When You Are Born Matters: The Impact of Date of Birth on Child Cognitive Outcomes in England

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Executive Summary

The impact of date of birth on cognitive test scores is well documented across many countries, with the youngest children in each academic year performing more poorly, on average, than the older members of their cohort (see, for example, Bedard and Dhuey (2006) or Puhani and Weber (2005)[1]). However, relatively little is known about the driving forces behind these differences, at least in England; nor does there appear to have been a robust discussion regarding what, if anything, should be done in light of these disparities. We address both of these issues in this report.

Background and research questions

In England, the academic year runs from 1 September to 31 August, so that a child born on 31 August will start school (and sit exams) up to a year earlier than a child born only one day later, on 1 September. Furthermore, as responsibility for determining school admissions policies falls on local, rather than central, authorities, there is considerable geographical variation in terms of length of schooling (and the age at which children start school) amongst the youngest members of each cohort.[2]

In this report, we use this framework to address four specific research questions:

1. ***What is the extent of the August birth penalty across different outcomes, and how does this vary by age (from age 5 to age 18)?*** We begin by simply comparing the cognitive outcomes (and special educational needs status) of August- and September-born children in the same school and school year.
2. We then move on to consider the impact of different school admissions policies on the outcomes of August-born (as well as January-, March- and May-born[3]) children. We do this by comparing children who start school in the September of the academic year in which they turn 5 with others of the same age who, as a result of the admissions policy in place in their local education authority (LEA), start school one or two terms later. ***What is the best admissions policy for summer-born children in terms of cognitive outcomes?***

[1] A summary of these papers, and others, can be found in Chapter 2 of this report.

[2] This variation is supported by almost universal compliance with the rules that are in place (despite the fact that children in England do not, by law, need to have started school until the term after they turn 5).

[3] These are children born on the 'wrong' side of other cut-offs introduced by the presence of certain admissions policies. For example, under a policy in which all children start school at the beginning of the term in which they turn 5, a child born on 1 January would start school one term later than a child born only one day earlier, on 31 December.

3. Observed differences between the outcomes of August- and September- born children could be due to a number of factors:
   - **Age of sitting the test (absolute age) effect:** If all children in a particular cohort sit exams on the same day, then those born later in the academic year will always be younger than their peers when taking the tests.
   - **Age of starting school effect:** Perhaps it is not the age at which children sit the test that is important, but the age at which they start school, i.e. it is their 'readiness for school' that matters.
   - **Length of schooling effect:** If younger children have experienced fewer terms of schooling prior to the exams than older members of their cohort, then this might explain their poorer academic performance.
   - **Age position (relative age) effect:** Under this hypothesis, younger children tend to perform more poorly not because they are the youngest in absolute terms but because they are the youngest relative to others in their year group.

   Which of these factors – absolute age, age of starting school, length of schooling, age position – drive differences in cognitive outcomes between August- and September-born children?
4. ***Does the August birth penalty vary across particular subgroups of interest?*** For example, does it differ between children who are eligible for free school meals[4] and those who are not?

We use the answers to these questions to determine whether there is a need for policy intervention and, if so, which options are most appropriate.

Data and methods

We use administrative data on all children in state schools in England to answer these questions. These data comprise test results from the Foundation Stage (sat at age 5), Key Stage 1 (age 7), Key Stage 2 (age 11), Key Stage 3 (age 14), Key Stage 4 (age 16) and Key Stage 5 (age 18), plus some basic background characteristics collected via an annual schools' census. As yet, it is not possible to follow the same individuals from the Foundation Stage all the way through to Key Stage 5, so instead we consider three separate groups, covering the full spectrum of results. These groups are as follows:

[4] This can be thought of as a proxy for low family income.

- **Group 1:** For a one-in-ten sample of children (born in 1997–98 or 1998–99), we can analyse outcomes at the Foundation Stage (age 5) and Key Stage 1 (age 7).
- **Group 2:** For two cohorts of children (born in 1990–91 or 1991–92), we can analyse outcomes at Key Stage 1 (age 7), Key Stage 2 (age 11) and Key Stage 3 (age 14).
- **Group 3:** For three cohorts of children (born in 1985–86, 1986–87 or 1987–88), we can analyse outcomes at Key Stage 2 (age 11), Key Stage 3 (age 14), Key Stage 4 (age 16) and Key Stage 5 (age 18).

The outcomes we consider are standardised average point score[5] (for all but Key Stage 5), whether the child has reached the expected level at a particular Key Stage (for all but the Foundation Stage), whether they have achieved above the expected level at a particular Key Stage (for Key Stage 1, Key Stage 2 and Key Stage 3 only) and special educational needs status.[6] For all three groups, we restrict our sample to individuals for whom all outcomes are observed in the expected year.

Figures 1 and 2 motivate our work, by showing how the raw standardised average point score varies by date of birth and cohort, for Groups 2 and 3 respectively.[7] From the graphs, it is clear that the outcomes for August-born children are always lower than those for September-born children. This gap steadily decreases between age 7 (Key Stage 1) and age 16 (Key Stage 4), but remains evident even at the end of compulsory schooling, so that it may potentially be affecting decisions over whether to stay on at school beyond age 16.

These are just the raw differences, however, whilst most of our methodological approaches involve making comparisons between August- and September-born children[8] within schools, controlling for all observed characteristics that might affect cognitive outcomes.[9] As long as we capture observed differences between August- and September-born children within a particular school – and assuming that the remaining unobserved characteristics of students at

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[5] This is normalised to have mean 0 and standard deviation 1, thus allowing comparison across groups.

[6] This is observed at age 5 for Group 1, age 11 for Group 2 and age 16 for Group 3.

[7] We do not use Key Stage 5 standardised average point score, because we only observe this information for individuals who remain in state schools for post-compulsory provision (a highly selected sample).

[8] Or between February- and March-born children, December- and January-born children or April- and May-born children.

[9] Details of these variables can be found in Section 3.1.4. They include ethnicity, free school meals status (a proxy for low family income), whether English is the child's first language and a variety of local neighbourhood characteristics.

the school, plus the effectiveness of the school, do not vary by age – we will difference out the impact of this (assumed) unobserved fixed effect and obtain an estimate of the causal impact of being born in August (rather than September) on cognitive outcomes.
Furthermore, in considering our third research question, we have to assume in addition that our observed individual characteristics are sufficiently rich to allow us to compare children across schools and local education authorities (in which different admissions policies are employed). This assumption appears to be warranted, as the estimates obtained from this model are very similar to those obtained from the models that compare individuals within schools, which suggests that our results are likely to be robust to model choice.

Key findings

The key findings across our four research questions are summarised below.

1. ***What is the extent of the August birth penalty across different outcomes, and how does this vary by age (from age 5 to age 18)?***

This question is discussed at length in Chapter 5 of this report; the main results indicate that there is evidence of a significant August birth penalty in all outcomes and at every age for children in English state schools.

In terms of standardised average point scores and the proportion of children achieving the expected level, this penalty is largest when a child first enters school; it declines over time, but is still significant at ages 16 and 18, when students are making decisions about employment and/or future study. For example, at the Foundation Stage (age 5), August-born girls (boys) score, on average, 0.768 (0.817) standard deviations lower than September-born girls (boys); this penalty has fallen to 0.609 (0.602)[10] standard deviations by Key Stage 1, to 0.351 (0.337)[11] standard deviations at Key Stage 2, to 0.204 (0.212)[12] standard deviations at Key Stage 3 and to 0.116 (0.131) standard deviations at Key Stage 4.

Furthermore, August-born girls (boys) are, on average, 26.4 (24.9) percentage points[13] less likely to reach the expected level than September-born girls (boys) at Key Stage 1, 14.4

[10] These have been calculated by averaging the August birth penalties found at Key Stage 1 for Groups 1 and 2.

[11] These have been calculated by averaging the August birth penalties found at Key Stage 2 for Groups 2 and 3.

[12] These have been calculated by averaging the August birth penalties found at Key Stage 3 for Groups 2 and 3.

[13] These have been calculated by averaging the August birth penalties found at Key Stage 1 for Groups 1 and 2.

(13.9) percentage points[14] less likely to reach the expected level at Key Stage 2, 8.3 (9.1) percentage points[15] less likely to reach the expected level at Key Stage 3, 5.5 (6.1) percentage points less likely to reach the expected level at Key Stage 4 (as measured at age 16) and 2.0 (1.7) percentage points less likely to reach the expected level at Key Stage 5 (via an academic route). The expected level at Key Stage 4 is equivalent to being awarded five GCSEs at grades A*–C. Given that many further education institutions require students to have achieved at least this standard in order to admit them, this potentially means that August-born girls (boys) could be, on average, 5.5 (6.1) percentage points less likely (than September-born girls (boys)) to remain in education beyond age 16, simply because of the month in which they were born.

Interestingly, once attainment of Level 2 (Key Stage 4) and Level 3 (Key Stage 5) vocational qualifications (by age 18) is taken into account, the August birth penalty decreases – to 0.5 (1.4) percentage points for girls (boys) at Level 2 and to 0.9 (1.6) percentage points at Level 3. However, given that non-academic Level 2 qualifications have been found to be poorly rewarded in the labour market (see, for example, Dearden, McGranahan and Sianesi (2004)), these disparities remain concerning.

There is not such a clear pattern over time in terms of differences between the proportion of August- and September-born children who are recorded as having statemented (i.e. more severe) or non-statemented (i.e. less severe) special educational needs. At age 5 (when children are in their first year of school), very few have been diagnosed with special educational needs, so differences according to month of birth are small and generally insignificant. The largest August birth penalties for this outcome are evident at age 11, after which they appear to fall back somewhat by age 16. At age 11, August-born girls are 0.4 percentage points (25 per cent) more likely to have statemented special educational needs and 8.1 percentage points (72 per cent) more likely to have non-statemented special educational needs; the corresponding figures for boys are 0.6 percentage points (14 per cent) and 9.4 percentage points (46 per cent).

[14] These have been calculated by averaging the August birth penalties found at Key Stage 2 for Groups 2 and 3.

[15] These have been calculated by averaging the August birth penalties found at Key Stage 3 for Groups 2 and 3.

2. What is the best admissions policy for summer-born children in terms of cognitive outcomes?

Our findings on this question (discussed in Chapter 6 of this report) suggest that admissions policies do matter, at least for early cognitive outcomes. In general, August-born children are slightly better off (and certainly no worse off) if they start school in the September of the academic year in which they turn 5 (rather than in the January or the April, as happens in some local education authorities). Furthermore, this is likely to be of greater benefit to girls than to boys.

For example, in terms of the proportions achieving the expected level, August-born girls (boys) who receive two terms less schooling (or, equivalently, start school when they are seven months older) than other August-born children face an additional penalty of 3.8 (2.4) percentage points at Key Stage 1, 2.5 (0.2) percentage points at Key Stage 2 and 2.4 (0.3) percentage points at Key Stage 3. These differences are all significant for girls but only significant at Key Stage 1 for boys, and there are no significant differences[16] by admissions policy area at either Key Stage 4 or Key Stage 5.[17]

These findings suggest that the August birth penalty is not being driven by differences in admissions policies, which leads us nicely on to our third research question.

3. Which of these factors – absolute age, age of starting school, length of schooling, age position – drive differences in cognitive outcomes between August- and September-born children?

The results of our work on this question (discussed in Chapter 7 of this report) suggest that the major reason why August-born children perform significantly worse than September-born children in the Key Stage tests is simply that they are almost a year younger when they sit them. Whilst, as we saw above, August-born children do benefit from starting school earlier rather than later (for example, in the September, rather than the January or the April, of their reception year), this makes only a modest positive contribution to test scores and only at early

[16] At conventional levels (5 per cent or below), and in terms of the proportion of individuals reaching the expected level at each Key Stage.

[17] The additional penalties for August-born children who receive one term less schooling (or, equivalently, start school when they are four months older) than other August-born children are generally smaller than the effects for August-born children who receive two terms less schooling; further, they do not persist beyond Key Stage 2 for either girls or boys.

Key Stages. Age position effects are generally not important.[18] Clearly, other policy options are needed in order to eliminate the August birth penalty.

4. Does the August birth penalty vary across particular subgroups of interest?

This issue is discussed in Chapter 8 of this report. We considered comparisons across a number of subgroups: students who are eligible for free school meals (a proxy for low family income) vs. students who are not;[19] students who live in one of the 20 per cent most deprived Super Output Areas (SOAs)[20] vs. students who do not; students of Black Caribbean ethnic origin vs. students of White British ethnic origin; students of Black ethnic origin vs. students of White British ethnic origin; and students of Pakistani or Bangladeshi ethnic origin vs. students of White British ethnic origin.

Whilst there are some significant differences in terms of the magnitude of the August birth penalty for children who are and are not eligible for free school meals (discussed in Chapter 8), perhaps the most important finding is the lack of significant differences amongst the majority of subgroups considered. This suggests that, in most cases, August-born children, regardless of observable characteristics, face the same disadvantage (in terms of cognitive outcomes) relative to September-born children. This suggests that policy options (discussed below) do not need to be tailored to the needs of particular subgroups: in theory, all August-born children should benefit from the suggestions that we make.

Policy options and conclusions

It is clear from the results presented in this report that cognitive outcomes are affected by date of birth: a child born in September will, on average, perform significantly better in academic tests than a child born in August, simply because they start school (and sit the tests) up to a year later.

Our work suggests that these differences arise predominantly because August-born children are almost a year younger than September-born children when they sit the tests. Further, these disparities remain significant at ages 16 and 18, so that date of birth may be influencing

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[18] The age position effect also has a small (and sometimes significant) additional negative impact on the test scores of August-born children (usually in earlier Key Stages), but its magnitude is dwarfed by that of the absolute age (age of sitting the test) effect.

[19] We present the results of this comparison in Chapter 8. Results for other subgroups are available from the authors on request.

[20] A Super Output Area comprises approximately 1,500 households.

decisions over whether to stay in education or to leave school and enter the labour market. This cannot be optimal from either an efficiency or equity perspective, and it seems clear to us that some form of policy change is necessary to ensure that this inequity does not continue. In Chapter 9, we suggest a number of policy options that might help overcome this date-of-birth penalty. In our opinion, the most viable of these are the following:

1. Age normalisation of test results

Perhaps the easiest and most effective solution would be to explicitly recognise that attainment differs by month of birth and accordingly age normalise Key Stage test results (including results used to generate school league tables and those used to sort children into classes on the basis of ability[21]). The aim, using this approach, would be to ensure that the proportion of students reaching a particular grade at a particular Key Stage does not vary by month of birth. The argument in favour of this option is that somebody always has to be the youngest, and no policy is going to get around this fact; what one needs to ensure instead is that being the youngest does not unnecessarily penalise students who get the ‘unlucky’ summer birth draw.

Of course, age normalisation cannot continue for ever. At the point at which students leave the education system – for example, to enter the labour market – it is important that test results measure *actual* levels of human capital rather than some age-normalised version. For this reason, we argue that age normalisation should only be implemented up to age 14. However, given that there is still evidence of an August birth penalty at age 16 – and that many providers of further education require some minimum level of attainment in order for students to progress – it seems sensible to determine whether a child stays on in education beyond age 16 (and what type of provision they opt for) on the basis of age-normalised scores, to ensure that summer-born children are not penalised.

Details of possible implementation methods, together with the effects of age normalisation on the magnitude of the August birth penalty and school league table rankings, can be found in Section 9.1.1 of this report.

[21] The idea here would be that children were streamed according to potential (rather than actual) attainment.

2. Testing when ready

The government has already announced that it is piloting a scheme (the 'Making Good Progress' programme) to introduce greater flexibility into the current testing system. This pilot allows children to sit Key Stage 2 and Key Stage 3 tests in English and maths at twice-yearly sittings, whenever they are ready to take them.[22]

It seems to us that the most sensible way of adapting this scheme to better suit the needs of summer-born children would be to use the age at which they sat (and passed) the Key Stage tests as the outcome. This could also be used in school league tables, by averaging the age at which all children in a particular cohort passed each Key Stage test. Furthermore, if expected levels were also set on this basis, then August-born children (and their parents and teachers) would be given a much clearer picture of their relative position in the ability distribution, conditional on age.

This option alone would not act to reduce the August birth penalty present in Key Stage 4 and Key Stage 5 results – unless behavioural factors (for example, in terms of increased motivation and/or self-belief) improved the performance of currently low-scoring students, including summer-born children, enough to reduce or eliminate this gap. Of course, this policy could be implemented alongside the option of age normalisation of Key Stage 4 outcomes (at least when assessing progression to Key Stage 5, as discussed above).

3. Changes to free nursery provision and flexibility over school starting ages

Every child in England is currently entitled to 12½ hours of free nursery education per week,[23] from the beginning of the term after they turn 3 until the beginning of the term in which they start school. This means that, depending on the admissions policy in place in their area, summer-born children may receive up to two terms less nursery education than their autumn-born counterparts. Given that August-born children are already disadvantaged as a result of being the youngest in their year, it might be sensible to grant them access to free nursery provision from the beginning of the academic *year* in which they turn 3 rather than the beginning of the *term* after they turn 3. Assuming that August-born children are able to benefit from this extra nursery provision (despite being extremely young when they access

[22] See Section 9.1.2 for more details of this pilot programme.

[23] This is due to increase to 15 hours per week in April 2010.

it),[24] this policy may help to reduce the August birth penalty for children across admissions policy areas.

Alternatively, flexibility over the age at which children can start school might also act to reduce the August birth penalty. If this option were to be implemented, then the government would need to think carefully about exactly who would be allowed to decide at what age a particular child started school. Currently, 3- and 4-year-olds who have not yet started school are only entitled to 12½ hours of free nursery provision per week. Thus there may be some concern that if parents are involved in the decision-making process, it is more likely to be middle-class parents who would take advantage of this flexibility: children from more disadvantaged backgrounds, whose parents may need the extra hours of free childcare that school provides to make work affordable, may not benefit. Given these concerns, it seems clear to us that if flexibility over school starting age were to be seriously considered, then full-time nursery provision would need to be offered as an alternative to full-time schooling.

4. Other options

There are also a number of more minor policy changes that could be implemented alongside any of the above options for reform.

The answer to our third research question suggests that if all local education authorities adopted an admissions policy under which all children started school in the September of the academic year in which they turned 5, then the outcomes (at least at the earliest Key Stages) of the youngest members of each cohort would improve (or at least not worsen).

Perhaps more fundamentally, it does not appear that the issue of age and its relationship with test scores features in the current teacher training programme. This means that newly qualified teachers (and possibly, as a consequence, the parents of young children) may not realise how big an impact relative age has on test scores. Raising awareness of this issue seems to be a vital first step towards any potential tailoring of classroom tuition towards children of different ages.[25]

[24] Our results for August-born children at age 5 suggest that this may be plausible.

[25] This may be particularly true for non-statemented special educational needs: greater awareness of the expected performance of August-born children compared with others in their class may reassure parents that their child does not necessarily have special educational needs simply because they are progressing more slowly than their peers.

What is clear from this report is that there is a significant inequity that needs to be urgently addressed: August-born children are, on average, being penalised (in terms of cognitive outcomes) simply because of an unlucky birth draw. This is not acceptable on either equity or efficiency grounds, and steps should be taken to eliminate this penalty.

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1 Introduction

The impact on cognitive test scores of being the youngest in the academic year is well documented across many countries, with children born at the end of the academic year (which runs from 1 September to 31 August in England) consistently performing more poorly, on average, than older members of their cohort (see, for example, Bedard and Dhuey (2006) or Puhani and Weber (2005)[1]).

Various theories have been put forward as to why such disparities occur:

- **Age of sitting the test (absolute age) effect:** If all children in a particular cohort sit exams on the same day, then those born later in the academic year will always be younger than their peers when taking the tests.
- **Age of starting school effect:** Perhaps it is not the age at which children sit the test that is important, but the age at which they start school, i.e. it is their 'readiness for school' that matters.
- **Length of schooling effect:** If younger children have experienced fewer terms of schooling prior to the exams than older members of their cohort, then this might explain their poorer academic performance.
- **Age position (relative age) effect:** Under this hypothesis, younger children tend to perform more poorly not because they are the youngest in absolute terms but because they are the youngest relative to others in their year group.[2]

Identifying the causal impact of being amongst the youngest in a school year is not necessarily straightforward, however, as many of the countries in which studies have been carried out (for example, the US and Germany) permit parents a degree of flexibility over the age at which children start school. This means that estimates of the disadvantage faced by younger pupils are obtained either by comparing children who have been held back (or

[1] These papers – and others – are discussed in more detail in Chapter 2 of this report.

[2] The implication is that if all children in a particular class sat the exam on their birthday (assuming that they also all received the same amount of schooling beforehand), then the scores of the youngest would still not be as high as those of the oldest.

skipped forwards) a year with those who have not – which raises selection issues – or by instrumenting actual age of starting school with expected age of starting school.[3]

Whilst some flexibility is also available to parents in England, anecdotal evidence suggests that there is almost universal compliance with local admissions policies.[4] Moreover, almost no children are held back if they do not reach key academic targets. This allows us to investigate the causal impact of date of birth on cognitive outcomes without the need to deal with the issues described above.

Of course, we are not the first to have used the English school system for these purposes (see, for example, Thomas (1995) or Bell and Daniels (1990)); but previous studies tend to have had small sample sizes, potentially limiting the relevance of their findings. For this report, we have been able to access long panels of *all* children in the English state school system (containing a rich set of cognitive outcomes from age 5 to age 18). This means that we can compare individuals of different ages in the same school year *within schools*. Moreover, we can follow them over a period of years to see how the disadvantage associated with a summer birthday changes over time and can also consider whether this impact varies for different subgroups of interest.

Another aspect of the English education system that is beneficial for our purposes is that whilst, by law, children must have started school by the beginning of the term following their fifth birthday, no minimum age is specified. It is then the responsibility of local education authorities (LEAs) – of which there are approximately 150 in England – to determine the admissions policy for all community and voluntary-controlled schools in their area.[5] This local freedom gives rise to considerable geographical variation in the age at which children born on a particular day of the year start school, which allows us to identify separately the

[3] This is necessary because of the potential endogeneity that the choice creates. The resulting IV estimates are generally larger than the OLS estimates for such countries (see Bedard and Dhuey (2006) for estimates of the impact of school starting age in 12 OECD countries, including England, where this is not such a problem, and the US). This is because those who start school early are generally at the higher end of the ability distribution, while those who start school late are generally at the lower end of the ability distribution, thus downward-biasing OLS estimates using actual age at school entry.

[4] There may be a more formal way of testing this statement, but we have not done so yet.

[5] A community school is a state school run by the local authority, which employs the teachers, owns the land and buildings, and sets the admissions criteria. A voluntary-controlled school is a state school in which the local authority employs the teachers and sets the admissions criteria, but the school land and buildings are normally owned by a charity – often a religious organisation – which also appoints some members of the governing body.

impacts of absolute age, age of starting school (or length of schooling, not both[6]) and age position for both compulsory and post-compulsory schooling outcomes – something that no other papers have been able to do.

Identifying which of several hypotheses is driving the poorer performance of younger children is important in terms of consequent policy implications and should allow us to answer the question 'Which is the best admissions policy for summer-born children *in terms of cognitive outcomes*?'.[7] The dilemma is comprehensively summarised by Sharp (1995): 'in an annual system, summer-borns start school soon after their fourth birthday, and may not encounter conditions appropriate to their age and stage of development. In a termly or biannual system, summer borns experience less time in school, and may have difficulties "breaking in" to the social group already established when they arrive'.

The report will now progress as follows: in Chapter 2, we discuss findings from the existing literature; in Chapter 3, we provide more information about the data-sets that we use; and in Chapter 4, we outline our modelling approaches. In Chapter 5, we concentrate on August- and September-born children (those either side of the academic-year cut-off in England) and document the August birth penalty for a variety of cognitive outcomes. In Chapter 6, we consider how the August birth penalty varies across different admissions policy areas and we also make other month-of-birth comparisons. In Chapter 7, we exploit geographical variation in school admissions policies to decompose the differences in attainment observed between August- and September-born children into an absolute age effect, an age of starting school (or length of schooling) effect and an age position effect. In Chapter 8, we undertake subgroup analysis to see whether the findings from Chapters 5, 6 and 7 differ according to individual characteristics – for example, eligibility for free school meals (a proxy for low family income) or ethnicity. Finally, Chapter 9 considers various policy options that arise from our findings.

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[6] Note that there is insufficient variation in the admissions policies implemented in England for us to be able to separate the effect of age of starting school and the effect of length of schooling.

[7] There are, of course, many other outcomes that may be affected by the choice of school admissions policy – for example, children's social (non-cognitive) skills or parental labour supply – but the focus of this paper will be purely on academic outcomes.

2 Previous Research

In this chapter, we first provide a small selection of evidence on the academic performance of the youngest members of each cohort (relative to the oldest). We then move on to consider attempts that have been made in the literature to disentangle the impact of the four effects outlined in Chapter 1 (absolute age, age of starting school, length of schooling and age position). We do this first for all members of a particular cohort and then specifically for the youngest members.

Evidence on the disadvantages of being the youngest

Thomas (1995) uses data from the 1992 Key Stage 1 tests (sat at age 7 in England) to determine whether there is any relationship between age and academic achievement. Her results indicate that for every additional month of age (at the time of the test), attainment, across all subjects examined, rose by 0.08 of an outcome level, i.e. the oldest pupils in the year group achieve, on average, one level higher than the youngest.[8]

Puhani and Weber (2005) use three German data-sets to investigate the impact of age at school entry (using expected age at school entry as an instrument[9]) on literacy scores at the end of primary school (age 10) and number of years of secondary schooling. They find that children who start school aged 7 rather than aged 6 have test scores that are 0.42 standard deviations higher at the end of primary school and also have six months' additional secondary schooling.

Bedard and Dhuey (2006) use internationally comparable data from the Trends in International Mathematics and Science Study (TIMSS) for OECD countries to estimate the impact of relative age[10] on test scores at ages 9 and 13. They find that a child being one

[8] At Key Stage 1, outcomes are classified as W (working towards Level 1), Level 1, Level 2C, Level 2B, Level 2A and Level 3. An increase of one outcome level is therefore equivalent to moving from Level 1 to Level 2C, for example, or from Level 2A to Level 3.

[9] See footnote 3 on page 2

[10] Bedard and Dhuey (2006) use the term 'relative age' as a way of distinguishing the effects they find in their paper from season-of-birth effects (which they can do as a result of variation in the month in which the academic year starts across countries); however, their estimate of the impact of 'relative age' on test scores compounds the effects of absolute age, age of starting school and age position.

month older when they sit the tests means that their maths score at the age of 9 increases by between 0.19 and 0.43 points, compared with between 0.128 and 0.353 points at age 13.[11] In England, the figures are 0.33 (equivalent to a 12 percentile test score ranking premium) and 0.175 respectively.

Attempts to disentangle the different effects

Some studies have argued that being the youngest relative to others in your class (the age position effect) is the most important driver of the difference in test scores between summer- and autumn-born children. For example, Bell and Daniels (1990) examine the results of the Assessment of Performance Unit's Science Survey tests, sat in 1983 and 1984 by a sample of children aged 11, 13 and 15 in England, and conclude that the age position effect explains the greatest proportion of the variance in test scores. However, it is not clear how they separate the age position effect from the absolute age effect (the age at which the test is taken), nor is it clear whether there is any variation in the age at which children in their sample started school (and hence whether length of schooling or age of starting school effects may play a role).

Other studies are more focused on identifying the impact of school starting age on academic outcomes. Datar (2006) uses data from the Early Childhood Longitudinal Study in the US to look at the impact of (expected[12]) school starting age on reading and maths test scores when children are in kindergarten, and then again two years later. She finds that the oldest starters score 0.8 standard deviations higher in maths and 0.6 standard deviations higher in reading than the youngest entrants in the kindergarten class. However, these estimates are only able to identify the combined impact of age of starting school, absolute age (age of sitting the test) and age position on test scores.[13] To separate these effects, Datar differences test scores over time in an attempt to eliminate the impact of absolute age, leaving only the effect of entrance age on cognitive outcomes.[14] She finds that the test scores of older entrants increase by 0.12 standard deviations over and above those of the youngest starters over a two-year period,

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[11] The impacts are of roughly similar magnitude for science test scores.

[12] See footnote 3 on page 2

[13] Because all children enter kindergarten at the same time, there is no length of schooling effect.

[14] If the absolute age effect is linear (which seems to be supported by the data), then differencing will eliminate this effect, leaving only the impact of entrance age on test scores.

implying that it is better for children, on average, to start kindergarten when they are older. However, it is not clear in which estimate the age position effect will appear, as Datar does not address this issue in her paper.

Fredriksson and Ockert (2005) use Swedish administrative data for the population born 1935–84 to look at the impact of school starting age on education and labour market outcomes. They find that increasing school starting age by one year increases grade point average at the age of 16 by 0.2 standard deviations. They exploit within-school variation in the age composition across cohorts to separate the impact of relative age (the age position effect) from the impact of absolute age (plus the effect of school entrance age) and find that relative age accounts for only 6 per cent of the difference in test scores at that age. However, they can only separate the effect of age at entry to school from absolute age by looking at outcomes after the end of compulsory schooling (when there is independent variation between the two). They find that starting school later has a small positive impact on earnings (although they point out that the net earnings effect over the life cycle is negative, because starting school later implies entering the labour market later as well).[15]

Fogelman and Gorbach (1978) use data from the National Child Development Study (NCDS) – a survey comprising all children (approximately 20,000) born in England in a particular week in March 1958 – to estimate differences between ‘early’ and ‘late’ school starters in reading, maths and general ability test scores at age 11. Given that all children in this study were born in the same week, the impact of absolute age and (assuming an approximately similar distribution of ages across schools) age position should have been eliminated. The authors find that starting school earlier (and, by definition, receiving more schooling prior to the tests) added the equivalent of approximately 2.5 months[16] to attainment in each area compared with those who started school later. However, it is not clear whether these results would also apply to children born at other times of the year – and in particular to the youngest members of each cohort.

There are very few papers that focus exclusively on the disadvantages faced by summer-born children. Sharp, Hutchison and Whetton (1994) use a random sample of 4,000 English school

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[15] It should be noted that there is never any variation in length of schooling in this paper.

