had similar trends before the policy was implemented and are thus comparable[29]. The analysis sample restricts the data down to a 'treatment' and 'comparison' sample. The 'treatment sample' used in estimating this model are the 876 schools surveyed as part of the official evaluation of the policy (i.e. those surveyed in Martin et al. 2013)[30]; the comparison group are those schools who did not deliver a summer school in 2012, but did so in 2013.

7.2.2 The effect of summer schools on school absence.

The method to estimate the effect of the summer schools on school absence also exploits the longitudinal nature of the absence data using a difference in difference design. Whereas the analysis of

[28] Hence no indicator variable for the summer school programme aside from its inclusion in the interaction with the PolicyOn variable.

[29] Credibly identifying the effect of a policy using difference in difference relies on making the 'parallel trends' assumption that the difference between the treatment and control groups would have remained constant in the absence of treatment. This assumption can be tested by analysing whether the difference between the two groups was constant in the pre-policy period.

[30] 37 (4%) of these schools ended up withdrawing from the programme prior to delivery.

GCSE attainment identifies the effect of summer schools via cohort to cohort differences in exposure to the policy. The analysis of school absence exploits the fact that for absence we can observe pupils' absence rates before and after the transition, both for pupils that were eligible for the summer school and those that were not. Using pupil fixed effects models, we can than control for all fixed pupil characteristics (whether observed or unobserved) and test for whether the trajectory of absence in secondary school differs for those eligible for the summer schools. The sample used in this part of the analysis are pupils from the treatment and comparison groups for a single cohort, those that completed KS4 in 2017. The model estimated is a pupil level difference in difference model using pupil level fixed effects:

$$y_{ist} = \alpha_0 + \sum_{\{t=5\}}^{\{t=9\}} \delta_t SSCH_s * SY_t + \beta X_{ist} + \tau SY_t + \theta_i + \epsilon_{ist} \quad (7.2)$$

Where y is the absence rate for pupil i in school s and school-year t (t=5,6,7,8,9). SSCH is an indicator variable of whether a school delivered a summer school, SY is a set of dummy variables for each school year, with year 6 left out as the reference category. X is a vector of pupil characteristics; T is a set of time dummies and θ represents pupil fixed effect with ϵ representing the pupil-observation level error. The set of coefficients δ_t provide the difference in difference estimates of the effect of the summer school on absence in each of the early secondary years. This specification also provides a test of the parallel trends assumption as $\delta_{t=5}$ should, in the presence of parallel trends in the treatment and comparison group, be equal to zero.

7.3 Results

7.3.1 The effect of summer schools on KS4 attainment

The estimates of δ_0 from equation 7.1. are shown in Table 7.1 The estimates are very small, vary in sign across outcome measures and not statistically significant. The estimated effects on the target (pupil premium) group appear to be more positive; however, these are still very small and not statistically significant.

Table 7.1 Estimated effects of summer school programme for disadvantaged pupils on KS4 outcomes

	I	II	III	IV	V	VI
Coefficient	-0.004	0.005	-0.004	-0.002	0.007	0.006
SE	(0.004)	(0.005)	(0.008)	(0.007)	(0.008)	(0.013)
N(Pupils)	426334	431733	431734	113636	116545	116545
N(Schools)	1434	1437	1437	1432	1433	1433
Outcome	Maths A*-C	English A*-C	Capped points (Std.)	Maths A*-C	English A*-C	Capped points (Std.)
Sample	All	All	All	Pupil Prem.	Pupil Prem.	Pupil Prem.

Notes: Robust standard errors clustered by school in parentheses; **p<0.01; *p<0.05. Controls include gender, FSM eligibility, EAL, SEND status, ethnic group, Deprivation index (IDACI) of home postcode, KS2 teacher assessments in Maths, English and Science, month of birth, year fixed effects

Appendix 10.12 shows the results of a 'placebo analysis', that is, testing for whether there is an 'effect' of the policy when the model is estimated on data before the policy was implemented (i.e. on the 2015 and 2016 cohort, with 2016 as the treatment cohort). Again, the estimates are very small suggesting that there are no pre-treatment trends in the data that might explain the null result. The results are consistent with a zero effect of summer schools on KS4 outcomes.

7.3.2 The effect of summer schools on school absence

Figure 7.1. presents the absence trajectories of pupils in the 2017 KS4 cohort from late primary into early secondary, split by treatment and comparison groups, over the whole sample and restricted to the target (pupil premium pupils). The chart provides some assurance that the parallel trends assumption holds with the trajectory between years 5 and 6 being near identical, especially for the target group. The chart indicates little in the way of any positive effects on school attendance from the summer schools policy. This result is confirmed in the estimation of models based on equation 7.2.; the estimated effects are very small. For the target group the estimated effects are positive and statistically significant in years 7 and 9, suggesting that summer schools resulted in an *increase* in school absence. The estimated effects even here though are very small, equating to an additional half a day missed over the whole of year 7-9. Overall, the results suggest a zero effect of the summer schools policy on school absence.

