**Stratified at seven: In-class ability-grouping and the relative age effect**

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**Abstract**

There is an established body of evidence indicating that a pupil’s relative age within their school year cohort is associated with academic attainment throughout compulsory education. In England, autumn-born pupils consistently attain at higher levels than summer-born pupils. Analysis here investigates a possible channel of this relative age effect: ability-grouping in early primary school. Relatively younger children tend more often to be placed in the lowest in-class ability groups, and relatively older children in the highest group. In addition, teacher perceptions of pupils’ ability and attainment are associated with the child’s birth month: older children are more likely to be judged above average by their teachers. Using 2008 data for 5481 English seven-year old pupils and their teachers from the Millennium Cohort Study, this research uses linear regression modelling to explore whether birth month gradation in teacher perceptions of pupils is more pronounced when pupils are in-class ability grouped than when they are not. It finds an amplification of the already disproportionate tendency of teachers to judge autumn-born children as more able when grouping takes place. The autumn-summer difference in teacher judgements is significantly more pronounced among in-class ability-grouped pupils than among non-grouped pupils. Given evidence that teacher perceptions and expectations can influence children’s trajectories, this supports the hypothesis that in-class ability-grouping in early primary school may be instrumental in creating the relative age effect.

**Keywords:** *Relative age effect, month of birth effect, ability-grouping, teacher perceptions*

**Introduction**

*Month of birth and academic attainment*

In England, as in many other countries, the vast majority of pupils are educated within class groups formed according to the structure of the school academic year. Annually, pupils born over the period beginning in September and ending in August will, with a very few exceptions, comprise a distinct cohort (Riggall & Sharp, 2008).

There is a mounting body of international evidence which indicates a relationship between month of birth, school year structure, and a variety of academic and extra-academic outcomes. Pupils who are younger in the school year (in England, those born during the summer months) tend consistently, throughout compulsory education, to score lower on tests of academic ability than their relatively older peers (Bedard & Dhuey, 2006; Boardman, 2006; Crawford *et al*, 2007; Crawford *et al*, 2011; Daniels *et al*, 2000; Department for Education, 2010a; Lawlor *et al*, 2006; Martin *et al*, 2004; McEwan & Shapiro, 2008; Menet *et al*, 2000; Oshima & Domaleski, 2006; Strom, 2004, Sykes *et al*, 2009). They are more often diagnosed with special educational needs (Crawford *et al*, 2007; Department for Children, Schools and Families 2009; Department for Education, 2010a; Gledhill *et al*, 2002; Goodman et al, 2003; Martin *et al*, 2004; Polizzi *et al*, 2007; Sykes *et al*, 2009 ; Wallingford & Prout, 2000; Wilson, 2000), and progress less frequently into further education (Bedard & Dhuey, 2006; Crawford *et al* 2011; Sampaio *et al*, 2011; Sykes *et al*, 2009). Relatively younger children are also disproportionately likely to report bullying victimhood, to demonstrate lower levels of confidence and self-efficacy, and to report lesser enjoyment of school (Crawford *et al*, 2011; Department for Education, 2010; Mühlenweg, 2010).

To date, no one theory (or set of theories) on the primary cause(s) of this ‘relative age effect’ has definitively been supported (Crawford *et al*, 2011; Sharp *et al*, 2009; Sykes *et al*, 2009). With regard specifically to birth month disproportionalities in academic attainment, research has proposed and is providing the beginnings of evidence that differences in absolute age at testing might, to some extent, explain birth month variation - given that August pupils are up to a year younger than September-borns when undertaking national assessments (Crawford *et al,* 2011; 2013).

However, other studies have suggested that it is the relative social, emotional, behavioural and / or cognitive immaturity of summer-born pupils in early primary school that is key to laying the foundations for inequalities (Boardman, 2006; Sharp *et al*, 2009). Most pupils in England enter primary school at some point during the year following their fourth birthday (Riggall & Sharp, 2008). At this stage, and throughout their early education, the in-cohort age difference of up to a year between relatively younger and relatively older pupils comprises a significant fraction of life lived, and of development.

The possibility, therefore, is that the early maturational inequalities necessitated by the structure of the annual cohort-based educational system are instrumental in creating the relative age effect. This theory is supported by research which indicates that younger pupils may disproportionately frequently be diagnosed with special educational needs on the basis of relative developmental immaturity, rather than any inherent trait difference (Dhuey & Lipscomb, 2010; Elder & Lubotsky, 2009; Gledhill et al, 2002; Wallingford et al, 2000). In addition, analysis of international evidence by Sprietsma (2010) begins to suggest that ability-grouping (where groups are constructed on thebasis of performance / perceived ability relative to cohort peers) may account for some of the attainment variation associated with month of birth.

