



Social disparities in children's vocabulary in early childhood. Does pre-school education help to close the gap?¹

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Abstract

Children start school with differing levels of skills. Thus, children of different social origin have different probabilities of educational success right from the start of their school career. This paper analyses how the gap in language abilities of children with different social backgrounds develops from age three to five. A focus lies on the question whether pre-school education can help to close this gap. The data of the UK Millennium Cohort Study (MCS) show that children's score on a standardized vocabulary test strongly depends on their parents' education. These social differences remain stable or even increase slightly over the two-year period. Using fixed effect models, it is demonstrated that children of higher educated parents can improve their vocabulary more strongly than children whose parents have a lower educational level. Participation in an early education institution positively affects the vocabulary development of children with lower educated parents while there is no significant pre-school effect for children of higher educated parents. The results indicate that pre-school attendance does not lead to a catching-up process of children with lower educated parents. But without pre-school attendance, the gap between children of higher and lower educated parents widens even further.

Keywords: Early education; educational inequality; pre-school attendance; language skills; vocabulary; primary effect of stratification

Introduction

Children's educational attainment depends on their social origin. This educational inequality can be found in all Western countries although the strength of this association varies between countries and has declined over time (see Ballarino et al. 2009; Breen et al. 2009; Esping-Andersen 2004; Goldthorpe 1996). In the discussion about the explanations of this phenomenon, usually

two factors are differentiated which Boudon (1974) has termed primary and secondary effects of stratification. *Primary effects* relate to social differences in academic ability and school achievement. Children with higher class parents have on average better grades in school and score better on achievement tests compared to children with lower class parents (Mullis et al. 2007: 122–5; Schütz, Ursprung, and Wößmann 2008). The *secondary effects* of stratification relate to transition probabilities: Even if children are on the same level of educational performance, their (or their parents') educational decisions (e.g. about school continuation) differ according to the children's social background. This results because the evaluations of the perceived costs, benefits and probabilities of success differ systematically among social groups (Breen and Goldthorpe 1997; Erikson and Jonsson 1996). Both factors contribute to the emergence and persistence of educational inequality and thus to the reproduction of social inequality. The present paper focuses on the first factor and analyses social differences in children's cognitive abilities. Such differences are already present at an early age (Lee and Burkam 2002; Zill and West 2001). Thus, children already start their school careers with differing levels of skills and hence with different probabilities of educational success.

One main explanation of these early disparities in cognitive abilities refers to differences in parenting, home environments, parental stimulation and parent–child interactions (see Cheadle 2008; Lareau 1993, 2002). In short, the primary socialization and childhood conditions differ by socioeconomic status (SES) which leads to differences in children's cognitive abilities already at an early age. This mechanism has been regarded as 'fairly similar between countries and stable over time' in the literature (Erikson and Jonsson 1996: 50). So, are these SES-differences in children's cognitive abilities at an early age inevitable? One hope for more equal educational opportunities lies in early education programmes. The participation in pre-school education could have compensational effects. The literature shows that pre-school attendance positively affects the development of skills in various domains (e.g., Currie 2001; Magnuson et al. 2004; Melhuish et al. 2008; NICHD 2002a; Sammons et al. 2004; Sylva et al. 2004). There are also some hints that 'disadvantaged children' (from lower educated, lower class, and/or poor parents) can benefit more from pre-school attendance than their more advantaged counterparts (Magnuson et al. 2004). Can pre-school education therefore help to close the gap in children's cognitive abilities at an early age?

This paper analyses how the gap in language abilities of children with different social background develops from age three to five. The main question is whether pre-school education can help to close this gap. Language skills are important determinants for children's educational success (Durham et al. 2007; Sullivan 2001: 908). Examining the development of language skills therefore contributes to the explanation of educational inequality. Especially the skill level at an early age is essential because this builds children's 'starting

capital' at the beginning of their school career. Social differences in children's skills at an early age are likely to remain stable or even increase over time (Feinstein 2003). Or, as Heckman and Wax (2004) have put it: 'Like it or not, the most important mental and behavioral patterns, once established, are difficult to change once children enter school'. Thus, it is important to have a closer look at this critical early childhood period and examine whether interventions like pre-school education are effective in reducing the differences between children from different social origins.

For the empirical analyses, I use the second and third wave of the UK Millennium Cohort Study. In both waves, a standardized test of children's expressive vocabulary has been conducted. Fixed effects regressions are used to analyse the development of the children's vocabulary between the age of three and five. This method only considers the within-individual variation over time and, therefore, controls for any (even unmeasured) time-constant individual characteristics (see Allison 2005). As a first step, I analyse whether children of higher educated parents score better on the vocabulary test than children of lower educated parents and whether this gap remains stable, increases or decreases during this two-year period. In a next step, I examine whether the participation in any kind of early education institution influences children's vocabulary development. It is hypothesized that children of lower educated parents can benefit more strongly from such pre-school attendance than children of higher educated parents. Thus, an interaction between parents' education and pre-school attendance is tested. Finally, I analyse whether children with lower educated parents who attend an early education institution are able to catch up to children with higher educated parents. The results are discussed in the last section.

