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**Social class differences in the effects of pre-school on children's academic  
performance at age 7**

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## Abstract

### Abstract:

This paper describes the differential effect of pre-school on children's academic attainment in Year 2 (age 7) of English primary school. The Effective Provision of Pre-school Education (EPPE) project was designed to study the effects of pre-school education and care on a large representative sample. Funded by the British government, it follows the progress of 3000 children from 3 to 7 years. Using an 'educational effectiveness' design (Sammons, Sylva, Melhuish, Siraj-Blatchford, Taggart, & Elliot, 2002 & 2003), EPPE aims to explore the effects of individual pre-school centres on children's attainment and social/behavioural development at entry to primary school and later at age 7. Compared to children with no pre-school experience, pre-school children scored higher on academic tests such as phonological awareness and number skills at age 5 (school entry). At age 7 pre-school children were still showing higher academic scores when compared to children without pre-school, but not social-behavioural ones (Sammons et al 2004; Sylva et al 2004). However, many children who did not attend pre-school were 'catching up' with their peers who did. This was not the case for children whose parents had unskilled jobs or were unemployed. The implications of the failure of the poorest children to catch up by age 7 are discussed in terms of the targeting of government support to schools in disadvantaged neighbourhoods.

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## **Social class differences in the effects of pre-school on children's academic performance at age 7**

### **Objectives**

The aim of this study is to explore the medium-term effects of pre-school education on children from different social groups drawn from a large and representative sample in England.

### **Theoretical framework**

The context of this paper is the debate about the effects of Early Childhood Education on children from different social backgrounds. Numerous studies on the impact of pre-school on children's development have led to two main conclusions: pre-school has long-lasting effects (Early Head Start Research and Evaluation Team, 2002; Schweinhart et al., 1993) and they are strongest when the quality of early education is high (NICHD, 2002; Cost, Quality and Child Care Outcomes Study Team, 1995; Love, et al., 2003). However there is still debate about how long the effects last and whether they last longer, or are more powerful, for the poorest groups (Brooks-Gunn, 2003). This paper contributes to that debate.

### **Methodological strategy**

The Effective Provision of Pre-school Education (EPPE) research explored the effects of pre-school provision on a large representative sample. Funded by the British government, it followed the progress of 3000 children from 3 to 7 years. Using an 'educational effectiveness' design (Sammons et al., 2002 & 2003), EPPE studied the effects of individual pre-school centres on children's attainment and social/behavioural development at ages 5 and 7 years.

The combination of multivariate quantitative analyses (multilevel modelling) along with qualitative techniques (case studies) has enabled EPPE researchers to describe the effects of pre-school on different categories of 'vulnerable' children, i.e. those from disadvantaged groups and also those who have a weak intellectual profile at the age of 3 years (Sammons et al., 2005).

### *Research questions*

- a. Do the effects of pre-school education last after three years after entry to the primary school?
- b. Do poor children experience greater pre-school benefits (effect sizes) than children from more affluent backgrounds?

### *Sample*

Five regions in the U.K were included, strategically chosen to include urban, suburban and rural areas and also areas with social and ethnic diversity. In each region centres were randomly selected from different types of sessional provisions (playgroups, nursery classes, nursery schools, private day nurseries, social services nurseries and nursery schools that integrated care with education). A total of 141 centres participated in the EPPE study.

### **Data sources**

#### *Cognitive and linguistic assessments of children at ages 3, 5 and 7 years*

A wide array of child assessments was administered at the beginning of pre-school (age 3+), at entry to primary school (age 5) and at the end of Year 2 (age 7). The first assessment served as a baseline measurement against which to measure attainment in later years. The baseline consisted

of four subtests of the British Ability Scales II (BAS II; Elliott et al., 1996): Block Building, Verbal Comprehension, Pictures Similarities, and Naming Vocabulary. An overall General Cognitive Ability (GCA) was used as an index of each child's overall cognitive profile.