Figure 7.1 Pupil absence trajectories - summer school pupils vs control group

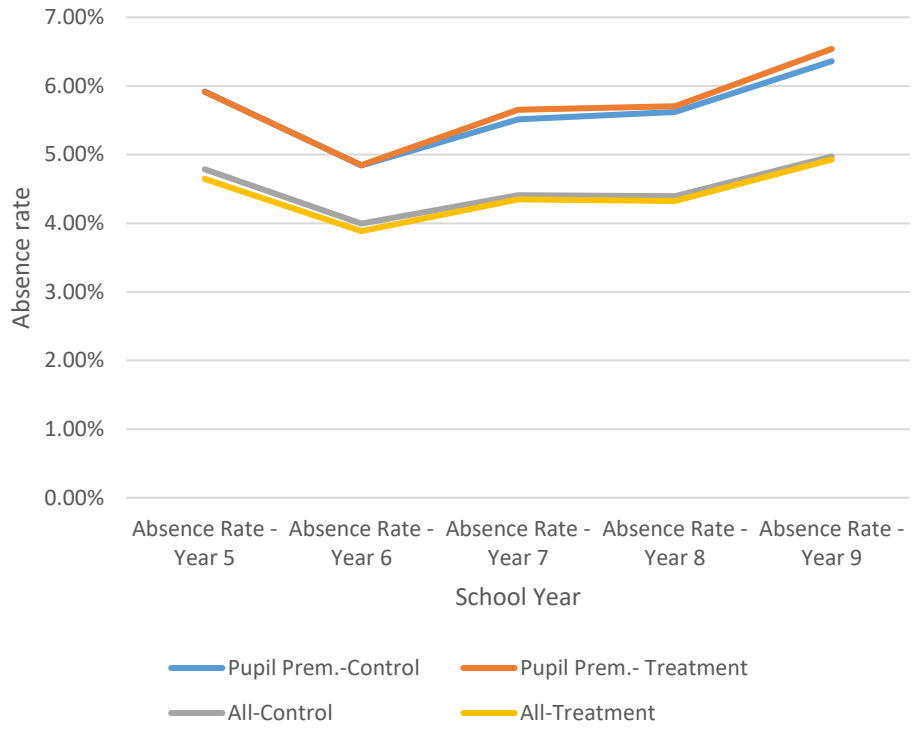

Table 7.2 Pupil level difference in difference estimates of the effect of summer schools on school absence.

	I	II
Year 5*Summer School	-0.0003	0.0000
	(0.0003)	(0.0005)
Year 7*Summer School	0.0006	0.0015
	(0.0004)	(0.0006)*
Year 8*Summer School	0.0005	0.0010
	(0.0004)	(0.0007)
Year 9*Summer School	0.0006	0.0017
	(0.0004)	(0.0008)*
N(Observations)	1006737	321344
N(Pupils)	205991	65954
Outcome	Absence Rate	Absence Rate
Sample	All	Pupil Prem.
Model	Pupil FE	Pupil FE

Notes: Robust standard errors clustered by pupil in parentheses; **p<0.01; *p<0.05.

7.4 Conclusion

These results find that the summer schools appear ineffective in improving pupil outcomes. In terms of attainment, this was perhaps to be expected – why should a summer school held before starting secondary school affect educational outcomes some 5 years later? This was however, the intended outcome of the policy that was well resourced and demonstrates that KS4 attainment is unlikely to be affected by short-term interventions in early secondary. The results on summer schools concur with results from a small scale EEF funded RCT into literacy catch up over the transition which found that summer schools for literacy had a negligible effect on reading attainment at significant cost; individualised programmes within school time were found to hold more promise (Gorard, Siddiqui and See 2017). A major issue with summer schools is also the recruitment and attendance of pupils.

The intent to treat nature of the estimates need to be borne in mind, especially as many of the participating schools were found to have problems with summer school attendance, and it may be the case that for individual pupils the summer schools may have made their transition into secondary schools easier. Indeed the Sharp et al (2013) evaluation does find positive associations between summer school attendance on other outcomes such as confidence, socialisation and school readiness; the analysis presented here does not directly capture these.

8 Overall conclusions and Policy Recommendations

8.1 Summary of findings

Existing literature on the early secondary and the transition from primary to secondary school

- A review of the existing evidence around early secondary and the transition from primary finds that there is extensive evidence that socio-economic inequalities in education attainment widen during the early secondary phase. Factors that contribute to this include the disruption caused by the primary-secondary transition, the negative influence of peer groups and the inequalities in the home learning environment.

Influence of economic disadvantage on attitudes and experience between the ages 11-14

- Analysis of Millennium Cohort Study data finds that disadvantaged pupils have less confidence in their academic abilities, are less likely to have support at home and more likely to report that they have peers who do not work hard. This is true even when comparing pupils within the same school and controlling for detailed background characteristics. These gaps either widen or appear over early secondary. These are all factors that have been shown in other research to be influential on KS4 attainment and thus points to early secondary as a key phase in which attainment gaps become solidified.

Pupil Absence over KS3

- The absence rate of disadvantaged pupils is higher than other pupils during each phase of schooling. This difference increases over KS3, even when comparing disadvantaged and non-disadvantaged pupils within the same school. In fact, the general rise in absence over early secondary across all pupils in the national statistics is almost entirely due to disadvantaged pupils.
- Disadvantaged White pupils living in high deprivation neighbourhoods have absence rates at the end of KS3 that are almost twice as high as non-disadvantaged pupils, and are absent from school in excess of 2 months in total over KS3 on average.
- Not having a 6th form, a high cohort proportion of male pupils and a higher proportion of pupils eligible for FSM are all associated with higher school absence in early secondary for disadvantaged pupils. For non- disadvantaged pupils, these relationships tend to be weaker and non-significant. Beyond neighbourhood deprivation, area level variables do not seem to be related to absence rates.
- Absence rates in early secondary are predictive of achievement at GCSE. This is after controlling for pupil characteristics and for the school attended. This negative association between KS3 absence and GCSE attainment is stronger for pupils that are high attainers at KS2.