Studies on children's language abilities in early childhood

Disparities in language skills at an early age

Various studies find an association between families' socioeconomic status and children's language abilities at an early age. Especially linguistic studies often examine children's language development longitudinally in a very detailed way. A good example of such a study is the one by Hoff (2003) which analyses the vocabulary development of two-year-old children during a ten week period. Children with a similar level of language development were selected at the start of the study. The families were visited at their homes and interactions between the mothers and their children were video-recorded. This was repeated ten weeks later. Although the children had a similar language level at time 1, children from high-SES families had a significant higher vocabulary level at time 2 compared to children from middle-SES backgrounds. So, the

high-SES children had progressed at a faster rate. Hoff can show that this difference in children's development is due to differences in maternal speech characteristics. Controlling for properties of maternal speech reduces the SES-effect to non-significance (Hoff 2003: 1373).

The work of Hart and Risley is especially notable in this field (Hart and Risley 1992, 1995). They have done a very comprehensive longitudinal study of early language learning and the central role of home and family in this process. The vocabulary development of 42 children was analysed from the time they first began to say words (at about ten months) until they were three years old. The families were visited once a month during this period. One hour of parent-child interactions was recorded on each occasion. Although the children started to speak around the same time, large differences in their language skills were observed at the age of three. Children from high-SES families had larger vocabularies compared to children from working-class families while children from welfare families had the most limited vocabularies. The authors show that 'parent talkativeness' completely accounts for this association. Children's vocabulary growth is strongly related to the amount of parent talk. And here, the authors detected very pronounced social differences: Toddlers in professional families hear, on average, three times as many words as children in welfare families. Also the quality of parents' verbal interactions differs by social background with children of high-SES families getting more encouragements. Other linguistic studies report similar results on SES-differences in parent-child interactions (Hoff-Ginsberg 1991; Rowe 2008) and even SES-differences in non-verbal communication (e.g. gesture use, see Rowe and Goldin-Meadow 2009) which are important mediators of the relation between SES and children's language abilities. Also the role of parental speech characteristics for children's language development has been confirmed in other studies (Fish and Pinkerman 2003; Pan et al. 2005; Pancsofar and Vernon-Feagans 2006).

Also economic and sociological studies based on large-scale data sets report SES-differences in children's language abilities at an early age. In their study of class and race differences in oral vocabulary, Farkas and Beron (2004) used the data from the 'Children of the National Longitudinal Survey of Youth 1979' (CNLSY). The authors pooled together the survey waves 1986-2000 in which children between three and fourteen years were administered several skill assessments including the 'Peabody Picture Vocabulary Test' (PPVT). They find that at three years of age, a large social class gap in children's vocabulary has already emerged. This gap continues to widen until age five for black children but remains rather stable for whites. Also Ermisch (2008) reports large SES-differences in children's vocabulary at age three. Using the data of the 'UK Millennium Cohort Study' (MCS), he finds a strong association between the families' income when the child was nine months old and the child's 'Naming Vocabulary' test score at age three. An important part of this

difference can be accounted for by stimulating activities like reading to the child. Results from the 'Effective Provision of Pre-School Education' (EPPE) Project support this finding (Melhuish et al. 2008; Sylva et al. 2004): Social differences in children's language skills are already detectable at age three. Parental activities such as reading to their child, teaching songs and nursery rhymes, playing with letters and numbers, visiting the library, painting and drawing etc. have a significant influence on children's attainment at both age three years and later at the start of primary school, but significant SES-effects remain.

In summary, it can be stated that social differences in children's language skills emerge very early. Various linguistic studies have demonstrated that it is essential for children's language development how their parents communicate with them. It is important how often and in which way their parents interact with them. Also economic and sociological studies have found large SES-differences in children's language skills at an early age. 'What parents do' with their children in terms of familial activities partly accounts for these differences.

The role of pre-school education

The last section has shown that the family background has a strong influence on children's language development. But also learning contexts outside the family can have an independent effect. Here, especially early education institutions can be important.² Such institutions explicitly aim at children's education and have trained personnel and stimulating materials to foster children's development in various domains.