[16] It is not clear exactly how they have calculated this.

children who sat their Key Stage 1 exams, comprising English, maths and science tests, at age 7 in 1991. They find that while autumn- and spring-born children seem to benefit from having more terms of schooling prior to the test (equivalently, starting school at a younger age), this relationship is not evident for summer-born children. However, these differences do not appear to be statistically significant, nor do they control for background characteristics;[17] and it is not clear how absolute age or age position are accounted for in the analysis.

3 Data

The data-sets that we use

Our analysis uses data from the English National Pupil Database (NPD). This is an administrative data-set maintained by the Department for Children, Schools and Families (DCSF), comprising academic outcomes in the form of Key Stage test results for all children aged between 7 and 16, and background characteristics from the Pupil Level Annual School Census (PLASC).

We also have access to test results from two other sources: the first is the Foundation Stage Profile (FSP) – introduced in 2002–03 and sat at the end of the first year of primary school (aged 5) – for a one-in-ten sample of children;[18] the second is a data-set that provides a cumulative record of qualifications usually associated with examinations undertaken at ages 16 and 18. This provides a useful addition to the NPD, as it enables us to identify individuals who reached particular levels of academic achievement but perhaps not at the ages that might have been expected (i.e. it is more likely to provide an accurate picture of the qualifications of low achievers). Both of these data-sets can be linked to the NPD via a unique pupil identifier.

[17] This will be important if the choice of admissions policy by the local education authority is related to the characteristics of the communities that it serves or the results it obtains: for example, if poorly performing LEAs tend to send their summer-born children to school in September, while LEAs with better results (on average) tend to send their summer-born children to school when they are slightly older, then any comparison of the results of summer-born children across areas will tend to overestimate the benefit or underestimate the penalty of starting school later.

[18] To be included in the FSP data held by DCSF, children had to be born on the 5th, 15th or 25th of any month.

Foundation Stage Profile

In the FSP, students are given a score between 0 and 9 (with 9 being the highest) for three measures of personal, social and emotional development; for four measures of communication, language and literacy skills; for three components of mathematical development; for their knowledge and understanding of the world; for their physical development; and for their creative development. The total score for the FSP comprises the sum of these 13 components, with a maximum value of 117.[19] The government has not identified an expected level for the FSP; hence we focus on the total score – and each of the aggregated components of this total score – and normalise them to have mean 0 and standard deviation 1 across the entire sample (see Section 3.2).

Key Stage tests (from the NPD)

The Key Stage tests are national achievement tests sat by all children in state schools in England: Key Stage 1 is taken at age 7, Key Stage 2 at age 11, Key Stage 3 at age 14 and Key Stage 4 (GCSEs) at age 16. For individuals who choose to remain in the education system beyond statutory school-leaving age (16 in England), Key Stage 5 (A levels or equivalent) is sat at age 18. In our data-set, results are available for Key Stage 1 from 1997–98 to 2005–06, for Key Stage 2 from 1994–95 to 2005–06, for Key Stage 3 from 1996–97 to 2005–06, for Key Stage 4 from 2001–02 to 2005–06 and for Key Stage 5 from 2003–04 to 2005–06 (see Appendix A).[20]

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[19] We have looked at how important each of the 13 components (for details of which see www.qca.org.uk/libraryAssets/media/Foundation_stage_profile_handbook_COMPLETE.pdf) of the FSP is in predicting outcomes at age 7 for this group. It is clear that only the first measure of personal, social and emotional development explains outcomes at age 7, whilst all four components of the communications, language and literacy (CLL) score and all three components of the mathematical development score have significant predictive power at age 7. For the CLL components, the second component is the most predictive, followed by the fourth, the third and then the first. For the mathematical development components, the first is the most predictive, followed by the second and then the third. The score on knowledge and understanding of the world is inversely related to outcomes at age 7, as is creative development (controlling for all other scores and background characteristics). It appears that both of these measures are strongly correlated with the CLL and mathematical development scores. Physical development has no power in explaining outcomes at age 7. The predictive power of different components of the FSP may be important in terms of the potential policy implications of our findings (see Chapter 9 for more details).

[20] Key Stage 5 scores will only be observed in the NPD for pupils who have chosen to stay on in education beyond the statutory leaving age and who attend post-compulsory provision in a state school. This is necessarily a selected sample of the population of school-leaving age, which will be of concern for our purposes if, for example, there is selection into post-compulsory state schooling according to birthdate. For this reason, we do not make use of Key Stage 5 scores in our analysis.

At Key Stage 1, the main subjects assessed are reading, writing and maths, while at Key Stage 2 and Key Stage 3, they are English, maths and science. In each case, pupils are allocated an attainment level,[21] which can be translated into a corresponding points score (using a specified formula) ranging from 3 to 21[22] at Key Stage 1 (with 15 being the expected level), from 15 to 33[23] at Key Stage 2 (with 27 being the expected level) and from 21[24] to 51 at Key Stage 3 (with 33 being the expected level).[25] An average point score (APS) can be calculated by averaging across the three subjects at each level. We make use of each of these individual subject scores, plus the overall average point score, and normalise each to have mean 0 and standard deviation 1 across the entire sample (see Section 3.2).

For each subject, it is straightforward to calculate whether a pupil achieved at or above the expected level on the basis of their assigned score. To determine whether a particular pupil achieved at or above the expected level overall – i.e. across all three subjects – we follow the same process using the overall APS. This is a rather exacting standard at Key Stage 1 and Key Stage 2, because it means that in order to achieve above the expected level overall, an individual must have scored above the expected level in all three subjects.[26] This should be borne in mind when interpreting the results.

At Key Stage 4 (GCSEs and equivalent), we use data from two separate sources, one of which is the NPD.[27] At Key Stage 4, we use a capped average point score – available from the raw data – that takes into account the student's eight highest grades. As a result of a change in the

[21] At Key Stage 1, outcomes are classified as W (working towards Level 1), Level 1, Level 2C, Level 2B, Level 2A and Level 3 (for the earlier cohorts, Level 4 was also available). At Key Stage 2, outcomes are classified as Level 2 (or below), Level 3, Level 4 and Level 5 (for the earlier cohorts, Level 6 was also available). At Key Stage 3, outcomes are classified as Level 3 (or below), Level 4, Level 5, Level 6, Level 7 and Level 8. There are also classifications for absence (amongst other things); to avoid losing individuals classified as absent from our analysis, we award them the lowest number of points attainable at each Key Stage.

[22] From 3 to 27 for cohorts in which Level 4 was attainable (see footnote 46). Note that we assign individuals attaining Level 4 a score of 21 in our analysis, to ensure comparability across cohorts.

[23] From 15 to 39 for cohorts in which Level 6 was attainable (see footnote 46). Note that we assign individuals attaining Level 6 a score of 33 in our analysis, to ensure comparability across cohorts.

[24] 21 points is equivalent to Level 3 (or below) in English; however, 15 points are awarded for Level 3 (or below) in maths and science.

[25] Note that for Key Stage 2 and Key Stage 3 results, we also have access to raw test marks, which allow one to calculate a much more detailed average point score than that described above. We used these raw test scores to check whether the restriction of only having access to discrete measures of educational attainment at other Key Stages would bias our results. The results of this comparison for individuals born in 1990–91 or 1991–92 are shown in Appendix B. From this analysis, it is clear that using discrete rather than continuous measures of educational attainment makes virtually no difference to our results.

[26] This is because at Key Stages 1 and 2, one level above the expected level is the highest that can be achieved. At Key Stage 3, an individual can score above the expected level overall by scoring at the expected level in one subject, above the expected level in another subject and below the expected level in a third, for example.

[27] The other is the cumulative data-set described in Section 3.1.3.

Key Stage 4 scoring system during our period of interest,[28] we normalise this capped APS to have mean 0 and standard deviation 1 *within cohort* (rather than across the entire sample) and use this as our primary measure of attainment. We also make use of a variable indicating whether the pupil achieved at least five A*–C grades, which is the expected level at Key Stage 4.

Cumulative Key Stage 4 and Key Stage 5 data-set

Our second source of Key Stage 4 outcomes and our only source of Key Stage 5 outcomes is a cumulative data-set that captures details of a pupil's highest educational qualification. Here, we make use of variables identifying whether individuals ever achieved a Level 2 qualification (equivalent to five A*–C grades at GCSE) via any route (or via an academic route) and whether they ever achieved a Level 3 qualification via any route (or via an academic route).[29] Unfortunately, this data-set does not contain details of test results; thus we cannot construct a broader average point score than that available through the NPD for Key Stage 5. We therefore focus purely on attainment of Level 3 qualifications at age 18, which is the expected level at Key Stage 5.

Pupil Level Annual School Census (PLASC)

This census was first carried out in January 2001 and it covers all pupils attending state schools in England. It records pupil-level information – such as date of birth, home postcode, ethnicity, special educational needs, entitlement to free school meals and whether English is their first language – plus a school identifier.

Of these variables, date of birth is particularly important, because it allows us to determine at what age each pupil started school. Equally important is the school identifier, which allows us

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[28] A change to the Key Stage 4 scoring system occurred between 2002–03 and 2003–04. In 2001–02 and 2002–03, students received from 0 to 8 points for each of their GCSE subjects, where 8 points were awarded for an A*, 7 for an A and 5 for a C (for example). Under the new system, 58 points were awarded for an A*, 52 for an A and 40 for a C (for example). For standard GCSEs, the relationship between the new point score and the old point score was
New points = (Old points × 6) + 10. But under the new scoring system, marks are also allocated for all qualifications approved for use pre-16, such as entry-level qualifications, vocational qualifications, and AS levels taken early. Hence the coverage of the new scoring system is much wider than the coverage before 2003–04, and so it cannot be directly compared with the old scoring system.

[29] Note that differences between the number of pupils who achieved five A*–C grades at GCSE (according to the Key Stage 4 data in the NPD) and those who ever achieved a Level 2 qualification through an academic route (according to the cumulative data-set) will largely reflect differences in the age at which these qualifications were achieved.

to map in LEA-level admissions policy information (see Section 3.1.5) and also to carry out our analysis by comparing pupils born in different months within particular schools (see Chapter 4 for more details). Further, as previous research has suggested that special educational needs (SEN) may be at least partly related to date of birth (see, for example, Gledhill, Ford and Goodman (2002) or Wilson (2000)), we decided to consider statemented (i.e. more severe) and non-statemented (i.e. less severe) SEN as separate outcomes, alongside FSP and Key Stage test results.

As the age at which a child starts school is determined by date of birth – which should be randomly distributed – there is theoretically no need to control for background characteristics in the majority of models considered in this report (except to improve the precision of our estimates).[30] However, if, for example, wealthier parents deliberately decide to have children in the autumn rather than the summer, then date of birth will be correlated with background characteristics. More importantly for our work, if wealthier parents are more likely to place their child in private schooling if they are August-born (rather than September-born), for example, then we will need to control for background characteristics in all our models, because we cannot observe children in private schooling in our data. We test the importance of background characteristics directly in this report, by considering models both with and without such controls.

To compensate partially for the lack of family background characteristics available in PLASC, we use the pupil's home postcode to map in neighbourhood characteristics, such as the Index of Multiple Deprivation (IMD)[31] and variables from the 2001 Census, to control for any local area influences on academic outcomes. These are included alongside the available individual-level data to generate the following list of controls:

- ethnicity;
- whether English is the child's first language;
- whether the child is eligible for free school meals;[32]

[30] The exception is the regression-based model (Model 4), described in more detail in Chapter 4, in which we attempt to identify separately the impacts of age of sitting the test (also referred to as absolute age) and age of starting school (length of schooling) by comparing children of the same age across admissions policy areas.

[31] This is a local measure of deprivation, available at Super Output Area (SOA) level (comprising approximately 1,500 households), that makes use of seven different domains: income; employment; health and disability; education, skills and training; barriers to housing and services; living environment; and crime.

[32] This can be thought of as a proxy for low family income.

- quintiles of the IMD, plus quintiles of the domains comprising income, employment, and education, skills and training;
- quintiles of the Income Deprivation Affecting Children Index (IDACI);[33]
- age distribution of the Output Area (OA)[34] in which the child lives;
- proportion of lone parents (OA level);
- proportion of working-age population in employment (OA level);
- social class (OA level);
- highest educational qualification of local population (OA level).

Background characteristics will also enable us to carry out subgroup analysis to see whether date of birth is more or less important for particular sectors of the population.

Admissions policy information

As outlined in Chapter 1, geographical variation in local education authorities' admissions policies is the source of our identification strategy for separately estimating the impacts of age of sitting the test and age of starting school (or length of schooling) on academic outcomes.

In order to obtain a comprehensive historical record of LEA admissions policies in England, we telephoned every LEA admissions department, requesting a detailed picture of their policy history over the last 20 years. We then checked this information by ringing at least three community primary schools in each LEA in order to obtain independent reports of admissions policy history.[35] Table 1 provides a summary of the admissions policy information for each group under consideration in this report (see Section 3.2 for more information).[36]

[33] An additional element of the Index of Multiple Deprivation.

[34] Output Areas contain approximately 150 households.

[35] It is important to remember that only community and voluntary-controlled schools are required to follow the LEA admissions policy. Voluntary-aided or foundation schools, for example, may choose to set their own admissions policy (although anecdotal evidence suggests that they often follow the admissions policy set by their LEA). In this report, we include all children in our models, including those who do not attend community or voluntary-controlled schools; hence treatment is defined for children attending school in an LEA where policy X is in operation, rather than for children attending a school that follows policy X. This should, theoretically, weaken the treatment effect, so our estimates are likely to provide a lower bound to the true impact of being born in August rather than September, for example.

[36] Given the difference in school starting age across groups (see Section 3.2), this also provides some indication of how admissions policies have been changing over time. So, for example, the popularity of single-entry-point systems has been increasing over time, while the popularity of triple-entry-point systems has been in decline.

The admissions policies outlined in Table 1 are as follows:

Single entry point

- **Policy B:** All children, regardless of age, start school in the September of the academic year in which they turn 5.

These figures indicate the percentage of children in our sample who started school in an LEA in which the admissions policy indicated was in operation (including those who started at schools that do not necessarily have to follow the admissions policy set by the LEA).

Two entry points

- **Policy A:** Children born 1 September to 31 March start school in the September of the academic year in which they turn 5; children born 1 April to 31 August start school in the January of the year in which they turn 5.
- **Policy D:** Children born 1 September to 30 April start school in the September of the academic year in which they turn 5; children born 1 May to 31 August start school in the January of the academic year in which they turn 5.
- **Policy E:** Children born 1 September to 29 February start school in the September of the academic year in which they turn 5; children born 1 March to 31 August start school in the January of the academic year in which they turn 5.
- **Policy F:** Children born 1 September to 31 December start school in the September of the academic year in which they turn 5; children born 1 January to 31 August start school in the April of the academic year in which they turn 5.

Three entry points

- **Policy C:** Children start school at the beginning of the term in which they turn 5, so children born 1 September to 31 December start school in September, children born 1 January to 30 April start school in January and children born 1 May to 31 August start school in April.
- **Policy H:** Children start school at the beginning of the term *after* they turn 5, so children born 1 September to 31 December start school in January, children born 1 January to 30 April start school in April and children born 1 May to 31 August start school in September of the following academic year.[37]

Flexible/Other admissions policy

- **Policy O:** Schools can choose their own admissions policy, or the admissions policy in place is not known or clear.

[37] This means that summer-born children miss out entirely on the reception year (the first year of primary education).

For pupils in our first group (see Section 3.2), we observe the LEA in which they sat the Foundation Stage. This occurs at the end of the year in which they started school; thus we should have assigned the admissions policy information to the children correctly. For our second and third groups, however, we only observe the LEA in which they sat Key Stage 1 (age 7) or Key Stage 2 (age 11) respectively – not of the school they were attending at age 5. This means that if either: (a) the child has remained in the same LEA, but the LEA has switched admissions policies since they started school; or (b) the child has switched LEAs since they started school (from one with a different admissions policy in place in the year in which they started), then the information we assign to the child will be inaccurate.[38]

We have checked the importance of this potential measurement error by analysing the difference between estimates obtained by assigning admissions policy according to the LEA at age 7 rather than at age 5 (using our first group) or at age 11 rather than at age 7 (using our second group). In neither case do we find any evidence of significant differences as a result of mismeasurement of admissions policy information.[39]

Our sample

As yet, it is not possible to follow children right through from the Foundation Stage (age 5) to Key Stage 5 (age 18). Table A.1 in Appendix A demonstrates how the availability of Key Stage test data lends itself to the construction of particular groups of interest. As can be seen from this table, three clear groups emerge, covering the full spectrum of results from the Foundation Stage to Key Stage 5:

- **Group 1:** For a one-in-ten sample of individuals born in 1997–98 or 1998–99 (who started school in 2002–03 or 2003–04), we can analyse outcomes from the Foundation Stage Profile (age 5) and Key Stage 1 (age 7).
- **Group 2:** For two cohorts of individuals (born in 1990–91 or 1991–92, who started school in 1995–96 or 1996–97), we can analyse outcomes from Key Stage 1 (age 7), Key Stage 2 (age 11) and Key Stage 3 (age 14).

[38] For information, approximately 3 per cent of children move across LEA policy areas between the time they start school and the time they sit Key Stage 1 (two years later).

[39] Results are available from the authors on request.

- **Group 3:** For three cohorts of children (born in 1985–86, 1986–87 or 1987–88, who started school in 1990–91, 1991–92 or 1992–93), we can analyse outcomes from Key Stage 2 (age 11), Key Stage 3 (age 14), Key Stage 4 (age 16) and Key Stage 5 (age 18).

It is these groups that we focus on in this report.[40] For all three groups, we restrict our sample to individuals for whom all outcomes are observed in the expected year. At Key Stage 5 (age 18), if a person does not have any results information, we assume that they have left education but we do not exclude them from our analysis.[41]

Non-standardised mean outcomes, by group

Table 2 presents the (non-standardised) average point score – and associated standard deviation – for all available tests from the Foundation Stage to Key Stage 4 for each of our three groups, split according to gender. It is clear from these results that girls always score higher than boys on average and that boys, on average, face greater variability in their results than girls. This is true in every group and across a variety of ages, which is the reason we analyse boys and girls separately throughout the remainder of this report.

For the two groups for whom we have Key Stage 1 results, the mean results for girls are just above the expected level (15 points), while the mean results for boys are at or just below the expected level. Of the two groups for whom we have Key Stage 2 and Key Stage 3 results, only girls in the younger group (Group 2) achieve, on average, above the expected level (27 points) at Key Stage 2. However, by Key Stage 3, all but boys in the older group (Group 3) are achieving above the expected level (33 points). By Key Stage 4, girls are significantly outperforming boys.

[40] Of course, it is possible to have other groups. For instance, there are five cohorts for whom we have Key Stage 1 and Key Stage 2 results and five cohorts for whom we have Key Stage 2, Key Stage 3 and Key Stage 4 results. Analysis of these groups indicates broadly similar results to those for our second and third groups (which are subsets of these larger groups). Results from these larger groups are available from the authors on request.

[41] As we have results information from pupils attending private schools at Key Stage 4 and Key Stage 5 (from the cumulative Key Stage 4 and Key Stage 5 data-set), the only misclassification such an assumption will cause is if the person has moved outside the English education system. Whilst this will no doubt have occurred for some individuals, as long as the probability of doing so does not vary by date of birth, our findings should be sound.

In general, where we have results for more than one group, the average test score for the younger group tends to be higher than that for the older group, and the variation in outcomes – especially for girls – seems to fall (albeit only marginally) over time.

Standardised mean outcomes, by date of birth and cohort

In this section, we illustrate how the *standardised* average point score for each of our three groups varies by date of birth and cohort. Figure 3 presents the results for Group 1 (for whom we have Foundation Stage and Key Stage 1 scores), Figure 4 presents the results for Group 2 (for whom we have Key Stage 1, Key Stage 2 and Key Stage 3 scores) and Figure 5 presents the results for Group 3 (for whom we have Key Stage 2, Key Stage 3 and Key Stage 4 scores).

From Figures 3-5, it is clear that the outcomes for August-born children are always lower than those for September-born children, but that this gap steadily decreases between age 5 (Foundation Stage) and age 16 (Key Stage 4).[42] It is also clear that girls perform significantly better than boys, on average, at all ages and that it is August-born boys who have the worst absolute outcomes.

4 ModellingApproach

The purpose of this report is to answer the following question: 'What impact does being born in month *k* (the treatment, e.g. August) rather than month *j* (the control, e.g. September) have on cognitive outcomes at ages 5, 7, 11, 14, 16 and 18?'.[43] Further, does the impact of month of birth differ across admissions policy areas?[44] To try to answer these questions, we use a total of four modelling strategies, each of which invokes different assumptions.

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[42] Using Group 2, Appendix C also shows that the variance in outcomes for August-born children is greater than that for September-born children at Key Stage 1 (age 7) and Key Stage 2 (age 11), but that this variation by age has virtually disappeared by Key Stage 3 (age 14).

[43] Throughout our analysis, the treatment is always 'being younger'.

[44] Whilst all community and voluntary-controlled schools in each LEA must comply with the LEA's stated admissions policy, other types of school are not required to do so. However, we still assign these schools the admissions policy of their LEA, meaning that we estimate something more akin to an intention-to-treat effect (as it is known in the literature). The question we are asking is 'What is the impact on child cognitive outcomes of attending school in an LEA that follows one admissions policy rather than any other?'.

The first three of these models are as follows:

1. **Within-school:** This model only includes individuals attending schools that have at least one boy (girl)[45] born in month *k* and at least one boy (girl) born in month *j* in the same cohort.[46] We then compare the difference in outcomes *within each school and each cohort* for *k*- and *j*-born children using analytical weights (such that greater weight is given to larger schools).[47] This essentially means that we are including school fixed effects that differ across cohorts.
2. **School fixed effects, restricted sample:** Here, we employ the same sample of individuals used in Model 1 but estimate the impact of being born in month *k* rather than month *j* using a model where the school fixed effects are assumed to be constant across cohorts. This means that the only difference between this model and Model 1 is that the school fixed effect can vary by cohort in Model 1, whereas it cannot in this model.
3. **School fixed effects, unrestricted sample:** This model employs school fixed effects that cannot vary across cohorts (as in Model 2), but here we make use of the entire sample of individuals born in month *j* or month *k*, including those attending schools that do not have both *j*- and *k*-born boys (girls) in the same cohort. Differences between Models 2 and 3 will therefore occur only as a result of differences in the composition of the sample.

In each of these models, we are making comparisons within schools (and also within each cohort of a particular school in Model 1). Thus, as long as the observed and unobserved characteristics of students at the school and the effectiveness of the school do not vary by age, we will difference out the impact of this (assumed) fixed effect and will obtain the causal impact of being born in month *k* compared with being born in month *j*.

We can check the validity of part of this assumption by testing whether the probability of being a *k*-born child compared with the probability of being a *j*-born child varies by *observed* characteristics. This could happen if parents from certain backgrounds try to ensure that their

[45] Given the well-documented differences in academic achievement between boys and girls, all models are assessed separately by gender.

[46] Approximately 80 per cent of individuals are included in the model at Key Stage 1 (Group 2 only) and Key Stage 2 (Groups 2 and 3), while nearly 100 per cent of individuals are included at Key Stage 3 (Groups 2 and 3) and Key Stage 4 (Group 3 only); this is due to the smaller size of primary schools compared with secondary schools. We do not estimate Model 1 for Group 1 (for whom we only have a one-in-ten sample) because sample sizes are simply not large enough to make the analysis meaningful.

[47] To investigate whether these effects vary across admissions policy areas, we interact treatment (being born in month *k*) with admissions policy dummy variables.

child will always be one of the oldest in the school year through conception decisions, or if children from certain backgrounds who are amongst the youngest in their year are more likely to be put into private schools. Initial analysis of our sample suggests that there is some evidence that children who are eligible for free school meals (a proxy for low family income) are more likely to be born in August than children who are not eligible for free school meals. Hence, in all our models, we always control for observed background characteristics in an attempt to mitigate this possibility (see Section 3.1.4 for details).[48]

If we are able to ascertain that there is a significant difference between the outcomes of children born in month *j* and children born in month *k*, then gaining a fuller understanding of the underlying causes of these differences becomes very important. In most countries, it is extremely difficult to separate the impacts of absolute age (age at which the child sits the test), age of starting school and length of schooling on compulsory schooling outcomes, because there is an exact linear relationship between the three:

Age at test = Age of starting school + Length of schooling.

If all children in a particular cohort start school at the same time and sit tests at the same time, then it is impossible to identify these three effects separately.[49] However, whilst it is the case that children in England all sit tests at the same time, the geographical variation in LEA admissions policies generates variation in the age at which children start school, and hence their length of schooling; this allows us to separate the impacts of absolute age and age of starting school (or length of schooling, not both[50]) on outcomes. In addition, because the age distribution of a particular cohort within each school varies by chance, we can also look at the impact of age position, which we measure as the proportion of pupils older than the child in their school cohort.

[48] We have estimated all of our results using Models 1 to 3 both including and excluding observed individual characteristics; whether or not they are included, our findings remain the same. All results reported in this Commentary *include* controls for observed individual characteristics; the results without such controls are available from the authors on request.

[49] In addition, the oldest children (in absolute terms) in each cohort will also be the oldest relative to others in their class, so the age position effect may also play a role.

[50] Unfortunately, there is insufficient variation in the admissions policies in place to enable us to separate the impacts of age of starting school and length of schooling.

To separate these effects, we make use of an additional model to those described above:

4. **Regression model:** Instead of separately estimating the impact of being born in month *k* rather than month *j* (across admissions policy areas), we use a regression model estimated on our entire sample – i.e. including children born across all months and all admissions policy areas – to identify separately the impacts of absolute age, age of starting school (length of schooling) and age position. We do this by including cubics in age, age of starting school and age position; further, for children attending schools that are free to choose their own admissions policy, we include a dummy variable that is also interacted with the cubics of age. Given that – unlike in Models 1 to 3 – we are comparing children across admissions policy areas (and hence schools) in order to identify these effects, it becomes even more important to control for all observed characteristics that might affect academic outcomes (see Section 3.1.4 for details).

Appendix D shows that estimates of the mean difference in standardised average point score between August- and September-born children in Groups 2 and 3 obtained using the four models described above are virtually identical, giving us confidence that we can safely rely on any of these models in our analysis.

5 The August Birth Penalty

In this chapter, we report differences (across a range of cognitive outcomes and for each of our three groups) between students born in August and September of the same academic year. These estimates are obtained using Model 3, which compares August- and September-born children within the same school (and school year, through the use of cohort dummies) and uses the entire sample of August- and September-born individuals, regardless of admissions policy area.

It is important to remember that in this chapter, we simply document the extent of the August birth penalty and show how it varies as children move through the education system (for different groups). In Chapter 7, we go further and attempt to disentangle the impacts of absolute age (age of sitting the test), length of schooling (age of starting school) and relative age (age position); but for now, our estimates represent a combination of these effects.

The remainder of this chapter proceeds as follows: in Section 5.1, we report estimates of the mean difference in key outcomes between August- and September-born children, while in Section 5.2, we investigate whether these estimates vary across the ability distribution; in Section 5.3, we consider mean differences between August- and September-born children across a wider range of outcomes; Section 5.4 concludes.

August birth penalty: mean differences in key outcomes

In this section, we consider differences in overall summary measures between August- and September-born children for each of our three groups. The results we focus on are standardised average point score (for all but Key Stage 5), whether the child has reached the expected level (for all but the Foundation Stage) and whether they have achieved above the expected level (for Key Stage 1, Key Stage 2 and Key Stage 3 only).[51] The way in which these overall measures are constructed is discussed in Chapter 3.

We also look at the impact of an August birthdate on being classified as having a special educational need – both statemented (severe special educational need) and non-statemented (less severe special educational need). This outcome is of clear policy interest, as being labelled or identified as having a special educational need not only affects the support a pupil receives in school, but may also have an impact on parental and teacher attitudes towards the child and on child self-perception.

Group 1: children born in 1997–98 or 1998–99

Table 3 shows the differences in key outcomes between August- and September-born children across the Foundation Stage Profile and Key Stage 1 tests for our youngest group (Group 1).[52]

[51] These restrictions are due to data limitations.

[52] Remember that for this group, we only have a one-in-ten sample of children in English state schools.

A number of stylised facts can be inferred from these results:

- September-born girls and boys perform above average at both the Foundation Stage and Key Stage 1. In the FSP, for example, September-born girls score 0.483 standard deviations above average, while September-born boys score 0.238 standard deviations above average.[53]
- The difference between the standardised average point score of August- and September-born children at the Foundation Stage is 0.768 standard deviations for girls and 0.817 standard deviations for boys; all results are significant at the 1 per cent level. From Table 2 on page 66, we saw that the standard deviation in the total score for the FSP was 18.10 points for girls and 20.33 points for boys. These estimates therefore imply that August-born girls score, on average, 14 points lower than September-born girls, while August-born boys score, on average, 17 points lower than September-born boys (out of a possible score of 117); clearly, these differences are substantial.
- The difference between the standardised APS of August- and September-born children has fallen slightly by Key Stage 1 but remains large and significant: August-born girls score, on average, 0.623 standard deviations lower than September-born girls, while August-born boys score, on average, 0.593 standard deviations lower than September-born boys. Using estimates of the standard deviation in the APS for girls and boys (shown in Table 2), we see that these results translate into a difference of around 2.2 points for girls and 2.4 points for boys; this is equivalent to just over one attainment level at Key Stage 1.[54] This is of similar magnitude to the differences found by Thomas (1995) using a sample of the 1992 Key Stage 1 data (see Chapter 2). Again, all results are significant at the 1 per cent level.
- If instead we look at differences in the proportion of August- and September-born children obtaining the expected level at Key Stage 1 – for which they must average at least 15 points across all three components (reading, writing and maths) – we see that, on average, August-born girls are 27.1 percentage points (34 per cent) less likely to reach the expected level than September-born girls, while the difference is 23.4 percentage points (33 per cent) for boys. Hence, whilst 80.1 (70.5) per cent of September-born girls (boys)

[53] All average point scores have been normalised to have mean 0 and standard deviation 1; thus across our sample as a whole – including boys and girls, and all cohorts within a particular group – positive outcomes are above average and negative outcomes are below average.

[54] Level 2C attracts 13 points, Level 2B attracts 15 points and Level 2A attracts 17 points.

reach the overall expected level, on average, at Key Stage 1, only 53.0 (47.1) per cent of August-born girls (boys) do the same.