*In-class ability grouping and month of birth*

Analysis of 2008 data for a large, national sample of British seven-year-olds who are participating in the Millennium Cohort Study (MCS) shows that, across both whole-year and in-class grouping practices, relatively younger pupils are disproportionately frequently placed in lower groups, while their relatively older peers are more often found in the highest placements. This tendency is consistent across all practices, and steadily, linearly-incrementally related to birth month (Campbell, 2013; Hallam and Parsons, 2012).

Campbell (2013) reports that 78.8% of 5374 English MCS children are subject to an overriding, high-level within-class ability grouping, and shows that among these pupils, September-born children are more than twice as likely than August-born children to be placed in the highest group, with the inverse being the case for the lowest grouping (Figure 1). There is strong evidence, therefore, that a large proportion of pupils are in-class ability-grouped at a very early age, and there are indications of major disparities in placement according to relative age within-cohort. This lends initial support to a theory that early in-class ability-grouping, at a stage where absolute age differentials are highly pronounced, may be influential in the creation of the month of birth effect.

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**Figure 1 about here**

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*In-class ability-grouping and academic attainment*

Reviews of the wider research on the associations between ability-grouping and pupil attainment have generally suggested that grouping entrenches between-pupil difference and has a detrimental effect on pupils placed at lower levels (Kutnick *et al*, 2005; Dunne *et al*, 2007; Blatchford *et al*, 2008). There is also evidence that pupils’ positions within in-school hierarchies have tended largely to be stable over time (Blatchford *et al*, 2008). In-class ability-grouping in early primary school may, therefore, establish a structured hierarchy which is predicated on birth month and which embeds differentiated trajectories of academic achievement.

Campbell (2013) proposes a theoretical model where the initial disparity in within-class group position may play out in as a disparity in eventual attainment via three possible routes: through pupils’ self-perceptions, as engendered by their in-class position; through the educational and assessment opportunities offered to pupils placed at different in-class levels; and through teacher perceptions, expectations of, and behaviours towards pupils situated in different groups. The investigation presented in the current paper begins to explore this third hypothetical channel.

*Teacher perceptions and academic attainment*

Since Rosenthal and colleagues began investigating the relationships between teacher expectations and pupil performance in the 1960s (Rosenthal & Jacobsen, 1968), a solid body of evidence has built which suggests that teacher perceptions of, expectations of, and beliefs about their pupils can influence attainment, and lead to self-fulfilling prophesies: ‘when teachers believe… their students [are] very able [they interact] with them in ways which promote…their academic development’ – and vice versa (Rubie-Davies, 2010).

Research has indicated that teacher judgements of their pupils can relate to the groups of which children are members - groups which may bear little or no necessary relationship to a child’s ability or potential (Harlen, 2004). Recent studies have suggested that this bias is apparent, for example, in relation to pupil ethnic group (Burgess & Greaves, 2009), gender (Hansen & Jones, 2011), and special educational needs status (Reaves *et al*, 2001).

Most significantly, there is evidence that teacher perceptions of pupil ability and attainment are gradated according to birth month, with August-born pupils tending to be judged as less able by their teachers, and September-borns as more able. Crawford *et al* (2011) indicate that, at age seven, relatively younger pupils are more likely to be judged by their teacher as of ‘below average’ ability in reading, writing and maths, while Crawford *et al* (2013) use national data to show a steady downward September-August trend in the grades allocated through the teacher assessed component of Key Stage Two tests. Unless there truly is a difference in pupil ability which corresponds, expediently, to the structure of the cohort-based educational system, this indicates a fundamental bias in teacher assessments of children according to their birth month – a bias which may further be confounded by the unequal distribution of pupils born in different months across in-class ability groups.

**The current study**

To investigate whether in-class ability-grouping is, as hypothesised, instrumental in the construction of the relative age effect, the current study therefore focuses on the mediating pathway of teacher perceptions of pupil ability, and examines whether birth month gradation in these perceptions is greater where there *is* in-class ability grouping than where there *is not*. If there is *no* difference in magnitude of variation, then in-class grouping will not be indicated as a key mechanism in the creation and proliferation of the effect. If variation in teacher perceptions according to birth month *is* more pronounced where in-class ability grouping takes place, and given evidence that teacher perceptions may affect pupil attainment, then in-class ability grouping will begin to be implicated as playing a part in the formation of the relative age effect.

**Methodology**

*Sample*

Analyses in this paper use 2008 data on seven-year-old, English Millennium Cohort Study (MCS) children, and the children’s teachers. The MCS is an on-going, UK-wide longitudinal sample survey, whose target population in England is defined as: ‘all children born between 1 September 2000 and 31 August 2001…alive …at age nine months and eligible to receive Child Benefit at that age; and, after nine months: for as long as they remain living in the UK at the time of sampling’ (Plewis *et al*, 2007).