- The absence rate over early secondary statistically 'explains' 30% of the gap in Progress 8 scores between disadvantaged and other pupils (20% of the gap when pupil characteristics are taken into account). This relationship is not necessarily causal, but does indicate that KS3 absence is predictive of underachievement independently from other pupil characteristics.

Does catch up provision and testing in year 7 work?

- The 'catch up' programme and associated testing the end of year 7 for pupils who did not make the expected attainment at KS2 in English and Maths was a policy that existed in England from 2001-2007. Using data from the National Pupil Database (NPD), comparing groups who were and were not affected by the policy, we find no evidence that this increased attainment at KS4. This indicates that care must be taken when designing catch up programmes as part of efforts to counter the effects of the Covid-19 closure of schools; test based accountability of 'catch up' may not produce positive outcomes in the long run.

Does identifying and supporting highly able pupils in year 7 affect KS4 outcomes?

- Analysis of the NPD finds that the policy of identifying and providing for pupils as "Gifted and Talented" in year 7 that ran from 2006-2011 is associated with higher KS4 attainment for high attaining but disadvantaged pupils (when compared to similar pupils in schools that chose not to identify pupils under this policy). However, the methods used to estimate this effect make establishing causality difficult as there may be other, unobserved factors (like performance on cognitive ability tests) that may explain this association. Combined with evidence from the literature review this does however suggest that this group of pupils may benefit from specialised programmes, particularly around helping parents support such pupils.

Do summer schools for pupils transitioning to secondary school affect KS4 attainment or early secondary absence?

- The summer schools over the Y6-Y7 transition for disadvantaged pupils that started in 2012 do not appear to have had any effect on KS4 attainment nor on KS3 school attendance. They may however have effects on non-cognitive outcomes– these outcomes were not tested as part of this research but have been suggested by earlier evaluations of the programme.

8.2 Implications for schools

'Catch up' provision and summer schools in the context of Covid-19

- The results from this project in sections 5 and 7 have identified that efforts to aid pupils' progress by additional provision at the start of secondary school are not linked to improvements in KS4 attainment. This is particularly important in the context of efforts to make up for lost schooling due to the Covid-19 crisis. Summer schools are not a panacea for stalled academic progress and are unlikely to achieve their aims in terms of attainment. They are perhaps better focussed on socio-emotional outcomes rather than catch up; Mulcahy et al (2020) provide recommendations around the effective use of summer provision.

- Similarly catch up provision because of 'lost learning' for those in early secondary runs the risk of using resources without any long-term impact. Catch up provision therefore needs to be carefully evaluated, and, if possible designed so that the long-term impacts can be tracked. Test based accountability of the effectiveness of catch up is unlikely to make a difference to long term outcomes.

Transition arrangements

- The evidence reviewed in section 2 indicates that the transition may be particularly disruptive for disadvantaged pupils. A Nuffield funded project, Rice et al (2015) includes a number of strategies for a successful transition. Possible interventions to ease academic transition include bridging units – projects/topics that are started at the end of primary school and resumed in secondary, and exercises on KS3 academic language at the end of primary school. School trusts and local authorities might also further enable cross phase visits/observations such that KS2 and KS3 staff from feeder primaries and local secondaries can exchange ideas with each other. EEF (2019) provides an example of this sort of working.

- The analysis in section 3 identifies evidence that suggests within school sorting by socio-economic status may occur in early secondary. At the same time section 2 identifies peers as being a potentially important influence at this stage of education. Therefore schools should try to encourage social integration and stability by creating small groups of pupils that are mixed in terms of attainment & socio-economics backgrounds within year 7 tutor groups to support each other (e.g. as recommended in Evangelou et al. 2008).

Support for parents

- Parental engagement is identified as a key factor in mitigating the effect of disadvantage in the early secondary stage in section 2, yet section 3 identifies that gaps in parental support widen in KS3. Strategies to help parents support their child during this time would be beneficial. Parents, especially those with high attaining children, report that they often lack the knowledge to know how to support their child (Koshy et al. 2013).

- An intervention that has been found to encourage effective parental engagement in the early years and in post-16 education is text-message based prompts to inform parents on how to engage with their child's learning (Cortes et al. 2018). There is currently a trial going on the in the US testing whether such an intervention might be effective for the early secondary stage (Cortes, 2019) which could be implemented here.

- Schools may provide ways for teachers of Year 7s to have the kind of informal interactions with parents that are common in primary, and use these purposefully to suggest ways parents can help with school work, for example setting boundaries and timings around homework

Identifying pupils at risk of underachievement and improving attendance

- The evidence presented in section 4 clearly shows that absence in KS3 is a clear indicator of future underachievement at KS4 and should be used as a red flag and justification for targeted interventions. These interventions might include mentoring and text message prompting. Shaw and Bernandes (2018) provide guide to best practice on mentoring vulnerable pupils. Text message interventions have been found to be effective in reducing absence, both from text messages that focus on academic progress and those that specifically target attendance (BIT, 2017; Miller et al. 2018). Tierney (2018) provides an example of how this has worked in practice.