Many international studies show that attending such an early education institution positively affects children's language skills (for an overview, see Currie 2001). The early intervention studies in the USA with an experimental design have already demonstrated the impact of attending early education institutions. For example, the 'Perry Pre-school Study' shows that (randomly assigned) programme participants in a special pre-school programme perform better in language tests compared to non-participants. This advantage is preserved until adolescence (Schweinhart, Barnes, and Weikart 1993). Evaluating the impact of pre-school attendance, non-experimental studies always have to face the problem of selective participation. A good solution to this problem is presented by Lamy, Barnett and Jung (2005) who used regression discontinuity (RD) techniques to evaluate the effects of participating in the 'New Jersey's Abbott Pre-school Program'. The existence of an age cut-off date for enrolment eligibility made it possible to compare children who participated in the programme with children of roughly the same age who were going to participate in the following year. Attending the pre-school programme for one year leads to an increase in children's receptive vocabulary by a quarter of a

standard deviation (Lamy, Barnett, and Jung 2005: 8–9). Also other studies find a positive effect of pre-school attendance on children's language skills (e.g., Currie and Thomas 1995; Sammons et al. 2004).

It is discussed in the literature whether the effect of pre-school attendance differs depending on the children's family background. As already mentioned in the introduction, early education programmes may be one means for more equal educational opportunities. Early education institutions might buffer some of the negative influences of family risks such as poverty. But besides these compensational effects for 'disadvantaged children', it is also imaginable that pre-school attendance might do harm in cases where the childcare institution provides the child with poorer rearing experiences than the parents do at home (see NICHD 2002b). Some empirical studies support the hypothesis of compensational effects. Using the data from the 'Early Childhood Longitudinal Study, Kindergarten Class of 1998–1999' (ECLS-K), Magnuson et al. (2004) find positive pre-school effects which are larger for children of poor parents and children of low-educated mothers compared to the effects for the full sample. But other authors provide only limited support for such compensational effects. For example, Burchinal et al. (2000) do not find a significant interaction effect between pre-school quality and the families' poverty status. Similar findings are reported by the NICHD Early Child Care Research Network (2002a: 159). In contrast, Dearing, McCartney, and Taylor (2009) find with the data of the 'NICHD Study of Early Child Care and Youth Development' that the effect of high quality childcare on children's math and reading achievement in middle childhood is stronger for children in low income families than for children in more affluent families. Thus, there are inconsistent results on the question whether children from disadvantaged family background can benefit more from pre-school attendance compared to children with more advantageous social backgrounds.

Aim of this study and hypotheses

The present study analyses the development of the SES-gap in children's language skills between the age of three and five years thereby focusing on the role of pre-school education. Regarding the results presented in the last section, a large SES-gap can already be expected at an early age. So first of all, I show that such a gap already exists at the age of three. Next, I examine whether this gap remains stable, increases or decreases within this two-year period. The main aim of this study is then to analyse the role of pre-school education with its possible 'compensation effects'.

Because early education institutions have trained personnel and stimulating materials they can provide important learning experiences for children. Thus, I expect that pre-school attendance fosters children's language development:

Hypothesis 1: Pre-school attendance has a positive effect on the development of children's language skills.

The literature has shown that the home environment (like stimulating familial activities) mainly mediates the association between the social background and children's language skills. Since children of lower educated parents receive less language stimulation at home, extra-familial learning contexts may be of special importance for them. Thus, I expect that children of lower educated parents can benefit more from pre-school attendance than children of higher educated parents:³

Hypothesis 2: The positive pre-school effect is larger for children of lower educated parents compared to children of higher educated parents.

If the second hypothesis turns out to be true, a catching-up process may be possible. In this case, I analyse whether pre-school attendance really reduces the SES-gap:

Hypothesis 3: Those children with lower educated parents who attend pre-school are able to reduce the gap to the children with higher educated parents.

This last hypothesis is far from trivial. Even if the second hypothesis was supported and children with lower educated parents could benefit more from pre-school than children with higher educated parents, it would still be possible that children with higher educated parents improve their skills more strongly (independently of pre-school attendance). Thus, it is an empirical question whether such a 'catching-up process' really takes place or not.

Data and method

Data and operationalizations

I use data of the UK Millennium Cohort Study (MCS) for the empirical analyses in this paper (University of London 2008a, b, c). The MCS is a large-scale survey of children born in the four countries of the UK at the beginning of the century. Children living in areas with high rates of child poverty and in areas with high proportions of ethnic minorities were overrepresented in the sample. The first survey was carried out during 2001–2002 with about 18,500 parents when their babies were about nine months old. The second wave took place when the children were three years old and the third wave at age five. A detailed description of the MCS including sampling procedures, sample sizes and an overview of the modules can be found in the documentations at the UK data archive (see Hansen 2008; Plewis 2007; Plewis and Ketende 2006).