- If we look at the figures for those achieving, on average, above the expected level at Key Stage 1 – equivalent to scoring above average in each of the reading, writing and maths tests – virtually no August-born children achieve this exacting standard, such that the magnitude of the difference between the proportions of August- and September-born children scoring above average is governed by the proportion of September-born children reaching this level.
- For this group, there are no statistically significant differences between the proportions of August- and September-born boys who have a statemented or non-statemented special educational need at age 5; nor is there any difference between the proportions of August- and September-born girls who are classified as having statemented SEN at the same age. However, we see from Table 3 that an August-born girl is 2.0 percentage points (61 per cent) more likely to have been diagnosed as having non-statemented SEN at age 5, such that while only 3.3 per cent of September-born girls have a non-statemented special educational need, 5.3 per cent of August-born girls are similarly classified.[55]

Group 2: children born in 1990–91 or 1991–92

Table 4 provides estimates of the differences in key outcomes at Key Stage 1, Key Stage 2 and Key Stage 3 between August- and September-born children for our middle group (Group 2).

By comparing outcomes at Key Stage 1 for September-born children in this group with those for September-born children in our youngest group (Group 1; see Table 3), it becomes clear that there has been a big improvement in standards – for pupils born in all months – across the intervening years. Whilst the position of September-born pupils in the distribution has remained virtually constant over time,[56] the proportion of pupils achieving the expected level has increased by almost 10 percentage points: for example, 70.3 per cent of September-born

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[55] Note that relatively few children will have been diagnosed with any kind of special educational need by the January of their first year at school (indeed, some children will not even have started school by this time), so we may expect differences to develop over time.

[56] This can be seen through the fact that the standardised average point score is almost identical for September-born children in the two groups: for example, September-born girls in Group 1 score, on average, 0.418 standard deviations above average, while September-born girls in Group 2 score 0.420 standard deviations above average.

girls in Group 2 (the older group) achieved the expected level in 1997–98 or 1998–99, while 80.1 per cent of September-born girls achieved the expected level in 2004–05 or 2005–06 (Group 1).[57]

Table 4 shows the following:

- While September-born children in Group 2 perform well above average in every Key Stage test, their age-related advantage diminishes over time. For example, girls (boys) at Key Stage 1 score 0.420 (0.195) standard deviations higher than the mean, but by Key Stage 3, the difference has fallen to 0.175 (0.059) standard deviations above average.
- The difference in standardised average point scores between August- and September-born children similarly declines with time (as the relative age disparity falls), but it remains significant (at the 1 per cent level) even at Key Stage 3. For example, August-born girls (boys) score, on average, 0.595 (0.611) standard deviations lower than September-born girls (boys) at Key Stage 1.[58] This difference falls to 0.347 (0.333) standard deviations for girls (boys) at Key Stage 2[59] and to 0.198 (0.207) standard deviations at Key Stage 3.[60]
- If instead we look at differences in the proportions of August- and September-born children obtaining the expected level – i.e. averaging 15, 27 or 33 points across all three components of the Key Stage 1, 2 or 3 tests respectively – we see that a 25.7 (26.3) percentage point difference for girls (boys) at Key Stage 1 is reduced to a 13.3 (12.8) percentage point difference at Key Stage 2 and a 7.7 (8.5) percentage point difference at Key Stage 3.
- The estimates of the percentage point difference between August- and September-born children at Key Stage 1 are similar to those found for Group 1 (see Table 3). However, given the baseline difference in the proportion of September-born children achieving the expected level across the two groups (discussed above), this indicates that, in percentage terms, the gap between August- and September-born children has fallen over time. This is particularly true for boys: August-born boys were 43 per cent less likely than September-

[57] Differences in the proportions achieving the expected level are also observed at Key Stage 2 and Key Stage 3 between Group 2 (younger) and Group 3 (older).

[58] These are very similar to the differences found for Group 1 (see Table 3).

[59] This translates into an average point score difference of 1.5 points for girls and boys, where the expected level is 27 points (see Table 2 for details).

[60] This translates into an average point score difference of 1.3 (1.5) points for girls (boys), where the expected level is 33 points (see Table 2 for details).

born boys to reach the expected level at Key Stage 1 in 1997–98 or 1998–99 (Group 2), but by 2004–05 or 2005–06, this disadvantage had fallen to 33 per cent.

- Over time, the difference between the proportions of August- and September-born students reaching the expected level falls – approximately halving between Key Stage 1 and Key Stage 2, and again between Key Stage 2 and Key Stage 3, such that the difference observed at Key Stage 3 is just under one-third the size of that observed at Key Stage 1. For example, August-born girls are 25.7 percentage points less likely to achieve the expected level at Key Stage 1, whilst this difference has fallen to 7.7 percentage points at Key Stage 3.
- In terms of the proportion of pupils achieving above the expected level overall, on the other hand, the difference between August- and September-born children remains roughly constant – in percentage point terms – between Key Stage 1 and Key Stage 3. However, given the large increases in the proportion of September-born pupils achieving above the expected level over the same period – from 10.9 (7.3) per cent of girls (boys) at Key Stage 1 to 39.3 (36.2) per cent at Key Stage 3 – it is clear that the August birth penalty in percentage terms must decline over time.
- For this group, SEN status is recorded at age 11 (Key Stage 2). In contrast to the findings for our younger group (Group 1; see Table 3), we now observe statistically significant differences between the proportions of August- and September-born pupils who have a statemented or a non-statemented special educational need. This difference is particularly sizeable for non-statemented SEN status, and suggests that being 11 months younger can significantly increase the likelihood of being classified as having a less severe special educational need by around 70 per cent for girls and 45 per cent for boys.

Group 3: children born in 1985–86, 1986–87 or 1987–88

Table 5 provides estimates of the difference in academic achievement between August- and September-born children across a range of key outcomes at Key Stage 2, Key Stage 3, Key Stage 4 and Key Stage 5 for our oldest group (Group 3).

A number of stylised facts can be inferred from these results:

- It is clear from the scores of the September-born children in this group that the impact of age on academic achievement decreases with time. For example, while September-born boys score 0.140 standard deviations above average at Key Stage 2, they score 0.052 standard deviations *below* average at Key Stage 4.

- At Key Stage 2 and Key Stage 3, estimates of the difference between August- and September-born children in terms of standardised APS and in terms of the proportions of pupils achieving at and above the expected level are very similar to those found for our middle group (Group 2; see Table 4) – at least in percentage point terms. However, the fact that the proportions of September-born children achieving at and above the expected level have increased over time (i.e. across groups) means that the differences are greater in percentage terms – particularly at Key Stage 2. For example, August-born boys sitting Key Stage 2 in 1996–97, 1997–98 or 1998–99 (Group 3) were 24.6 per cent less likely to achieve the expected level than September-born boys in the same years, while this difference had fallen to 17.8 per cent by 2001–02 and 2002–03 (Group 2).
- Between Key Stage 3 and Key Stage 4, the difference between the standardised APS of August- and September-born children falls by approximately 44 per cent for girls and 40 per cent for boys, but it remains significant at the 1 per cent level in both cases. The August birth penalties at Key Stage 4 are equivalent to 1.7 points for girls (from an average of 37.18 points; see Table 2) and 2.0 points for boys (from an average of 32.98 points; see Table 2).
- If we look instead at differences in the proportion of August- and September-born children who achieve at least five GCSEs at grades A*–C (equivalent to a Level 2 qualification), we see that there is a 5.5 percentage point (9.1 per cent) gap for girls and a 6.1 percentage point (12.1 per cent) gap for boys at age 16. This finding is of some concern, given that this is the point at which students are making decisions about whether to continue in full-time education.
- However, if we consider differences in the proportion of August- and September-born children holding Level 2 qualifications (achieved via any route) at age 18, we see that this gap has narrowed somewhat, but remains significant, and is larger for boys (1.4 percentage points) than it is for girls (0.5 percentage points). This indicates that August-born children partially close the achievement gap to their September-born counterparts – but they do this after compulsory schooling has ended and by pursuing non-academic Level 2 qualifications (the gap between those attaining Level 2 qualifications via an academic route remains large, at 4.5 percentage points – equivalent to 6.9 per cent for girls and 8.2 per cent for boys). Given that Level 2 non-academic qualifications have

been found to be more poorly rewarded in the labour market than Level 2 academic qualifications (see, for example, Dearden, McGranahan and Sianesi (2004)), these disparities remain concerning, however.

- At Key Stage 5, the proportion of August-born students holding a Level 3 qualification (the expected level at age 18) remains significantly lower than that of September-born children. For girls, the penalty is twice as big for qualifications attained via an academic route (2.0 percentage points) as it is for qualifications attained via any route (0.9 percentage points). For boys, on the other hand, the differences are similar for academic qualifications (1.7 percentage points) and for all Level 3 qualifications (1.6 percentage points).
- For this group, SEN status is observed at age 16. The proportion of September-born children with statemented (more severe) SEN is approximately equal to that for our middle group (Group 2; see Table 4), as is the difference between the proportion of August- and September-born children with statemented SEN – 0.4 (0.8) percentage points for girls (boys). For non-statemented SEN, both the proportion of September-born children and the difference between the proportions of August- and September-born children with SEN are smaller than they were for Group 2. This may indicate that the impact of relative age on the likelihood of being diagnosed with SEN decreases with age, or it may indicate that, over time, the probability of being diagnosed with SEN has increased (and more quickly for August- than for September-born children), suggesting a cohort effect.

August birth penalty: distributional analysis for key outcomes

We saw in Section 5.1 that significant differences exist between the standardised average point scores achieved, on average, by August- and September-born children between ages 5 (Foundation Stage) and 16 (Key Stage 4). However, as shown in Appendix C, August-born children (at least in Key Stage 1 and Key Stage 2) not only tend to have lower mean outcomes but also face greater variability around those outcomes than September-born children. Thus the average impact may mask differences between the August birth penalty at the top and bottom of the ability distribution. We investigate this hypothesis further in this section, by estimating the August birth penalty at different points of the ability distribution: we have chosen the 10th percentile, the 25th percentile, the median (50th percentile), the 75th percentile and the 90th percentile.

To do this, we use our within-school model (Model 1).[61] This means that each of our samples is slightly smaller than in the previous section, as we can only include schools that have both an August- and a September-born child in the same academic year.[62] Further, we cannot carry out this analysis for Group 1 (for whom we have Foundation Stage and Key Stage 1 results) because the one-in-ten sample means that we do not observe enough schools containing both an August- and a September-born child to make the results meaningful.

Table 6 shows differences between the standardised average point score of August- and September-born children in the 10th, 25th, 50th, 75th and 90th percentiles of the ability distribution at Key Stage 1, Key Stage 2 and Key Stage 3 for our second group (born in 1990–91 or 1991–92).

From Table 6, the following points are clear:

- For both girls and boys at Key Stage 1 and Key Stage 2, the August birth penalty is larger for individuals at the bottom of the distribution than it is for individuals at the top. For example, August-born girls in the 10th percentile of the ability distribution score, on average, 0.628 standard deviations lower than September-born girls in the 10th percentile at Key Stage 1, while August-born girls in the 90th percentile score 0.538 standard deviations lower, on average, than September-born girls in the 90th percentile.
- By Key Stage 3, these differences appear to be largest in the middle of the distribution. However, the fact that September-born students in the 10th percentile at Key Stage 3 are significantly lower down the overall ability distribution than they were in either of the earlier Key Stages – September-born girls score almost 1 standard deviation below average at Key Stage 3, for example, whilst they score only 0.161 standard deviations below average at Key Stage 1 – suggests that the August birth penalty for individuals in the 10th percentile (at least) may well be censored at Key Stage 3.[63,64]

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[61] It is not possible to estimate individual quantile regression models with school fixed effects, which is why we use our within-school model.

[62] As shown in Appendix D, there is virtually no difference between the estimates obtained using our various models; thus we do not expect sample selection to bias these results.

[63] By this, we mean that the scores of September-born children in the 10th percentile are so far down the ability distribution that August-born children in the 10th percentile cannot score very much lower, placing a cap on the potential birth penalty for these individuals.

August birth penalty: mean differences in other outcomes

In this section, we look in more detail at the August birth penalty, by breaking down the key summary measures discussed in Sections 5.1 and 5.2 into their component subjects. This is only possible for Foundation Stage, Key Stage 1, Key Stage 2 and Key Stage 3 outcomes.

Group 1: children born in 1997–98 or 1998–99

Table 7 provides estimates of the August birth penalty for each component of the Foundation Stage Profile (personal, social and emotional development; communication, language and literacy skills; mathematical development; knowledge and understanding of the world; physical development; and creative development) and for each component of the Key Stage 1 tests (reading, writing and maths) to see whether the impact of age varies by subject.

A number of stylised facts can be inferred from these results:

- September-born girls and boys perform above average in all components of the FSP, with their advantage more apparent in academic subjects: for example, September-born boys score 0.3 standard deviations above average in maths, while they score only 0.063 standard deviations above average in terms of creativity.
- Further, the difference between the standardised average point scores for August- and September-born children at the Foundation Stage is also largest amongst the more academic measures of attainment (which are also the best predictors of Key Stage 1 outcomes). For example, August-born girls (boys) score 0.821 (0.845) standard deviations lower than September-born girls (boys) in literacy and 0.776 (0.787) standard deviations lower in maths; all results are significant at the 1 per cent level.
- Interestingly, the difference between August- and September-born children in terms of emotional development at age 5 is smaller than the difference in terms of literacy and numeracy skills. This may suggest that, contrary to popular opinion, it is academic rather than emotional maturity that is affected by an August birthdate. On the other hand, it may simply be that teachers are more likely to take age into account when assessing emotional

[64] This is also true for individuals in our oldest group (Group 3), results for which can be found in Appendix E.

development as part of the FSP than they are when assessing literacy or numeracy skills.[65]

- September-born girls and boys continue to perform above average in the three main subjects assessed at Key Stage 1, with girls doing relatively well (and boys relatively poorly) in writing, but with girls and boys performing approximately equally in maths.
- The difference between the standardised average point scores of August- and September-born girls and boys across each of the three components is broadly similar to that found for the overall score (see Table 3). Similarly, comparison of the proportions of August- and September-born pupils reaching the expected level at Key Stage 1 (15 points) indicates that being born in August tends to affect individuals roughly equally across all subjects.
- Comparison of the proportion of September-born children achieving above the expected level in each of the three subjects at Key Stage 1 highlights the difficulty of achieving above the expected level *overall*: while 29.1 (16.1) per cent of September-born girls (boys) achieve above the expected level in writing (the lowest amongst the three subjects), only 20.9 (13.9) per cent of September-born girls (boys) achieve above the expected level overall (see Table 3).
- Furthermore, while the disadvantages faced by August-born boys and girls at the expected and above-expected levels are approximately similar in percentage point terms, given the lower base for September-born students at the above-expected level, it is clear that very few August-born pupils can achieve above the expected level in any subject: for example, only 7.1 per cent[66] of August-born girls do so in maths and even fewer August-born boys do so in writing (3.2 per cent[67]).

[65] It would be interesting to test whether these differences vary by admissions policy, but, unfortunately, August-born individuals in Policy C areas (where all children start school at the beginning of the term in which they turn 5), for example, may not appear in our sample (because the PLASC data, through which we merge in admissions policy information, are collected in January each year, i.e. before these individuals would have started school).

[66] This is calculated by subtracting the 24.3 percentage point difference from the percentage of September-born girls achieving above the expected level (31.4 per cent).

[67] This is calculated by subtracting the 12.9 percentage point difference from the percentage of September-born boys achieving above the expected level (16.1 per cent).

Group 2: children born in 1990–91 or 1991–92

For our second group, we examine reading, writing and maths results at Key Stage 1 and English, maths and science results at Key Stages 2 and 3 to see whether the August birth penalty differs across subjects. The results are shown in Table 8.

The key stylised findings for this group are as follows:

- As was the case for our first group (see Table 7), September-born pupils perform above average in all subjects at Key Stage 1, with September-born girls performing relatively better than September-born boys in reading and writing, but with girls and boys performing approximately equally in maths. Further, the difference in standardised average point scores between August- and September-born children across all three components is broadly similar to that found for the overall score (see Table 3) and to the subject estimates for Group 1 (see Table 7).
- The 10 percentage point improvement in standards apparent in terms of the overall proportion of September-born children reaching the expected level between Group 2 and Group 1 (see Section 5.1) is reflected approximately equally across the individual subjects at Key Stage 1. Moreover, the differences between the proportions of August- and September-born pupils achieving the expected level in each of the three subjects appear to have fallen slightly over time, indicating that the gap associated with relative age may have lessened in the intervening period.[68] For example, while August-born girls were 25.7 percentage points (34 per cent) less likely to reach the expected level in maths at Key Stage 1 in 1997–98 or 1998–99 (Group 2), they were 23.4 percentage points (27 per cent) less likely to do so in 2004–05 or 2005–06 (Group 1).
- Differences across subjects (and over time) are more obvious when considering the proportion of children achieving above the expected level at Key Stage 1. First, only in writing do September-born students show a marked improvement over time (i.e. across groups), with September-born girls in our youngest group around 15 percentage points more likely to achieve above the expected level in writing at Key Stage 1 than September-born girls in Group 2. Second, the disparity (in percentage point terms) between the proportions of August- and September-born children achieving above the

[68] Alternatively, it may be a cohort effect – particularly given that Group 1 only comprises a one-in-ten sample.

expected level in writing also differs significantly – but only because of the difference in the September base; the differences remain largely similar in percentage terms (with August-born girls and boys approximately two-thirds less likely to achieve above the expected level in writing than September-born girls and boys).

- The overall differences between September-born girls and boys at Key Stage 2 (age 11) and Key Stage 3 (age 14) – see Table 4 – appear to be almost entirely driven by differences in English test results: for example, while 83.9 per cent of September-born girls reach the expected level in English at Key Stage 3, only 71.5 per cent of September-born boys do; similarly, there is a 14.9 percentage point gender gap in the proportions achieving above the expected level. This is also true for our older group (Group 3; see Appendix F for details).
- While the August birth penalty – in terms of the proportion of pupils reaching the expected level – roughly halves between Key Stage 2 and Key Stage 3 for maths and English (as it does overall; see Table 4), there is no corresponding reduction for science. Indeed, a decrease in the proportion of September-born pupils achieving the expected level at Key Stage 3 means that the August birth penalty actually increases in percentage terms between Key Stage 2 (7.0 per cent for girls and 5.9 per cent for boys) and Key Stage 3 (8.7 per cent for girls and 8.9 per cent for boys). This is true to a lesser extent for our older group (see Appendix F for details).
- By comparing the results for individual subjects and the overall results at Key Stages 2 and 3, it becomes clear that the overall August birth penalty appears to be larger than for any of the individual subjects at the expected level, while it is smaller than for any of the individual subjects at the above-expected level; this is particularly true at Key Stage 2. So, for example, while August-born girls are 13.3 percentage points less likely than September-born girls to reach the expected level overall at Key Stage 2, they are only 6.3 percentage points less likely to reach the expected level in science.

Conclusions

The results from this chapter indicate that there is an August birth penalty in terms of cognitive outcomes for all children in English state schools. This penalty is largest when a child first enters school, but it persists, and is still significant at ages 16 and 18. The fact that the penalty still exists when children are making decisions about work and future study must be of concern to policy-makers.

In the next chapter, we consider whether the size of these penalties differs across admissions policy areas.

6 Do Admissions Policies Matter?

The previous chapter clearly established the existence of an August birth penalty in terms of cognitive outcomes for pupils aged between 5 and 18. In this chapter, we investigate whether the magnitudes of this and other date-of-birth penalties vary by admissions policy area (discussed in Section 3.1.5).

For this exercise, we concentrate on the four largest admissions policies, covering around 97 per cent of children in each of our three groups (see Table 1). These are:

- **Policy B (single entry point)**: all children, regardless of age, start school in the September of the academic year in which they turn 5;
- **Policy E (two entry points)**: children born 1 September to 29 February start school in the September of the academic year in which they turn 5, while children born 1 March to 31 August start school in the January of the academic year in which they turn 5;
- **Policy C (three entry points)**: children start school at the beginning of the term in which they turn 5, so children born 1 September to 31 December start school in September, children born 1 January to 30 April start school in January and children born 1 May to 31 August start school in April;
- **Policy O (flexible/other)**: schools can choose their own admissions policy, or the admissions policy in place is not known or clear.

All estimates are based on Model 3. This means that we are comparing children born in the months either side of the cut-off of interest (for example, August- vs. September-born children, as in Chapter 5) within the same school (and school year) – although, unlike in Chapter 5, we are now doing this separately for each admissions policy area. We want to compare the size of the penalties associated with ‘being younger’ (for example, being born in

August rather than September of a particular academic year) across admissions policy areas. Thus it becomes even more important to control for observed characteristics, so that no bias arises if, for example, LEAs select their admissions policies on the basis of observed characteristics that may also affect cognitive outcomes.

In this chapter, we concentrate on differences in terms of standardised average point scores, the proportion of children achieving the expected level and special educational needs status.[69] Further, because admissions policies (which govern the age at which children start school and the amount of schooling they receive prior to the tests) are likely to impact more on earlier rather than later outcomes, our analysis in this chapter focuses on children in our second group (born in 1990–91 or 1991–92).[70] Unfortunately, it is not possible to carry out this analysis on our youngest cohort (born in 1997–98 or 1998–99), because August-born individuals in Policy C areas are unlikely to appear in our sample. This is because the Pupil Level Annual School Census – the data-set via which we assign admissions policies – is carried out in January each year, i.e. before these individuals would have started school.

This chapter now proceeds as follows: in Section 6.1, we investigate whether the mean August birth penalty varies by admissions policy; Section 6.2 then moves on to consider the existence and magnitude of date-of-birth penalties for other groups of interest – specifically, December- vs. January- and April- vs. May-born children in Policy C areas, and February- vs. March-born children in Policy E areas;[71] Section 6.3 concludes.

Mean August birth penalty, by admissions policy

Tables 9 and 10 provide estimates of the mean August birth penalty at Key Stage 1, Key Stage 2 and Key Stage 3 for girls and boys respectively who started school in Policy B, Policy C, Policy E or Policy O areas in 1995–96 or 1996–97 (Group 2).

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[69] We do not discuss those achieving above the expected level, because, as we saw in the previous chapter, this is a rather exacting standard that is unlikely to be informative for policy-making purposes.

[70] Results for Group 3 can be found in Appendix G. They tend to show less pronounced admissions policy effects at Key Stage 2 and Key Stage 3 than for Group 2; further, these effects are almost never significant.

[71] These are children of approximately similar age, who – as a result of the admissions policy in place in their local area – start school at different ages and receive different amounts of schooling prior to the Key Stage tests.

A number of stylised facts can be inferred from these results:

- For both boys and girls, the outcomes of September-born pupils in all Key Stage tests do not differ markedly across admissions policy areas.[72] For example, September-born girls at Key Stage 1 score, on average, 0.404 standard deviations above average in Policy B areas, 0.393 standard deviations above average in Policy E areas and 0.396 standard deviations above average in Policy C areas. This suggests that admissions policy choice is not correlated with academic ability.
- In terms of standardised average point score, the proportion of students who reach the expected level overall and the proportion who have been diagnosed with a statemented or non-statemented special educational need by age 11, estimates of the August birth penalty for boys and girls in Policy B areas (where August-born pupils start school younger than September-born pupils but receive the same amount of schooling prior to the tests) are slightly smaller than those across all admissions policy areas (see Table 4). Further, the difference is less pronounced for boys than it is for girls. This suggests that the August birth penalty is bigger in areas where August-born children start school when they are older (but receive less schooling prior to the tests) and that choice of admissions policy matters more for girls than it does for boys.
- The additional disadvantage of being an August-born child in a Policy E area (in which August-born children start school four months older than in Policy B areas but receive one term less schooling prior to the tests) is greater for girls than it is for boys at all Key Stages; however, these differences are only significant (at the 10 per cent level or above) for girls at Key Stage 1 and Key Stage 2 (APS only) and for boys at Key Stage 1 (APS only).[73] For example, at Key Stage 1, August-born girls (boys) in Policy E areas score 0.070 (0.043) standard deviations lower than August-born girls (boys) in Policy B areas and August-born girls in Policy E areas are 3.2 percentage points less likely than August-born girls in Policy B areas to reach the overall expected level; by Key Stage 2, the difference in standardised average point scores has fallen to 0.059 standard deviations for girls and is insignificant for boys.
- The additional disadvantage of being an August-born child in a Policy C area (in which August-born children start school seven months older than in Policy B areas but receive

[72] The exception is that individuals who started school in an area in which the admissions policy was not known (or where schools were able to select their own admissions policies) appear to perform slightly better, on average, than individuals in other admissions policy areas. It is not clear why this should be the case.

[73] Further, these differences are approximately similar across the ability distribution (see Appendix H for details).

two terms less schooling prior to the tests) is greater than that faced by August-born children in Policy E areas. For example, for girls in Policy C areas, the August birth penalty is 0.086 standard deviations greater than in Policy B areas, while for Policy E, it is 0.070 standard deviations greater, at Key Stage 1.

- Further, for August-born girls in Policy C areas, while the magnitude of this penalty decreases over time, it remains significant at Key Stage 3 (age 14):[74,75] in terms of the proportion of individuals reaching the expected level overall, August-born girls still face an additional 2.4 percentage point disadvantage at Key Stage 3 (significant at the 1 per cent level). Interestingly, August-born girls in Policy C areas are also more than twice as likely as August-born girls in Policy B areas to have a statemented special educational need at age 11. For boys, the reduction in schooling / increase in age of starting school associated with starting school in a Policy C area rather than a Policy B area only significantly affects cognitive outcomes at Key Stage 1.
- Given that Policy O is likely to comprise some individuals in schools that follow Policy B, some that follow Policy C and some that follow Policy E (amongst others), it is perhaps not surprising that the estimates of the August birth penalty for both boys and girls (across all Key Stages) generally fall somewhere between the bounds produced by individuals in Policy B and Policy C areas.

These results make clear that, for August-born children, length of schooling is more important – at least in terms of cognitive outcomes – than the age at which they start school. This means that the trend over time for LEAs to adopt single-entry admissions policies is having a small positive impact on the Key Stage test scores of August-born children (at least at Key Stage 1).

Birth penalties for children born in other months, by admissions policy

So far in this report, we have concentrated on estimating the August birth penalty. However, it is not only August-born children who are affected by admissions policy decisions. In this

[74] The impact of admissions policy on cognitive outcomes does not appear to persist beyond Key Stage 3 – at least for our older group (Group 3; see Appendix G). However, there was no significant disadvantage associated with starting school in an area following Policy C (rather than Policy B) at either Key Stage 2 or Key Stage 3 for this group; thus we cannot necessarily conclude that these differences would not persist for individuals in Group 2.

[75] Again, these differences (in terms of standardised average point scores) are approximately similar across the ability distribution (see Appendix H for details).

section, we consider the impact of starting school in an LEA that follows Policy E (two entry points) for February- vs. March-born children and the impact of starting school in an LEA that follows Policy C (three entry points) for December- vs. January-born children and April- vs. May-born children.

In each case, the children we compare are of virtually the same age (and will be in roughly the same place in the age distribution within their school year), but the younger child starts school when they are slightly older – and consequently receives fewer terms of schooling – than the older child. This is illustrated in Table 11.

From this table, it is clear that for our August–September comparisons, September-born children are always older when they start school than August-born children, and in areas with more than one entry point (for example, Policy E and Policy C areas) they also receive more terms of schooling in their first year, i.e. the effects both work in the same direction (to the benefit of September-born children).

For the other month-of-birth comparisons, however, there is a trade-off between starting school older and receiving more terms of schooling. So, for example, in a Policy E area, March-born children will start school when they are aged 4 years 10 months (rather than 4 years 7 months for February-born children) but will receive one term less schooling. The sign of the March birth effect should thus indicate which is more beneficial for children born in that month – starting school older or receiving an extra term of schooling.

The results of these comparisons for Group 2 (born in 1990–91 or 1991–92) can be found in Tables 12 and 13 for girls and boys respectively.

From these tables, the following points are clear:

- The relative position in the ability distribution of children born in our control group months (February for Policy E areas; December and April for Policy C areas) highlights the relative performance advantage of girls over boys: girls born in April in Policy B areas score above average in all Key Stages, whilst February-born boys in Policy B areas score below average in all Key Stages.[76]

[76] In fact, December-born boys also score below average at Key Stage 3.

- The relative differences between children born in each of our comparison months in Policy B areas suggests that attainment declines with age: for example, January-born boys in Policy B areas score, on average, 0.043 standard deviations lower than December-born boys at Key Stage 1, while March- and May-born boys in Policy B areas score, on average, 0.059 standard deviations lower than February- and April-born boys respectively.
- Starting school in an area that follows Policy E rather than Policy B more than doubles the disadvantage associated with being born in March rather than February for girls at Key Stage 1 – from 0.047 standard deviations in Policy B areas to 0.102 standard deviations in Policy E areas. Similarly, while March-born girls in Policy B areas are 2.6 percentage points less likely to reach the expected level overall at Key Stage 1 than February-born girls, in Policy E areas there is a 5.1 percentage point disadvantage. March-born boys are generally not affected by admissions policy choice.
- Similarly, only girls at Key Stage 1 suffer as a result of starting school in a Policy C area rather than a Policy B area: May-born girls in Policy C areas score, on average, 0.040 standard deviations lower than May-born girls in Policy B areas, while January-born girls in Policy C areas score, on average, 0.030 standard deviations lower than January-born girls in Policy B areas.
- Interestingly, these admissions policy effects are not much smaller than those found by comparing August- and September-born children (see Tables 9 and 10). For example, in terms of Key Stage 1 standardised average point scores, August-born girls who started school in Policy E areas score, on average, 0.070 standard deviations lower than August-born girls in Policy B areas, while March-born girls in Policy E areas score, on average, 0.055 standard deviations lower than March-born girls in Policy B areas. This may indicate that length of schooling is relatively more important than the age of starting school.[77] We will explore this issue further in the next chapter.

[77] Remember that our comparisons in this section are of individuals who are born only one month apart; hence the age at which they sit the tests should be almost identical, as should their relative age position within the school year.