8.3 Policy recommendations

Arrangements at transition

- Further research should be conducted into a promising psychological intervention from the USA, which helps pupils understand and prepare for the emotional challenges of transition (Borman et al. 2019) . An evaluation of this intervention found positive effects on *wellbeing, attendance, behaviour and attainment* when participants took part in a programme delivered by teachers who had been trained in the intervention.

- Understanding the different phases of schooling should be integrated into CPD courses and National Professional Qualifications at all level of school leadership.

Supporting high attaining pupils

- The results from this project indicate that high attaining disadvantaged pupils fall behind in KS3, but that early identification may mitigate against this. A potential low cost intervention could be packs sent out to parents of high attaining pupil premium pupils in year 7 on the basis of KS2 test scores. These could include: i) A letter from the DfE (similar to the SoS letters sent to schools), ii) materials on how to maintain high attainment (e.g. signposting to online subject resources) and information on pathways to higher education, iii) details of how their secondary school can support them. A similar intervention was trialled in Louisiana with promising (albeit limited) results (EdNavigator, 2019).

School attendance

- OFSTED should summarise best practice in improving attendance from inspected schools; research should be directed to understanding and mitigating against the 'attendance gap'.

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10 Appendices

10.1 Acronyms

KS1 Key stage one (ages 5-7)

KS2 Key stage two (ages 7-11)

KS3 Key stage three (ages 11-14)

KS4 Key stage four (ages 14-16); At the end of this stage pupils take terminal examinations, usually the General Certificate in Secondary Education (GCSE).

FSM Free School Meals

MCS Millennium Cohort Study

NPD National Pupil Database

OFSTED Office for Standards in Education, the school inspectorate in England

DfE Department for Education

10.2 MCS outcome variables used in the analysis

Outcome Variable	Description	Corresponding MCS5 variable[31]
Word Activity	Standardised score on a 20 item word ability test - see Sullivan et al (2017) for details.	None, but models control for Age 7 Word Reading Score and age 11 verbal ability,
Academic perceptions	As calculated by (Jerrim and Sims 2019) as the standardised sum of the questions in the MCS that ask pupil on 4 point scale whether they agree/disagree that they are good at maths, English and science.	Academic Perceptions in Maths, English and Science
University	How likely are you to go to university (0-100%)	How likely or unlikely do you think your child will attend university - 4 point scale, likely/not likely (to parent)?
Stay on	How likely is it you will remain in education after year 11? (0-100%)	Do you want to stay on at school or college full time when you are 16? (Y/N)
Prof./Man. Aspiration	What would you like to be when you grow up? (Coded =1 for any professional/managerial occupation mentioned; 0 otherwise)	When you grow up, what would you like to be? (Coded =1 for any professional/managerial occupation mentioned)
Interest	How often do you find school interesting? (Coded=1 for 'all' or 'most' of time; 0 otherwise)	How often do you find school interesting? 4 point scale

[31] Note – those variables on a 4 point scale are included in the modelling as dummies for each category, excluding a base category

Trybest	How often do you try your best at school? (Coded=1 for 'all' or 'most' of time; 0 otherwise)	How often do you try your best at school? 4 point scale
Waste	How often do you school is a waste of time? (Coded=1 for 'all' or 'most' of time; 0 otherwise)	How often do you school is a waste of time? 4 point scale
misbehave	How often so you misbehave in lessons? (Coded=1 for 'all' or 'most' of time; 0 otherwise)	How often do you misbehave or cause trouble in class? 4 point scale
Other misbehave	How often do other pupils misbehave in lessons? (Coded=1 for 'all' or 'most' of time; 0 otherwise)	How often do other children misbehave or cause trouble in class? 4 point scale
Friends work hard	How many of your close friends work hard at school? (Coded 1 for 'all' or 'most' of them; 0 otherwise)	No corresponding variable in MCS5, so the peer behaviour variable is used.
Read never	How often do you read for enjoyment (not for school)? (Coded =1 for 'never or almost never'; 0 otherwise)	How often do you read for enjoyment (not for school)? 5 point scale
Homework help	How often does anyone help with your homework? (Coded=1 for 'Always' or 'Usually; 0 otherwise ')	How often does anyone help with your homework? 4 point scale
Hours of homework	In a typical week in term time, how long do you spend doing homework? (Coded=1 less than three hours; 0 otherwise)	In a typical week in term time, how long do you spend doing homework?

10.3 MCS- household income gradient – school attitudes

Outcome			
Interest	*Quintile 1*	-0.10	(0.03)**
	Quintile 2	-0.11	(0.03)**
	Quintile 3	-0.07	(0.02)**
	Quintile 4	-0.03	(0.02)
Trybest	*Quintile 1*	-0.06	(0.03)*
	Quintile 2	-0.04	(0.02)*
	Quintile 3	-0.03	(0.02)
	Quintile 4	-0.01	(0.01)
Waste	*Quintile 1*	0.06	(0.03)*
	Quintile 2	0.05	(0.03)*
	Quintile 3	0.05	(0.02)*
	Quintile 4	-0.02	(0.02)
Misbehave	*Quintile 1*	0.06	(0.02)**
	Quintile 2	0.05	(0.02)**
	Quintile 3	0.02	(0.01)
	Quintile 4	0.004	(0.01)