In the present study, I used information from the second and third wave to analyse the change in children's vocabulary between the age of three and five

years. I only included cases for which full information on all time-varying model variables was available in wave 2 as well as in wave 3.⁴ In order not to mix up social and ethnic disparities, I also restricted my sample to white children and families with English as the only language spoken at home. This leaves an analysis sample of 10,358 children. Because of the stratified nature of the sample, the sampling weights provided in the dataset were used in all analyses. The operationalizations of the model variables are presented next.

Children's vocabulary

The test 'naming vocabulary' from the 'British Ability Scales' (BAS) was conducted in wave 2 and in wave 3 of the MCS. The BAS is a battery of individually administered tests of cognitive abilities and educational achievements (see Hansen 2008: 43). The subtest 'naming vocabulary' measures the expressive vocabulary of children. It is suitable for use with children aged from 2;6 (two years and six months) to 7;11. In this test, the children are shown coloured pictures of objects and are asked to name them. For the present analyses, the 'normative scores' were used. These are derived from standard BAS tables and defined with reference to the standardization sample. To have a better interpretation of these scores, they were z-standardized with an overall mean of 0 and a standard deviation of 1 across wave 2 and 3.

Parents' education

The dataset contains the level of the NVQ (National Vocational Qualification) equivalence of the respondents' and their partners' highest academic or vocational qualification (see Calderwood and Ward 2004: 78). I use the highest educational level of both parents. This variable is dichotomized so that roughly half of the parents are coded as having a 'low' and the other half as having a 'high' educational level:

Low educational level: up to NVQ level 3;

High educational level: NVQ level 4 or 5.

Pre-school attendance

To measure children's experience with early education institutions, I constructed a dichotomous variable indicating whether or not a child had already participated in any kind of educational institution at the time of each interview. For this purpose, I used the retrospective question in wave 3: 'Has [child's name] ever been to any of the early education or childcare providers on this card?' A list of six answers was provided for the respondents (nursery school/nursery class; playgroup; pre-school; childminder; day nursery; none of

these). If applicable, the starting times were asked in the next questions. I counted nursery school/nursery class, playgroup, pre-school, and day nursery as an 'early education institution'. For simplicity, I will refer to the participation in any of these early education institutions as 'pre-school attendance'.

Time-varying family characteristics (control variables)

To control for the possibility that changes in the children's vocabulary test score are attributable to a change in the families' situation, the following time-varying family characteristics are used as control variables:⁵

- *Mother's employment status*: Dichotomous variable indicating whether the mother was employed at the time of each interview.
- *Regular bedtimes*: Does [child's name] go to bed at regular times? [1: never or almost never; to 4: always].
- *Regular mealtimes*: Does [child's name] have meals at regular times? [1: never or almost never; to 4: always].
- *Frequency of reading to child*: How often do you read to [child's name]? [0: not at all; to 5: every day].

Method

When evaluating the impact of pre-school attendance, the problem of selectivity occurs. It is very probably not at random which parents send their child to early education institutions at all and which children start these pre-schools earlier. Not accounting for this selectivity can lead to biased estimates. Even when statistically controlling for some relevant characteristics of the family (e.g., parents' education), there are always further unmeasured variables that are correlated with pre-school attendance and may also be relevant for children's vocabulary acquisition. Some of these variables might also be very difficult to measure at all (e.g., parents' general involvement in their child's early education). This problem of unobserved heterogeneity (also termed 'omitted variable bias') is always present in non-experimental studies and can lead to biased results.

Fixed effects methods offer a solution for (at least time-constant) unobserved heterogeneity if repeated measures of the dependent and independent variables are available for the same individuals. Instead of considering differences *between* individuals, changes *within* individuals over time are regarded (see Wooldridge 2006: 485–7). This allows controlling for any person-specific time-constant characteristics (see Allison 2005). A disadvantage of fixed effects regressions is that only independent variables can be used that show a sufficient variability over time (for further disadvantages like larger standard errors because of disregarding the between variation, see Allison 2005: 1–6).

For this reason, effects of time-constant variables like sex or ethnic origin cannot be estimated (but these are nevertheless controlled as all other time-constant characteristics). But also variables like parents' education or social class rarely change over time, so that their effects cannot be estimated here. To account for the possibility that changes in the families' situation might have (partly) caused changes in children's vocabulary, time-varying family characteristics have to be included. Also interactions with time-constant variables are possible. For example, it is possible to analyse whether the effect of pre-school participation is different for children of lower and higher educated parents.

Results

Table I shows descriptive statistics of the model variables by survey wave and parents' education. Children differ greatly in their vocabulary test results according to their parents' education. The difference between children of higher and lower educated parents is 0.43 standard deviations at the age of three. This gap in children's test score has not narrowed in the following two years: At age five, the difference amounts to 0.51 standard deviations. So, there seems no catching-up process to be going on. If anything, the disparities have even widened a bit.