Conclusions

The results in this chapter have shown that admissions policies do matter and that, in general, children are slightly better off (and certainly no worse off) in terms of cognitive outcomes if they start school in September (rather than in January or April). However, the negative effects associated with receiving fewer terms of schooling are generally small, and often do not persist beyond Key Stage 1. This suggests that what is driving the August birth penalty is not differences in admissions policies.

We now move on to explore further what might be driving it, by attempting to decompose the August birth penalty into an absolute age (age of sitting the test) effect, an age of starting school or length of schooling effect (we cannot separate these two using our identification strategy) and an age position effect.

7 Decomposing the August Birth Effect

In the previous chapter, we saw that admissions policies matter: for August-born girls in particular, an increase in the age at which they start school (with a corresponding reduction in the amount of schooling they receive before sitting the tests) has a small but significant negative impact, at least on early cognitive outcomes.

In this chapter, we use our more structured regression model (Model 4; see Chapter 4 for details) to decompose this August birth penalty, in terms of standardised average point scores, into an absolute age (age of sitting the test) effect, an age of starting school effect (which, in the English school system, cannot be separated from a length of schooling effect) and an age position (relative age) effect.[78] We do this by exploiting geographical variation in local admissions policies, as a result of which children born on the same day may start school at different ages, and hence receive a different amount of schooling prior to the tests. Furthermore, due to variation in the age composition of cohorts within a particular school (by

[78] This necessarily assumes that these effects are the same for all children of all ages, regardless of admissions policy.

chance), we are able to disentangle the impact of relative age as well. We use *all* children in a particular group to do this.

The important elements of our model in terms of identifying the effects described above are as follows:

- cubics in age (measured in days): these will be used to identify the absolute age effect;
- cubics in the age of starting school (measured in days)[79] plus – for children attending schools that are free to choose their own admissions policy – a dummy variable interacted with cubics of age: these variables will be used to identify the age of starting school (length of schooling) effect;
- cubics in the proportion of children older than the child in their school year (this may vary across Key Stages, due to pupils moving schools;[80] hence, the variables used will be determined by the relevant outcome of interest): these variables will be used to identify the age position effect.

In addition, because we are identifying these effects by comparing children across admissions policy areas, it is particularly important to control for all observed characteristics that may affect academic outcomes. Details of the variables for which we control can be found in Section 3.1.4.

The results of decomposing the August birth penalty for individuals in Group 2 (born in 1990–91 or 1991–92) can be found in Tables 14 and 15 for girls and boys respectively.[81] When interpreting these findings, it is important to remember the following: in England, all September-born children start school at an older age than all August-born children – regardless of admissions policy. Hence, the age of starting school effect (column (v) in Tables 14 and 15) measures how much better or worse August-born children perform (compared with September-born children) as a result of starting school younger. This age of starting

[79] This variable measures the age at which each child would have started school if (a) the child's school followed the LEA policy and (b) the child's parents chose to send them to school at that time. As discussed earlier in this report, not all types of state schools are required to follow the LEA policy, and there is no compulsion for parents to send their child to school until the term in which they turn 5. However, anecdotal evidence suggests that both (a) and (b) are fairly commonplace.

[80] This necessarily happens when pupils are *required* to change schools (for example, when moving from primary to secondary school, between Key Stage 2 and Key Stage 3) and may happen at other times as well.

[81] For the reasons outlined in Chapter 6, it is not possible to carry out this analysis on our younger group (born in 1997–98 or 1998–99). The decomposition of the August birth penalty for our older group (born in 1985–86, 1986–87 or 1987–88) can be found in Appendix I. For this group, the results at Key Stages 2 and 3 are largely similar to those found for Group 2; moreover, the fact that, by Key Stage 3, there is little variation in the August birth penalty across admissions policy areas (shown in Chapter 6) means that there is little of interest to discuss at Key Stage 4.

school effect will be biggest for children who start school in Policy B areas – in which all children start school in the September of the academic year in which they turn 5 – because August-born children start school when they are 11 months younger than September-born children (a greater difference than in any other policy area).[82] To assess the impact of different admissions policies, therefore, we must compare each age of starting school effect with that for Policy B; this is done in column (vi) of the tables. This effectively identifies the difference in outcomes that is due to differences in the age at which August-born children start school (and hence their length of schooling), and should thus be equivalent to the analysis carried out in Chapter 6. Comparing these two sets of results will provide a good indication of how well our regression model is performing.

From Tables 14 and 15, we see the following:

- The total estimated effect of being born in August rather than September obtained from our regression model (Model 4) is broadly in line with the August birth effect obtained using Model 3 (see Chapter 6) in most admissions policy areas: for example, the August birth penalty for girls (boys) in Policy E areas is 0.627 (0.623) standard deviations at Key Stage 1, while the estimated August birth penalty is 0.598 (0.623) standard deviations, a difference of only 0.029 (0.000) standard deviations. This is encouraging, as it indicates that our model is likely to be correctly specified.
- When this model is used to estimate separately the impacts of absolute age, age of starting school (or length of schooling) and age position, it is clear that much of the overall difference in outcomes derives purely from the fact that August-born children are nearly a year younger than September-born children at the time they sit the test. This is the predominant driver of the August birth penalty for both girls and boys across all Key Stages,[83] although its impact decreases over time – from 0.576 (0.683) standard deviations for girls (boys) across all policy areas at Key Stage 1 to 0.238 (0.127) standard deviations at Key Stage 3.[84]
- The age of starting school effect (the difference in age between August- and September-born children when they start school) is always positive and significant at Key Stage 1,

[82] This means that, in Policy B areas, there is no variation between absolute age and age of starting school. To identify the age of starting school effect in Policy B areas, therefore, we rely on our linear specification to extrapolate using information from other policy areas (where there is variation between the two).

[83] Although it is not significant for boys at Key Stage 3, despite being the largest component of the August birth penalty for these individuals.

but it is largest for children attending schools in Policy B areas (for whom the difference in age between August- and September-born children is largest) – as indicated by the negative and significant differences from all other policy areas shown in column (vi) of Tables 14 and 15. This suggests that, given August-born children are always the youngest in their cohort, it is better for them to start school *earlier* (i.e. when they are younger), at least in terms of academic outcomes.

- August-born children in Policy E areas start school when they are four months older than August-born children starting school in Policy B areas (and consequently receive one term less schooling in the Reception Year). This difference in age of starting school (or length of schooling) is estimated to increase the August birth penalty for girls (boys) who start school in a Policy E area by 0.053 (0.046) standard deviations at Key Stage 1.[85] These estimates are broadly similar to those found in the previous chapter (see Table 9 for girls and Table 10 for boys), which gives us confidence that our model is correctly specified.
- Similarly, the difference in age of starting school (or length of schooling) between August-born children in Policy C areas and August-born children in Policy B areas (seven months, or two terms) is estimated to increase the August birth penalty for girls (boys) who start school in a Policy C area by 0.085 (0.071) standard deviations at Key Stage 1.[86] Again, these estimates are broadly similar to those found in Chapter 6.
- The age of starting school (length of schooling) effect is still significant for girls (but not for boys) at Key Stage 2, but its importance declines.[87] For example, for August-born girls who start school in an area that follows Policy C, the additional impact of starting school slightly older (and consequently receiving two terms less schooling) than August-born girls who start school in an area that follows Policy B diminishes from 0.085 standard deviations at Key Stage 1 to 0.037 standard deviations at Key Stage 2.[88]
- It is also interesting to note that the point estimates are slightly larger for girls than they are for boys at Key Stages 1 and 2, highlighting the fact that girls benefit relatively more

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[84] The absolute age effect is also the main driver of the August birth penalty for our older group (results for which can be found in Appendix I to this report).

[85] Note that the age of starting school effect is, of course, identical across all policies in which August-born children start school in January – namely, Policy A, Policy D and Policy E.

[86] Note that the age of starting school effect is, of course, identical across all policies in which August-born children start school in April – namely, Policy C and Policy F.

[87] The age of starting school effect re-emerges for some boys at Key Stage 3, but only for policy areas in which August-born children start school in January.

[88] The estimates for Group 3 are slightly smaller and are significant in fewer policy areas (see Appendix I). This may not be surprising, given the greater potential for mismeasurement of admissions policy information in our older group.

from having additional terms of schooling (and/or starting school younger) than boys – at least up to age 11 (this was also found in Chapter 6).

- Finally, the age position effect tends to be negative, but is only significant at conventional levels (5 per cent or below) for girls at Key Stage 2. For these individuals, the negative effect of being the youngest in their school year more than counteracts the positive effect of starting school earlier. However, both impacts are dwarfed by the fact that August-born children sit the Key Stage tests when they are almost a year younger than September-born children (the absolute age effect).

The results of this work suggest that the major reason why August-born children perform significantly worse than September-born children in the Key Stage tests is simply that they are almost a year younger when they sit them. While August-born children do benefit from starting school earlier rather than later (for example, in the September, rather than the January or the April, of their Reception Year), this makes only a modest positive contribution, and its effect has generally disappeared by Key Stage 3. Other policy options are clearly needed in order to tackle this August birth penalty. We return to this issue in Chapter 9. Before we do so, however, Chapter 8 investigates whether the August birth penalty differs across key sectors of the school population.

8 Subgroup Analysis of the August Birth Penalty

The results presented so far in this report have shown that August-born children, on average, perform significantly worse than September-born children in all Key Stage tests, from age 5 to age 18. In this chapter, we assess whether the magnitude of this August birth penalty varies across different groups of the student population.

We carried out our analysis on a number of subgroups:

- students who are eligible for free school meals (a proxy for low family income) vs. students who are not;
- students who live in one of the 20 per cent most deprived Super Output Areas (SOAs)[89] vs. students who do not;

[89] A Super Output Area comprises approximately 1,500 households.

- students of Black Caribbean ethnic origin vs. students of White British ethnic origin;
- students of Black ethnic origin vs. students of White British ethnic origin;
- students of Pakistani or Bangladeshi ethnic origin vs. students of White British ethnic origin.

However, we focus our attention in this chapter on the first group: students who are eligible for free school meals (FSM) compared with those who are not. This is for two reasons. First, the analysis that compares students according to the neighbourhood in which they live produces broadly similar results to the analysis that compares students according to FSM status. This is perhaps not surprising, given that neighbourhood deprivation may too be considered a proxy for low family income (albeit a somewhat poorer one, given that the measure of deprivation used is based on the average characteristics of 1,500 households, rather than on the individuals themselves). Second, estimates of the magnitude of the August birth penalty across ethnic groups do not show many significant differences. This suggests that being born in August (rather than September) disadvantages children from all ethnic groups equally.[90] This is an interesting finding in itself but, given that the purpose of this chapter is to highlight differences across particular subgroups, we do not discuss these results any further here.[91]

This chapter now proceeds as follows: in Section 8.1, we discuss how our subgroups are defined; in Section 8.2, we compare the magnitude of the mean August birth penalty[92] by FSM status for individuals in each of our three groups, while in Section 8.3, we make similar comparisons across the ability distribution;[93] Section 8.4 concludes.

[90] However, often, September-born children of non-White-British ethnic origin score significantly lower than September-born children of White British ethnic origin, so that while the magnitude of the August birth penalty may not differ significantly across ethnic groups in percentage point terms, it may be somewhat larger in percentage terms. Further details are available from the authors on request.

[91] Results are available from the authors on request.

[92] In terms of standardised average point score, the proportion of individuals reaching the expected level and special educational needs status.

[93] We do not do this for our youngest group because the one-in-ten sample means that we do not have enough individuals to make our analysis robust.

Defining our subgroups

Eligibility for free school meals is recorded annually in the Pupil Level Annual School Census. This census was first carried out in 2001–02, and the last year for which we hold data is 2005–06. The impact of these limitations on the ages at which we observe FSM eligibility for our three groups of interest is shown in Table 16.

With this in mind, we record FSM status at age 5 for our first group, age 11 for our second group and age 16 for our third group. It would be preferable if we could observe eligibility at the time of school entry (given that it is a characteristic that can change over time); however, the fact that approximately 49 per cent of pupils who were eligible for free school meals in 2001–02 were still eligible in 2005–06[94] means that FSM eligibility recorded after school entry may be a reasonable approximation for our purposes. Furthermore, unless income levels or eligibility criteria have changed considerably over this period, it is not clear, a priori, in which direction estimates are likely to be biased by potentially misrecording eligibility in some cases.

Mean August birth penalty, by free school meal status

Group 1: children born in 1997–98 or 1998–99

Table 17 provides estimates of the mean August birth penalty for students who are and are not eligible for free school meals for our youngest group (for whom FSM status is recorded at age 5).

The following key points emerge from this analysis:

- In terms of standardised average point scores, at both the Foundation Stage and Key Stage 1, September-born students who are *not* eligible for free school meals always score above average: for example, girls (boys) at the Foundation Stage score 0.559 (0.310) standard deviations above average. For September-born students who *are* eligible for free school meals, on the other hand, only girls at the Foundation Stage perform above average; girls

[94] Authors' calculations using 2001–02 and 2005–06 PLASC data.

at Key Stage 1 and boys at both levels score below average. This is particularly pronounced for September-born boys at Key Stage 1, who score 0.402 standard deviations below average.

- For both girls and boys at the Foundation Stage, the August birth penalty is larger for students who are eligible for free school meals than it is for students who are not; however, these differences are not significant at conventional levels (5 per cent or below). This may reflect the relatively small sample sizes that we are dealing with – we only have a one-in-ten sample for this group – because the actual point estimates are quite large: 0.179 standard deviations for girls and 0.120 standard deviations for boys.
- Interestingly, at Key Stage 1, the increase in the August birth penalty associated with FSM eligibility is greater for boys (0.122 standard deviations) than it is for girls (0.048 standard deviations) in terms of the standardised average point score, but greater for girls (9.3 percentage points) than it is for boys (for whom there is an insignificant August birth *premium* of 1.4 percentage points) in terms of the proportion achieving the expected level.[95] Furthermore, the proportion of FSM-eligible September-born children who reach the expected level overall at Key Stage 1 is much lower than it is for September-born children who are not eligible for free school meals, so that the difference is even greater in percentage terms: August-born girls who are eligible for free school meals are 56.7 per cent less likely (than September-born girls who are eligible) to reach the expected level, while August-born girls who are not eligible are 30.6 per cent less likely (than September-born girls who are not eligible) to do so.
- The only significant difference that we observe for Group 1 comes in terms of the proportion of August-born girls who are reported to have a non-statemented (i.e. less severe) special educational need. While August-born girls who are not eligible for free school meals are equally likely to have been diagnosed with non-statemented SEN as non-eligible September-born girls, August-born girls who are eligible for free school meals are 7.6 percentage points (125 per cent) more likely to have a non-statemented special educational need than FSM-eligible September-born girls, a difference (significant at the 5 per cent level) of 6.6 percentage points.[96]

[95] Although none of these differences is significant at conventional levels.

[96] FSM-eligible August-born boys also face a disadvantage compared with non-eligible August-born boys, being 4.3 percentage points more likely to have been diagnosed with a non-statemented special educational need, but this difference is not significant. Again, this may be the result of small sample sizes.

Group 2: children born in 1990–91 or 1991–92

Table 18 presents estimates of the mean August birth penalty by FSM status for students in Group 2 (for whom eligibility is recorded at age 11).

The table shows the following:

- The attainment gap between students who are eligible for free school meals and students who are not is particularly clear for this group: September-born girls and boys who are *not* FSM-eligible score, on average, above the mean at all Key Stages, while September-born girls and boys who *are* FSM-eligible score, on average, below the mean in all tests. Furthermore, this gap increases with age – from 0.602 (0.639)[97] standard deviations for girls (boys) at Key Stage 1 to 0.751 (0.803) standard deviations at Key Stage 3 – indicating that the impact of FSM status (relative to age) increases over time.
- At Key Stage 1, the August birth penalty in terms of standardised average point scores for girls (boys) who *are* eligible for free school meals is 0.060 (0.051) standard deviations greater than for girls (boys) who are *not* eligible for free school meals; these differences are significant at the 1 per cent level.
- In contrast to the findings for our younger group, the magnitude of the August birth penalty – in terms of the proportion of students who reach the expected level overall at Key Stage 1 – differs significantly by FSM status for boys but not for girls; moreover, the difference for boys is positive. This means that the August birth penalty is smaller for boys who are eligible for free school meals than it is for boys who are not eligible for free school meals (albeit from a much lower base): FSM-eligible August-born boys are 23.3 percentage points (58 per cent) less likely to reach the expected level than FSM-eligible September-born boys, while non-FSM-eligible August-born boys are 26.9 percentage points (41 per cent) less likely to reach the expected level than non-FSM-eligible September-born boys.
- By Key Stage 2 (age 11) and Key Stage 3 (age 14), the only differences by FSM status that are significant at conventional levels are for August-born girls at the expected level: the August birth penalty for girls who are eligible for free school meals is 2.3 percentage

[97] These figures are calculated by subtracting the average score for FSM-eligible September-born children from the average score of non-FSM-eligible September-born children.

points larger than it is for girls who are not eligible for free school meals at Key Stage 2, and 2.0 percentage points larger at Key Stage 3.[98]

- Interestingly, September-born children who are eligible for free school meals are more likely to have been diagnosed with statemented (more severe) and non-statemented (less severe) special educational needs than September-born children who are not eligible for free school meals. This is particularly true for boys with non-statemented SEN: nearly one-third of September-born boys who are eligible for free school meals have been diagnosed with non-statemented SEN compared with 18 per cent of September-born boys who are not eligible. Further, the existence of an August birth penalty means that almost 45 per cent of August-born boys who are eligible for free school meals are recorded as having non-statemented special educational needs.
- The August birth penalty is significantly larger for girls who are eligible for free school meals than it is for girls who are not eligible for free school meals, in terms of both statemented and non-statemented SEN, while it is also significantly greater for August-born boys in terms of non-statemented SEN. For example, the August birth penalty for girls (boys) who are eligible for free school meals in terms of non-statemented SEN is 4.2 (2.0) percentage points larger than it is for girls (boys) who are not eligible for free school meals.

We also carried out similar analysis across admissions policy areas, the results of which can be found in Appendix K. In almost all cases, there is no evidence of any differential impact of admissions policy choice according to FSM status. The only exceptions are in terms of the proportion of August-born girls diagnosed with statemented special educational needs in Policy C areas[99] and the proportion of August-born girls reaching the expected level at Key Stage 1 in Policy C and Policy O areas. Interestingly, both differences at Key Stage 1 are positive, indicating that the August birth penalty is smaller for girls who are eligible for free school meals than it is for girls who are not. This suggests that August-born girls who are not eligible for free school meals suffer more as a result of starting school later (or, equivalently,

[98] This is similarly true for Group 3 at these Key Stages (the results for which can be found in Appendix J) – the only significant difference is for girls at Key Stage 3, where the August birth penalty for those who are eligible for free school meals is 1.7 percentage points greater than it is for girls who are not eligible for free school meals.

[99] The additional August birth penalty, over and above that for girls in Policy B areas, is 3.1 percentage points larger for FSM-eligible August-born girls in Policy C areas than it is for non-FSM-eligible August-born girls in Policy C areas.

receiving fewer terms of schooling) than August-born girls who are eligible for free school meals.[100]

Group 3: children born in 1985–86, 1986–87 or 1987–88

Table 19 presents estimates of the mean August birth penalty at Key Stage 4 and Key Stage 5[101] by FSM status for students in Group 3; for this group, eligibility is recorded at age 16.

The key results for this group indicate the following:

- For both boys and girls, the proportions of FSM-eligible September-born students reaching the expected level at Key Stage 4 and Key Stage 5 are much lower than they are for non-FSM-eligible September-born students. Moreover, these differences appear to be greater for academic qualifications at Key Stage 4, but greater for vocational qualifications at Key Stage 5. For example, the penalty associated with low family income (as measured by FSM eligibility) is 30.1 percentage points (44 per cent) for girls achieving a Level 2 qualification via an academic route, but 26.8 percentage points (34 per cent) for girls achieving a Level 2 qualification via any route, while the differences are 26.7 percentage points (58 per cent) and 29.3 percentage points (55 per cent) for Level 3 qualifications achieved via an academic or any route respectively.
- The August birth penalty does not differ significantly (at least at conventional levels) by FSM status for any of the academic outcomes under consideration at Key Stage 4 or Key Stage 5.[102] However, there remain significant differences for girls in terms of statemented and non-statemented SEN and for boys in terms of non-statemented SEN: students who are eligible for free school meals are significantly more likely to have been diagnosed with SEN – by 1.3 (1.4) percentage points for girls (boys) in terms of non-statemented SEN, for example.

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[100] This may suggest that August-born girls who are not eligible for free school meals are more ‘school-ready’ than August-born girls who are eligible.

[101] Estimates for Key Stage 2 and Key Stage 3 outcomes can be found in Appendix J.

[102] August-born boys who are eligible for free school meals are 1 percentage point more likely to receive a Level 3 qualification via an academic route than are August-born boys who are not eligible for free school meals, but this result is only significant at the 10 per cent level.

August birth penalty across the ability distribution, by free school meal status

Tables 20 and 21 present estimates of the August birth penalty (in terms of standardised average point scores) for girls and boys respectively in the 10th, 25th, 50th, 75th and 90th percentiles of the ability distribution, by FSM status. These estimates are for individuals in our middle group (Group 2), for whom we have Key Stage 1, Key Stage 2 and Key Stage 3 results. For our youngest group (Group 1), the fact that we only have a one-in-ten sample means that sample sizes are too small for our analysis to be meaningful. We have also carried out this analysis on individuals in our older group (Group 3), the results of which can be found in Appendix L.

From Tables 20 and 21, the following points are clear:

- For both boys and girls, the difference in standardised average point scores between September-born students who are eligible for free school meals and September-born students who are not is greater at the top of the distribution than it is at the bottom. For example, in the 10th percentile of the ability distribution, FSM-eligible September-born girls (boys) score 0.410 (0.413) standard deviations lower than September-born girls (boys) who are not eligible for free school meals, whilst in the 90th percentile of the ability distribution, their scores are 0.794 (0.848) standard deviations lower.
- Furthermore, at Key Stage 1 and Key Stage 2, the magnitude of the August birth penalty for individuals who are *not* eligible for free school meals is greater for girls and boys at the bottom of the ability distribution than it is for girls and boys at the top (as it was for the sample as a whole; see Section 5.2), but for individuals who *are* eligible for free school meals the August birth penalty is of roughly similar magnitude across the ability distribution. For example, at Key Stage 1, while the August birth penalty for girls who are *not* eligible for free school meals is 0.603 standard deviations in the 10th percentile of the ability distribution and 0.530 standard deviations in the 90th percentile, it is 0.657 and 0.656 standard deviations respectively for girls in the 10th and 90th percentiles of the ability distribution who *are* eligible for free school meals.

- At Key Stage 3, on the other hand, the August birth penalty for individuals who are eligible for free school meals is now greater for boys and girls at the top of the ability distribution than it is for boys and girls at the bottom (although this may, at least partly, be due to censoring; see Section 5.2). For example, FSM-eligible August-born girls (boys) in the 10th percentile of the ability distribution score 0.174 (0.136) standard deviations lower than FSM-eligible September-born girls (boys), while for girls (boys) in the 90th percentile of the ability distribution, the August birth penalty is 0.226 (0.212) standard deviations.[103]

Conclusions

The results presented in this chapter have highlighted some significant differences between children who are and are not eligible for free school meals in terms of the extent to which August-born children are penalised (relative to September-born children) in academic tests, simply because of their age. Perhaps more important, however, is the lack of significant differences found amongst many of the subgroups we initially considered, including those for different ethnic groups. This suggests that, in most cases, August-born children, regardless of observable characteristics, face the same disadvantage relative to September-born children. This suggests that we will not need to tailor policy recommendations (discussed in the next chapter) to particular subgroups: in theory, all August-born children should benefit from the suggestions we make.

9 Policy Implications and Conclusions

It is clear from the results presented in Chapters 5 to 8 of this report that both cognitive outcomes and special educational needs status are affected by date of birth: children born in September will, on average, perform significantly better in academic tests (and are significantly less likely to have been diagnosed with special educational needs) than children born in August, simply because they start school (and sit the tests) up to a year later.

The work of Chapter 7 suggests that these differences (at least in terms of Key Stage test results) arise predominantly because August-born children are almost a year younger than

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[103] This is also true at Key Stages 3 and 4 for our older group; see Appendix L.

September-born children when they sit the tests.[104] Further, these disparities remain significant at ages 16 and 18, so that date of birth may be influencing decisions over whether to stay in education or to leave school and enter the labour market. This cannot be optimal from an efficiency or an equity perspective. It seems clear that some form of policy change is necessary to ensure that this inequity does not continue.

We discuss some possible policy options in Section 9.1, before Section 9.2 concludes.

Policy options

Age normalisation of test results

One of the easiest and most effective solutions would be to explicitly recognise the age differences of students and accordingly age normalise Key Stage test results (including results used to generate school league tables and those used to sort children into classes on the basis of ability,[105] discussed further below). The aim using this approach would be to ensure that the proportion of students reaching a particular grade at a particular Key Stage does not vary by month of birth. The argument for this option is that somebody always has to be the youngest in any given year, and no policy is going to get around this fact; what one needs to ensure instead is that being the youngest does not unnecessarily penalise students who get the 'unlucky' summer birth draw.

Of course, age normalisation cannot continue for ever. At the point at which students leave the education system – for example, to enter the labour market – it is important that test results measure *actual* levels of human capital rather than some age-normalised version. For this reason, we argue that age normalisation should only be implemented up to age 14. However, given that there is still evidence of an August birth penalty at age 16 – and that many providers of further education require some minimum level of attainment in order for students to progress – it seems sensible to determine whether a child stays on in education

[104] Whilst part of the disparity at early ages arises because spring- and summer-born children in some local education authorities receive less schooling than their autumn-born counterparts (because of the admissions policies that are in place), this only accounts for a small amount of the difference, and these length of schooling (age of starting school) effects have largely disappeared by age 14 (Key Stage 3).

[105] The idea here would be that children were streamed according to potential (rather than actual) attainment.

beyond age 16 (and what type of provision they opt for) on the basis of age-normalised scores, to ensure that summer-born children are not penalised.

There are a number of ways age normalisation could be implemented, but it seems clear to us that simplicity is of the essence and that no child should be made worse off through this option. Broadly speaking, there are two (only slightly different) ways of ensuring that the proportion of children achieving a particular level does not differ according to month of birth:

1. One option is to use the proportion of September-born children reaching each level as the base, and then adjust the cut-off for other months of birth to ensure that the proportion of children getting each level is the same as that observed for September-born children. So, for example, if 50 per cent of September-born children achieved at least a grade C in maths at GCSE by scoring over 60 marks, then this process would check to see how many marks August-born children would need to have scored in order to ensure that 50 per cent of them achieved at least a grade C (and similarly for other months).
2. The other option is to obtain a (linear[106]) estimate of the drop-off in test scores associated with month of birth, and then simply inflate the scores of younger children accordingly – hopefully ensuring that the proportion of children achieving each level is similarly increased. So, for example, we would increase the scores of October-born children by one times this figure, those of November-born children by two times this figure and those of August-born children by 11 times this figure.

We have simulated the effects of Option 2 for Group 2 (those born in 1990–91 or 1991–92) and we present the results in Table 22.[107] We have concentrated on age normalising Key Stage 2 and Key Stage 3 scores, for which we have a continuous measure of the average point score (typically used to calculate value-added scores). The age correction factor was obtained by regressing each outcome of interest on month of birth (and cohort dummies) in order to obtain an estimate of the drop-off in test scores arising from a one-month reduction in age. The scores of children born from October to August were then adjusted and the entire sample

[106] The assumption of linearity is not strictly necessary but avoids complications arising from cohort-specific differences in the performance of different months of birth. Further, our work suggests that linearity is not an unreasonable assumption to make.

[107] Note that the sample is slightly smaller than that used in the previous chapters, because we have only included individuals for whom we have a continuous point score; hence the unadjusted outcomes are slightly different from those seen in Chapter 5. In calculating whether a person achieves the expected level or above the expected level, we have based our assessment on the average of the continuous point score, together with the cut-offs used for individual subject scores.

re-standardised (to have mean 0 and standard deviation 1). This is why September-born children now score much closer to the mean than they did before age normalisation (with girls slightly above and boys slightly below in most cases).

The results from Table 22 show that even with a very simple age-normalisation process, applied in an identical manner to boys and girls, most of the August birth disadvantage can be eliminated, at least in terms of average point scores. Where significant differences remain, they tend to be relatively small and not always negative (for example, the proportion of August-born girls achieving above the expected level at Key Stage 2 is now 1.1 percentage points *higher* than the proportion of September-born girls doing so).

The biggest anomaly that remains following age normalisation is in terms of the proportion of children achieving the expected level. In reality, the Department for Children, Schools and Families (DCSF) would not want this to vary by month of birth. To ensure that it did not, one would need to consider every test in every Key Stage exam, and set grade cut-offs accordingly (as outlined in Option 1 above). If the total number of marks in each test remained constant across years (which it does not at present), then it would be possible to give schools a table indicating the total number of marks needed to achieve at (or above) the expected level for pupils born in each month.

Of course, unless DCSF is happy to collect all results, carry out these adjustments and then pass age-normalised results back to schools to pass on to their pupils, this will necessarily require cut-offs to be calculated using results from previous cohorts. (This is equally true for the linear adjustment factor required for Option 2.) Further, the use of continuous point scores (to obtain more accurate cut-off or age-correction information) means that, when applied to more discrete points systems, age normalisation may not achieve exactly the desired result. For example, if it is calculated that August-born children need to score 25.25 points in order to achieve a Level 4 at Key Stage 2 but teachers only know whether someone scored 25 or 26 points, then some children who scored 25 marks will (wrongly) not be awarded the expected level, simply because the system does not allow sufficient flexibility.[108]

[108] Of course, this may be a relatively minor problem.

If either of these age-normalisation systems were to be introduced, then clearly the proportions of children achieving at and above the expected level would go up for all Key Stages. This may mean that formerly unmet government targets for Key Stage 2 results, for example, would then be met. This will no doubt be very appealing to politicians. But it appears to us that perhaps part of the reason why targets are not being met is that they are simply too difficult for some summer-born children to achieve. This is not necessarily because they are less able than their September-born counterparts; it may simply be because they are younger when they sit the tests. We return to this point in Section 9.1.2.