Five waves of the MCS have taken place to date: in 2001, 2004, 2006, 2008, and 2012. At wave one, 11,695 individual babies were included in the final achieved sample in England. At wave four, 8887 interviews took place in England, of which 5627 (63%) also generated responses to the separate questionnaire completed by the child’s class teacher (Johnson *et al*, 2011) which is used for analyses here. Analyses are for MCS children surveyed in England only so that, in line with the assumption that the structure of a school system underpins associations between month of birth and child outcomes, findings apply within a single educational framework with consistent school year cut-off points.

Twins and triplets are removed from analyses, because in-class groupings and teacher judgements for these pupils may be subject to different tendencies compared to singleton children. This leaves a base total of 5481 English seven-year-old pupils with returned teacher surveys. There are some variations in sample sizes across analyses due to missing data; exact numbers are stated throughout reporting.

Campbell (2013) demonstrates that the 5481 English MCS teacher sample seven-year-olds are, at an aggregate level, similar to the national population of seven-year-olds as reported in (then) Department for Children, Schools and Families statistics for the corresponding year 2008-09. They may therefore tentatively be considered reasonably to represent the target population. Unweighted data are used throughout this paper, as weights are not available for the teacher survey sample.

See Campbell (2013), Chaplin Grey (2010), Huang & Gatenby (2010), Johnson *et al* (2011), Plewis *et al* (2007), and <http://www.cls.ioe.ac.uk/> for further technical details, documentation and discussion of the MCS in general and the teacher survey in particular. All MCS data used for analyses here are publically available and can be downloaded at <http://www.esds.ac.uk/>.

*Key measures*

The two key predictor variables used in analyses are pupil season of birth and teacher report of whether the pupil is in-class ability-grouped, or not. The outcome variable is teacher assessment of whether the pupil is of *above average ‘*ability and attainment’ at a given subject.

The *season of birth* predictor combines month of birth into four categories (autumn, winter, spring, summer), in order to ensure robust sample sizes for modelling. Autumn comprises those born in September, October, or November (27.3% of the sample); Winter: December, January, February (25.2%); Spring: March, April, May (24.3%); Summer: June, July, August (23.2%). As detailed in the results section, and in line with the linear incremental associations demonstrated throughout relative age research, this amalgamation of months into seasons does not affect the direction of findings.

The ability grouping predictor variable derives from a question in the wave four teacher survey which asks whether, at age seven, ‘In this child’s class, is there within-class ability grouping?’ – having defined within-class ability-grouping as follows:

Some schools group children within the same class by general ability and they are taught in these ability groups for most or all lessons.

Respondents provided a *yes / no* answer to this question, and this is used as a binary 1 / 0 variable in analyses. 79% of the base sample pupils are reported as being in-class grouped.

The outcome variable derives from a question in the teacher survey asking the respondent to ‘rate some aspect of the study child’s ability and attainment…in relation to all children of this age…’ Teachers could rate children as *well above average, above average, average, below average,* or *well below average.* Teachers were asked their opinion on children’s *ability and attainment* in the following domains: speaking and listening; reading; writing; science; maths and numeracy; physical education; information and communication technology; and expressive and creative arts. See Appendix A for a breakdown of teacher responses in each domain for all sample pupils. For brevity, the results presented in this paper are for the first four domains on which teachers were questioned: speaking and listening, reading, writing, and science. Analysis using responses in other domains has also been undertaken and is available from the author on request; results are consistent with those included in this paper.

In each subject domain, there is an overriding month of birth gradient in teachers’ ratings of pupils’ *ability and attainment,* where relatively older children are more likely to be judged *well above average* or *above average*, and relatively younger children are more likely to be judged *average, below average,* or *well below average.* Figure 2 illustrates this for judgements of speaking and listening *ability and attainment.*

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**Figure 2 about here**

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This five-category teacher judgement outcome variable is recoded to be binary, so that 1, ‘above average,’ combines teacher responses of *well above average* and *above average*, and 0, ‘average or below,’ combines responses of *average, below average,* or *well below average.* This focusses analysis on disproportionalities and patterns in positive, favourable judgements of pupils.

*Analytical approach*

Linear probability regression is used to model the relationships between birth season, ability grouping, and whether teacher judgement is ‘above average.’ All main analyses use the *Generalised Linear Modelling* option in PASW (SPSS) 18. Linear probability regression has been used in some of the most recent research into relative age effects (Crawford et al, 2013) and is chosen for analyses here because the model-predicted probabilities offered are more straightforwardly interpretable than the odds ratios produced by a logistic regression. However, as a check, equivalent analyses have also been performed using the latter technique, and do not affect results. They are available from the author on request, and an example is described in the results section.