Also the pre-school attendance rates at age three differ by parents' education: 63 per cent of the children with lower educated parents participate in any kind of early education institution at age three. This is true for 72 per cent of the children with higher educated parents. At age five, the vast majority of all children has experienced pre-school (93 per cent in both groups). Thus, almost all children seem to attend an early education institution at some time before school, but there seems to be social selectivity in the starting time.

Differences can also be found in the distribution of the other family characteristics. Disparities in mother's employment status are especially

Table I: *Descriptive statistics by child's age and parents' education (means or proportions)*

	Low parental education			High parental education		
	Age 3	Age 5	Average change	Age 3	Age 5	Average change
Vocabulary test score	-0.42	0.02	0.44	0.01	0.53	0.52
Pre-school attendance	0.63	0.93	0.30	0.72	0.93	0.22
Mother employed	0.48	0.54	0.06	0.67	0.73	0.06
Regular bedtimes	3.06	3.47	0.41	3.35	3.59	0.24
Regular mealtimes	3.35	3.48	0.13	3.45	3.59	0.14
Reading to child	4.13	4.14	0.01	4.66	4.44	-0.22
N (number of cases)	5,422			4,936		

Source: UK Millennium Cohort Study, own calculations.

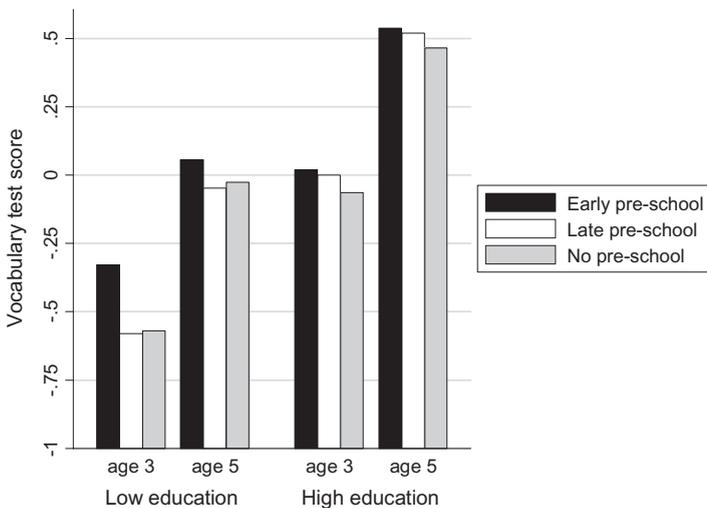
Notes: All differences between children of lower and higher educated parents at age 3 and 5 are significant at $p \leq 0.05$ with the exception of pre-school attendance at age 5 (no significant difference).

pronounced: When the children are three years old, 67 per cent of the mothers in families with a higher educational level are employed compared to only 48 per cent in families with a lower educational level. In families with a higher educational level, there are also more regular bedtimes and mealtimes and the parents read books to their child more frequently compared to families with a lower educational level. Regarding these control variables, there is not very much change between the two panel waves.

The results of Table I have already shown that children of lower educated parents – as a whole group – do not catch up with children of higher educated parents. But there could be variation within the subgroup of children with lower educated parents: some could catch up and others could fall behind even further. This might depend on their pre-school experience. To get a first impression whether this association shows up, Figure I depicts the mean vocabulary test scores by parents' education and pre-school experience.

Figure I illustrates the social differences in children's vocabulary test scores: Within all pre-school subgroups, children with higher educated parents score better than children with lower educated parents of the same age (all these differences are significant at $p \leq 0.05$). Within the lower educational group, children who have already some pre-school experience at age three ('early

Figure I: Children's vocabulary test score by age, parents' education and pre-school attendance



Source: UK Millennium Cohort Study, own calculations.

Notes: Arithmetic means of the vocabulary test score.

Early pre-school: First pre-school attendance before the interview at age 3.

Late pre-school: First pre-school attendance after the interview at age 3 but before the interview at age 5.

No pre-school: No pre-school attendance up to the interview at age 5.

pre-school' group) have the best starting position: They score better in the vocabulary test compared to children who start pre-school later or not at all (the differences are significant at $p \leq 0.05$). This could be traced back either to the early pre-school attendance in this group or to some selectivity. This pattern cannot be found in the high education group (the pre-school group differences here at not significant). The other two groups that start pre-school later ('late pre-school' group) or not at all ('no pre-school' group) are similar in their test performance at age three (no significant group differences).

At age five, children of lower educated parents score better in the 'early pre-school' group compared to either the 'late pre-school' group or the 'no pre-school' group (the differences are significant at $p \leq 0.05$). In contrast, the differences between the pre-school groups are not significant in the high education group. Children of higher educated parents reach very high test scores – independently from their pre-school experience. This finding can be interpreted as support of the view that especially children of lower educated parents can profit from pre-school attendance. But it has to be noted that even in the 'early pre-school' group, the differences by parents' education remain very strong.