Finally, it is not just individuals who may benefit from age normalisation of test scores; schools – particularly primary schools, where the yearly intake tends to be smaller – may benefit too. This is because the age distribution of pupils in a particular year will affect outcomes – and consequently school league tables – in a way that is totally unrelated to the effort put in by pupils or teachers, which cannot be helpful. As such, it might be useful for league tables to be based on age-normalised scores as well.

With this in mind, we have looked at how school rankings – on the basis of Key Stage 2 and Key Stage 3 results for Group 2 individuals – would have changed if age normalisation had been in operation. We calculate that at Key Stage 2, 70 per cent of primary schools would have changed rankings within their LEA as a result of age normalisation; in some cases, the number of places by which schools would have shifted is substantial: this is particularly true for schools in Lancashire, Essex, North Yorkshire and Kent. At Key Stage 3, 20 per cent of secondary schools would have changed rankings (with the same four LEAs again experiencing the largest movement).

If implemented sensibly and alongside measures (discussed in Section 9.1.6) that are designed to make teachers and/or parents more aware of the impact of relative age, the option of age normalisation seems to us a potentially powerful way of eliminating (or at least reducing) the August birth penalty and ensuring that August-born children (and their parents) are given a much more accurate picture of their true academic achievement *given their age*.

Testing when ready

The government has already announced that it is piloting a scheme (the 'Making Good Progress' programme) to introduce greater flexibility into the current testing system. This pilot allows children to sit Key Stage 2 and Key Stage 3 tests in English and maths when they are ready to do so, rather than at a prescribed time as happens at the moment. Under the pilot scheme, tests would be offered twice yearly between Year 3 (age 7, when children start following the Key Stage 2 curriculum) and Year 9 (age 14, when they stop following the Key Stage 3 curriculum). This would allow pupils to sit Key Stage 2 tests up to four years earlier (or three years later) than is currently permitted and to sit Key Stage 3 tests up to seven years earlier.[109]

It is not yet clear how such a system would record results in school league tables, but one relatively simple way of doing this would be to use the age at which each child achieves a particular outcome. If outcomes were measured in this way, then age normalisation would happen by default, and school results for Key Stage 2, for example, could report the average age at which a child in Year 6 obtained Level 2, Level 3, Level 4 and so on.[110]

Furthermore, it seems to us that this system would be most effective if expected levels were also set in this way. So, for example, the government might decide that it expects all children to reach Level 4 by age 11 years 0 months (rather than 11 years 8 months for September-born children and 10 years 9 months for August-born children, as essentially happens under the current testing system), with the same approach similarly applied to all levels. This means that August-born children would necessarily be expected to sit the tests, on average, 12 months later than September-born children,[111] which might be useful for teachers, students and parents in determining how a particular child is progressing. For example, under this system, if an August-born child were entered for a particular test at the same time as a September-born child, then this would be recognised as a greater achievement for the August-born child

[109] It is not clear how sitting Key Stage 3 tests earlier would affect the start of the Key Stage 4 curriculum.

[110] Of course, this may reflect outcomes obtained at different schools, but this is also true with the current Key Stage 2 test results.

[111] If Key Stage tests can be taken only every six months (as under the current pilot scheme), then the age by which children may be expected to have reached a particular level should also be set according to six-monthly intervals (to avoid introducing other month-of-birth penalties).

than for the September-born child (whereas this is what is expected of both children under the current system).

However, it is not clear to us how this option alone would act to reduce the August birth penalty present in Key Stage 4 and Key Stage 5 results – unless behavioural factors (for example, in terms of increased motivation and/or self-belief) improve the performance of currently low-scoring students, including summer-born children, enough to reduce or eliminate this gap. Of course, this policy could be implemented alongside the option of age normalisation of Key Stage 4 outcomes (at least when assessing progression to Key Stage 5, as outlined in Section 9.1.1).

Testing before progression

Under the 'testing when ready' system described in Section 9.1.2, children of widely differing abilities would remain in the same year group (as happens at the moment). If this were considered undesirable, then an alternative option would be to test students at the end of each school year, for example, and to use these results to determine whether children should be allowed to progress to the next stage.

Our results on Key Stage 4 and Key Stage 5 suggest that this option might help to reduce the August birth penalty, as the difference between the proportions of August- and September-born students achieving Level 2 qualifications (equivalent to five GCSEs at grades A*–C) decreases between age 16 and age 18. In other words, our results suggest that August-born students take slightly longer to reach a given level but they get there in the end. This logic could, of course, also be applied to the 'testing when ready' approach outlined above.

There would be many things to consider if such a policy were to be piloted. For example, should children be held back at all Key Stages or only at some (for example, at Key Stage 2, as suggested by the Conservative Party[112])? What happens if a child simply cannot progress past a particular Key Stage? The risk of stigmatisation, which may result from being held back, will clearly increase. More specifically, should students be held back if they do not

[112] See www.telegraph.co.uk/opinion/main.jhtml;jsessionid=AQQXNPSCZ2FYPQFIQMFSFFOAVCBQ0IV0?xml=/opinion/2007/09/02/do0204.xml.

achieve the expected level in all subjects? Or in any subject? Or just in English and maths? Should children only be held back for one year at most, or for as long as it takes them to reach the expected level? What about children with special educational needs?

Clearly, such a system could interfere with the school admissions process as a whole. Under the current approach, successful school applicants are usually told that they have secured a place well before end-of-year test results are known. However, under a ‘testing before progression’ system, until schools know the number of children progressing and the number being held back, it will be extremely difficult for them to know how many places they are likely to have available at the start of each new academic year.

Furthermore, for this policy to be successful, it is important that the right children are held back. Presumably, the government would not want to hold back children who do not reach the expected level at one Key Stage but do reach it at the next. To reduce the risk of holding back such children, it is important that early Key Stage results (particularly whether or not a child reaches the expected level) are good predictors of later Key Stage results. With this in mind, Tables 23 and 24 present transition matrices for August- and September-born girls and boys in Group 2 (born in 1990–91 or 1991–92) as they progress from Key Stage 1 to Key Stage 2 and from Key Stage 2 to Key Stage 3 respectively.[113]

Tables 23 and 24 clearly show that the probability of wrongly holding back an August-born child (by which we mean someone who does not achieve the expected level overall at Key Stage 1 (2), but does at Key Stage 2 (3)) is much greater than the probability of wrongly holding back a September-born child – particularly at earlier Key Stages. So, for example, if we consider transitions between Key Stage 1 and Key Stage 2, we see that 21.7 (26.2) per cent of August-born girls (boys) would be wrongly held back on the basis of these results, while only 11.3 (15.1) per cent of September-born girls (boys) would be. Whilst the potential for misallocation has been considerably reduced by Key Stage 2, there remain differences between August- and September-born children in the same direction. This suggests that other criteria (such as teacher expectations) would need to be considered alongside academic

[113] In Appendix M, we consider transition matrices for English and maths results separately. These show broadly similar patterns to those found overall.

performance when deciding which children would benefit from being held back – which may introduce greater potential for bias.[114]

Flexible school starting dates

Another option that might reduce the August birth penalty is to allow flexibility over the age at which children can start school. This already happens in many other countries. If the current statutory requirement – that children must have started school by the beginning of the term following their fifth birthday – were to remain in place, then the only children who could delay entry by up to a year and still satisfy this requirement are those born between May and August (the children about whom we are most concerned). (Children born September to December could only delay entry by up to one term, and children born January to April could only delay entry by at most two terms.)

If the option of flexible school starting dates were to be implemented, then the government would need to think carefully about exactly who would be allowed to decide at what age a particular child started school. Would it be solely a parental decision? Or would nurseries also play a role? Currently, 3- and 4-year-olds who have not yet started school are only entitled to 12½ hours of free nursery provision per week.[115] Thus there may be some concern that if parents are involved in the decision-making process, it is more likely to be middle-class parents who take advantage of this flexibility, while children from more disadvantaged backgrounds – whose parents need the extra hours of free childcare that school provides to make work affordable – may not benefit. Given these issues, it seems clear to us that if flexibility over school starting age were to be seriously considered, then full-time nursery provision would need to be offered as an alternative to full-time schooling.

Further, if it were the responsibility of nurseries to determine the age at which children started school, then on what criteria would they base their decisions? Perhaps performance in the Foundation Stage Profile could be used. To inform this discussion, Table 25 presents transition matrices (similar to those shown in Section 9.1.3) for outcomes across the Foundation Stage and Key Stage 1. As the literacy and numeracy components of the

[114] For example, teachers might be more likely to recommend that disruptive August-born children are moved on to the next level (even if they are not academically ready) if it meant they would no longer be teaching them.

[115] This is due to increase to 15 hours per week in April 2010.

Foundation Stage Profile are the best predictors of Key Stage 1 outcomes (as shown in Chapter 3), we focus on whether individuals achieved, on average, at least six out of nine points across these components (which we refer to here as the expected level).

Table 25 shows that the proportions of students who would be wrongly prevented from starting school at the usual age on the basis of their results at the Foundation Stage are quite low (compared with those for Key Stage 1 in Table 23); however, it remains the case that August-born children are more than twice as likely to be incorrectly held back as September-born children. This suggests that other factors would also need to be taken into consideration to ensure that this policy eliminates (or at least reduces) the August birth penalty.

Changing the age at which free nursery education can be accessed

Every child in England is currently entitled to 12½ hours of free nursery education per week[116] from the beginning of the term after they turn 3 until the beginning of the term in which they start school. This means that summer-born children in Policy B areas (in which all children start school in the September of the academic year in which they turn 5) receive two terms less nursery provision than their autumn-born counterparts. In Policy E areas (in which children born 1 September to 29 February start school in the September of the academic year in which they turn 5, while children born 1 March to 31 August start school in the January of the academic year in which they turn 5), summer-born children spend one term less in nursery and one term less in school, while in Policy C areas (in which children start school at the beginning of the term in which they turn 5), summer-born children receive the same amount of nursery education as, but spend two terms less in school than, their autumn-born counterparts.

Given that August-born children are the youngest in their year (with all the consequent disadvantages that this entails), it is hard to see why they should not be able to access free nursery provision from the beginning of the academic *year* in which they turn 3 rather than the beginning of the *term* after they turn 3. Assuming that August-born children are able to benefit from this extra nursery provision (despite being extremely young when they access

[116] This is due to increase to 15 hours per week in April 2010.

it),[117] this policy may help to reduce the August birth penalty for children across all admissions policy areas.

Other options

There are a number of more minor policy changes that could be implemented alongside any of the above options for reform, or, indeed, without making any fundamental changes to the education system (although on their own they are unlikely to be successful in entirely eliminating the birth penalty).

Our findings from Chapter 7 regarding the age of starting school (length of schooling) effect suggest that if all LEAs adopted Policy B (in which all children start school in the September of the academic year in which they turn 5), then the outcomes (at least at the earliest Key Stages) of the youngest members of each cohort in current non-Policy-B areas would improve (or at least not worsen).

Perhaps more fundamentally, it does not appear that the issue of age and its relationship with test scores features in the current teacher training programme. This means that newly qualified teachers (and possibly, as a consequence, the parents of young children) may not realise how big an impact relative age has on test scores. Raising awareness of this issue seems to be a vital first step towards any potential tailoring of classroom tuition towards children of different ages.[118]

With this in mind, it might be useful for further research to consider whether particular types of schools, or particular educational approaches, work especially well for the youngest children. This could perhaps be accomplished by comparing schools that are particularly good at reducing the average age disparity over time with schools that are not quite so good at it, with a view to putting forward suggestions for best practice in this area.

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[117] Our results for August-born children at age 5 suggest that this may be plausible.

[118] This may be particularly true for non-statemented special educational needs: greater awareness of the expected performance of August-born children compared with others in their class may reassure parents that their child does not necessarily have special educational needs simply because they are progressing more slowly than their peers.

Conclusions

This report has shown that there is a significant penalty associated with date of birth, such that the youngest children in a particular year perform significantly worse in academic tests (and in terms of the likelihood of being diagnosed with a special educational need) than the oldest children. Furthermore, this penalty remains significant until age 18, so that it may potentially affect further and/or higher education choices.

We have shown that the driving force behind this penalty is simply that summer-born children have to sit the Key Stage tests up to 11 months earlier than their autumn-born counterparts. Adopting an admissions policy in which summer-born children start school younger than (but consequently receive the same amount of schooling prior to the tests as) their autumn-born counterparts can reduce the magnitude of this penalty – at least in tests up to age 14. But much more is needed to remove this penalty entirely.

A number of policy options have been put forward in this report. In our opinion, the simplest and least disruptive option would be to age normalise all test results up to age 14, plus those at age 16 when they are used to determine progression to post-compulsory education but not when students are leaving the education system (at which point results should reflect true human capital acquisition). This would, by construction, ensure that the month in which you are born does not affect the likelihood of achieving at or above the expected level in a particular test, so that there would be no birth penalty from age 5 (Foundation Stage) to age 14 (Key Stage 3); furthermore, the month in which you are born should not affect the probability of staying on in education beyond age 16.

It might also be possible to achieve essentially the same outcome via the current 'Making Good Progress' pilot, which allows children to take Key Stage 2 and Key Stage 3 English and maths tests 'when ready'. However, in our opinion, this would only achieve the same outcome as age normalisation if performance were to be recorded through the age at which children reach a particular level (alternatively, through the average age at which children in a particular school year reach the various levels). Furthermore, it would be useful if the expected and above-expected levels were set according to age, rather than school year as currently happens.

Increased flexibility over the age at which children can start school is another possibility, but we feel that this should only be considered alongside the option of full-time (school hours) nursery provision for those who defer school entry (however this decision is made). Otherwise, one risks creating division along socioeconomic lines if, for example, parents from poorer socioeconomic backgrounds are more reluctant to delay entry because they are unable to make appropriate alternative childcare arrangements. Furthermore, one needs to be aware of the potential implications of 'wrongly' holding back children on the basis of Foundation Stage results, for example.

What is clear from this report is that there is a significant inequity that should be urgently addressed: August-born children are, on average, being penalised, simply because of an unlucky birth draw. This is not acceptable on either equity or efficiency grounds.

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Table 1 Admissions policy information, by group

	Group 1	Group 2	Group 3
Single entry point			
Policy B	48.5%	43.4%	38.3%
Two entry points			
Policy A	1.5%	0.6%	0.7%
Policy D	1.1%	0.6%	0.6%
Policy E	14.0%	7.8%	6.4%
Policy F	0.0%	0.3%	0.3%
Three entry points			
Policy C ('rising 5s')	7.5%	16.1%	22.4%
Policy H (statutory)	0.5%	1.5%	1.6%
Other			
Policy O	26.9%	29.6%	29.7%

Notes:

Figures may not sum exactly due to rounding.

Table 2 Summary of non-standardised scores for all available compulsory school outcomes for our three groups, by gender

	Group 1: Children born in 1997–98 or 1998–99		**Group 2: Children born in 1990–91 or 1991–92**		**Group 3: Children born in 1985–86, 1986–87 or 1987–88**	
	Girls	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**
Foundation Stage						
Mean	92.97	87.46				
Standard deviation	18.10	20.33				
Key Stage 1						
Mean	15.97	14.99	15.12	14.22		
Standard deviation	3.57	3.97	3.68	3.98		
Key Stage 2						
Mean			27.41	26.99	26.00	25.61
Standard deviation			4.32	4.55	4.40	4.53
Key Stage 3						
Mean			34.57	33.74	33.43	32.64
Standard deviation			6.81	7.10	6.92	6.96
Key Stage 4						
Mean					37.18	32.98
Standard deviation					15.07	15.58
Total sample	*45,842*	*47,908*	*543,378*	*565,376*	*736,386*	*748,879*

Notes:

For simplicity, we convert Key Stage 4 results using the old scoring system into Key Stage 4 results using the new scoring system for children born in 1985–86 or 1986–87.

With the exception of the Foundation Stage results, we use a capped average point score in all cases, to ensure comparability across cohorts within a particular group.

Table 3 August birth penalty: mean differences in key outcomes at the Foundation Stage and Key Stage 1 (Group 1)

	Girls		Boys	
	Sept score	**Aug birth effect**	**Sept score**	**Aug birth effect**
Foundation Stage Profile				
Standardised average point score	0.483	–0.768***	0.238	–0.817***
Key Stage 1				
Standardised average point score	0.418	–0.623***	0.164	–0.593***
Proportion achieving expected level	0.801	–0.271***	0.705	–0.234***
Proportion achieving above expected level	0.209	–0.170***	0.139	–0.114***
Special educational needs				
Statemented	0.006	–0.001	0.016	–0.003
Non-statemented	0.033	0.020**	0.075	0.019
Number of observations	*4,273*	*3,639*	*4,329*	*3,877*

Notes:

Special educational needs outcomes are measured at age 5 for this group.

All results presented are based on an individual-level model with school fixed effects (Model 3).

All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table 4 August birth penalty: mean differences in key outcomes at Key Stage 1, Key Stage 2 and Key Stage 3 (Group 2)

	Girls		Boys	
	Sept score	**Aug birth effect**	**Sept score**	**Aug birth effect**
Key Stage 1				
Standardised average point score	0.420	–0.595***	0.195	–0.611***
Proportion achieving expected level	0.703	–0.257***	0.612	–0.263***
Proportion achieving above expected level	0.109	–0.083***	0.073	–0.058***
Key Stage 2				
Standardised average point score	0.228	–0.347***	0.132	–0.333***
Proportion achieving expected level	0.760	–0.133***	0.719	–0.128***
Proportion achieving above expected level	0.225	–0.108***	0.202	–0.098***
Key Stage 3				
Standardised average point score	0.175	–0.198***	0.059	–0.207***
Proportion achieving expected level	0.729	–0.077***	0.688	–0.085***
Proportion achieving above expected level	0.393	–0.090***	0.362	–0.087***
Special educational needs				
Statemented	0.016	0.004***	0.042	0.006***
Non-statemented	0.113	0.081***	0.205	0.094***
Number of observations	*46,125*	*46,038*	*48,526*	*47,306*

Notes:

Special educational needs outcomes are measured at age 11 for this group.

All results presented are based on an individual-level model with school fixed effects (Model 3).

All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table 5 August birth penalty: mean differences in key outcomes at Key Stage 2, Key Stage 3, Key Stage 4 and Key Stage 5 (Group 3)

	Girls		Boys	
	Sept score	**Aug birth effect**	**Sept score**	**Aug birth effect**
Key Stage 2				
Standardised average point score	0.231	–0.355***	0.140	–0.340***
Proportion achieving expected level	0.654	–0.154***	0.609	–0.150***
Proportion achieving above expected level	0.127	–0.070***	0.109	–0.058***
Key Stage 3				
Standardised average point score	0.180	–0.209***	0.072	–0.217***
Proportion achieving expected level	0.659	–0.088***	0.616	–0.097***
Proportion achieving above expected level	0.336	–0.085***	0.292	–0.075***
Key Stage 4				
Standardised average point score	0.213	–0.116***	–0.052	–0.131***
Achieved 5+ GCSEs at grades A*–C (Level 2)	0.607	–0.055***	0.503	–0.061***
Achieved Level 2 via academic route	0.653	–0.045***	0.547	–0.045***
Achieved Level 2 via any route	0.748	–0.005**	0.651	–0.014***
Key Stage 5				
Achieved Level 3 via academic route	0.425	–0.020***	0.332	–0.017***
Achieved Level 3 via any route	0.496	–0.009***	0.393	–0.016***
Special educational needs				
Statemented	0.017	0.004***	0.040	0.008***
Non-statemented	0.085	0.020***	0.141	0.035***
Number of observations	*61,703*	*63,608*	*62,926*	*64,686*

Notes:

Special educational needs outcomes are measured at age 16 for this group.

All results presented are based on an individual-level model with school fixed effects (Model 3).

All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table 6 August birth penalty in standardised average point score at Key Stage 1, Key Stage 2 and Key Stage 3, across the distribution (Group 2)

	Girls		Boys	
	Sept score	**Aug birth effect**	**Sept score**	**Aug birth effect**
Key Stage 1				
10th percentile	–0.161	–0.628***	–0.448	–0.626***
25th percentile	–0.004	–0.630***	–0.259	–0.641***
Median	0.456	–0.609***	0.243	–0.642***
75th percentile	0.843	–0.565***	0.683	–0.611***
90th percentile	0.933	–0.538***	0.800	–0.578***
Number of observations	*14,905*		*15,426*	
Key Stage 2				
10th percentile	–0.432	–0.378***	–0.571	–0.358***
25th percentile	–0.220	–0.388***	–0.341	–0.366***
Median	0.280	–0.369***	0.188	–0.360***
75th percentile	0.683	–0.324***	0.626	–0.315***
90th percentile	0.784	–0.290***	0.743	–0.278***
Number of observations	*14,493*		*14,968*	
Key Stage 3				
10th percentile	–0.941	–0.187***	–1.094	–0.183***
25th percentile	–0.330	–0.229***	–0.463	–0.244***
Median	0.272	–0.246***	0.171	–0.250***
75th percentile	0.768	–0.225***	0.684	–0.220***
90th percentile	1.102	–0.174***	1.031	–0.173***
Number of observations	*5,909*		*6,079*	

Notes:

All results presented are based on a within-school weighted quantile regression model (Model 1). The model uses the same individuals at each Key Stage but allows these individuals to change schools. The number of observations refers to the number of schools.

All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table 7 August birth penalty: breakdown by subject at the Foundation Stage and Key Stage 1 (Group 1)

	Girls		Boys	
	Sept score	**Aug birth effect**	**Sept score**	**Aug birth effect**
Foundation Stage Profile				
Standardised average point score:				
Emotional development	0.411	–0.552***	0.121	–0.628***
Literacy	0.522	–0.821***	0.248	–0.845***
Maths	0.404	–0.776***	0.300	–0.787***
General knowledge	0.282	–0.574***	0.248	–0.622***
Physical development	0.357	–0.495***	0.151	–0.657***
Creativity	0.403	–0.495***	0.063	–0.519***
Key Stage 1				
Standardised average point score:				
Reading	0.397	–0.543***	0.112	–0.542***
Writing	0.470	–0.575***	0.065	–0.533***
Maths	0.291	–0.631***	0.298	–0.585***
Proportion achieving expected level:				
Reading	0.865	–0.196***	0.770	–0.188***
Writing	0.807	–0.226***	0.659	–0.222***
Maths	0.857	–0.234***	0.839	–0.212***
Proportion achieving above expected level:				
Reading	0.425	–0.245***	0.321	–0.208***
Writing	0.291	–0.203***	0.161	–0.129***
Maths	0.314	–0.243***	0.373	–0.223***
Number of observations	*4,273*	*3,639*	*4,329*	*3,877*

Notes:

All results presented are based on an individual-level model with school fixed effects (Model 3).

All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table 8 August birth penalty: breakdown by subject at Key Stage 1, Key Stage 2 and Key Stage 3 (Group 2)

	Girls		Boys	
	Sept score	**Aug birth effect**	**Sept score**	**Aug birth effect**
Key Stage 1				
Standardised average point score:				
Reading	0.405	–0.512***	0.126	–0.517***
Writing	0.420	–0.508***	0.107	–0.522***
Maths	0.320	–0.608***	0.305	–0.633***
Proportion achieving expected level:				
Reading	0.786	–0.188***	0.682	–0.202***
Writing	0.698	–0.241***	0.554	–0.238***
Maths	0.756	–0.257***	0.737	–0.262***
Proportion achieving above expected level:				
Reading	0.444	–0.232***	0.328	–0.192***
Writing	0.151	–0.101***	0.090	–0.066***
Maths	0.293	–0.198***	0.320	–0.209***
Key Stage 2				
Standardised average point score:				
English	0.310	–0.323***	0.035	–0.326***
Maths	0.140	–0.321***	0.187	–0.301***
Science	0.155	–0.282***	0.133	–0.259***
Proportion achieving expected level:				
English	0.849	–0.098***	0.763	–0.114***
Maths	0.788	–0.121***	0.786	–0.104***
Science	0.905	–0.063***	0.897	–0.053***
Proportion achieving above expected level:				
English	0.402	–0.153***	0.288	–0.127***
Maths	0.314	–0.122***	0.367	–0.124***
Science	0.457	–0.140***	0.458	–0.133***
Key Stage 3				
Average point score:				
English	0.301	–0.202***	–0.051	–0.225***
Maths	0.107	–0.182***	0.101	–0.182***
Science	0.094	–0.162***	0.095	–0.164***
Proportion achieving expected level:				
English	0.839	–0.052***	0.715	–0.084***
Maths	0.801	–0.068***	0.789	–0.066***
Science	0.758	–0.066***	0.751	–0.067***

Proportion achieving above expected level:				
English	0.479	–0.105***	0.330	–0.092***
Maths	0.602	–0.091***	0.607	–0.089***
Science	0.428	–0.081***	0.445	–0.079***
Number of observations	*46,125*	*46,038*	*48,526*	*47,306*

Notes to Table 8

All results presented are based on an individual-level model with school fixed effects (Model 3).

All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table 9 Girls' mean August birth penalty: key outcomes at Key Stage 1, Key Stage 2 and Key Stage 3, by admissions policy area (Group 2)

	Single entry point (Policy B)		Two entry points (Policy E)			Three entry points (Policy C)			Flexible/Other entry (Policy O)		
	(i) Sept score	(ii) Aug birth effect	(iii) Sept score	(iv) Aug birth effect	(v) Diff in effect from Policy B (iv)–(ii)	(vi) Sept score	(vii) Aug birth effect	(viii) Diff in effect from Policy B (vii)–(ii)	(ix) Sept score	(x) Aug birth effect	(xi) Diff in effect from Policy B (x)–(ii)
Key Stage 1											
Standardised average point score	0.404	–0.557***	0.393	–0.627***	–0.070***	0.396	–0.642***	–0.086***	0.462	–0.619***	–0.063***
Propn achieving expected level	0.699	–0.242***	0.696	–0.274***	–0.032**	0.696	–0.280***	–0.038***	0.716	–0.263***	–0.021***
Key Stage 2											
Standardised average point score	0.220	–0.318***	0.233	–0.376***	–0.059**	0.219	–0.388***	–0.071***	0.242	–0.367***	–0.049***
Propn achieving expected level	0.759	–0.121***	0.759	–0.136***	–0.014	0.754	–0.147***	–0.025***	0.764	–0.143***	–0.022***
Key Stage 3											
Standardised average point score	0.147	–0.184***	0.164	–0.213***	–0.029	0.163	–0.221***	–0.037**	0.216	–0.207***	–0.023*
Propn achieving expected level	0.717	–0.070***	0.720	–0.078***	–0.009	0.728	–0.094***	–0.024***	0.747	–0.079***	–0.009
Special educational needs											
Statemented	0.016	0.003**	0.018	0.003	0.000	0.014	0.008***	0.005**	0.016	0.003**	0.000
Non-statemented	0.113	0.079***	0.119	0.083***	0.004	0.112	0.083***	0.004	0.110	0.084***	0.005
Number of observations	*20,069*	*19,980*	*3,649*	*3,651*		*7,287*	*7,355*		*13,667*	*13,617*	

Notes:
Special educational needs outcomes are measured at age 11 for this group.
All results presented are based on an individual-level model with school fixed effects (Model 3).
All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).
*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table 10 Boys' mean August birth penalty: key outcomes at Key Stage 1, Key Stage 2 and Key Stage 3, by admissions policy area (Group 2)

	Single entry point (Policy B)		Two entry points (Policy E)			Three entry points (Policy C)			Flexible/Other entry (Policy O)		
	(i) Sept score	(ii) Aug birth effect	(iii) Sept score	(iv) Aug birth effect	(v) Diff in effect from Policy B (iv)–(ii)	(vi) Sept score	(vii) Aug birth effect	(viii) Diff in effect from Policy B (vii)–(ii)	(ix) Sept score	(x) Aug birth effect	(xi) Diff in effect from Policy B (x)–(ii)
Key Stage 1											
Standardised average point score	0.196	–0.580***	0.161	–0.623***	–0.043*	0.151	–0.645***	–0.065***	0.228	–0.637***	–0.057***
Propn achieving expected level	0.612	–0.251***	0.600	–0.264***	–0.013	0.600	–0.275***	–0.024**	0.621	–0.273***	–0.023***
Key Stage 2											
Standardised average point score	0.135	–0.320***	0.107	–0.338***	–0.018	0.099	–0.333***	–0.013	0.151	–0.350***	–0.030**
Propn achieving expected level	0.722	–0.124***	0.715	–0.132***	–0.008	0.705	–0.122***	0.002	0.723	–0.136***	–0.012
Key Stage 3											
Standardised average point score	0.044	–0.203***	0.020	–0.195***	0.009	0.014	–0.203***	0.000	0.111	–0.218***	–0.014
Propn achieving expected level	0.683	–0.083***	0.678	–0.091***	–0.008	0.672	–0.086***	–0.003	0.705	–0.086***	–0.002
Special educational needs											
Statemented	0.040	0.007***	0.045	0.014***	0.007	0.046	0.003	–0.004	0.040	0.004*	–0.003
Non-statemented	0.204	0.091***	0.212	0.097***	0.007	0.214	0.097***	0.006	0.198	0.096***	0.005
Number of observations	*21,135*	*20,432*	*3,681*	*3,618*		*7,852*	*7,660*		*14,366*	*14,062*	

Notes:
Special educational needs outcomes are measured at age 11 for this group.
All results presented are based on an individual-level model with school fixed effects (Model 3).
All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).
*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table 11 Comparison of age at which children start school and length of schooling, by admissions policy area

	Age at which child starts school	Number of terms spent in Reception Year
Policy B		
September	5 years	3 terms
August	4 years 1 month	3 terms
September – August	*11 months*	*0 terms*
Policy E		
September	5 years	3 terms
August	4 years 5 months	2 terms
September – August	*7 months*	*1 term*
February	4 years 7 months	3 terms
March	4 years 10 months	2 terms
February – March	*–3 months*	*1 term*
Policy C		
September	5 years	3 terms
August	4 years 8 months	1 term
September – August	*4 months*	*2 terms*
December	4 years 9 months	3 terms
January	5 years	2 terms
December – January	*–3 months*	*1 term*
April	4 years 9 months	2 terms
May	4 years 11 months	1 term
April – May	*–2 months*	*1 term*

Table 12 Girls' January, March and May birth penalties: key outcomes, by admissions policy area (Group 2)

	February vs. March comparison					December vs. January comparison					April vs. May comparison				
	Single entry point (Policy B)		Two entry points (Policy E)			Single entry point (Policy B)		Three entry points (Policy C)			Single entry point (Policy B)		Three entry points (Policy C)		
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)	(xii)	(xiii)	(xiv)	(xv)
	Feb score	Mar birth effect	Feb score	Mar birth effect	Diff from Policy B (iv)–(ii)	Dec score	Jan birth effect	Dec score	Jan birth effect	Diff from Policy B (ix)–(vii)	Apr score	May birth effect	Apr score	May birth effect	Diff from Policy B (xiv)–(xii)
Key Stage 1															
Standardised APS	0.142	-0.047***	0.147	-0.102***	-0.055**	0.244	-0.053***	0.217	-0.084***	-0.030*	0.058	-0.062***	0.024	-0.103***	-0.040**
Propn achieving expected level	0.593	-0.026***	0.600	-0.051***	-0.026*	0.631	-0.018***	0.626	-0.044***	-0.026***	0.554	-0.032***	0.533	-0.036***	-0.005
Key Stage 2															
Standardised APS	0.057	-0.027***	0.083	-0.070***	-0.043*	0.119	-0.038***	0.093	-0.041**	-0.003	0.006	-0.030***	-0.008	-0.047***	-0.017
Propn achieving expected level	0.702	-0.015***	0.703	-0.015	0.001	0.725	-0.020***	0.713	-0.025***	-0.006	0.678	-0.009*	0.673	-0.017**	-0.007
Key Stage 3															
Standardised APS	0.037	-0.006	0.051	-0.038*	-0.032	0.083	-0.028***	0.066	-0.033**	-0.005	0.015	-0.020**	0.024	-0.020	0.000
Propn achieving expected level	0.678	-0.007*	0.687	-0.013	-0.006	0.695	-0.008*	0.692	-0.020***	-0.012	0.670	-0.007*	0.673	-0.002	0.006
SEN															
Statemented	0.018	0.001	0.016	0.005	0.003	0.017	0.001	0.020	-0.003	-0.005**	0.020	0.000	0.019	0.003	0.003
Non-statemented	0.151	0.003	0.150	0.006	0.003	0.137	0.007*	0.142	0.012*	0.005	0.160	0.015***	0.164	0.008	-0.007
No. of obsns	*18,444*	*19,752*	*3,242*	*3,535*		*19,015*	*19,745*	*7,179*	*7,411*		*19,217*	*20,047*	*7,099*	*7,607*	

Notes:

Special educational needs outcomes are measured at age 11 for this group.