Because analyses investigate whether the relationship between season of birth and teacher perceptions varies *according to* whether pupils are ability grouped or not, an interaction between these two predictors is key to each model (SoB x Gr), and included along with the season of birth (SoB) and ability grouping (Gr) predictors. The basic equation underpinning all analyses is therefore:

The reference categories in each analysis are set as *summer* and *not grouped*. Therefore, given the inclusion of the interaction, the first three coefficients in the equation describe the relationships between likelihood of being judged ‘above average’ and birth season (autumn, winter, or spring – in comparison to the summer reference) among pupils who are *not grouped*. The fourth coefficient describes the relationship between being grouped and probability of being judged ‘above average’ for summer pupils. The fifth coefficient, for the interaction, isolates the association between being grouped and being judged ‘above average’ for autumn-born pupils (and the sixth and seventh for winter and spring-born pupils). Key coefficients are described throughout the results section, alongside graphs which illustrate model predicted probabilities (estimated marginal means) of being judged ‘above average’ for pupils born in each season who are grouped and not grouped.

*Stages two, three and four: addition of controls*

Because any difference in the relationships between being born in the autumn / summer, being grouped or not, and teacher perceptions may be due to selection of pupils with different family backgrounds and individual characteristics into schools which group / do not group, a second stage of analysis adds controls for a range of pupil- and family-level factors. Table 1 describes the variables included at this second stage (and Appendix B details each, its origin and identifier in the MCS surveys, and its distribution in the sample, in greater depth).

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**Table 1 about here**

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Even controlling for the factors included at this second stage, it is still possible that there are other, systematic, school- or teacher-level differences between grouping / non-grouping establishments which influence teacher perceptions. Stage threetherefore attempts to account for this, by adding further controls available in the MCS (see Table 1).

Lastly, a fourth stage adds additional controls for previous in-school assessments of pupils, which serve two potential purposes, each premised on a separate assumption.

The MCS data contain no information on the point at which ability-grouping commenced for sample pupils, so, firstly, based on an assumption that pupils are grouped at school entry, stage four provides an indication of any continuing, pervasive, additional effect of grouping, *after* Foundation Stage Profile (FSP) teacher assessment at age five, and *after* any special educational needs (SEN) diagnoses prior to surveying at age seven.

Alternatively, if the assumption that grouping placement commences immediately on school entry does not hold, inclusion of the FSP and SEN variables should account for additional school decisions and evaluations which may be entangled with relative age and with grouping practice and placements as initiated, at some point, between entry and age seven. Pupils may be placed in a lower in-class group because they have a SEN diagnosis, or vice versa; because they have a low FSP score, or vice versa; these decisions may take place sequentially, or concurrently.

If associations between ability-grouping and teacher perceptions remain, even taking into account the potential confounding effects of these final factors (on top of the variables added at previous stages), stage four will therefore strengthen indications that grouping has a strong, independent effect.

**Results**

Table 2 indicates, for each subject domain, whether and the extent to which non-grouped autumn pupils are more likely to be judged as of ‘above average’ *ability and attainment* by their teachers, compared to summer-born, non-groupedpupils (‘Autumn’; see equation on page \*\*12\*\* - this is coefficient 1). In each subject domain, at stages one, two, and three, there is a positive, significant relationship between being born in the autumn and being judged ‘above average.’ For example, according to stage one analysis, autumn-born pupils are 11.9 percentage points more likely to be judged ‘above average’ than summer-borns at speaking and listening. At stage four, however, upon addition of controls for previous in-school judgements, this difference is no longer significant. Having controlled for pupil, family, school and teacher characteristics, and previous in-school judgements, non-groupedautumn pupils and non-grouped summer pupils do not significantly differ in their chances of being judged ‘above average’ by their teacher.

Table 2 also indicates any association, for summer pupils, between being ability-grouped and being judged ‘above average’ (‘Ability grouped’; coefficient 4 from the equation). At each stage of analysis, in each subject domain, this relationship is negative – being grouped appears to lessen the chances of summer pupils of being judged ‘above average’ – but it is not statistically significant at the 5% level, in any subject, upon addition of controls beyond stage one.

However, the relationship indicated in Table 2 between being grouped and being judged ‘above average’ for autumn pupils (‘Autumn x ability grouped’; coefficient 5) is positive and statistically significant at the 5% level or above at all stages of analysis, across all subject domains. For example, autumn-born children who are grouped have chances 11 percentage points higher than autumn-born pupils who are not grouped of being judged ‘above average’ at speaking and listening by their teacher at stage one, and this difference is barely altered at stage four, where it remains significant, at 10.9 percentage points higher.

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**Table 2 about here**

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There are therefore three initial findings. Firstly, ungrouped autumn-born pupils are more likely than ungrouped summer-born pupils to be judged as of ‘above average’ ability and attainment by their teachers. This tendency holds upon addition of controls for pupil, family, school and teacher characteristics – but is negated upon addition of controls for previous in-school judgements.

Secondly, the difference made to summer pupils by being grouped appears minimal, though negative. Grouping appears slightly to lower teacher judgements of summer pupils – but these apparent effects are largely non-significant.

Thirdly, however, and in contrast, the practice of in-class grouping is indicated as strongly, positively related to teacher judgements of autumn pupils, even upon addition of all controls, including previous in-school evaluations and decisions.