Note: All outcomes are binary variables, as per table 3.2

10.4 Absence – Descriptive statistics

Variable	N	Mean	SD
Absence Rate - Years 7-9	1,331,557	0.044	0.046
Absence Rate - Year 6	1,331,557	0.037	0.040
Absence Rate - Year 5	1,331,557	0.042	0.043
KS2 Maths - below expected level	1,331,557	0.125	0.331
KS2 English - below expected level	1,331,557	0.111	0.314
Female	1,331,557	0.491	0.500
EAL	1,331,557	0.137	0.344
SEN	1,331,557	0.147	0.354
Ever FSM	1,331,557	0.267	0.443
IDACI	1,331,557	0.202	0.151
School FSM %	1,331,557	0.286	0.161
School Female %	1,331,557	0.493	0.171
School Absence	1,331,557	0.038	0.008
School Size	1,331,557	201.678	64.122
School has sixth form	1,331,557	0.686	0.464
Ethnic group			
Asian	1,331,557	0.098	0.297
Black	1,331,557	0.048	0.215
Chinese	1,331,557	0.003	0.057
Mixed	1,331,557	0.045	0.207
Unclassified	1,331,557	0.011	0.103
White	1,331,557	0.782	0.413
Other Ethnic Group	1,331,557	0.013	0.112
ONS Area Classification			
Affluent England	1,284,804	0.134	0.340
Business, Education and Heritage Cent..	1,284,804	0.115	0.319
Countryside Living	1,284,804	0.117	0.321
Ethnically Diverse Metropolitan Living	1,284,804	0.116	0.321
London Cosmopolitan	1,284,804	0.036	0.185
Services and Industrial Legacy	1,284,804	0.120	0.324
Town and Country Living	1,284,804	0.161	0.367
Urban Settlements	1,284,804	0.203	0.402

10.5 Descriptive statistics – Schools participating in the catch up testing

Policy implementation

Sample = Schools participating in the English test (2001)						
Variable	N	Mean	SD	N	Mean	SD
KS4 Capped Points Score (std.)	237086	-0.161	0.853	215898	-0.180	0.852
Achieving level 2 threshold	237086	0.300	0.458	215898	0.285	0.451
IDACI (std)	233476	0.104	1.023	213483	0.133	1.034
KS2 Maths Mark (std.)	234655	-0.189	0.873	213301	-0.279	0.864
KS2 English Mark (std.)	236989	-0.395	0.702	215645	-0.287	0.672
FSM	234551	0.149	0.356	214352	0.156	0.363
Female	237341	0.477	0.499	215891	0.465	0.499
EAL	234551	0.082	0.274	214352	0.086	0.281
SEN	234551	0.141	0.348	214352	0.165	0.371

Sample = Schools participating in the Maths test (2001)						
Variable	N	Mean	SD	N	Mean	SD
KS4 Capped Points Score (std.)	239983	-0.184	0.874	235433	-0.148	0.874
Achieving level 2 threshold	239983	0.288	0.453	235433	0.305	0.460
IDACI (std)	236353	0.105	1.024	232796	0.109	1.029
KS2 Maths Mark (std.)	239914	-0.303	0.733	235167	-0.338	0.720
KS2 English Mark (std.)	235259	-0.348	0.858	230391	-0.140	0.852
FSM	237423	0.151	0.358	233738	0.152	0.359
Female	240237	0.508	0.500	235428	0.510	0.500
EAL	237423	0.078	0.268	233738	0.081	0.274
SEN	237423	0.154	0.361	233738	0.165	0.371

Sample = Schools participating in the English test (2007)

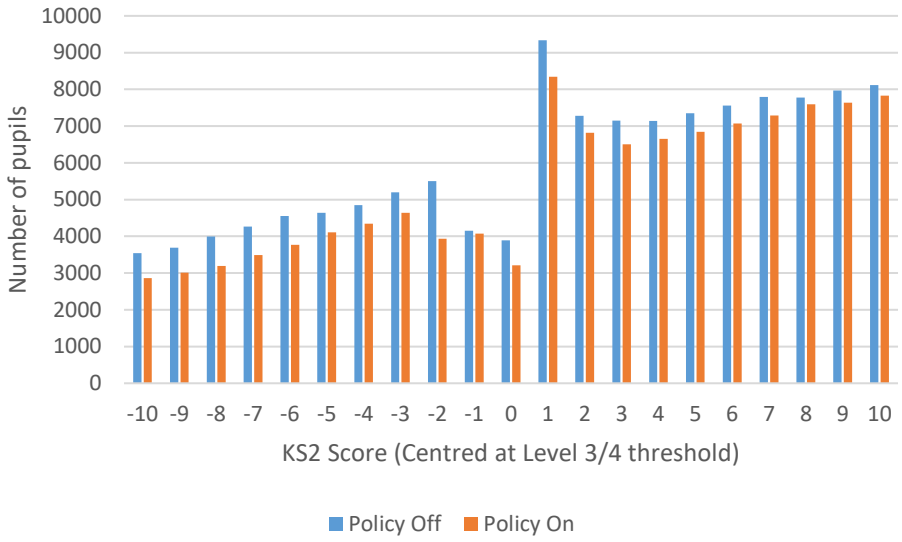
Variable	N	Mean	SD	N	Mean	SD
KS4 Capped Points Score (std.)	98,942	-0.140	0.795	92,688	-0.146	0.804
Achieving level 2 threshold	98,942	0.458	0.498	92,688	0.444	0.497
IDACI (std)	95,976	0.185	1.032	89,781	0.204	1.036
KS2 Maths Mark (std.)	97,825	-0.376	0.903	92,615	-0.515	0.708
KS2 English Mark (std.)	98,780	-0.524	0.694	90,857	-0.398	0.871
FSM	96,380	0.207	0.405	90,131	0.210	0.407
Female	98,942	0.544	0.498	92,688	0.489	0.500
EAL	96,380	0.123	0.328	90,131	0.122	0.327
SEN	96,380	0.270	0.444	90,131	0.265	0.441