At entry to primary school five subscales from the BAS II were administered to children: Verbal Comprehension, Picture Similarities, Naming Vocabulary, Pattern Construction and Early Number Concepts. Children were also given the Letter Recognition test (Clay, 1993) and the subscales Rhyme and Alliteration from the Phonological Awareness assessment (Bryant & Bradley, 1985). Means and standard deviations at post-test appear in Table 2.

At age 7 children were assessed on National Assessment Tests (SATS) in reading, writing and mathematics. These were administered in the same week according to standardised instructions and marked on a government marking scheme. Because assessments have different means and standard deviations each year, they were turned into decimalised z-scores for comparison purposes (Sammons et al, 2004)

#### *Co-variates: Child and family characteristics*

Interviews with the child's main caregiver (usually the mother) were conducted shortly after the initial cognitive and behavioural assessments. Information was collected on parental characteristics (socio-economic status, mother and father's educational level, employment, age and marital status), family characteristics (lone parent, number of siblings and child's first language), child characteristics (birth weight, perinatal difficulties, previous developmental and behaviour problems), previous health problems, home characteristics (home learning environment, bedtime rules, TV rules, time watching TV, play with friends at home and elsewhere), childcare history and ethnic status. These variables were used in subsequent analyses as predictor and/or control variables. After taking into account background variables, we were able to establish the 'value added' to children's development by attendance at pre-school.

## **RESULTS**

### *Reading, Writing and Mathematics at age 7*

The relationship between attendance at pre-school (compared to staying at home) and children's developmental progress was explored via multilevel modelling. The main effects of pre-school were established before exploring interactions between pre-school and social class. Multilevel models take into account children's pre-test scores and various child, family and home characteristics. They also take into account the amount of variation in the data that is due to the clustering of children within the same pre-school centre.

This paper presents the outcomes on children's reading, writing and spelling in their third year of primary school. Social-behavioural development was also assessed but this is not the focus of this paper (see Sammons et al., 2004).

At the age of 7 years boys score significantly lower on literacy tests but were equivalent to girls for numeracy outcomes. Boys also had lower scores on social-behavioural outcomes than girls. Children who had English as an additional language (EAL) showed poorer scores on cognitive outcome when they entered school at age 5 but this effect was reduced (but not eliminated) by the time children reached age 7.

Figure 1 shows that children from lower socio-economic groups scored lower on all academic outcomes but that they did better if they had pre-school experience. Earlier work showed the

positive effects of longer duration and higher quality (Sammons et al., 2002). In England Level 2 is the minimum expected attainment for English children if they are to succeed in the next phase of education. For the lower socio-economic groups attendance at pre-school is usually sufficient to take them above the minimum expected level of 2, making them ready for the next phase of English education. Conversely without pre-school, the lowest socio-economic groups are less likely to be ready for the next phase of education ('Key Stage2') for children 8-11 years.

#### *Cognitive Attainment over Time*

Figures 2a and 2b plot the mean z-scores for pre-school children compared with 'home' children at Reception, Year 1 and Year 2. Maths and Reading scores were transformed into z-scores to create a comparable scale across the three cohorts of children.

The figures demonstrate two points. (1) There is a significant and fairly large gap in terms of average attainment levels between the three SES groups. (2) There remains a clear advantage for children who attended pre-school compared with those who did not (the 'home' group) all through the early years of school regardless of SES. Children who attended pre-school have higher attainment levels than 'home' children at Reception, Year 1 and Year 2 within each SES category. This gap in average attainment between the pre-school and 'home' groups appears to remain consistent or in some cases show some reduction (most evidently for the skilled group in Maths) across time, with the important exception of the unskilled group. Within this lowest group the attainment gap in both Reading and Maths appears to *increase* over time. This suggests that the experience of pre-school is particularly important in raising attainment levels in the early primary years and that 'home' children from unskilled manual backgrounds are likely to fall further behind other children. This group does not appear to catch up, suggesting that without the experience of pre-school it may be harder for poorer children to cope with the demands of the early years at school.