Crucially, these associations result in a much wider autumn-summer gap in teacher perceptions among pupils in schools which in-class group than among pupils in schools that do not in-class group. Figures 3 to 6 illustrate this finding for judgements in each subject domain, at stage four of analysis, with all controls.

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**Figures 3 – 6 about here**

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Figure 3 shows an autumn-summer difference in mean predicted probability of being judged ‘above average’ in speaking and listening of 14 percentage points among pupils in schools which group (p < .001). Among pupils in schools which do not group, this difference is much smaller (3.1 percentage points), and non-significant (p = .435). For judgements of reading (Figure 4), the difference is 14.2 percentage points for grouped pupils (p < .001 ) and 2.3 for non-grouped (p = .553); for writing (Figure 5) it is 13 percentage points for grouped pupils (p < .001) and 3.5 percentage points for non-grouped (p = .355); and for science (Figure 6) it is 15.6 percentage points for grouped pupils (p < .001) and 5.7 for non-grouped (p = .138).

*Robustness checks*

Two key alternative analyses were carried out in order to check whether methodological choices may have influenced the direction of results. Firstly, as mentioned, repeating analyses using a binary logistic regression rather than a linear regression produces equivalent findings. For example, in the logistic model, at stage four of analysis investigating teacher judgements of pupils’ speaking and listening *ability and attainment*, autumn-born pupils have odds 13% higher than summer born pupils of being judged ‘above average,’ but as with the linear model, this is not significant (p = .62); grouped summer-born pupils have 4% lower odds than non-grouped summer-borns of being judged ‘above average,’ but, again like the linear model, this difference is non-significant (p = .84); while, true to the linear model, the difference between ability-grouped and non-ability-grouped autumn-born pupils is large and significant: grouped autumn-borns have odds 88% higher than non-grouped of being judged ‘above average’ (p = .016).

Secondly, using month rather than season of birth in modelling results in larger standard errors for some estimates due to reduced sample sizes, but does not influence the direction or significance of key results. Indeed, given the linear incremental pattern of associations with birth month, coefficients for the September-August difference are larger than those for the autumn-summer difference. For example, at stage four of analysis using teachers’ judgements of speaking and listening, being in-class ability-grouped results in a predicted probability of being judged ‘above average’ 16 percentage points higher for September-born pupils who are grouped compared to those who are not grouped (p = .038). The September-August difference among grouped pupils according to this specification is 22 percentage points (p < .001), while the difference among non-grouped pupils is smaller and non-significant at 6 percentage points (p = .405).

**Discussion**

Analyses here set out to investigate whether there is support for the hypothesis that in-class ability-grouping early in primary school contributes to the creation of systematic birth month differentials in pupil attainment. Findings provide evidence which supports this hypothesis. Among children who *are* in-class ability-grouped, autumn-summer variation in teacher perceptions of *ability and attainment* is greater than among pupils who are *not* grouped. The already disproportionate tendency of autumn-borns to favourably be judged ‘above average’ is amplified among grouped children. This finding holds upon addition of a range of potentially confounding family, pupil, school and teacher factors.

Research indicates that teacher opinions and expectations can influence the academic trajectory of their pupils, so analysis here suggests that in-class ability-grouping may provide a significant ‘boost’ to the progress of autumn-born children which further raises their progress above their relatively younger peers. Findings begin to support a model where grouping is instrumental in the relative age effect – and where cessation of in-class ability-grouping may go some way towards alleviating the effect.

*Alternative explanations, and implications of these*

The data available in the MCS do not contain information on the exact decision-making and administrative processes that led to each of the study children being grouped, or not grouped. Therefore it is not possible to know whether the presence or absence of grouping is due to school policy, choice on the part of individual teachers, or some combination of these factors. The exact chain of events and pattern of effects is, therefore, uncertain. The main hypothesis proposed in this paper is that in-class grouping affects teacher perceptions – but it is possible that, in some cases (and as has, for example, been suggested by Kuklinski & Weinstein, 2000), teachers with a propensity to notions of fixed ability, and a tendency to more extreme discrimination and differentiation between students (including that, potentially, according to birth month), enact these tendencies in a decision to ability-group their pupils.

However, this possibility, if it is, in fact, the case for some of the MCS respondent teachers, does not negate the suggestion that ending in-class grouping during early primary school may assuage the month of birth effect. If a policy of *no* early in-class groupings were prescribed, it would disallow a practice which legitimises and reifies assumptions of intrinsic differences in ability and potential (which, as discussed, appear invalidly biased by pupil characteristics, including month of birth); a practice which embeds these assumptions, providing a deterministic conduit through which they may play out. Disallowing ability-grouping may therefore, in itself, evoke some reassessment of teachers’ own practices and beliefs – or, at least, provide some restraint to the application of premature and divisive categorisations and delineations between pupils.