As a next step, the results of fixed effects regressions are presented in Table II. The dependent variable in these models is the *change* between age 3 and 5 in children's vocabulary test scores that are defined with reference to a standardization sample. Model 1 shows that the children improve their vocabulary between the age of three and five. This is notable because the vocabulary scores are age-adjusted. A reason for this improvement may be that almost all children have started school at the time of the interview in wave 3. Model 1 also includes an interaction between the survey wave and parents'

Table II: *The influence of pre-school attendance on children's vocabulary development between age 3 and 5 (results of fixed effects regressions)*

	Model 1	Model 2	Model 3	Model 4
Wave	0.44 (0.02)*	0.43 (0.02)*	0.41 (0.02)*	0.39 (0.02)*
Wave* high parental education	0.08 (0.02)*	0.09 (0.02)*	0.10 (0.02)*	0.13 (0.03)*
Mother employed		-0.01 (0.03)	-0.02 (0.03)	-0.02 (0.03)
Regular bedtimes		0.02 (0.01)*	0.02 (0.01)*	0.02 (0.01)*
Regular mealtimes		-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
Reading to child		0.03 (0.01)*	0.03 (0.01)*	0.03 (0.01)*
Pre-school attendance			0.07 (0.02)*	0.13 (0.03)*
Pre-school* high parental education				-0.13 (0.05)*
R ² (within)	0.1962	0.1974	0.1982	0.1988
Number of cases	10,358	10,358	10,358	10,358
Number of observations	20,716	20,716	20,716	20,716

Source: UK Millennium Cohort Study, own calculations.

Notes: Regression coefficients from fixed effect regression (within children) with standard errors in parentheses.

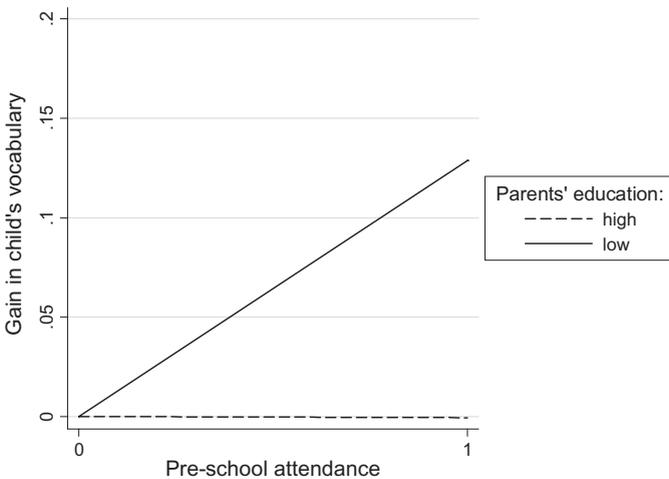
* $p \leq 0.05$.

education. This interaction effect is significant positive: Children of higher educated parents can improve their vocabulary more strongly than children of lower educated parents. As the descriptive results have already indicated, there is no catching up process. On the contrary, the social differences even increase.

Model 2 adds the family control variables. Regular bedtimes and reading to the child positively affect children's vocabulary development while the mother's employment status and regular mealtimes have no significant effect. Model 3 additionally includes children's pre-school experience. Pre-school attendance has a significant positive effect which supports the first hypothesis. The attendance of an early education institution leads to an increase in children's vocabulary test scores by 7 per cent of a standard deviation. This seems to be a rather low effect. But it equals the effect of changing children's bedtimes from 'never regular' to 'always regular'.

In the last model 4, an interaction between pre-school attendance and parents' education is tested. In fact, the effect of pre-school attendance differs by parents' education. The main effect of pre-school attendance (which now refers to the reference category of children with lower educated parents) has strongly changed compared to model 3: Within children of lower educated parents, attending an early education institution increases their vocabulary test scores by a 13 per cent of a standard deviation. The interaction effect between parents' education and pre-school experience is significant negative: The effect of pre-school attendance is 0.13 standard deviations lower for children with higher educated parents compared to children with lower educated parents. This implies that the total pre-school effect for the children of higher educated parents is zero. These differential pre-school effects by parents' education are also illustrated in Figure II. The interaction effect supports the second hypothesis that especially children of lower educated parents can profit from attending early education institutions. By contrast, children of higher educated parents seem not to benefit from pre-school attendance at all.