All results presented are based on an individual-level model with school fixed effects (Model 3).

All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table 13 Boys' January, March and May birth penalties: key outcomes, by admissions policy area (Group 2)

	February vs. March comparison					December vs. January comparison					April vs. May comparison				
	Single entry point (Policy B)		Two entry points (Policy E)			Single entry point (Policy B)		Three entry points (Policy C)			Single entry point (Policy B)		Three entry points (Policy C)		
	(i) Feb score	(ii) Mar birth effect	(iii) Feb score	(iv) Mar birth effect	(v) Diff from Policy B (iv)–(ii)	(vi) Dec score	(vii) Jan birth effect	(viii) Dec score	(ix) Jan birth effect	(x) Diff from Policy B (ix)–(vii)	(xi) Apr score	(xii) May birth effect	(xiii) Apr score	(xiv) May birth effect	(xv) Diff from Policy B (xiv)–(xii)
Key Stage 1															
Standardised APS	-0.077	-0.059***	-0.137	-0.061**	-0.002	0.013	-0.043***	-0.036	-0.069***	-0.026	-0.177	-0.059***	-0.239	-0.083***	-0.025
Propn achieving expected level	0.491	-0.021***	0.484	-0.031**	-0.010	0.534	-0.019***	0.516	-0.033***	-0.013	0.453	-0.026***	0.426	-0.042***	-0.016
Key Stage 2															
Standardised APS	-0.028	-0.030***	-0.054	-0.007	0.023	0.017	-0.016*	-0.021	-0.027	-0.011	-0.074	-0.027***	-0.123	-0.035**	-0.008
Propn achieving expected level	0.658	-0.006	0.645	0.007	0.013	0.681	-0.010**	0.663	-0.013	-0.004	0.640	-0.012**	0.620	-0.004	0.008
Key Stage 3															
Standardised APS	-0.069	-0.024***	-0.117	0.037*	0.061***	-0.046	-0.005	-0.080	-0.006	-0.001	-0.104	-0.010	-0.122	-0.001	0.009
Propn achieving expected level	0.638	-0.008	0.623	0.001	0.008	0.649	-0.001	0.636	-0.003	-0.002	0.624	-0.003	0.618	0.001	0.005
SEN															
Statemented	0.044	0.001	0.054	-0.008*	-0.009*	0.047	-0.003	0.050	0.000	0.003	0.046	0.000	0.049	0.001	0.001
Non-statemented	0.246	0.013***	0.248	0.018	0.005	0.232	0.007	0.236	0.015**	0.008	0.266	0.012***	0.278	0.007	-0.005
No. of obsns	*19,302*	*20,576*	*3,433*	*3,579*		*19,813*	*20,532*	*7,229*	*7,670*		*20,247*	*20,983*	*7,439*	*7,720*	

Notes:

Special educational needs outcomes are measured at age 11 for this group.

All results presented are based on an individual-level model with school fixed effects (Model 3).

All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table 14 Decomposing the August birth penalty (standardised average point score) for girls in Group 2, by admissions policy area

	(i) Sept score	(ii) Aug birth effect	(iii) Estimated Aug birth effect (iv)+(v)+(vii)	(iv) Age effect	(v) Age of starting school effect	(vi) Diff from Policy B	(vii) Age position effect
KS1							
All policies	0.420	–0.595***	–0.589***	–0.576***	0.081***	–0.044***	–0.094*
Policy A	0.123	–0.561***	–0.599***	–0.577***	0.072***	–0.053***	–0.094*
Policy B	0.404	–0.557***	–0.545***	–0.576***	0.125***		–0.094*
Policy C	0.396	–0.642***	–0.629***	–0.576***	0.040***	–0.085***	–0.094*
Policy D	0.493	–0.519***	–0.596***	–0.574***	0.072***	–0.053***	–0.093*
Policy E	0.393	–0.627***	–0.598***	–0.576***	0.072***	–0.053***	–0.094*
Policy F	0.532	–0.524***	–0.630***	–0.576***	0.040***	–0.085***	–0.094*
Policy H	0.505	–0.641***	–0.613***	–0.576***	0.057***	–0.068***	–0.094*
Policy O	0.462	–0.619***	–0.627***	–0.576***	0.043***	–0.082***	–0.094*
KS2							
All policies	0.228	–0.347***	–0.340***	–0.254***	0.025***	–0.020***	–0.111**
Policy A	–0.041	–0.334***	–0.349***	–0.254***	0.017**	–0.028***	–0.111**
Policy B	0.220	–0.318***	–0.320***	–0.254***	0.045***		–0.111**
Policy C	0.219	–0.388***	–0.357***	–0.254***	0.008	–0.037***	–0.111**
Policy D	0.278	–0.263***	–0.348***	–0.253***	0.017**	–0.029***	–0.112**
Policy E	0.233	–0.376***	–0.349***	–0.254***	0.017**	–0.028***	–0.111**
Policy F	0.388	–0.245***	–0.358***	–0.255***	0.008	–0.037***	–0.111**
Policy H	0.298	–0.278***	–0.344***	–0.254***	0.021	–0.024	–0.111**
Policy O	0.242	–0.367***	–0.357***	–0.254***	0.008	–0.037***	–0.111**
KS3							
All policies	0.175	–0.198***	–0.196***	–0.238***	0.006	–0.009*	0.036
Policy A	–0.036	–0.179***	–0.203***	–0.238***	–0.002	–0.016*	0.037
Policy B	0.147	–0.184***	–0.187***	–0.238***	0.014		0.036
Policy C	0.163	–0.221***	–0.201***	–0.238***	0.000	–0.014	0.036
Policy D	0.209	–0.139**	–0.203***	–0.237***	–0.002	–0.016*	0.036
Policy E	0.164	–0.213***	–0.204***	–0.238***	–0.002	–0.016*	0.036
Policy F	0.341	–0.185**	–0.201***	–0.239***	0.000	–0.014	0.037
Policy H	0.374	–0.136***	–0.179***	–0.238***	0.023	0.008	0.037
Policy O	0.216	–0.207***	–0.204***	–0.238***	–0.002	–0.017	0.036

Notes:

The August birth effect (column (ii)) is based on the individual-level model with school fixed effects (Model 3). All estimated effects (columns (iv), (v) and (vii)) come from our regression model (Model 4).

All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table 15 Decomposing the August birth penalty (standardised average point score) for boys in Group 2, by admissions policy area

	(i) Sept score	(ii) Aug birth effect	(iii) Estimated Aug birth effect (iv)+(v)+(vii)	(iv) Age effect	(v) Age of starting school effect	(vi) Diff from Policy B	(vii) Age position effect
KS1							
All policies	0.195	–0.611***	–0.614***	–0.683***	0.064***	–0.037***	0.005
Policy A	–0.080	–0.586***	–0.623***	–0.683***	0.055***	–0.046***	0.005
Policy B	0.196	–0.580***	–0.577***	–0.683***	0.101***		0.005
Policy C	0.151	–0.645***	–0.649***	–0.683***	0.030***	–0.071***	0.005
Policy D	0.319	–0.600***	–0.624***	–0.684***	0.055***	–0.046***	0.005
Policy E	0.161	–0.623***	–0.623***	–0.683***	0.055***	–0.046***	0.005
Policy F	0.319	–0.735***	–0.649***	–0.684***	0.030***	–0.071***	0.005
Policy H	0.232	–0.594***	–0.635***	–0.682***	0.043**	–0.058***	0.005
Policy O	0.228	–0.637***	–0.644***	–0.683***	0.034**	–0.067***	0.005
KS2							
All policies	0.132	–0.333***	–0.333***	–0.296***	0.010	–0.011**	–0.046
Policy A	–0.104	–0.317***	–0.334***	–0.296***	0.009	–0.012	–0.047
Policy B	0.135	–0.320***	–0.321***	–0.296***	0.021*		–0.046
Policy C	0.099	–0.333***	–0.336***	–0.296***	0.007	–0.014	–0.046
Policy D	0.231	–0.297***	–0.334***	–0.297***	0.009	–0.012	–0.047
Policy E	0.107	–0.338***	–0.333***	–0.296***	0.009	–0.012	–0.046
Policy F	0.309	–0.416***	–0.337***	–0.297***	0.007	–0.014	–0.047
Policy H	0.166	–0.300***	–0.320***	–0.296***	0.022	0.001	–0.046
Policy O	0.151	–0.350***	–0.347***	–0.296***	–0.005	–0.026**	–0.046
KS3							
All policies	0.059	–0.207***	–0.204***	–0.127	–0.009	–0.005	–0.067
Policy A	–0.132	–0.283***	–0.208***	–0.127	–0.014**	–0.010	–0.067
Policy B	0.044	–0.203***	–0.199***	–0.127	–0.004		–0.067
Policy C	0.014	–0.203***	–0.199***	–0.127	–0.005	0.000	–0.067
Policy D	0.119	–0.149***	–0.208***	–0.128	–0.014**	–0.010	–0.067
Policy E	0.020	–0.195***	–0.208***	–0.128	–0.014**	–0.010	–0.067
Policy F	0.263	–0.206***	–0.199***	–0.128	–0.005	0.000	–0.067
Policy H	0.180	–0.169***	–0.167***	–0.127	0.027	0.031*	–0.067
Policy O	0.111	–0.218***	–0.215***	–0.127	–0.020	–0.016	–0.067

Notes:

The August birth effect (column (ii)) is based on the individual-level model with school fixed effects (Model 3). All estimated effects (columns (iv), (v) and (vii)) come from our regression model (Model 4).

All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table 16 Availability of PLASC data, by group

Year of entry	Earliest available information		Latest available information	
	Academic year	Age	Academic year	Age
Group 1				
2002–03	**2002–03**	**5**	**2005–06**	**8**
2003–04	**2003–04**	**5**	**2005–06**	**7**
Group 2				
1995–96	**2001–02**	**11**	**2005–06**	**15**
1996–97	**2001–02**	**10**	**2005–06**	**14**
Group 3				
1990–91	**2001–02**	**16**	**2003–04**	**18**[a]
1991–92	**2001–02**	**15**	**2004–05**	**18**[a]
1992–93	**2001–02**	**14**	**2005–06**	**18**[a]

[a] Information at this age is only available if the individual remains in the state school education system beyond age 16 (excluding non-school-based educational establishments).

Table 17 Mean August birth penalty at Foundation Stage and Key Stage 1, by FSM status (Group 1)

	Girls		Boys	
	Sept score	**Aug birth effect**	**Sept score**	**Aug birth effect**
Foundation Stage Profile				
Standardised total point score:				
Not eligible for free school meals	0.559	–0.745***	0.310	–0.793***
Eligible for free school meals	0.124	–0.924***	–0.129	–0.913***
Difference		–0.179*		–0.120
Key Stage 1				
Standardised average point score:				
Not eligible for free school meals	0.519	–0.618***	0.274	–0.578***
Eligible for free school meals	–0.060	–0.667***	–0.402	–0.700***
Difference		–0.048		–0.122
Proportion achieving expected level:				
Not eligible for free school meals	0.840	–0.257***	0.748	–0.238***
Eligible for free school meals	0.617	–0.350***	0.480	–0.225***
Difference		–0.093*		0.014
Special educational needs				
Statemented:				
Not eligible for free school meals	0.005	0.001	0.015	–0.001
Eligible for free school meals	0.011	–0.012	0.018	–0.009
Difference		–0.013		–0.008
Non-statemented:				
Not eligible for free school meals	0.027	0.010	0.062	0.013
Eligible for free school meals	0.061	0.076***	0.143	0.056
Difference		0.066**		0.043
Number of observations				
Not eligible for free school meals	*3,524*	*3,106*	*3,623*	*3,268*
Eligible for free school meals	*749*	*533*	*706*	*609*

Notes:

Special educational needs outcomes and FSM status are measured at age 5 for this group.

All results presented are based on an individual-level model with school fixed effects (Model 3).

All models include cohort dummies, individual-level characteristics (including ethnicity and whether English is the child's first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table 18 Mean August birth penalty at Key Stage 1, Key Stage 2 and Key Stage 3, by FSM status (Group 2)

	Girls		Boys	
	Sept score	Aug birth effect	Sept score	Aug birth effect
Key Stage 1				
Standardised average point score:				
Not eligible for free school meals	0.521	–0.585***	0.301	–0.603***
Eligible for free school meals	–0.081	–0.645***	–0.338	–0.654***
Difference		–0.060***		–0.051***
Proportion achieving expected level:				
Not eligible for free school meals	0.746	–0.258***	0.654	–0.269***
Eligible for free school meals	0.489	–0.253***	0.399	–0.233***
Difference		0.005		0.036***
Key Stage 2				
Standardised average point score:				
Not eligible for free school meals	0.332	–0.341***	0.240	–0.331***
Eligible for free school meals	–0.288	–0.375***	–0.414	–0.338***
Difference		–0.034*		–0.007
Proportion achieving expected level:				
Not eligible for free school meals	0.800	–0.129***	0.761	–0.125***
Eligible for free school meals	0.559	–0.151***	0.508	–0.139***
Difference		–0.023**		–0.014
Key Stage 3				
Standardised average point score:				
Not eligible for free school meals	0.300	–0.197***	0.192	–0.208***
Eligible for free school meals	–0.451	–0.203***	–0.611	–0.202***
Difference		–0.006		0.006
Proportion achieving expected level:				
Not eligible for free school meals	0.779	–0.073***	0.739	–0.082***
Eligible for free school meals	0.482	–0.093***	0.430	–0.098***
Difference		–0.020**		–0.015*
Special educational needs				
Statemented:				
Not eligible for free school meals	0.013	0.002***	0.034	0.005***
Eligible for free school meals	0.030	0.011***	0.084	0.008**
Difference		0.009***		0.003
Non-statemented:				
Not eligible for free school meals	0.095	0.074***	0.181	0.091***
Eligible for free school meals	0.203	0.117***	0.327	0.111***
Difference		0.042***		0.020**
Number of observations				
Not eligible for free school meals	*38,406*	*37,926*	*40,486*	*39,087*
Eligible for free school meals	*7,719*	*8,112*	*8,040*	*8,219*

Notes to Table 18
Special educational needs outcomes and FSM status are measured at age 11 for this group.
All results presented are based on an individual-level model with school fixed effects (Model 3).
All models include cohort dummies, individual-level characteristics (including ethnicity and whether English is the child's first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).
*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table 19 Mean August birth penalty at Key Stage 4 and Key Stage 5, by FSM status (Group 3)

	Girls		Boys	
	Sept score	Aug birth effect	Sept score	Aug birth effect
Key Stage 4				
Standardised average point score:				
Not eligible for free school meals	0.314	–0.118***	0.042	–0.130***
Eligible for free school meals	–0.480	–0.106***	–0.714	–0.137***
Difference		0.012		–0.007
Achieved 5+ GCSEs at grades A–C:*				
Not eligible for free school meals	0.648	–0.055***	0.539	–0.061***
Eligible for free school meals	0.331	–0.059***	0.248	–0.058***
Difference		–0.004		0.003
Achieved Level 2 via academic route:				
Not eligible for free school meals	0.691	–0.044***	0.581	–0.044***
Eligible for free school meals	0.390	–0.048***	0.303	–0.049***
Difference		–0.003		–0.005
Achieved Level 2 via any route:				
Not eligible for free school meals	0.782	–0.004	0.684	–0.013***
Eligible for free school meals	0.514	–0.011	0.418	–0.020***
Difference		–0.007		–0.007
Key Stage 5				
Achieved Level 3 via academic route:				
Not eligible for free school meals	0.459	–0.021***	0.361	–0.019***
Eligible for free school meals	0.192	–0.016***	0.134	–0.009*
Difference		0.004		0.010*
Achieved Level 3 via any route:				
Not eligible for free school meals	0.533	–0.009***	0.424	–0.016***
Eligible for free school meals	0.240	–0.010	0.173	–0.012**
Difference		–0.001		0.005
Special educational needs				
Statemented:				
Not eligible for free school meals	0.014	0.003***	0.034	0.008***
Eligible for free school meals	0.036	0.008***	0.079	0.013***
Difference		0.005**		0.006
Non-statemented:				
Not eligible for free school meals	0.071	0.018***	0.127	0.033***
Eligible for free school meals	0.176	0.031***	0.244	0.048***
Difference		0.013**		0.014**
Number of observations				
Not eligible for free school meals	*53,822*	*54,749*	*55,123*	*55,750*
Eligible for free school meals	*7,881*	*8,859*	*7,803*	*8,936*

Notes to Table 8.4:

Special educational needs outcomes and FSM status are measured at age 16 for this group.

All results presented are based on an individual-level model with school fixed effects (Model 3).

All models include cohort dummies, individual-level characteristics (including ethnicity and whether English is the child's first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table 20 August birth penalty for girls, by FSM status, across the ability distribution (Group 2)

	Not eligible for free school meals		Eligible for free school meals	
	Sept score	**Aug birth effect**	**Sept score**	**Aug birth effect**
Key Stage 1				
10th percentile	0.029	–0.603***	–0.381	–0.657***
25th percentile	0.149	–0.611***	–0.360	–0.657***
Median	0.563	–0.598***	–0.078	–0.651***
75th percentile	0.911	–0.558***	0.172	–0.659***
90th percentile	0.978	–0.530***	0.184	–0.656***
No. of obsns	*12,452*		*1,930*	
Key Stage 2				
10th percentile	–0.241	–0.369***	–0.587	–0.394***
25th percentile	–0.069	–0.373***	–0.572	–0.395***
Median	0.389	–0.362***	–0.305	–0.388***
75th percentile	0.752	–0.313***	–0.067	–0.384***
90th percentile	0.830	–0.279***	–0.055	–0.383***
No. of obsns	*12,163*		*2,023*	
Key Stage 3				
10th percentile	–0.733	–0.190***	–1.148	–0.174***
25th percentile	–0.165	–0.229***	–0.962	–0.199***
Median	0.390	–0.236***	–0.460	–0.227***
75th percentile	0.859	–0.222***	0.026	–0.238***
90th percentile	1.147	–0.160***	0.184	–0.226***
No. of obsns	*5,714*		*2,415*	

Notes:
All results presented are based on a within-school weighted quantile regression model (Model 1). The model uses the same individuals at each Key Stage but allows these individuals to change schools. The number of observations refers to the number of schools.
All models include cohort dummies, individual-level characteristics (including ethnicity and whether English is the child's first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).
*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table 21 August birth penalty for boys, by FSM status, across the ability distribution (Group 2)

	Not eligible for free school meals		Eligible for free school meals	
	Sept score	**Aug birth effect**	**Sept score**	**Aug birth effect**
Key Stage 1				
10^{th} percentile	–0.243	–0.614***	–0.656	–0.682***
25^{th} percentile	–0.103	–0.620***	–0.623	–0.690***
Median	0.352	–0.626***	–0.313	–0.672***
75^{th} percentile	0.749	–0.591***	–0.033	–0.654***
90^{th} percentile	0.838	–0.563***	–0.010	–0.657***
No. of obsns	*13,055*		*1,932*	
Key Stage 2				
10^{th} percentile	–0.373	–0.361***	–0.759	–0.325***
25^{th} percentile	–0.189	–0.358***	–0.738	–0.318***
Median	0.301	–0.353***	–0.431	–0.336***
75^{th} percentile	0.701	–0.311***	–0.149	–0.340***
90^{th} percentile	0.791	–0.274***	–0.134	–0.340***
No. of obsns	*12,664*		*2,019*	
Key Stage 3				
10^{th} percentile	–0.885	–0.217***	–1.351	–0.136***
25^{th} percentile	–0.287	–0.252***	–1.148	–0.165***
Median	0.300	–0.241***	–0.591	–0.214***
75^{th} percentile	0.781	–0.210***	–0.076	–0.227***
90^{th} percentile	1.090	–0.166***	0.091	–0.212***
No. of obsns	*5,741*		*2,448*	

Notes:

All results presented are based on a within-school weighted quantile regression model (Model 1). The model uses the same individuals at each Key Stage but allows these individuals to change schools. The number of observations refers to the number of schools.

All models include cohort dummies, individual-level characteristics (including ethnicity and whether English is the child's first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table 22 Age normalisation of Key Stage 2 and Key Stage 3 outcomes using continuous standardised average point scores (Group 2)

	Before age normalisation		After age normalisation	
	Sept score	Aug birth effect	Sept score	Aug birth effect
Girls				
Key Stage 2				
English average point score	0.314	–0.319***	0.152	0.005
Maths average point score	0.144	–0.328***	–0.015	–0.011*
Science average point score	0.162	–0.292***	0.022	–0.012*
Overall average point score	0.225	–0.340***	0.057	–0.006
Proportion achieving expected level	0.846	–0.101***	0.846	–0.019***
Proportion achieving above expected level	0.347	–0.142***	0.347	0.011***
Key Stage 3				
English average point score	0.300	–0.194***	0.191	0.024***
Maths average point score	0.107	–0.184***	0.010	0.008
Science average point score	0.100	–0.160***	0.016	0.006
Overall average point score	0.175	–0.193***	0.071	0.013**
Proportion achieving expected level	0.792	–0.067***	0.792	–0.006**
Proportion achieving above expected level	0.492	–0.100***	0.492	–0.005
Number of observations	*45,191*	*45,081*	*45,191*	*45,081*
Boys				
Key Stage 2				
English average point score	0.029	–0.325***	–0.134	–0.001
Maths average point score	0.192	–0.312***	0.033	0.005
Science average point score	0.135	–0.267***	–0.005	0.013**
Overall average point score	0.130	–0.328***	–0.038	0.006
Proportion achieving expected level	0.810	–0.100***	0.810	–0.016***
Proportion achieving above expected level	0.331	–0.137***	0.331	0.007**
Key Stage 3				
English average point score	–0.054	–0.224***	–0.164	–0.006
Maths average point score	0.109	–0.185***	0.012	0.007
Science average point score	0.090	–0.159***	0.006	0.007
Overall average point score	0.058	–0.203***	–0.046	0.003
Proportion achieving expected level	0.747	–0.077***	0.747	–0.017***
Proportion achieving above expected level	0.450	–0.094***	0.450	–0.004
Number of observations	*47,534*	*46,321*	*47,534*	*46,321*

Table 23 Percentages of August- and September-born children reaching and not reaching expected level across Key Stage 1 and Key Stage 2 (Group 2)

	September-born children		**August-born children**	
	Did not achieve expected level at Key Stage 2	**Achieved expected level at Key Stage 2**	**Did not achieve expected level at Key Stage 2**	**Achieved expected level at Key Stage 2**
Girls				
Did not achieve expected level at Key Stage 1	18.4	**11.3**	34.0	**21.7**
Achieved expected level at Key Stage 1	5.7	64.7	3.5	40.9
Boys				
Did not achieve expected level at Key Stage 1	23.7	**15.1**	39.2	**26.2**
Achieved expected level at Key Stage 1	4.4	56.8	2.3	32.3

Table 24 Percentages of August- and September-born children reaching and not reaching expected level across Key Stage 2 and Key Stage 3 (Group 2)

	September-born children		**August-born children**	
	Did not achieve expected level at Key Stage 3	**Achieved expected level at Key Stage 3**	**Did not achieve expected level at Key Stage 3**	**Achieved expected level at Key Stage 3**
Girls				
Did not achieve expected level at Key Stage 2	18.8	**5.2**	28.7	**8.8**
Achieved expected level at Key Stage 2	8.2	67.7	6.8	55.8
Boys				
Did not achieve expected level at Key Stage 2	22.8	**5.3**	33.4	**8.1**
Achieved expected level at Key Stage 2	8.4	63.5	6.9	51.6

Table 25 Percentages of August- and September-born children reaching and not reaching the expected level across the Foundation Stage and Key Stage 1 (Group 2)

	September-born children		**August-born children**	
	Did not achieve expected level at Key Stage 1	**Achieved expected level at Key Stage 1**	**Did not achieve expected level at Key Stage 1**	**Achieved expected level at Key Stage 1**
Girls				
Did not achieve expected level in the FSP	7.6	**3.4**	29.3	**10.4**
Achieved expected level in the FSP	12.3	76.7	14.9	45.3
Boys				
Did not achieve expected level in the FSP	13.0	**4.1**	39.3	**9.9**
Achieved expected level in the FSP	16.6	66.4	14.0	36.9

Figure 1 Mean standardised average point score at Key Stage 1, Key Stage 2 and Key Stage 3 for Group 2, by date of birth and cohort

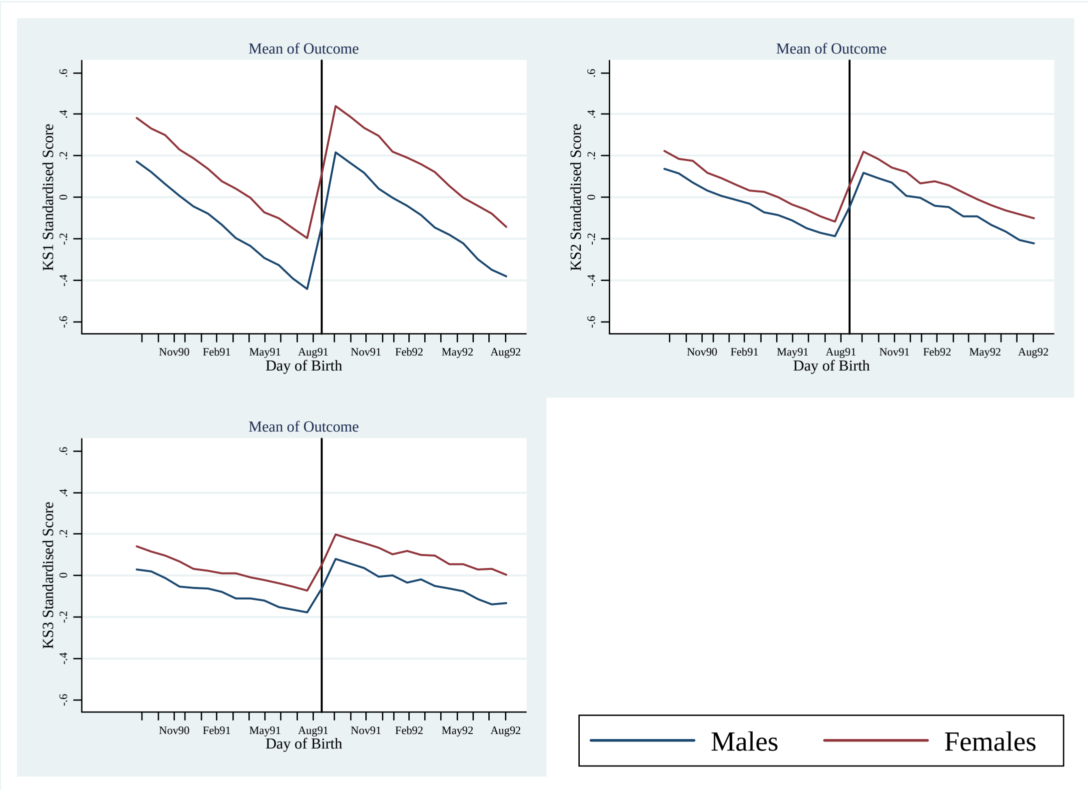


Figure 2 Mean standardised average point score at Key Stage 2, Key Stage 3 and Key Stage 4 for Group 3, by date of birth and cohort