Moreover, research suggests a number of additional channels alongside that of teacher expectations through which ability-grouping might affect pupil attainment - including pupil self-perceptions, and differentiated educational and assessment opportunities (Kutnick *et al*, 2005; Blatchford *et al*, 2008). Given the disproportionate distribution of pupils born in different months across the in-class hierarchy, whether the presence of grouping affects teacher perceptions, or vice versa, or both, an *absence* of in-class grouping may, theoretically, prevent its effects from manifesting by blocking a variety of subsequent pathways.

*Policy implications*

Recent UK governments have consistently encouraged ability-grouping (see Department for Education and Skills, 2005; Conservative Party, 2007; Department for Children, Schools, and Families, 2008; Department for Education, 2010b) - while, at the same time, stating a desire for an educational system which engenders parity of access and opportunity:

Our schools should be engines of social mobility, helping children to overcome the accidents of birth and background to achieve much more than they may ever have imagined. But, at the moment, our schools system does not close gaps, it widens them (*Department for Education, 2010b, p 6*).

Findings in this paper, from a large, recent, national sample of seven-year-olds, suggests that the policy and practice of in-class ability-grouping pupils early in primary school may, in fact, be detrimental to mobility. If systematic month of birth variation in attainment is to be ‘overcome’ through changes to policy and practice – and few ‘accident[s] of birth’ are more arbitrarily foisted upon an individual than their birth *date* – then the evidence here indicates that reversal of the policy of in-class ability-grouping in early primary school may contribute to ‘closing the gap’ between relatively younger and relatively older pupils.

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**Appendix A**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**Table 3 about here**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**Appendix B**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**Table 4 about here**

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

**Figure 1: Percentage of pupils born in each month who are reported as being in each within-class ability-group, among those pupils who are reported as being within-class grouped\***

(n = 4140) \*From Campbell (2013)

**Figure 2: Percentage of sample pupils born in each month judged to be at each level of *speaking and listening* ability and attainment by their respective respondent teacher**

(n = 5429)

**Table 1: Controls added cumulatively to each model at stages two, three and four**

|  |  |  |
| --- | --- | --- |
| Stage two: pupil and family controls | Stage three: school and teacher controls | Stage four: previous in-school assessments of pupil |
| Pupil gender | Whether school at wave four same school child attended two years previously | Total (teacher-assessed, age five) Foundation Stage Profile score |
| Pupil ethnicity | Whether family pays fees for schooling | Teacher report of any identified special educational need |
| Pupil age five British Ability Scale (age-) standardised T-scores (Pattern Construction, Picture Similarity, Naming Vocabulary)[[1]](#footnote-1) | Whether family displayed religiosity for school admission |  |
| Family income at age seven | Whether there are mixed year groups in child’s class |  |
| Family housing tenure at age seven | Number of classes in child’s year group |  |
| Whether languages other than English are spoken in pupil’s home at age seven | Number of pupils in child’s class |  |
| Main parent’s highest academic qualification at child’s birth | Respondent teacher’s gender |  |
| Main parent’s highest vocational qualification at child’s birth | Number of years respondent teacher has taught |  |
| Whether a single parent when child was born | Number of years respondent teacher has taught at this school |  |
| Whether internet is available in family home at age seven |  |  |
| Whether, and length of time for which, pupil was breastfed |  |  |

**Table 2: Key coefficients at each stage of analysis for relationships between month of birth / ability grouping and probability of being judged ‘above average’ by teacher**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Stage one | Stage two | Stage three | Stage four |
| Speaking and listening | | | | |
| Autumn (ref: summer) | .119\*\* | .159\*\*\* | .158\*\*\* | .031 |
| Winter (ref: summer) | .072 | .111\*\* | .117\*\* | .019 |
| Spring (ref: summer) | -.009 | -.003 | -.001 | -.058 |
| Ability grouped (ref: not grouped) | -.050 | -.019 | -.010 | -.005 |
| Autumn x ability grouped | .110\*\* | .092\* | .093\* | .109\* |
| N. | 5325 | 5036 | 5036 | 4531 |
| Reading | | | | |
| Autumn (ref: summer) | .124\*\* | .171\*\*\* | .158\*\*\* | .024 |
| Winter (ref: summer) | .051 | .100\* | .098\* | .013 |
| Spring (ref: summer) | .025 | .039 | .036 | -.008 |
| Ability grouped (ref: not grouped) | -.069\* | -.039 | -.039 | -.026 |
| Autumn x ability grouped | .127\*\* | .111\* | .119\*\* | .118\*\* |
| N. | 5322 | 5033 | 5033 | 4530 |
| Writing | | | | |
| Autumn (ref: summer) | .115\*\* | .163\*\*\* | .158\*\*\* | .036 |
| Winter (ref: summer) | .032 | .073 | .077\*\* | -.010 |
| Spring (ref: summer) | .008 | .024 | .027 | -.009 |
| Ability grouped (ref: not grouped) | -.071\* | -.035 | -.027 | -.020 |
| Autumn x ability grouped | .107\* | .082\* | .081\* | .094\* |
| N. | 5233 | 5032 | 5032 | 4530 |
| Science (ns = 5319; 5029; 5029; 4526) | | | | |
| Autumn (ref: summer) | .160\*\*\* | .191\*\*\* | .183\*\*\* | .058 |
| Winter (ref: summer) | .045 | .081\* | .084\* | -.004 |
| Spring (ref: summer) | .008 | .016 | .016 | -.030 |
| Ability grouped (ref: not grouped) | -.038 | -.018 | -.014 | -.016 |
| Autumn x ability grouped | .076 | .078 | .083\* | .099\* |
| N. | 5319 | 5029 | 5029 | 4526 |