#### *Multi-level models showing the attainment gap between classes over time*

The graphs, however, only show the gross differences in average attainment levels related to pre-school attendance within different SES groups; they do not take into account other contributing factors such as low income (measured by the indicator Free School Meals), maternal education and other factors known to show a significant relationship with children's attainment. To investigate the net impact of family SES on the pre-school versus 'home' groups' gap in attainment, a SES by pre-school interaction variable was created and used in a multilevel analysis to calculate the *net effect size* of pre-school for each family SES category.

A range of explanatory variables were added to the multilevel analysis to control for the influences of child and family characteristics on cognitive attainment, including, gender, ethnicity, mother's qualifications, Free School Meal eligibility, English as an Additional Language, and Home Learning Environment. The multilevel models used within each cognitive outcome pair were consistent across the three years so as to obtain effect sizes that were comparable across time. The estimates produced by these analyses were used to calculate the effect size for the (six) family SES by pre-school groups presented in figures 2a and 2b for each subject in each year.

The effect size of pre-school versus 'home' groups within each SES category were subtracted to yield an effect size for the difference between attainment of the pre-school versus 'home' groups for Reception, Year 1 and Year 2. For the skilled SES group on Reading, the effect size of pre-school v 'home' gap is 0.57 ([Effect size for skilled/pre-school group = 0.81] – [Effect size for skilled/'home' group = 0.24] = [Effect size of the gap in attainment]). This procedure was repeated for all pairs of social class categories for each cognitive outcome. The results from this analysis are presented in Figures 3a and 3b below.

Having taken into account other explanatory variables, the effect sizes of the attainment gap presented in figures 3a and 3b demonstrate the net effect of having attended pre-school compared with not attending pre-school for the different social classes. Even after control for the influence of a wide range of child, family and 'home environment' influences, a significant positive effect remains for attending pre-school. This supports the conclusions drawn from the simple analysis of the patterns already observed in figures 2a and 2b.

*Is there 'catch-up' after school entry?*

During the KS1 period the 'home' children of professional and skilled parents begin slowly to improve their attainment level relative to children of professional and skilled parents who attended pre-school, although a large and significant gap remains evident. Thus there is some catch up, but attendance at pre-school remains an advantage. In contrast, the attainment levels of 'home' children of parents in semi/unskilled manual work are becoming progressively worse relative to those of pre-school children of the same social class category, again suggesting that pre-school is particularly beneficial for children of more disadvantaged backgrounds and supporting earlier claims that pre-school attendance can act as a protective factor reducing the risk of SEN. For Reading in particular the largest effect sizes are found for the skilled manual group (the largest SES category) who attended pre-school compared with those who had no pre-school. For Mathematics the professional group show a particular large effect size compared with the 'home' group.

**Educational significance of the study**

Earlier EPPE papers (Sammons et al., 2002, 2003) reported a significant net positive impact for both duration and quality of pre-school over and above child, family and 'home learning environment' influences, including family SES. For the most disadvantaged groups therefore the experience of longer duration and higher quality is likely to be particularly important in reducing the social class attainment gap, although it can be seen that all SES groups show significant benefit from attending pre-school in relation to attainment in Reading and Mathematics.