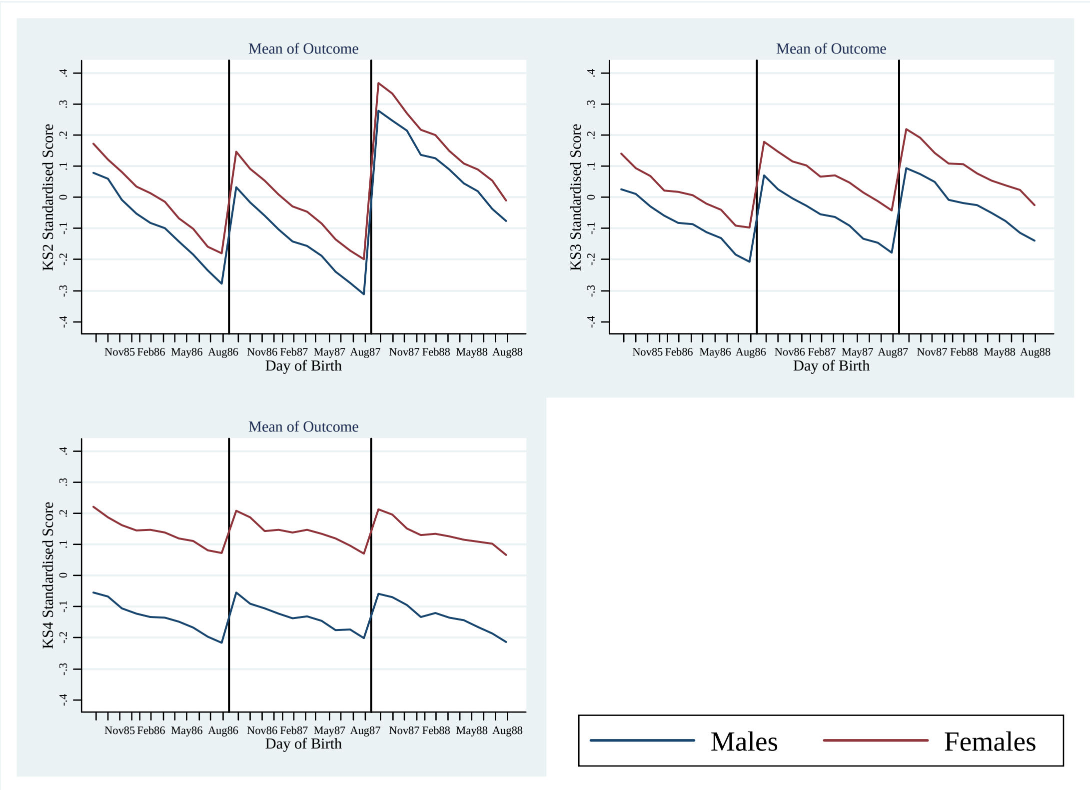


Figure 3 Mean standardised average point score at the Foundation Stage and Key Stage 1 for Group 1, by date of birth and cohort

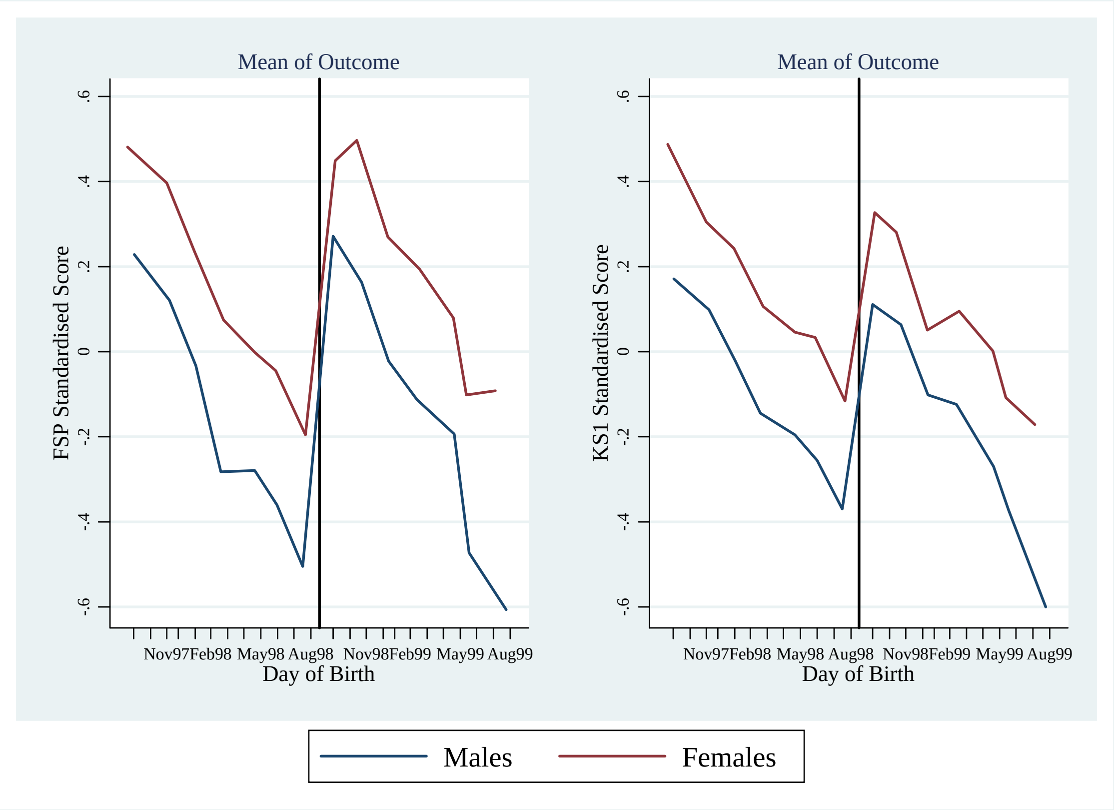


Figure 4 Mean standardised average point score at Key Stage 1, Key Stage 2 and Key Stage 3 for Group 2, by date of birth and cohort

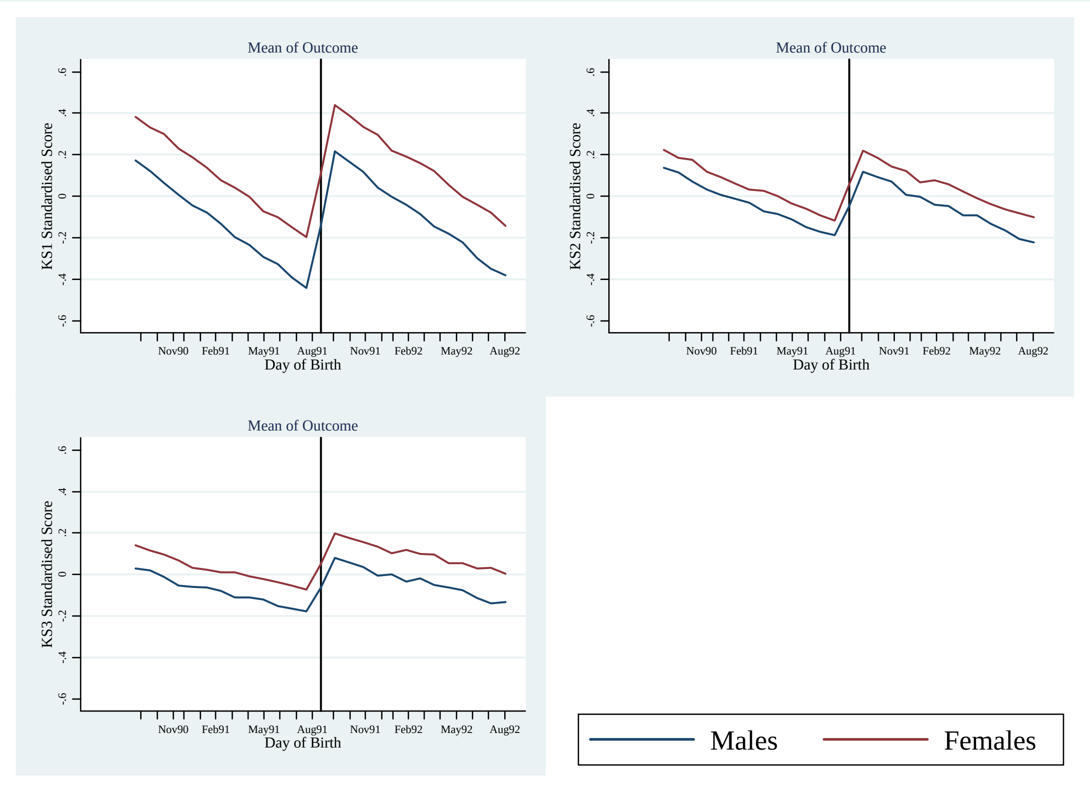
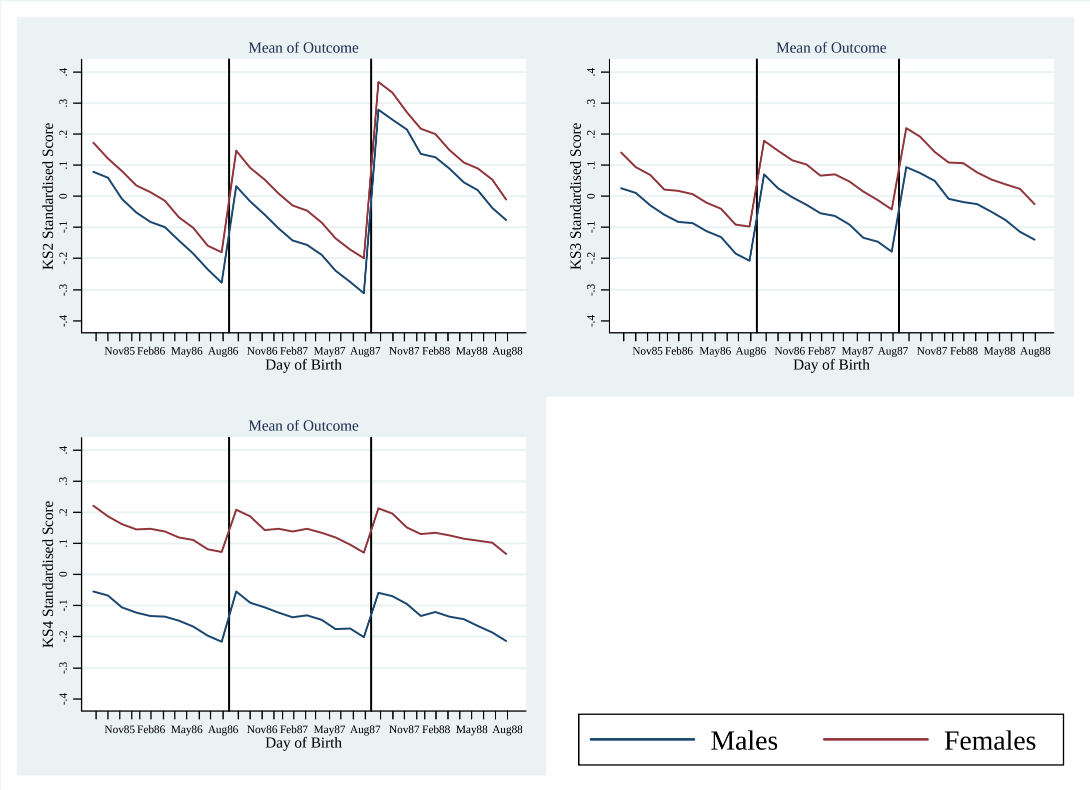


Figure 5 Mean standardised average point score at Key Stage 2, Key Stage 3 and Key Stage 4 for Group 3, by date of birth and cohort



Appendix A

Table A.1. Cohort progression in our data: from birth to Key Stage 5 (age 18)

Born	Start school	Sit FSP (age 5)	Sit KS1 (age 7)	Sit KS2 (age 11)	Sit KS3 (age 14)	Sit KS4 (age 16)	Sit KS5 (age 18)
1982–83	1987–88				1996–97		
1983–84	1988–89			1994–95	1997–98		
1984–85	1989–90			1995–96	1998–99		
1985–86	1990–91			1996–97	1999–00	2001–02	2003–04
1986–87	1991–92			1997–98	2000–01	2002–03	2004–05
1987–88	1992–93			1998–99	2001–02	2003–04	2005–06
1988–89	1993–94			1999–00	2002–03	2004–05	
1989–90	1994–95			2000–01	2003–04	2005–06	
1990–91	1995–96		1997–98	2001–02	2004–05		
1991–92	1996–97		1998–99	2002–03	2005–06		
1992–93	1997–98		1999–00	2003–04			
1993–94	1998–99		2000–01	2004–05			
1994–95	1999–00		2001–02	2005–06			
1995–96	2000–01		2002–03				
1996–97	2001–02		2003–04				
1997–98	2002–03	2002–03	2004–05				
1998–99	2003–04	2003–04	2005–06				
1999–00	2004–05	2004–05					
2000–01	2005–06	2005–06					

Group 1 Note that for this group, SEN status is observed at age 5 (concurrently with FSP results).

Group 2 Note that for this group, SEN status is observed at age 11 (concurrently with Key Stage 2 results).

Group 3 Note that for this group, SEN status is observed at age 16 (concurrently with Key Stage 4 results).

Appendix B

Table B.1. Comparison of estimated August birth penalty using Key Stage 2 and Key Stage 3 discrete and continuous point scores, Group 2

	Girls		Boys	
	Sept score	**Aug birth effect**	**Sept score**	**Aug birth effect**
Key Stage 2				
Discrete standardised APS:				
Overall	0.227	–0.347***	0.132	–0.332***
English	0.310	–0.322***	0.034	–0.325***
Maths	0.139	–0.321***	0.188	–0.301***
Science	0.155	–0.282***	0.133	–0.258***
Continuous standardised APS:				
Overall	0.225	–0.340***	0.130	–0.328***
English	0.314	–0.319***	0.029	–0.325***
Maths	0.144	–0.328***	0.192	–0.312***
Science	0.162	–0.292***	0.135	–0.267***
Key Stage 3				
Discrete standardised APS:	0.172	–0.198***	0.064	–0.206***
Overall	0.300	–0.201***	–0.052	–0.223***
English	0.105	–0.185***	0.110	–0.185***
Maths	0.094	–0.162***	0.095	–0.162***
Science				
Continuous standardised APS:				
Overall	0.175	–0.193***	0.058	–0.203***
English	0.300	–0.194***	–0.054	–0.224***
Maths	0.107	–0.184***	0.109	–0.185***
Science	0.100	–0.160***	0.090	–0.159***
Number of observations	*45,191*	*45,081*	*47,534*	*46,321*

Notes:

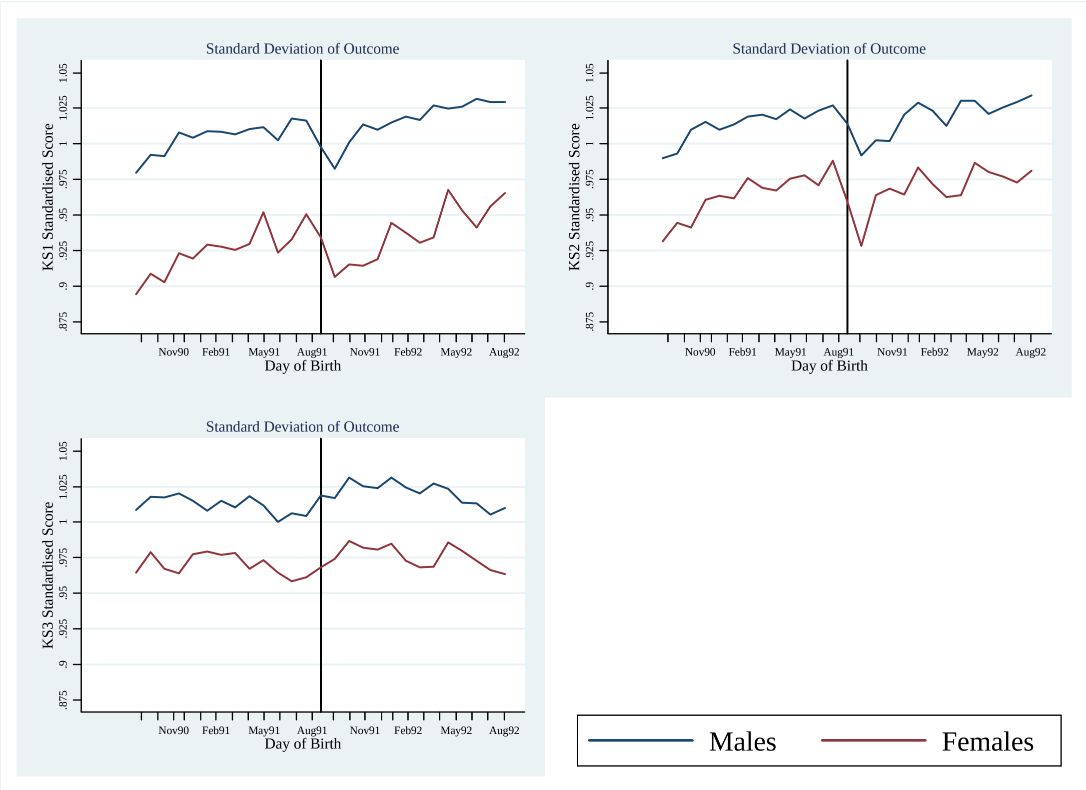
All results presented are based on an individual-level model with school fixed effects (Model 3).

All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Appendix C

Figure C.1. Standard deviation of the standardised average point score at Key Stage 1, Key Stage 2 and Key Stage 3 for Group 2, by date of birth and cohort



Appendix D

Table D.1. Model comparisons (Group 2)

	Girls		Boys	
	Sept score	**Aug birth effect**	**Sept score**	**Aug birth effect**
Key Stage 1				
Model 1	0.420	–0.595***	0.210	–0.622***
Model 2	0.420	–0.598***	0.210	–0.617***
	N = 36,496	*N* = 36,301	*N* = 38,634	*N* = 38,042
Model 3	0.420	–0.595***	0.195	–0.611***
Model 4	0.420	–0.589***	0.195	–0.614***
	N = 46,125	*N* = 46,038	*N* = 48,526	*N* = 47,306
Key Stage 2				
Model 1	0.228	–0.351***	0.138	–0.337***
Model 2	0.228	–0.350***	0.138	–0.333***
	N = 37,450	*N* = 37,342	*N* = 39,582	*N* = 38,635
Model 3	0.228	–0.347***	0.132	–0.333***
Model 4	0.228	–0.340***	0.132	–0.333***
	N = 46,125	*N* = 46,038	*N* = 48,526	*N* = 47,306
Key Stage 3				
Model 1	0.182	–0.210***	0.075	–0.215***
Model 2	0.182	–0.199***	0.075	–0.207***
	N = 45,594	*N* = 45,443	*N* = 47,841	*N* = 46,529
Model 3	0.175	–0.198***	0.059	–0.207***
Model 4	0.175	–0.196***	0.059	–0.204***
	N = 46,125	*N* = 46,038	*N* = 48,526	*N* = 47,306

Notes:

Model 1 is the within-school model (school fixed effects that vary across cohorts); Model 2 contains school fixed effects that do not vary across cohorts, and uses the same sample as Model 1; Model 3 contains school fixed effects that do not vary across cohorts, but uses the entire sample of individuals; Model 4 is the regression model.

All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table D.2. Model comparisons (Group 3)

	Girls		Boys	
	Sept score	**Aug birth effect**	**Sept score**	**Aug birth effect**
Key Stage 1				
Model 1	0.224	–0.360***	0.133	–0.342***
Model 2	0.224	–0.358***	0.133	–0.342***
	N = 48,955	*N* = 49,690	*N* = 50,066	*N* = 50,743
Model 3	0.231	–0.355***	0.140	–0.340***
Model 4	0.231	–0.360***	0.140	–0.342***
	N = 61,703	*N* = 63,608	*N* = 62,926	*N* = 64,686
Key Stage 2				
Model 1	0.181	–0.222***	0.076	–0.224***
Model 2	0.181	–0.209***	0.076	–0.217***
	N = 61,223	*N* = 62,892	*N* = 62,394	*N* = 63,751
Model 3	0.180	–0.209***	0.072	–0.217***
Model 4	0.180	–0.211***	0.072	–0.216***
	N = 61,703	*N* = 63,608	*N* = 62,926	*N* = 64,686
Key Stage 3				
Model 1	0.217	–0.126***	–0.046	–0.136***
Model 2	0.217	–0.116***	–0.046	–0.131***
	N = 61,172	*N* = 62,955	*N* = 62,367	*N* = 63,773
Model 3	0.213	–0.116***	–0.052	–0.131***
Model 4	0.213	–0.120***	–0.052	–0.129***
	N = 61,703	*N* = 63,608	*N* = 62,926	*N* = 64,686

Notes:

Model 1 is the within-school model (school fixed effects that vary across cohorts); Model 2 contains school fixed effects that do not vary across cohorts, and uses the same sample as Model 1; Model 3 contains school fixed effects that do not vary across cohorts, but uses the entire sample of individuals; Model 4 is the regression model.

All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Appendix E

Table E.1. August birth penalty in standardised average point score at Key Stage 2, Key Stage 3 and Key Stage 4, across the distribution (Group 3)

	Girls		Boys	
	Sept score	Aug birth effect	Sept score	Aug birth effect
Key Stage 2				
10th percentile	–0.424	–0.358***	–0.537	–0.343***
25th percentile	–0.229	–0.370***	–0.342	–0.360***
Median	0.258	–0.371***	0.166	–0.365***
75th percentile	0.682	–0.357***	0.611	–0.328***
90th percentile	0.801	–0.338***	0.737	–0.308***
Number of observations	*20,500*		*20,767*	
Key Stage 3				
10th percentile	–0.938	–0.189***	–1.038	–0.188***
25th percentile	–0.357	–0.240***	–0.484	–0.246***
Median	0.247	–0.252***	0.133	–0.257***
75th percentile	0.778	–0.236***	0.677	–0.240***
90th percentile	1.139	–0.196***	1.060	–0.202***
Number of observations	*8,712*		*8,772*	
Key Stage 4				
10th percentile	–0.907	–0.096***	–1.185	–0.105***
25th percentile	–0.298	–0.133***	–0.614	–0.140***
Median	0.313	–0.153***	0.027	–0.158***
75th percentile	0.794	–0.142***	0.560	–0.156***
90th percentile	1.128	–0.122***	0.940	–0.143***
Number of observations	*8,608*		*8,675*	

Notes:

All results presented are based on a within-school weighted quantile regression model (Model 1). The model uses the same individuals at each Key Stage but allows these individuals to change schools. The number of observations refers to the number of schools.

All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Appendix F

Table F.1. August birth penalty: breakdown by subject at Key Stage 2 and Key Stage 3 (Group 3)

	Girls		Boys	
	Sept score	**Aug birth effect**	**Sept score**	**Aug birth effect**
Key Stage 2				
Standardised average point score:				
English	0.330	–0.324***	0.012	–0.309***
Maths	0.149	–0.330***	0.195	–0.317***
Science	0.135	–0.291***	0.167	–0.280***
Proportion achieving expected level:				
English	0.797	–0.117***	0.679	–0.131***
Maths	0.707	–0.139***	0.719	–0.132***
Science	0.784	–0.109***	0.789	–0.100***
Proportion achieving above expected level:				
English	0.302	–0.130***	0.184	–0.087***
Maths	0.235	–0.107***	0.268	–0.104***
Science	0.251	–0.103***	0.275	–0.102***
Key Stage 3				
Standardised average point score:				
English	0.318	–0.208***	–0.063	–0.226***
Maths	0.111	–0.192***	0.121	–0.197***
Science	0.080	–0.170***	0.121	–0.169***
Proportion achieving expected level:				
English	0.796	–0.071***	0.648	–0.097***
Maths	0.729	–0.080***	0.727	–0.084***
Science	0.696	–0.074***	0.714	–0.074***
Proportion achieving above expected level:				
English	0.456	–0.093***	0.302	–0.082***
Maths	0.495	–0.090***	0.501	–0.095***
Science	0.370	–0.075***	0.387	–0.074***
Number of observations	*61,703*	*63,608*	*62,926*	*64,686*

Notes:

All results presented are based on an individual-level model with school fixed effects (Model 3).

All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Appendix G

Tables G.1 and G.2 appear on the next two pages

Notes to Tables G.1 and G.2:

Special educational needs outcomes are measured at age 16 for this group.

All results presented are based on an individual-level model with school fixed effects (Model 3).

All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table G.1. Girls' mean August birth penalty: key outcomes from Key Stage 2 to Key Stage 5, by admissions policy area (Group 3)

	Single entry point (Policy B)		Two entry points (Policy E)			Three entry points (Policy C)			Flexible/Other entry (Policy O)		
	(i) Sept score	(ii) Aug birth effect	(iii) Sept score	(iv) Aug birth effect	(v) Diff from Policy B (iv)–(ii)	(vi) Sept score	(vii) Aug birth effect	(viii) Diff from Policy B (vii)–(ii)	(ix) Sept score	(x) Aug birth effect	(xi) Diff from Policy B (x)–(ii)
Key Stage 2											
Standardised average point score	0.218	–0.345***	0.266	–0.361***	–0.016	0.231	–0.346***	–0.001	0.240	–0.375***	–0.030**
Proportion achieving expected level	0.647	–0.145***	0.670	–0.161***	–0.016	0.655	–0.155***	–0.010	0.658	–0.163***	–0.018***
Key Stage 3											
Standardised average point score	0.140	–0.204***	0.233	–0.215***	–0.011	0.162	–0.214***	–0.010	0.223	–0.212***	–0.008
Proportion achieving expected level	0.643	–0.086***	0.680	–0.090***	–0.004	0.657	–0.095***	–0.009	0.674	–0.086***	0.000
Key Stage 4											
Standardised average point score	0.172	–0.116***	0.280	–0.131***	–0.015	0.210	–0.120***	–0.004	0.248	–0.115***	0.001
Achieved 5+ GCSEs at grades A*–C	0.594	–0.057***	0.641	–0.066***	–0.009	0.605	–0.058***	–0.001	0.618	–0.052***	0.005
Achieved Level 2 via academic route	0.641	–0.047***	0.672	–0.052***	–0.005	0.652	–0.047***	0.000	0.662	–0.043***	0.004
Achieved Level 2 via any route	0.739	–0.005	0.764	0.002	0.007	0.744	–0.008	–0.003	0.757	–0.007	–0.001
Key Stage 5											
Achieved Level 3 via academic route	0.411	–0.017***	0.442	–0.022**	–0.004	0.428	–0.030***	–0.012*	0.432	–0.018***	–0.001
Achieved Level 3 via any route	0.481	–0.006	0.517	–0.014	–0.008	0.498	–0.018***	–0.012*	0.503	–0.006	0.000
Special educational needs											
Statemented	0.017	0.004***	0.017	0.003	0.000	0.017	0.002	–0.002	0.016	0.005***	0.001
Non-statemented	0.087	0.025***	0.073	0.015**	–0.010	0.088	0.022***	–0.003	0.083	0.013***	–0.012***
Number of observations	*23,624*	*24,457*	*4,016*	*4,145*		*13,889*	*14,044*		*18,214*	*18,954*	

Notes: See previous page.

Table G.2. Boys' mean August birth penalty: key outcomes from Key Stage 2 to Key Stage 5, by admissions policy area (Group 3)

	Single entry point (Policy B)		Two entry points (Policy E)			Three entry points (Policy C)			Flexible/Other entry (Policy O)		
	(i) Sept score	(ii) Aug birth effect	(iii) Sept score	(iv) Aug birth effect	(v) Diff from Policy B (iv)–(ii)	(vi) Sept score	(vii) Aug birth effect	(viii) Diff from Policy B (vii)–(ii)	(ix) Sept score	(x) Aug birth effect	(xi) Diff from Policy B (x)–(ii)
Key Stage 2											
Standardised average point score	0.127	–0.334***	0.177	–0.366***	–0.033	0.132	–0.326***	0.007	0.147	–0.356***	–0.023*
Proportion achieving expected level	0.607	–0.146***	0.623	–0.152***	–0.006	0.604	–0.150***	–0.004	0.611	–0.158***	–0.012*
Key Stage 3											
Standardised average point score	0.040	–0.213***	0.118	–0.240***	–0.028	0.048	–0.216***	–0.003	0.113	–0.221***	–0.009
Proportion achieving expected level	0.604	–0.095***	0.635	–0.115***	–0.020*	0.604	–0.098***	–0.003	0.633	–0.100***	–0.006
Key Stage 4											
Standardised average point score	–0.093	–0.118***	0.017	–0.161***	–0.042**	–0.058	–0.140***	–0.022*	–0.017	–0.134***	–0.015
Achieved 5+ GCSEs at grades A*–C	0.489	–0.057***	0.527	–0.073***	–0.015	0.502	–0.064***	–0.006	0.515	–0.061***	–0.003
Achieved Level 2 via academic route	0.535	–0.042***	0.567	–0.061***	–0.019*	0.546	–0.048***	–0.006	0.554	–0.044***	–0.002
Achieved Level 2 via any route	0.645	–0.012***	0.667	–0.020**	–0.008	0.650	–0.017***	–0.005	0.656	–0.013***	–0.001
Key Stage 5											
Achieved Level 3 via academic route	0.321	–0.019***	0.350	–0.032***	–0.013	0.330	–0.018***	0.001	0.339	–0.012***	0.007
Achieved Level 3 via any route	0.381	–0.016***	0.412	–0.021*	–0.005	0.392	–0.018***	–0.002	0.399	–0.013***	0.003
Special educational needs											
Statemented	0.038	0.009***	0.034	0.014***	0.005	0.040	0.007***	–0.002	0.041	0.008***	–0.001
Non-statemented	0.145	0.035***	0.123	0.037***	0.002	0.146	0.037***	0.002	0.138	0.034***	–0.001
Number of observations	*24,274*	*24,785*	*4,013*	*4,101*		*14,024*	*14,548*		*18,688*	*19,246*	

Notes: See first page of Appendix G.

Appendix H

Tables H.1 and H.2 appear on the next two pages

Notes to Tables H.1 and H.2:

All results presented are based on a within-school weighted quantile regression model (Model 1). The model uses the same individuals at each Key Stage but allows these individuals to change schools. The number of observations refers to the number of schools.