The differential pre-school effect by parents' education seems to point to compensation processes: Children of lower educated parents can profit more strongly from pre-school experience. Can it now be concluded that more (and earlier) pre-school attendance of low-SES children will lead to a catching-up process? This does not necessarily need to be the case. Model 1 in Table II has already shown that children of higher educated parents have improved more strongly between age three and age five than children of lower educated parents. In model 4, this interaction effect between the time and parents' education has even increased compared to model 1: Independently of any pre-school attendance, children with higher educated parents gain 0.13 standard deviations more than children with lower educated parents. In order to find out whether children of lower educated parents with pre-school experience really catch up (hypothesis 3), the differential pre-school effect as well as

Figure II: *Pre-school effect by parents' education*

Source: UK Millennium Cohort Study, own calculations.

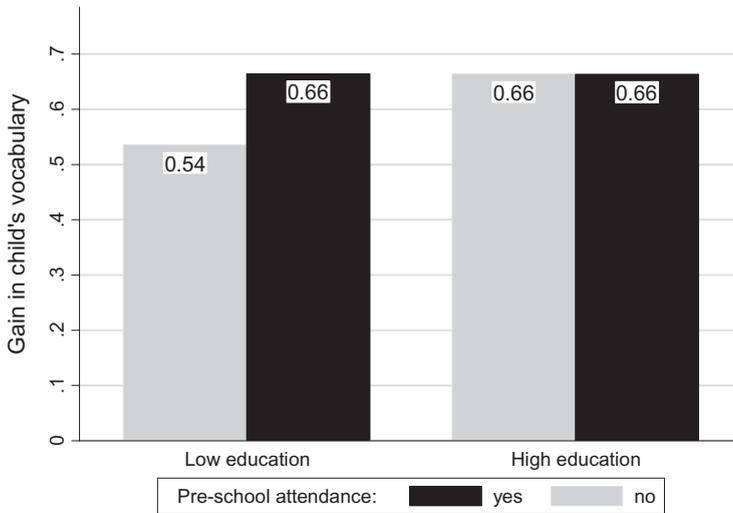
Notes: Combined effects of pre-school attendance and parents' education * pre-school attendance from model 4, table II.

this interaction effect between time and parents' education has to be considered simultaneously. The predicted improvements in children's vocabulary test scores by parents' education and pre-school experience are depicted in Figure III. Two results stick out: Firstly, the differential pre-school effect is visible here again: Children of lower educated parents can benefit from pre-school attendance (the black bar is higher than the gray bar) while there is no pre-school effect for children of higher educated parents. Secondly, children of lower educated parents who attend pre-school do not gain more than children of higher educated parents who either attend pre-school or not. So, there is no catching-up process – not even for the children who attend an early education institution (the black bars are at the same height). But for the children who do *not* attend pre-school (gray bars), the social differences even increase.

Summary and discussion

The present study confirms a result which has already been found by other authors: Social differences in skills are established early in life. Until the age of three years, large differences in children's language skills have already emerged. This gap in children's skills in early childhood lays the foundation for later educational inequality and thus – in the long run – the reproduction of social inequality. Early education programmes are seen as a means to provide more equal education opportunities. Pre-schools might offer a possibility for

Figure III: Predicted gain in child's vocabulary test score by parents' education and pre-school attendance



Source: UK Millennium Cohort Study, own calculations.

Notes: Predicted values from model 4, table II. All other variables are set on mean.

compensation and children from lower-SES backgrounds might catch up in their skill development (see Magnuson et al. 2004).

In this study, I analysed the development of the SES-gap in children's language skills between the age of three and five using the UK Millennium Cohort Study. Overall, this gap remains rather stable or even widens slightly during this time period. A positive effect of pre-school attendance can be found for children of lower educated parents while there is no pre-school effect for children of higher educated parents. This differential pre-school effect seems to point to compensation effects. But it has to be regarded that children of higher educated parents improve their vocabulary more strongly than children of lower educated parents – independently from pre-school attendance. In sum, there is no catching-up process of low-SES children. But low-SES children who do *not* attend pre-school fall even further behind. Thus, pre-school attendance seems highly recommendable especially for low-SES children even though it probably fails to accomplish the goal of creating equal opportunities for all children at the start of their school career.

The result that pre-school attendance has no effect at all for children of higher educated parents might seem surprising. But at this point it has to be considered that only a very rough measure of pre-school attendance has been used here: whether or not the child has participated in any kind of early education institution at the time of the interview. This completely neglects differences between various types and kinds of pre-schools. Of course, there is

a large variety of pre-school institutions and the effect sometimes differs between the concrete types (see Sylva et al. 2004). Also, the quality of the concrete institution has not been considered here. The finding that high-SES children cannot profit from pre-school attendance might only apply for certain types of pre-schools and might not be true for high quality pre-schools.