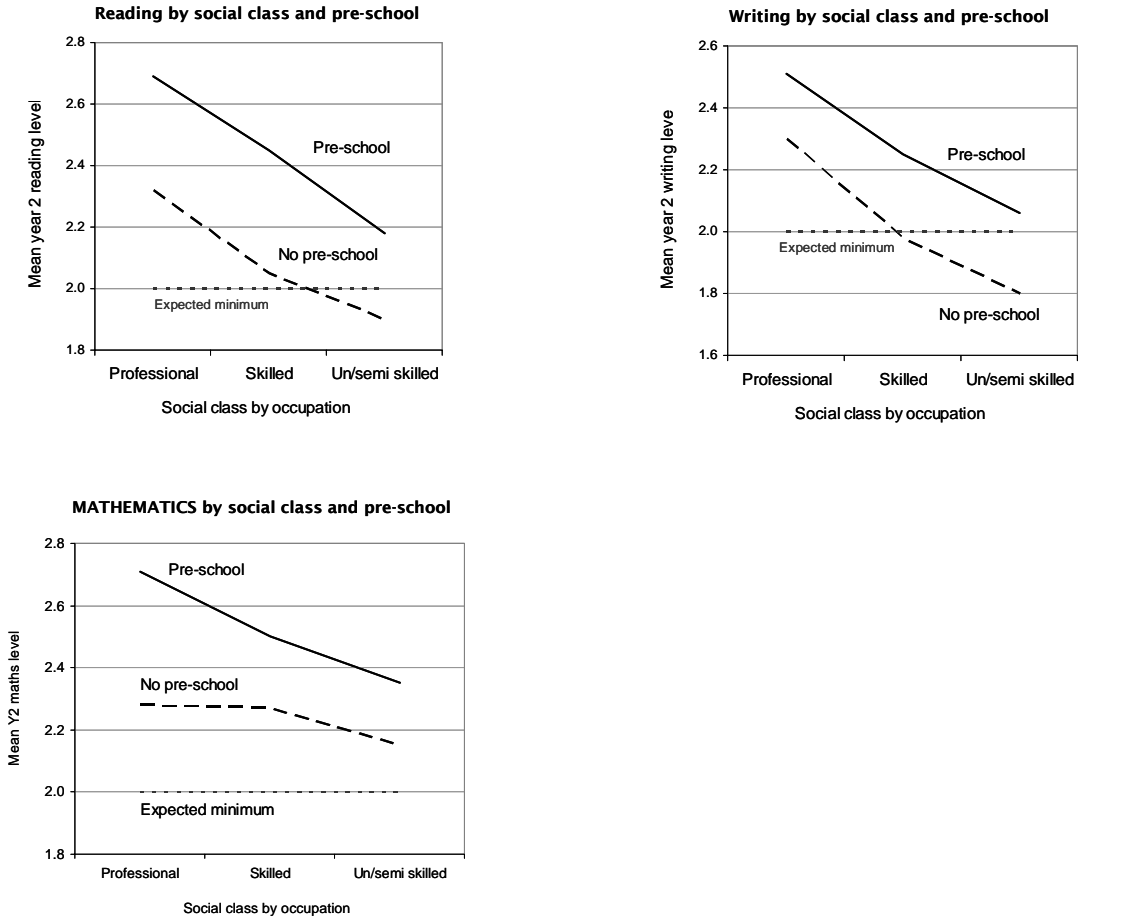
This paper has shown that pre-school effects may be fading over time in a large, representative study. However, the gap for the lowest social class appears to be widening in some important subjects. There are two implications for policy: (1) continue to support free pre-school education for all 3 and 4 year old children whose parents wish it, and (2) consider 'top up' programmes in primary school for the most disadvantaged.