(\*\*\* = p < .001; \*\* = p < .01; \* = p < .05. Each coefficient indicates percentage change in predicted probability of being judged ‘above average.’ Controlled at stage two for pupil and family characteristics; stage three addsschool and teacher factors; stage four adds pupil FSP score / presence of SEN diagnosis – see Table 1.)

**Figure 3: Average predicted probabilities for pupils in each season of birth / in-class grouped or not category, produced by stage four regression – probability of being judged ‘above average’ in speaking and listening *ability and attainment* by teacher** (n = 4531; controlled for pupil and family characteristics *and* school and teacher factors *and* pupil FSP score / presence of SEN diagnosis)

**Figure 4: Average predicted probabilities for pupils in each season of birth / in-class grouped or not category, produced by stage four regression – probability of being judged ‘above average’ in reading *ability and attainment* by teacher** (n = 4530; controlled for pupil and family characteristics *and* school and teacher factors *and* pupil FSP score / presence of SEN diagnosis)

**Figure 5: Average predicted probabilities for pupils in each season of birth / in-class grouped or not category, produced by stage four regression – probability of being judged ‘above average’ in writing *ability and attainment* by teacher** (n = 4530; controlled for pupil and family characteristics *and* school and teacher factors *and* pupil FSP score / presence of SEN diagnosis)

**Figure 6: Average predicted probabilities for pupils in each season of birth / in-class grouped or not category, produced by stage four regression – probability of being judged ‘above average’ in science *ability and attainment* by teacher** (n = 4526; controlled for pupil and family characteristics *and* school and teacher factors *and* pupil FSP score / presence of SEN diagnosis)

**Table 3: Percentage in whole teacher survey sample judged to be at each level of *ability and attainment* in each subject domain**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Speaking and listening**  **(n = 5429)** | **Reading**  **(n = 5426)** | **Writing**  **(n = 5426)** | **Science**  **(n = 5423)** | **Maths**  **(n = 5412)** | **PE**  **(n = 5429)** | **ICT**  **(n = 5418)** | **Arts**  **(n = 5425)** |
| **Well above average** | 9.3 | 12.8 | 6.7 | 5.9 | 9.3 | 4.2 | 2.8 | 4.0 |
| **Above average** | 30.4 | 33.6 | 25.7 | 28.6 | 31.5 | 23.7 | 23.4 | 22.3 |
| **Average** | 43.7 | 32.1 | 38.0 | 51.5 | 38.9 | 63.0 | 62.2 | 60.7 |
| **Below average** | 13.4 | 15.9 | 22.9 | 11.3 | 16.1 | 7.5 | 9.7 | 11.1 |
| **Well below average** | 3.3 | 5.6 | 6.8 | 2.7 | 4.2 | 1.6 | 1.8 | 1.8 |