Sample = Schools participating in the maths test (2007)

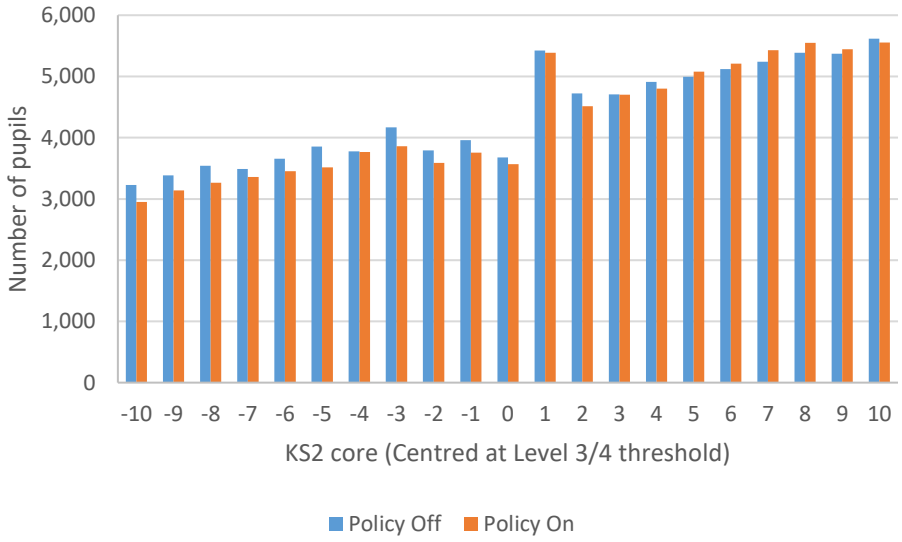
Variable	N	Mean	SD	N	Mean	SD
KS4 Capped Points Score (std.)	95,119	-0.105	0.779	90,826	-0.094	0.783
Achieving level 2 threshold	95,119	0.461	0.498	90,826	0.469	0.499
IDACI (std)	92,491	0.264	1.059	88,130	0.264	1.060
KS2 Maths Mark (std.)	94,208	-0.354	0.906	90,826	-0.457	0.720
KS2 English Mark (std.)	95,119	-0.524	0.693	89,134	-0.355	0.870
FSM	92,816	0.203	0.402	88,435	0.202	0.402
Female	95,119	0.545	0.498	90,826	0.493	0.500
EAL	92,816	0.129	0.335	88,435	0.129	0.335
SEN	92,815	0.293	0.455	88,434	0.279	0.449

10.6 Catch up testing – distribution of pupil numbers around threshold

2000 and 2001 (policy off/on) English KS2 marks distribution



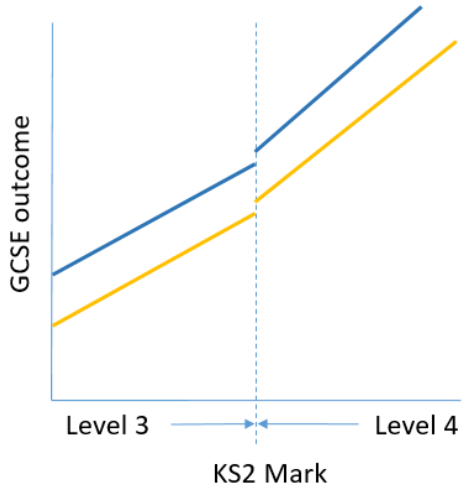
2000 and 2001 (policy off/on) Maths KS2 marks distribution



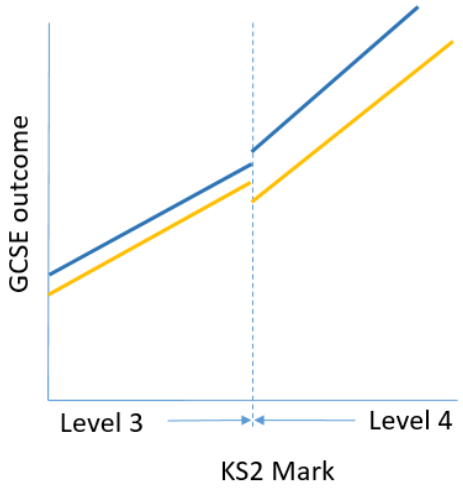
10.7 Difference in discontinuities – graphical explanation of method

The diagrams below show a hypothetical relationship between KS2 test scores and GCSE outcomes. The blue line represents the relationship when the policy is off, orange when it is on. In i) although there is a discontinuous relationship around the level 4 threshold, this discontinuity is similar in both years and would reflect no effect of the policy. In ii) the comparison of discontinuities reveals change in the discontinuity in the policy on year; GCSE outcomes are higher than they would have been had the relationship mirrored the policy off year. Therefore ii) represents the relationships when there is a positive effect of the policy (it was targeted at level 3 pupils).