However, from a theoretical point of view, it is less surprising that only low-SES children benefit from pre-school attendance. One argument is that high-SES children are already exposed to a cognitive stimulating environment at their home. Spending time in a pre-school instead of spending this time at home therefore does not mean more cognitive stimulation for them. On the contrary, spending their time in pre-schools of poor quality with little cognitive stimulation can even have negative effects (for this argumentation, see NICHD 2002b). But for low-SES children who are less exposed to a cognitive stimulating home environment, pre-school attendance means more cognitive stimulation with positive effects on these children's cognitive skills development. The results of this paper can be interpreted in this sense: Children of higher educated parents and children of lower educated parents with pre-school experience make the same progress in their language development – presumably because they all are exposed to a cognitively stimulating environment (either in their home or in a pre-school). Only low-SES children who do not attend a pre-school lack this stimulating learning environment – and therefore fall behind in their cognitive skills development. But in order to analyse this argumentation empirically in more detail, also the pre-schools' quality need to be taken into account.

The last paragraphs already point to some limitations of the present study. The major limitation is the very rough measure of pre-school experience as attendance of any early education institution. I did not differentiate between various types of early education institutions (nursery school, nursery class, day nurseries, pre-school, and playgroup) because they are often not clearly distinguishable from each other (e.g. the labels 'pre-school' and 'playgroup' are often used synonymously) and parents also may interpret these terms differently. Furthermore, some of these institutions typically admit children within special age ranges making comparisons difficult.

An even greater problem is that there is no information available about the quality of these early education institutions in the MCS data. However, various studies indicate that especially the quality of pre-schools is essential for children's skill development and not just attendance per se. Positive effects of childcare quality on children's development can, for example, be found in the 'NICHD (National Institute of Child Health and Human Development) Study of Early Child Care' (NICHD 2002a, 2004; Belsky et al. 2007), the 'Cost, Quality, and Child Outcomes Study' (CQO) (Burchinal et al. 2000; Peisner-Feinberg et al. 2001) and the 'Effective Provision of Pre-School Education Project' (EPPE) (Sylva et al. 2004; Sammons et al. 2007; Melhuish et al. 2008).

These studies also show that effects of pre-school attendance per se (or duration of pre-school attendance) are rather small and tend to diminish at older ages while the effects of a longer time in high quality pre-school are larger and are still sustained at older ages (Belsky et al. 2007; Sammons et al. 2007). Thus, it is possible that the results of the present study would have been different if high quality pre-schools could be compared to pre-schools of poorer quality. High and low-SES children may be unevenly distributed over pre-schools with different quality levels with low-SES children being overrepresented in low quality pre-schools. It is possible that low-SES children attending a high quality pre-school do catch up. Unfortunately, this cannot be addressed with the MCS data. Thus, the findings of the present study are clearly limited in this respect.

Finally, it has to be noted that the associations found in this study should be interpreted with care due to the problem of unobserved heterogeneity. The use of fixed effects models allows controlling for time-constant unobserved characteristics. But it is still possible that important time-varying variables are not included in the models which may bias the estimates. For example, a change in the parental involvement in their child's early education between the two panel waves may lead to a change in the child's language development and this parental involvement may also be correlated with the decision of the parents on their child's pre-school attendance. In this case, the pre-school effect may be overestimated. Unfortunately, only a few time-varying family characteristics could be controlled in the present study because many of these variables are not measured (identically) in both panel waves.

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Notes

1. The analyses of this paper were carried out during an EQUALSOC visitorship at Nuffield College, University of Oxford. The author gratefully acknowledges the financial support granted by the 'Economic Change, Quality of Life, and Social Cohesion' (EQUALSOC) Network of Excellence for this visitorship. A previous version of this paper was presented at the EDUC Research Group Conference in Tallinn, 11–13 June 2009. I especially thank Carlo Barone and Robert Erikson for their very helpful comments at this conference in Tallinn.

2. There are various types of early education institutions. These vary from country to

country but there is also a great variety of such institutions within many countries. Examples are childcare centres, pre-schools, pre-kindergartens, nursery schools, etc. In this paper, those institutions are not differentiated but are all classified as 'early education institution' or, 'pre-school' (these terms are used synonymously). I use a very basic definition of such an institution: The childcare has to be provided by *qualified personnel* at a *special facility* that is equipped for this purpose (and not at the child's home).

3. As a measure of SES, I use parents' education in the following analyses. The use

of parents' occupational status leads to similar results.

4. This restriction of the sample to children with valid test scores and non-missing family variables in both waves might be problematic because of non-random panel attrition or other non-response. In fact, the probability to be included in this analysis sample is associated with parents' education and children's vocabulary test score at age 3. To account for this problem, I firstly estimated the probability to be part of the analysis sample using logistic regression

with some family and child characteristics as independent variables. I used the predicted values from this regression as sampling weights in the further analyses. The results of these analyses are very similar to the results in Table II (without these special sampling weights).

5. Only time-varying family characteristics that were measured (virtually) identically in wave 2 and 3 could be selected. Thus, no further variables from the module 'parenting activities' could be used here.

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