**Table 4: Details of variables used at each stage of modelling**

|  |  |  |  |
| --- | --- | --- | --- |
| **Intends to measure…** | **Original variable name in MCS dataset** | **Whether recoded** | **Response possibilities (in original variable or in recoded variable if applicable). Reference categories in bold. Whole sample proportion in each category, or 25th / 50th / 75th percentiles, in brackets** |
| Dependent variables: Whether at age seven teacher assessment of ‘ability and attainment’ in given category is *above average* / *well above average* | | | |
| Speaking and listening | DQ2160 | Yes | Above average (39.6%) / **average or below average** (60.4%) |
| Reading | DQ2162 | Yes | Above average (46.4%) / **average or below average** (53.6%) |
| Writing | DQ2164 | Yes | Above average (32.3%) / **average or below average** (67.7%) |
| Science | DQ2166 | Yes | Above average (34.5%) / **average or below average** (65.5%) |
| Key predictors | | | |
| Child’s season of birth | dhcdbma0 | Yes | **Summer** (23.2%) / Spring (24.3%) / Winter (25.2%) / Autumn (27.3%) |
| Whether in-class ability-grouped or not | DQ2466 | Yes | Yes (78.8%) / **No** (21.2%) |
| Stage two controls: pupil and family characteristics | | | |
| Pupil gender | dhcsexa0 | No | Male (50.2%) / **female** (49.8%) |
| Pupil ethnicity | ddc06ea0 | Yes | **White** (80%) / mixed (3.4%) / Indian (3.3%) / Pakistani and Bangladeshi (6.9%) / Black or Black British (3.9%) / Other or missing (2.6%) |
| BAS Naming Vocabulary T-score at age 5 | cdnvtscr | No | 20 – 80 (48, 56, 62) |
| BAS Pattern Construction T-score at age 5 | cdpctscr | No | 20 – 80 (46, 51, 57) |
| BAS Picture Similarities T-score at age 5 | cdpstscr | No | 20 – 80 (49, 55, 61) |
| Family income level when child is age 7 | doedp000 | Yes | **Above 60% median level** (72.7%) / below 60% or missing data (27.3%) |
| Family housing tenure when child is age 7 | ddroow00 | Yes | **Own with mortgage or loan** (60.7%) / rent (30.7%) / other (8.6%) |
| Whether English is spoken as an additional language in child’s household at age 7 | ddhlan00 | Yes | **English only or missing** (86.3%) / Mostly English (5%) / Half English and half other language (4.6%) / Mostly or only other language (4.1%) |
| Main parent’s highest academic qualification when pupil was born | amacqu00 | Yes | Higher degree (3.5%) / First degree (14.4%) / Dip HE (9%) / A or AS level (8.8%) / **O level or GCSE A-C** (32.1%) / GCSE D-G (10.5%) / Other academic inc overseas (2.6%) / None, or missing data (19.2%) |
| Main parent’s highest vocational qualification when pupil was born | amvcqu00 | Yes | Professional at degree level (12.3) / Nursing or other medical (4.6%) / NVQ 3 (9.9%) / NVQ 2 (9.3%) / NVQ 1 (7.6%) / Other (6.9%) / **None, or missing data** (49.5%) |
| Whether single parent when child was born | adhtys00 | Yes | One parent resident (12%) / **Two parents resident** (88%) |
| Whether internet available in home at age 7 | dminlna0 | Yes | No or missing data (16.8%) / **Yes** (83.2%) |
| Whether / length of time for which breastfed | ambfeaa0 | Yes | Less than a week (11%) / Some weeks (16.6%) / Some months (28.6%) / Still breastfeeding at wave one interview (13.8%) / **Did not try breastfeeding, or baby would not breastfeed** (30%) |
| Stage three controls: School and respondent teacher characteristics | | | |
| Whether this is the same school as attended at Wave 3 | dmsamsa | Yes | No, don’t know, not applicable (15.5%) / **Yes** (84.5%) |
| Whether child is in year two | dmstsca0 | Yes | No, in different year (5.9%) / **Yes, in year 2** (94.1%) |
| Whether parent reports paying fees for the school | dmsctya0 | Yes | Yes (4.8%) / **No** (95.2%) |
| Whether family displayed religiosity for school admission | dmfthsa0 | Yes | Yes (28.3%) / **No, not a faith school, or missing data** (71.7%) |
| Whether pupil’s class contains mixed year groups | DQ2513 | Yes | Yes (14%) / **No** (46.5%) / Question non-response (39.5%)\* |
| Number of children in class | DQ2511 | Yes | 1-25 (21.6%) / 26-29 (19.9%) / **30** (14.9%) / 31+ (3.2%) / Question non-response (40.4%)\* |
| Number of classes in pupil’s year | DQ2524 | Yes | **One** (21.2%) / Two (24.5%) / Three or more (13.8%) / Question non-response (40.5%)\* |
| Teacher gender | DQ2479 | Yes | Male (4.1%) / **Female** (46.1%) / Question non-response (39.7%)\* |
| Number of years teacher has taught | DQ2481 | Yes | **1-3** (11.2%) / 4-7 (12.4%) / 8-13 (10.6%) / 14-23 (11.6%) / 24-48 (11.1%) / Question non-response (43.1%)\* |
| Number of years teacher has taught at this school | DQ2487 | Yes | **1-3** (19.9%) / 4-7 (16.7%) / 8-48 (20.4%) / Question non-response (43%)\* |
| Stage four controls: previous school / teacher assessments of pupil | | | |
| Foundation Stage Profile: total score – at age 5 | FSPTOTAL | No | 0 – 117 (77, 91, 102) |
| Whether teacher reports that child has any SEN at age 7 | DQ2328 | Yes | Yes (22.6%) / **No or missing data** (77.4%) |

\*Due to administrative problems, a number of sections of the teacher survey suffer question non-response (personal correspondence with survey administrators). These instances are coded as such and included in analyses as a separate category.

1. These tests are postulated by their developers and by some users as providing (respective) indications of spatial ability, pictorial reasoning ability, and verbal ability, which, together, measure a latent, absolute, stable trait of ‘general conceptual ability’ (see Hill, 2005). In these analyses, they are simply assumed to indicate prior performance on cognitive tests, at age five, around the time a pupil entered primary school. [↑](#footnote-ref-1)