i) No effect

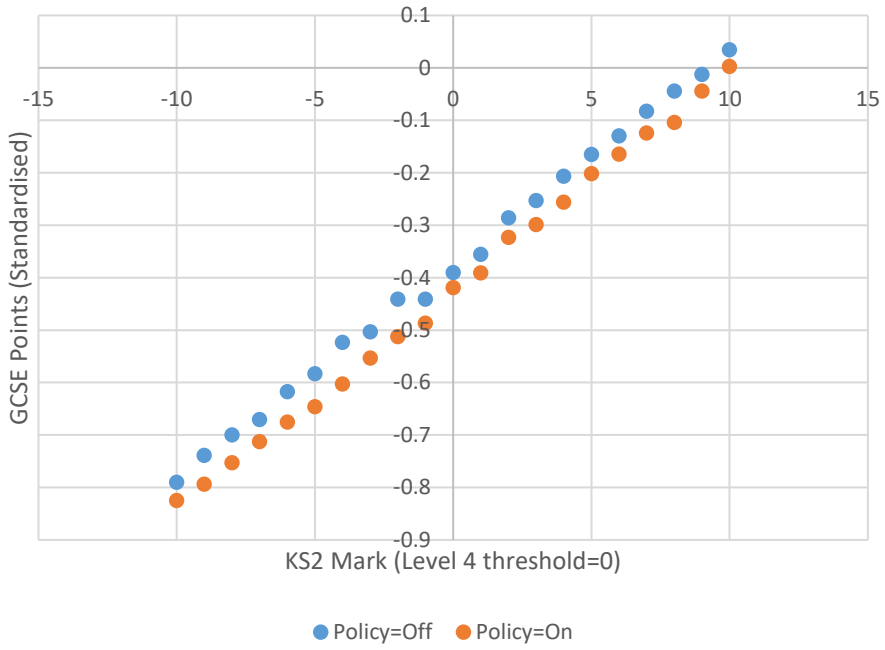


ii) Positive effect of policy

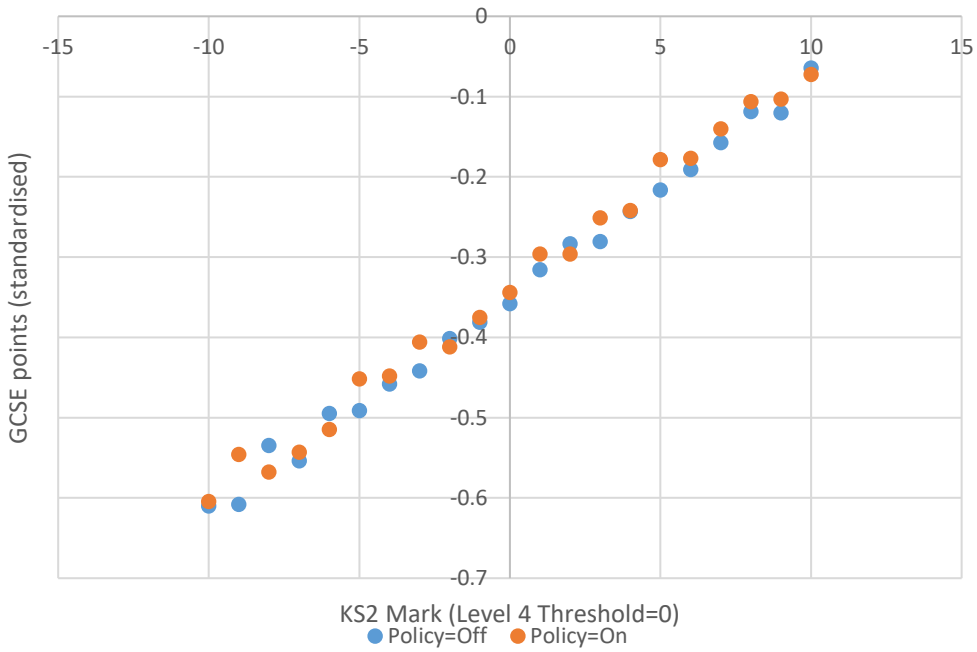


10.8 Catch up testing - graphical results

i) Policy Introduction: Average GCSE standardised points score by KS2 English Mark (all values to the left of zero inclusive are level 3; to the right level 4)



ii) Policy Introduction: Average GCSE standardised points score by KS2 Maths Mark (all values to the left of zero inclusive are level 3; to the right level 4)



10.9 Descriptive statistics – G&T analysis

Full sample

	Not G&T			G&T		
Variable	N	Mean	SD	N	Mean	SD
FSM	1,379,886	0.152	0.359	132826	0.094	0.292
EAL	1,379,886	0.104	0.305	132826	0.093	0.291
SEN	1,379,884	0.202	0.401	132826	0.057	0.232
Winter Born	1,379,886	0.33	0.47	132826	0.386	0.487
Spring Born	1,379,886	0.325	0.469	132826	0.322	0.467
Summer Born	1,379,886	0.345	0.475	132826	0.292	0.455
Male	1,379,886	0.503	0.5	132826	0.486	0.5
KS2 English (Std.)	1,379,886	-0.05	0.968	132826	0.857	0.729
KS2 Science (Std.)	1,379,886	-0.013	0.95	132826	0.804	0.612
KS2 Mathematics (Std.)	1,379,886	-0.047	0.97	132826	0.89	0.639
Outcomes						
5A*-A	1,379,886	0.13	0.336	132826	0.433	0.496
Capped Points (Std.)	1,379,068	0.077	0.836	132813	0.68	0.608