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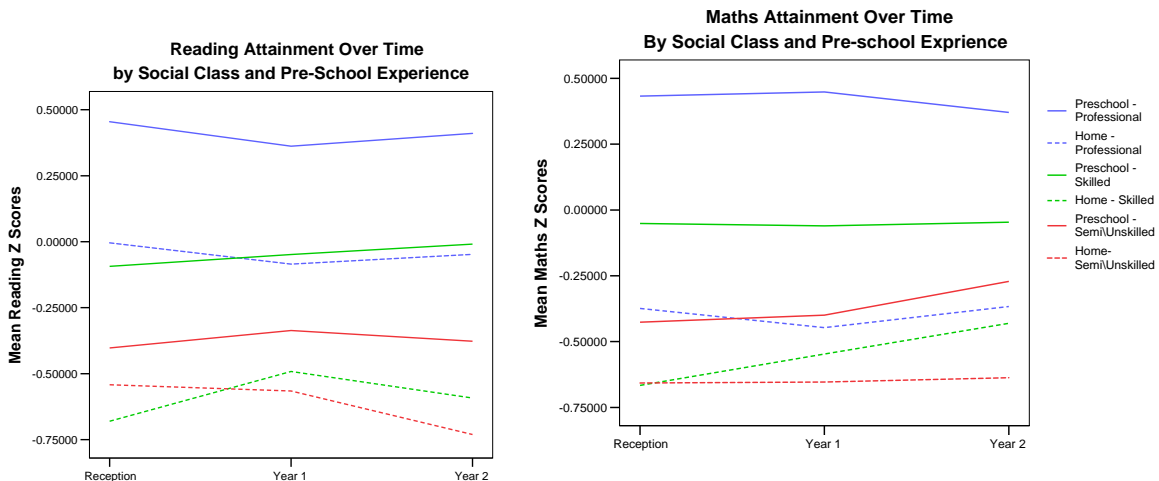
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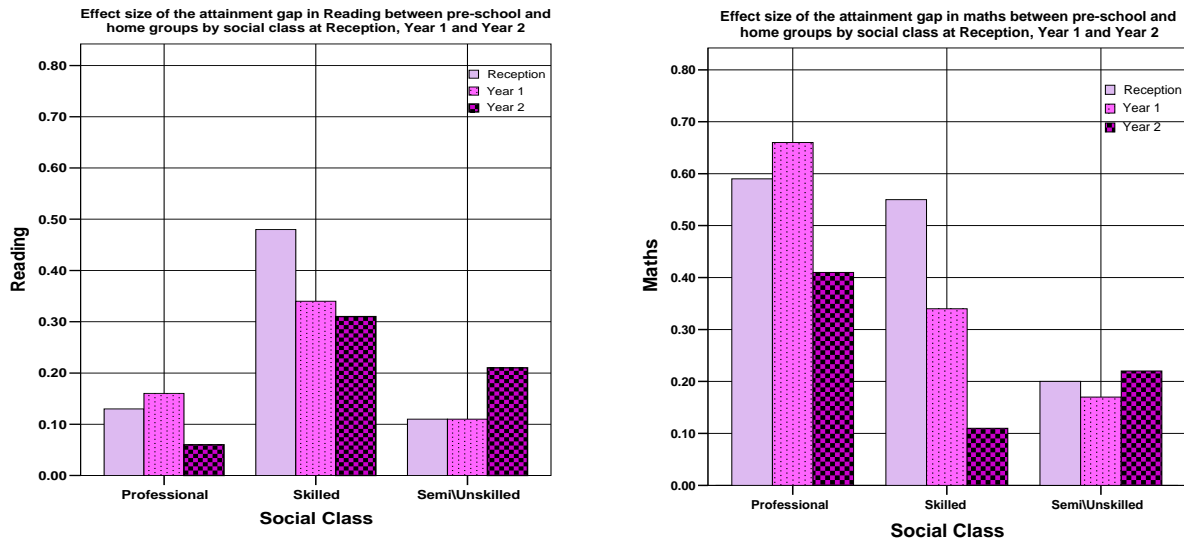
**Figure 1a, 1b, 1c – Impact of Pre-school by Social Group (for Reading, Writing and Maths).**



**Figures 2a and 2b Reading and Maths attainment over time by social class and pre-school.**



**Figures 3a and 3b The attainment gap at three time points for pre-school compared to ‘home’ children for different SES groups (expressed as effect sizes).**



### Summary

The first phase of the study has demonstrated the positive effects of high quality pre-school provision on children’s intellectual and social/behavioural development up to entry to primary school. The EPPE research indicates that pre-school can play an important part in combating social exclusion and promoting inclusion by offering disadvantaged children, in particular, a better start to primary school. The findings indicate pre-school has a positive impact on children’s progress over and above important family influences. The quality of the pre-school experience as well as the duration (more terms but not necessarily more hours per day) are both influential. The results show that individual pre-school centres vary in their effectiveness in promoting intellectual progress over the pre-school period, and indicate that better outcomes are associated with some forms of provision. Likewise, the research points to the separate and significant influence of the home learning environment. These aspects (quality and duration of pre-school and home learning environment) can be seen as more susceptible to change through policy and practitioner initiatives than other child or family characteristics, such as SES.

The second part of the research explored whether the benefits of pre-school education was still evident at the end of Key Stage 1 (at 7 years old). Such analyses helps to establish whether the positive impact of pre-school on young children’s development remains significant as children progress through their first years at primary school.

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