All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level

Table H.1. Girls' August birth penalty in standardised average point score at Key Stage 1, Key Stage 2 and Key Stage 3, across the ability distribution, by admissions policy area (Group 2)

	Single entry point (Policy B)		Two entry points (Policy E)			Three entry points (Policy C)			Flexible/Other entry (Policy O)		
	(i) Sept score	(ii) Aug birth effect	(iii) Sept score	(iv) Aug birth effect	(v) Diff from Policy B (iv)–(ii)	(vi) Sept score	(vii) Aug birth effect	(viii) Diff from Policy B (vii)–(ii)	(ix) Sept score	(x) Aug birth effect	(xi) Diff from Policy B (x)–(ii)
Key Stage 1											
10th percentile	–0.170	–0.596***	–0.144	–0.681***	–0.085**	–0.165	–0.695***	–0.099***	–0.146	–0.638***	–0.042
25th percentile	–0.016	–0.601***	0.002	–0.658***	–0.057	–0.023	–0.687***	–0.086***	0.022	–0.643***	–0.042*
Median	0.440	–0.572***	0.449	–0.624***	–0.052*	0.427	–0.649***	–0.077***	0.495	–0.644***	–0.072***
75th percentile	0.830	–0.522***	0.810	–0.582***	–0.061**	0.816	–0.622***	–0.100***	0.886	–0.601***	–0.080***
90th percentile	0.919	–0.497***	0.920	–0.569***	–0.073**	0.898	–0.601***	–0.104***	0.974	–0.562***	–0.065***
No. of observations	*6,738*		*1,121*			*2,277*			*4,344*		
Key Stage 2											
10th percentile	–0.419	–0.352***	–0.427	–0.384***	–0.032	–0.457	–0.411***	–0.059*	–0.445	–0.411***	–0.059**
25th percentile	–0.224	–0.360***	–0.193	–0.392***	–0.032	–0.243	–0.441***	–0.080***	–0.213	–0.411***	–0.051**
Median	0.274	–0.345***	0.307	–0.392***	–0.047	0.253	–0.401***	–0.056**	0.294	–0.391***	–0.046**
75th percentile	0.679	–0.298***	0.691	–0.348***	–0.049*	0.655	–0.371***	–0.072***	0.700	–0.336***	–0.037**
90th percentile	0.771	–0.265***	0.794	–0.311***	–0.046	0.761	–0.342***	–0.077***	0.812	–0.299***	–0.034**
No. of observations	*6,608*		*1,078*			*2,205*			*4,182*		
Key Stage 3											
10th percentile	–0.983	–0.179***	–0.932	–0.161***	0.018	–0.985	–0.212***	–0.033	–0.865	–0.200***	–0.022
25th percentile	–0.368	–0.208***	–0.345	–0.246***	–0.038	–0.368	–0.237***	–0.029	–0.259	–0.259***	–0.051**
Median	0.242	–0.228***	0.255	–0.258***	–0.030	0.257	–0.253***	–0.024	0.321	–0.272***	–0.044**
75th percentile	0.753	–0.214***	0.753	–0.260***	–0.047*	0.768	–0.238***	–0.025	0.789	–0.230***	–0.016
90th percentile	1.094	–0.168***	1.094	–0.193***	–0.025	1.116	–0.191***	–0.023	1.104	–0.173***	–0.005
No. of observations	*2,579*		*430*			*936*			*1,790*		

Notes: See previous page.

Table H.2. Boys' August birth penalty in standardised average point score at Key Stage 1, Key Stage 2 and Key Stage 3, across the ability distribution, by admissions policy area (Group 2)

	Single entry point (Policy B)		Two entry points (Policy E)			Three entry points (Policy C)			Flexible/Other entry (Policy O)		
	(i) Sept score	(ii) Aug birth effect	(iii) Sept score	(iv) Aug birth effect	(v) Diff from Policy B (iv)–(ii)	(vi) Sept score	(vii) Aug birth effect	(viii) Diff from Policy B (vii)–(ii)	(ix) Sept score	(x) Aug birth effect	(xi) Diff from Policy B (x)–(ii)
Key Stage 1											
10th percentile	–0.449	–0.593***	–0.434	–0.678***	–0.085**	–0.493	–0.635***	–0.042	–0.430	–0.665***	–0.072***
25th percentile	–0.259	–0.606***	–0.252	–0.675***	–0.069*	–0.316	–0.654***	–0.048*	–0.231	–0.683***	–0.077***
Median	0.238	–0.607***	0.229	–0.641***	–0.033	0.207	–0.691***	–0.084***	0.273	–0.670***	–0.063***
75th percentile	0.683	–0.588***	0.653	–0.619***	–0.031	0.629	–0.651***	–0.062***	0.717	–0.622***	–0.033*
90th percentile	0.800	–0.555***	0.763	–0.584***	–0.028	0.730	–0.610***	–0.055**	0.842	–0.592***	–0.037*
No. of observations	*6,928*		*1,102*			*2,398*			*4,542*		
Key Stage 2											
10th percentile	–0.563	–0.331***	–0.544	–0.403***	–0.072	–0.617	–0.351***	–0.020	–0.575	–0.392***	–0.060**
25th percentile	–0.341	–0.346***	–0.335	–0.403***	–0.057	–0.382	–0.358***	–0.012	–0.325	–0.393***	–0.047**
Median	0.185	–0.342***	0.172	–0.357***	–0.014	0.153	–0.374***	–0.031	0.216	–0.383***	–0.041**
75th percentile	0.628	–0.312***	0.592	–0.302***	0.009	0.579	–0.313***	–0.002	0.655	–0.330***	–0.018
90th percentile	0.741	–0.272***	0.700	–0.264***	0.007	0.687	–0.272***	–0.001	0.789	–0.298***	–0.027
No. of observations	*6,777*		*1,074*			*2,358*			*4,322*		
Key Stage 3											
10th percentile	–1.124	–0.172***	–1.146	–0.124**	0.048	–1.183	–0.158***	0.015	–0.999	–0.227***	–0.055*
25th percentile	–0.489	–0.235***	–0.502	–0.235***	0.000	–0.542	–0.232***	0.003	–0.378	–0.268***	–0.033
Median	0.149	–0.241***	0.123	–0.238***	0.003	0.129	–0.250***	–0.009	0.230	–0.267***	–0.026
75th percentile	0.677	–0.229***	0.615	–0.202***	0.027	0.638	–0.194***	0.035	0.730	–0.226***	0.003
90th percentile	1.024	–0.188***	0.957	–0.125***	0.063**	1.009	–0.159***	0.029	1.067	–0.173***	0.015
No. of observations	*2,675*		*431*			*951*			*1,846*		

Notes: See first page of Appendix H.

Appendix I

Table I.1. Decomposing the August birth penalty (standardised average point score) for girls in Group 3, by admissions policy area

	(i) Sept score	(ii) Aug birth effect	(iii) Estimated Aug birth effect (iv)+(v)+(vii)	(iv) Age effect	(v) Age of starting school effect	(vi) Diff from Policy B	(vii) Age position effect
KS2							
All policies	0.231	–0.355***	–0.360***	–0.337***	0.014*	–0.020***	–0.038
Policy A	–0.096	–0.349***	–0.348***	–0.337***	0.026***	–0.008	–0.038
Policy B	0.218	–0.345***	–0.341***	–0.337***	0.034***		–0.038
Policy C	0.231	–0.346***	–0.360***	–0.337***	0.015***	–0.019**	–0.038
Policy D	0.349	–0.327***	–0.349***	–0.337***	0.026***	–0.008	–0.038
Policy E	0.266	–0.361***	–0.349***	–0.337***	0.026***	–0.008	–0.038
Policy F	0.261	–0.154*	–0.360***	–0.337***	0.015***	–0.019**	–0.037
Policy H	0.376	–0.350***	–0.364***	–0.337***	0.012	–0.023	–0.038
Policy O	0.240	–0.375***	–0.375***	–0.337***	–0.001	–0.035***	–0.037
KS3							
All policies	0.180	–0.209***	–0.211***	–0.251***	0.005	–0.003	0.035
Policy A	–0.081	–0.189***	–0.206***	–0.251***	0.010	0.001	0.035
Policy B	0.140	–0.204***	–0.207***	–0.251***	0.009		0.035
Policy C	0.162	–0.214***	–0.210***	–0.251***	0.006	–0.002	0.035
Policy D	0.335	–0.225***	–0.206***	–0.251***	0.010	0.001	0.035
Policy E	0.233	–0.215***	–0.206***	–0.251***	0.010	0.001	0.035
Policy F	0.357	–0.057	–0.210***	–0.251***	0.006	–0.002	0.035
Policy H	0.383	–0.195***	–0.212***	–0.252***	0.004	–0.004	0.035
Policy O	0.223	–0.212***	–0.217***	–0.251***	–0.001	–0.009	0.035
KS4							
All policies	0.213	–0.116***	–0.120***	–0.158**	0.000	0.003	0.038
Policy A	–0.043	–0.112***	–0.116***	–0.158**	0.003	0.006	0.038
Policy B	0.172	–0.116***	–0.122***	–0.158**	–0.003		0.038
Policy C	0.210	–0.120***	–0.116***	–0.158**	0.003	0.006	0.038
Policy D	0.232	–0.047	–0.116***	–0.158**	0.003	0.006	0.038
Policy E	0.280	–0.131***	–0.116***	–0.158**	0.003	0.006	0.038
Policy F	0.404	–0.023	–0.116***	–0.158**	0.003	0.006	0.038
Policy H	0.370	–0.082**	–0.116***	–0.158**	0.004	0.007	0.038
Policy O	0.248	–0.115***	–0.120***	–0.158**	0.000	0.003	0.038

Notes:

The August birth effect (column (ii)) is based on the individual-level model with school fixed effects (Model 3).

All estimated effects (columns (iv), (v) and (vii)) come from our regression model (Model 4).

All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table I.2. Decomposing the August birth penalty (standardised average point score) for boys in Group 3, by admissions policy area

	(i) Sept score	(ii) Aug birth effect	(iii) Estimated Aug birth effect (iv)+(v)+(vii)	(iv) Age effect	(v) Age of starting school effect	(vi) Diff from Policy B	(vii) Age position effect
KS2							
All policies	0.140	–0.340***	–0.342***	–0.377***	0.007	–0.008*	0.028
Policy A	–0.017	–0.282***	–0.332***	–0.377***	0.016**	0.002	0.028
Policy B	0.127	–0.334***	–0.335***	–0.377***	0.014		0.028
Policy C	0.132	–0.326***	–0.337***	–0.377***	0.012**	–0.003	0.028
Policy D	0.243	–0.327***	–0.332***	–0.378***	0.016**	0.002	0.028
Policy E	0.177	–0.366***	–0.332***	–0.377***	0.016**	0.002	0.028
Policy F	0.323	–0.382***	–0.337***	–0.377***	0.012**	–0.003	0.028
Policy H	0.253	–0.297***	–0.332***	–0.376***	0.017	0.002	0.028
Policy O	0.147	–0.356***	–0.360***	–0.377***	–0.011	–0.026**	0.028
KS3							
All policies	0.072	–0.217***	–0.216***	–0.201***	0.011	–0.003	–0.027
Policy A	–0.068	–0.235***	–0.218***	–0.201***	0.010	–0.005	–0.027
Policy B	0.040	–0.213***	–0.213***	–0.201***	0.015*		–0.027
Policy C	0.048	–0.216***	–0.218***	–0.201***	0.010**	–0.004	–0.027
Policy D	0.196	–0.192***	–0.218***	–0.202***	0.010	–0.005	–0.026
Policy E	0.118	–0.240***	–0.218***	–0.201***	0.010	–0.005	–0.027
Policy F	0.314	–0.244***	–0.218***	–0.201***	0.010**	–0.004	–0.027
Policy H	0.227	–0.131***	–0.192***	–0.200***	0.036**	0.022	–0.027
Policy O	0.113	–0.221***	–0.220***	–0.201***	0.007	–0.007	–0.027
KS4							
All policies	–0.052	–0.131***	–0.129***	–0.089	0.015**	–0.006	–0.055
Policy A	–0.233	–0.175**	–0.135***	–0.089	0.009	–0.012*	–0.054
Policy B	–0.093	–0.118***	–0.123***	–0.089	0.021**		–0.055
Policy C	–0.058	–0.140***	–0.136***	–0.089	0.008*	–0.013*	–0.055
Policy D	0.073	–0.144***	–0.135***	–0.090	0.009	–0.012*	–0.054
Policy E	0.017	–0.161***	–0.135***	–0.089	0.009	–0.012*	–0.055
Policy F	0.094	–0.150***	–0.136***	–0.090	0.008*	–0.013*	–0.055
Policy H	0.100	–0.091***	–0.111***	–0.089	0.032**	0.011	–0.055
Policy O	–0.017	–0.134***	–0.130***	–0.089	0.014	–0.007	–0.055

Notes:
The August birth effect (column (ii)) is based on the individual-level model with school fixed effects (Model 3). All estimated effects (columns (iv), (v) and (vii)) come from our regression model (Model 4).
All models include cohort dummies, individual-level characteristics (including ethnicity, whether the child is eligible for free school meals and whether English is their first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).
*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Appendix J

Table J.1. Mean August birth penalty at Key Stage 2 and Key Stage 3, by free school meal status (Group 3)

	Girls		Boys	
	Sept score	**Aug birth effect**	**Sept score**	**Aug birth effect**
Key Stage 2				
Standardised average point score:				
Not eligible for free school meals	0.314	–0.355***	0.215	–0.338***
Eligible for free school meals	–0.330	–0.353***	–0.390	–0.355***
Difference		0.002		–0.017
Proportion achieving expected level:				
Not eligible for free school meals	0.688	–0.153***	0.641	–0.151***
Eligible for free school meals	0.420	–0.155***	0.388	–0.145***
Difference		–0.002		0.006
Key Stage 3				
Standardised average point score:				
Not eligible for free school meals	0.278	–0.208***	0.160	–0.214***
Eligible for free school meals	–0.490	–0.213***	–0.549	–0.233***
Difference		–0.005		–0.018
Proportion achieving expected level:				
Not eligible for free school meals	0.700	–0.085***	0.652	–0.096***
Eligible for free school meals	0.381	–0.102***	0.357	–0.105***
Difference		–0.017**		–0.009
Number of observations				
Not eligible for free school meals	*53,822*	*54,749*	*55,123*	*55,750*
Eligible for free school meals	*7,881*	*8,859*	*7,803*	*8,936*

Notes:

All results presented are based on an individual-level model with school fixed effects (Model 3).

All models include cohort dummies, individual-level characteristics (including ethnicity and whether English is the child's first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Appendix K

Tables K.1 and K.2 appear on the following pages

Notes to Tables K.1 and K.2:

Special educational needs outcomes and FSM status are measured at age 11 for this group.

All results presented are based on an individual-level model with school fixed effects (Model 3).

All models include cohort dummies, individual-level characteristics (including ethnicity and whether English is the child's first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table K.1. Girls' mean August birth penalty: key outcomes at Key Stage 1, Key Stage 2 and Key Stage 3, by admissions policy area (Group 2)

	Single entry point (Policy B)		Two entry points (Policy E)			Three entry points (Policy C)			Flexible/Other entry (Policy O)		
	(i) Sept score	(ii) Aug birth effect	(iii) Sept score	(iv) Aug birth effect	(v) Diff from Policy B (iv)–(ii)	(vi) Sept score	(vii) Aug birth effect	(viii) Diff from Policy B (vii)–(ii)	(ix) Sept score	(x) Aug birth effect	(xi) Diff from Policy B (x)–(ii)
Key Stage 1											
Standardised APS:											
Not eligible for FSM	0.506	–0.541***	0.499	–0.633***	–0.093***	0.528	–0.619***	–0.078***	0.551	–0.617***	–0.076***
Eligible for FSM	–0.071	–0.628***	–0.062	–0.681***	–0.053	–0.103	–0.659***	–0.031	–0.101	–0.635***	–0.007
Difference		–0.087***		–0.048	0.040		–0.040	0.047		–0.018	0.069
Proportion achieving expected level:											
Not eligible for FSM	0.743	–0.239***	0.740	–0.281***	–0.042***	0.756	–0.283***	–0.044***	0.753	–0.267***	–0.028***
Eligible for FSM	0.494	–0.255***	0.499	–0.279***	–0.024	0.477	–0.237***	0.018	0.477	–0.236***	0.019
Difference		–0.016		0.002	0.018		0.046*	0.062**		0.031*	0.047**
Key Stage 2											
Standardised APS:											
Not eligible for FSM	0.328	–0.307***	0.325	–0.390***	–0.083***	0.374	–0.383***	–0.076***	0.332	–0.362***	–0.055***
Eligible for FSM	–0.282	–0.365***	–0.252	–0.381***	–0.016	–0.284	–0.352***	0.013	–0.329	–0.395***	–0.030
Difference		–0.058**		0.009	0.067		0.031	0.088		–0.032	0.026
Proportion achieving expected level:											
Not eligible for FSM	0.801	–0.116***	0.792	–0.141***	–0.025**	0.816	–0.139***	–0.022*	0.799	–0.141***	–0.025***
Eligible for FSM	0.560	–0.145***	0.588	–0.173***	–0.028	0.551	–0.124***	0.021	0.537	–0.158***	–0.013
Difference		–0.029**		–0.032	–0.003		0.015	0.043		–0.017	0.012

	Single entry point (Policy B)		Two entry points (Policy E)			Three entry points (Policy C)			Flexible/Other entry (Policy O)		
	(i) Sept score	(ii) Aug birth effect	(iii) Sept score	(iv) Aug birth effect	(v) Diff from Policy B (iv)–(ii)	(vi) Sept score	(vii) Aug birth effect	(viii) Diff from Policy B (vii)–(ii)	(ix) Sept score	(x) Aug birth effect	(xi) Diff from Policy B (x)–(ii)
Key Stage 3											
Standardised APS:											
Not eligible for FSM	0.278	–0.180***	0.293	–0.225***	–0.045**	0.332	–0.219***	–0.039*	0.322	–0.206***	–0.026*
Eligible for FSM	–0.463	–0.203***	–0.419	–0.203***	0.000	–0.452	–0.186***	0.016	–0.457	–0.212***	–0.009
Difference		–0.022		0.022	0.044		0.033	0.055		–0.005	0.017
Proportion achieving expected level:											
Not eligible for FSM	0.769	–0.065***	0.779	–0.091***	–0.026***	0.787	–0.081***	–0.016	0.790	–0.078***	–0.013*
Eligible for FSM	0.474	–0.093***	0.498	–0.108***	–0.015	0.476	–0.069**	0.025	0.480	–0.088***	0.005
Difference		–0.029**		–0.018	0.011		0.012	0.041		–0.011	0.018
SEN											
Statemented:											
Not eligible for FSM	0.013	0.002*	0.012	0.006***	0.004	0.016	–0.004	–0.006*	0.013	0.003*	0.000
Eligible for FSM	0.030	0.007*	0.023	0.018***	0.011	0.023	0.032***	0.025***	0.038	0.007	0.000
Difference		0.005		0.012*	0.007		0.037***	0.031***		0.005	–0.001
Non-statemented:											
Not eligible for FSM	0.094	0.072***	0.093	0.075***	0.003	0.094	0.077***	0.005	0.094	0.078***	0.006
Eligible for FSM	0.199	0.110***	0.194	0.114***	0.003	0.209	0.110***	–0.001	0.214	0.125***	0.015
Difference		0.038***		0.038**	0.000		0.033	–0.006		0.048***	0.009
No. of observations											
Not eligible for FSM	*16,517*	*16,225*	*2,869*	*2,916*		*5,956*	*5,899*		*11,804*	*11,636*	
Eligible for FSM	*3,552*	*3,755*	*780*	*735*		*1,331*	*1,456*		*1,863*	*1,981*	

Table K.2. Boys' mean August birth penalty: key outcomes at Key Stage 1, Key Stage 2 and Key Stage 3, by admissions policy area (Group 2)

	Single entry point (Policy B)		Two entry points (Policy E)			Three entry points (Policy C)			Flexible/Other entry (Policy O)		
	(i) Sept score	(ii) Aug birth effect	(iii) Sept score	(iv) Aug birth effect	(v) Diff from Policy B (iv)–(ii)	(vi) Sept score	(vii) Aug birth effect	(viii) Diff from Policy B (vii)–(ii)	(ix) Sept score	(x) Aug birth effect	(xi) Diff from Policy B (x)–(ii)
Key Stage 1											
Standardised APS:											
Not eligible for FSM	0.304	–0.575***	0.263	–0.631***	–0.056***	0.312	–0.625***	–0.050*	0.316	–0.621***	–0.046***
Eligible for FSM	–0.327	–0.600***	–0.347	–0.699***	–0.099**	–0.395	–0.615***	–0.015	–0.319	–0.729***	–0.129***
Difference		–0.025		–0.068	–0.043		0.010	0.035		–0.108***	–0.083*
Proportion achieving expected level:											
Not eligible for FSM	0.656	–0.257***	0.645	–0.283***	–0.026**	0.655	–0.274***	–0.017	0.657	–0.278***	–0.021**
Eligible for FSM	0.398	–0.221***	0.397	–0.240***	–0.018	0.395	–0.226***	–0.005	0.403	–0.249***	–0.027
Difference		0.035***		0.043**	0.008		0.047*	0.012		0.029*	–0.007
Key Stage 2											
Standardised APS:											
Not eligible for FSM	0.250	–0.321***	0.203	–0.328***	–0.007	0.264	–0.352***	–0.030	0.241	–0.345***	–0.023
Eligible for FSM	–0.420	–0.315***	–0.364	–0.354***	–0.039	–0.472	–0.291***	0.024	–0.406	–0.384***	–0.069*
Difference		0.006		–0.026	–0.032		0.061	0.055		–0.040	–0.046
Proportion achieving expected level:											
Not eligible for FSM	0.767	–0.123***	0.744	–0.116***	0.007	0.779	–0.138***	–0.015	0.758	–0.132***	–0.008
Eligible for FSM	0.509	–0.128***	0.528	–0.145***	–0.018	0.479	–0.112***	0.015	0.508	–0.161***	–0.033
Difference		–0.004		–0.029	–0.025		0.026	0.030		–0.029	–0.025

	Single entry point (Policy B)		Two entry points (Policy E)			Three entry points (Policy C)			Flexible/Other entry (Policy O)		
	(i) Sept score	**(ii) Aug birth effect**	**(iii) Sept score**	**(iv) Aug birth effect**	**(v) Diff from Policy B (iv)–(ii)**	**(vi) Sept score**	**(vii) Aug birth effect**	**(viii) Diff from Policy B (vii)–(ii)**	**(ix) Sept score**	**(x) Aug birth effect**	**(xi) Diff from Policy B (x)–(ii)**
Key Stage 3											
Standardised APS:											
Not eligible for FSM	0.185	–0.205***	0.147	–0.209***	–0.004	0.202	–0.196***	0.008	0.221	–0.217***	–0.012
Eligible for FSM	–0.635	–0.197***	–0.579	–0.180***	0.017	–0.650	–0.189***	0.008	–0.574	–0.223***	–0.026
Difference		0.008		0.029	0.021		0.007	–0.001		–0.006	–0.014
Proportion achieving expected level:											
Not eligible for FSM	0.737	–0.080***	0.723	–0.086***	–0.006	0.751	–0.094***	–0.015	0.747	–0.083***	–0.004
Eligible for FSM	0.420	–0.100***	0.445	–0.090***	0.010	0.405	–0.081***	0.019	0.445	–0.100***	0.000
Difference		–0.021*		–0.004	0.016		0.013	0.034		–0.017	0.003
SEN											
Statemented:											
Not eligible for FSM	0.031	0.007***	0.039	0.002	–0.004	0.035	0.013***	0.007	0.032	0.003	–0.003
Eligible for FSM	0.084	0.010*	0.076	0.005	–0.005	0.082	0.018	0.008	0.086	0.008	–0.001
Difference		0.003		0.002	–0.001		0.004	0.001		0.005	0.002
Non-statemented:											
Not eligible for FSM	0.179	0.090***	0.189	0.088***	–0.002	0.174	0.100***	0.010	0.179	0.090***	0.000
Eligible for FSM	0.324	0.094***	0.327	0.134***	0.040*	0.352	0.087***	–0.007	0.318	0.133***	0.039**
Difference		0.004		0.045**	0.041*		–0.014	–0.017		0.043***	0.039*
No. of observations											
Not eligible for FSM	*17,509*	*16,709*	*2,896*	*2,847*		*6,413*	*6,182*		*12,373*	*12,004*	
Eligible for FSM	*3,626*	*3,723*	*785*	*771*		*1,439*	*1,478*		*1,993*	*2,058*	

Appendix L

Table L.1. August birth penalty for girls, across the ability distribution (Group 3)

	Not eligible for free school meals		Eligible for free school meals	
	Sept score	**Aug birth effect**	**Sept score**	**Aug birth effect**
Key Stage 2				
10th percentile	–0.280	–0.359***	–0.641	–0.355***
25th percentile	–0.111	–0.367***	–0.625	–0.368***
Median	0.347	–0.368***	–0.372	–0.386***
75th percentile	0.743	–0.352***	–0.146	–0.393***
90th percentile	0.843	–0.334***	–0.138	–0.390***
No. of obsns	*17,924*		*1,864*	
Key Stage 3				
10th percentile	–0.791	–0.201***	–1.102	–0.166***
25th percentile	–0.235	–0.241***	–0.967	–0.194***
Median	0.350	–0.245***	–0.508	–0.250***
75th percentile	0.856	–0.233***	–0.062	–0.269***
90th percentile	1.181	–0.189***	0.073	–0.281***
No. of obsns	*8,431*		*2,654*	
Key Stage 4				
10th percentile	–0.732	–0.111***	–1.075	–0.077***
25th percentile	–0.162	–0.134***	–0.936	–0.092***
Median	0.408	–0.147***	–0.454	–0.141***
75th percentile	0.862	–0.141***	0.004	–0.164***
90th percentile	1.168	–0.119***	0.108	–0.162***
No. of obsns	*8,336*		*2,636*	

Notes:

All results presented are based on a within-school weighted quantile regression model (Model 1). The model uses the same individuals at each Key Stage but allows these individuals to change schools. The number of observations refers to the number of schools.

All models include cohort dummies, individual-level characteristics (including ethnicity and whether English is the child's first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Table L.2. August birth penalty for boys, across the ability distribution (Group 3)

	Not eligible for free school meals		Eligible for free school meals	
	Sept score	**Aug birth effect**	**Sept score**	**Aug birth effect**
Key Stage 2				
10th percentile	–0.398	–0.351***	–0.708	–0.347***
25th percentile	–0.225	–0.367***	–0.690	–0.349***
Median	0.254	–0.359***	–0.420	–0.371***
75th percentile	0.668	–0.321***	–0.148	–0.398***
90th percentile	0.777	–0.305***	–0.135	–0.390***
No. of obsns	*18,211*		*1,880*	
Key Stage 3				
10th percentile	–0.919	–0.189***	–1.151	–0.192***
25th percentile	–0.374	–0.244***	–1.029	–0.199***
Median	0.230	–0.250***	–0.569	–0.253***
75th percentile	0.749	–0.230***	–0.123	–0.273***
90th percentile	1.101	–0.187***	0.014	–0.271***
No. of obsns	*8,467*		*2,576*	
Key Stage 4				
10th percentile	–1.049	–0.102***	–1.310	–0.120***
25th percentile	–0.488	–0.135***	–1.173	–0.133***
Median	0.126	–0.153***	–0.698	–0.168***
75th percentile	0.627	–0.150***	–0.235	–0.183***
90th percentile	0.983	–0.137***	–0.107	–0.167***
No. of obsns	*8,383*		*2,581*	

Notes:

All results presented are based on a within-school weighted quantile regression model (Model 1). The model uses the same individuals at each Key Stage but allows these individuals to change schools. The number of observations refers to the number of schools.

All models include cohort dummies, individual-level characteristics (including ethnicity and whether English is the child's first language) and a series of neighbourhood characteristics (see Section 3.1.4 for details).

*** indicates significance at the 1 per cent level; ** indicates significance at the 5 per cent level; and * indicates significance at the 10 per cent level. Standard errors are corrected for clustering at the school level.

Appendix M

Table M.1. Percentages of August- and September-born children reaching and not reaching the expected level in English across Key Stage 1 and Key Stage 2 (Group 2)

	September-born children		**August-born children**	
	Did not achieve expected level at Key Stage 2	**Achieved expected level at Key Stage 2**	**Did not achieve expected level at Key Stage 2**	**Achieved expected level at Key Stage 2**
Girls				
Did not achieve expected level at Key Stage 1	11.1	**10.3**	21.3	**19.2**
Achieved expected level at Key Stage 1	4.0	74.6	3.7	55.8
Boys				
Did not achieve expected level at Key Stage 1	18.8	**13.0**	31.5	**20.9**
Achieved expected level at Key Stage 1	4.9	63.3	4.3	43.3

Note:
At Key Stage 1, reading and writing are awarded separate marks. We use the result for reading as our indication of whether or not the child achieved the expected level in English at Key Stage 1.

Table M.2. Percentages of August- and September-born children reaching and not reaching the expected level in English across Key Stage 2 and Key Stage 3 (Group 2)

	September-born children		**August-born children**	
	Did not achieve expected level at Key Stage 3	**Achieved expected level at Key Stage 3**	**Did not achieve expected level at Key Stage 3**	**Achieved expected level at Key Stage 3**
Girls				
Did not achieve expected level at Key Stage 2	9.8	**5.3**	15.7	**9.2**
Achieved expected level at Key Stage 2	6.3	78.6	6.1	68.9
Boys				
Did not achieve expected level at Key Stage 2	18.4	**5.3**	27.7	**8.0**
Achieved expected level at Key Stage 2	10.1	66.3	9.7	54.6

Table M.3. Percentages of August- and September-born children reaching and not reaching the expected level in maths across Key Stage 1 and Key Stage 2 (Group 2)

	September-born children		**August-born children**	
	Did not achieve expected level at Key Stage 2	**Achieved expected level at Key Stage 2**	**Did not achieve expected level at Key Stage 2**	**Achieved expected level at Key Stage 2**
Girls				
Did not achieve expected level at Key Stage 1	14.5	**10.0**	28.6	**21.9**
Achieved expected level at Key Stage 1	6.7	68.9	4.8	44.7
Boys				
Did not achieve expected level at Key Stage 1	15.4	**10.9**	28.5	**24.2**
Achieved expected level at Key Stage 1	5.9	67.7	3.7	43.5

Table M.4. Percentages of August- and September-born children reaching and not reaching the expected level in maths across Key Stage 2 and Key Stage 3 (Group 2)

	September-born children		August-born children	
	Did not achieve expected level at Key Stage 3	Achieved expected level at Key Stage 3	Did not achieve expected level at Key Stage 3	Achieved expected level at Key Stage 3
Girls				
Did not achieve expected level at Key Stage 2	14.7	**6.4**	23.0	**10.4**
Achieved expected level at Key Stage 2	5.2	73.7	4.4	62.2
Boys				
Did not achieve expected level at Key Stage 2	15.7	**5.7**	23.5	**8.7**
Achieved expected level at Key Stage 2	5.4	73.3	4.7	63.1