FSM only sample

	Not G&T			G&T		
	N	Mean	SD	N	Mean	SD
EAL	209,404	0.211	0.408	12456	0.253	0.435
SEN	209,403	0.324	0.468	12456	0.112	0.316
Winter Born	209,404	0.334	0.472	12456	0.402	0.49
Spring Born	209,404	0.328	0.469	12456	0.315	0.465
Summer Born	209,404	0.339	0.473	12456	0.283	0.451
Male	209,404	0.489	0.5	12456	0.484	0.5
KS2 English (Std.)	209,404	-0.515	0.962	12456	0.539	0.816
KS2 English (Std.)	209,404	-0.452	1.019	12456	0.54	0.746
KS2 English (Std.)	209,404	-0.462	0.975	12456	0.636	0.771
Outcomes						
5A*-A	209,404	0.036	0.186	12456	0.21	0.407
Capped Points (Std.)	209,040	-0.342	1.022	12451	0.354	0.788

10.10 G&T PSM matched sample comparison

	Not G&T (matched control)		G&T		
	Mean	SD	Mean	SD	p-value*
EAL	0.228	0.420	0.235	0.424	0.273
SEN	0.123	0.328	0.119	0.324	0.377
Winter born	0.399	0.490	0.397	0.489	0.692
Spring born	0.322	0.467	0.315	0.464	0.222
Summer born	0.279	0.448	0.289	0.453	0.090
Male	0.481	0.500	0.484	0.500	0.629
KS2 English (Std.)	0.463	0.838	0.464	0.813	0.927
KS2 Science (Std.)	0.478	0.775	0.479	0.758	0.940
KS2 Mathematics (Std.)	0.566	0.807	0.566	0.781	0.970

*p-value of difference between G&T FSM pupils and matched control.

10.11 Summer school descriptives

Treatment schools	Pre (2016)			Post (2017)		
Variable	N	Mean	SD	N	Mean	SD
KS2 Maths L4+	137203	0.825	0.380	131128	0.865	0.342
KS2 Maths L5+	137203	0.326	0.469	131128	0.381	0.486
KS2 English L4+	137203	0.821	0.383	131128	0.863	0.344
KS2 English L5+	137167	0.298	0.458	131079	0.342	0.474
FSM	139490	0.148	0.355	133114	0.147	0.354
FSM6	139490	0.298	0.457	133114	0.292	0.455
Pupil Premium	137236	0.198	0.399	131279	0.312	0.463
Female	139490	0.498	0.500	133114	0.503	0.500
IDACI	139490	0.212	0.144	133114	0.212	0.144
EAL	139490	0.140	0.347	133114	0.146	0.353
SEN - with statement	139490	0.020	0.140	133114	0.020	0.140
SEN - without statement	139490	0.116	0.320	133114	0.112	0.315
Outcomes						
Capped Points (Std.)	139490	0.091	0.913	133114	0.092	0.936
Maths A*-C	137271	0.687	0.464	131256	0.688	0.463
English A*-C	139490	0.686	0.464	133114	0.679	0.467

Control schools	Pre (2016)			Post (2017)		
	N	Mean	SD	N	Mean	SD
KS2 Maths L4+	84759	0.813	0.390	80138	0.852	0.356
KS2 Maths L5+	84759	0.307	0.461	80138	0.354	0.478
KS2 English L4+	84759	0.805	0.396	80138	0.849	0.358
KS2 English L5+	84724	0.276	0.447	80097	0.317	0.465
FSM	86338	0.172	0.377	81480	0.170	0.375
FSM6	86338	0.341	0.474	81480	0.337	0.473
Pupil Premium	84820	0.236	0.425	80258	0.362	0.480
Female	86338	0.493	0.500	81480	0.492	0.500
IDACI	86338	0.237	0.146	81480	0.237	0.146
EAL	86338	0.164	0.370	81480	0.171	0.377
SEN - with statement	86338	0.020	0.140	81480	0.020	0.139
SEN - without statement	86338	0.125	0.331	81480	0.116	0.321
Outcomes						
Capped Points (Std.)	86338	0.055	0.916	81480	0.052	0.932
Maths A*-C	84952	0.666	0.472	80401	0.668	0.471
English A*-C	86338	0.671	0.470	81480	0.659	0.474

10.12 Summer schools – placebo analysis

	I	II	III	IV	V	VI
Coefficient	0.001	0.003	-0.00002	0.003	-0.00002	0.007
SE	(0.004)	(0.006)	(0.008)	(0.006)	(0.008)	(0.013)
N(Pupils)	419817	416838	425486	131637	131585	134992
N(Schools)	1543	1545	1545	1537	1535	1537
Outcome	Maths A*-C	English A*-C	Capped points (Std.)	Maths A*-C	English A*-C	Capped points (Std.)
Sample	All	All	All	Pupil Prem.	Pupil Prem.	Pupil Prem.

Notes: as per table 7.1.