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Can early schooling at age 2 narrow the gaps in child development? Evidence from the French Elfe cohort

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ABSTRACT

This article assesses the effects of early schooling in France, where children can access school-based preschool programmes from the age of 2. The aim of this policy is to increase readiness for school, and it especially targets children from disadvantaged areas. We use the Elfe cohort survey to estimate the effect of the policy on child development outcomes at age 3.5 and the contribution it makes to reducing developmental gaps among children. We controlled for a rich set of potential confounding variables, including children's baseline level of development. Using OLS regressions, we find that early schooling has a positive effect on motor skills, language skills, and knowledge of letters and numbers and to a lesser extent on social and self-help skills. Conversely, however, it has no effect on non-verbal reasoning abilities. We also find that disadvantaged children and those with a low level of skills at age 2 benefit more from early schooling. We also use logistic regressions to show that socially disadvantaged children and high-skilled children are more likely to access early schooling. We conclude that to make a more effective contribution to reducing gaps in child development, early schooling should be made more accessible to low-skilled children.

KEYWORDS

Early schooling; child development; educational inequalities; preschool

Introduction

Child development research has shown that the first years of life are critical for brain development (Shonkoff & Phillips, 2000) and the emergence of socio-economic inequalities. For example, a recent article estimates that in three European countries, up to 50–80% of social gaps in language achievement at the end of primary school are explained by gaps generated before formal schooling begins (Passaretta et al., 2022). Because differences in early childhood skills contribute greatly to the intergenerational transmission of socioeconomic status (Durham et al., 2007), policies that attempt to reduce differences in child development at a very early age can be central to giving all children an equal start.

Early childhood education programmes have long been identified as an efficient policy tool for fostering skills development (Heckman & Carneiro, 2003) and equalising initial endowments (Currie, 2001). However, the available evidence has come from intensive small-

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scale interventions in English-speaking countries (Kulic et al., 2019). In addition, there is only a limited amount of empirical evidence on the role of school-based rather than centre-based preschool childcare programmes for children under the age of 3 because very few countries have implemented such a policy at a national level (Heim, 2018). We contribute to the literature by studying the case of France, where all children attend a school-based preschool from age 3 although some can start earlier, on their second birthday. Early entrance into preschool has been implemented with the objective of increasing readiness for school and reducing inequalities among children (Ministère de l'Éducation, 2012).

We estimate the effect of early schooling (between the ages of 2 and 3) on child development measured at an early age during the first year of universal preschool, at age 3.5. Our aim is to investigate two main questions: the effect of early schooling on child development outcomes at age 3.5 and the extent to which this effect varies by developmental domains; and second, whether early schooling contributes to reducing gaps in child development at the beginning of the school career. If early schooling has a positive effect on child development, the implementation of a policy like this one could reduce these gaps in two ways. First, early schooling could target children from disadvantaged backgrounds and/or with the lowest levels of development to make them more likely to access it. Second, early schooling may benefit more children from disadvantaged backgrounds and/or with the lowest level of development, thereby leading to a reduction in the gaps in child development. We test these two hypotheses by looking at both the determinants of access to early schooling and the effects of early schooling on different subgroups.

We rely on data from a nationally representative French birth cohort, the Longitudinal Study of Children: *Étude Longitudinale Française depuis l'Enfance* (Elfe). This rich longitudinal dataset enables us to contribute to the literature in two ways. First, we can estimate the effect of early schooling on different skill domains, distinguishing between the effects of early schooling on language skills, motor skills, social and self-help skills, knowledge of letters and numbers, and non-verbal reasoning. Second, and unlike most articles on this topic, we are able to control for children's baseline level of development: children who are enrolled in early schooling may be positively selected in terms of development before they start preschool. A naïve estimate of the association between early schooling and later outcomes may therefore under- or over-estimate the benefits of early schooling.

Literature review

We review studies that estimate the effects of attending school-based preschool on various cognitive and non-cognitive outcomes and the heterogeneity of these effects in different social groups. It should be noted that these studies typically estimate the effect of preschool attendance between the ages of 3 and 5, while we concentrate on preschool attendance between 2 and 3, an age range for which the existing literature focuses almost exclusively on centre-based childcare programmes which are the only type of early education programmes available in many countries. It is beyond the scope of this article to provide a summary of the wealth of literature on the effects of childcare programmes (see, for example, van Huizen & Plantenga, 2018), which have an ambiguous effect on children's development (Melhuish et al., 2015), because French preschools differ significantly from centre-based childcare programmes. Most notably, French preschools are school-based, managed nationally, and focus explicitly on the acquisition of language and numeracy skills (see below).

The effects of preschool on children's skills

The literature on preschool attendance has consistently demonstrated a positive effect on school outcomes and cognitive skills, even where it accounts for selection biases by applying a quasi-experimental approach. For example, preschool attendance in England, among children born in 1989-1990, has a moderate positive effect on test scores at age 11 in both mathematics and language skills (Apps et al., 2013). In France, a single additional year of preschool (between ages 3 and 4) decreases the risk of repeating a year and increases test scores at age 11, as well as the likelihood of graduating from high school (Dumas & Lefranc, 2010). In Argentina, one year of preschool increases language and numeracy skills in third grade (Berlinski et al., 2009), and in Uruguay, it greatly increases the likelihood of still being at school at age 15 (Berlinski et al., 2008). In the US, prekindergarten (age 4) is associated with higher reading and mathematics skills on entry to a formal school (Magnuson et al., 2007).

It is unclear whether these results can be generalised for preschool attendance at age 2 because the preschool context may not be fully adapted to very young children, and may be less favourable for – or even detrimental to – their development (Brisset & Golse, 2006). A qualitative observation of 2-year-olds in a preschool in France suggests that the objectives of early schooling in terms of school skills and behaviour in the classroom can create difficulties for some children, who are then identified by their teachers as ‘underperforming pupils’ very early on (Garnier & Brougère, 2017). The quantitative results on preschool attendance at age 2 in France are mixed. One study has found a large positive effect of early schooling on numeracy skills at primary and lower secondary school (Filatriau et al., 2013), and another has found a small decrease in the numbers of primary school children having to repeat a year (Caille, 2001) in the case of children born in 1991. Conversely, two studies that analysed the school careers of children born in 1996 concluded that early schooling at age 2 does not have a statistically significant effect on test scores at age 11 (Ben Ali, 2012; Heim, 2018). However, none of these studies accounts for differences in child development before the children start preschool.

The results of the effect of attending preschool on non-cognitive outcomes are more mixed than they are for cognitive results. One study found no effect on non-cognitive outcomes in England, which are defined as socialisation and health-related risky or problematic behaviour measured at age 16 (Apps et al., 2013), while early schooling in Australia (Suziedelyte & Zhu, 2015) and the US (Magnuson et al., 2007) was found to have a negative effect on non-cognitive outcomes, defined as child behavioural problems measured at ages 6–7. In contrast, a slight positive effect was found in France (Filatriau et al., 2013) with regard to the sociability of children at age 6, and large positive outcomes were identified in Argentina (Berlinski et al., 2009) for third graders’ attention levels, effort, discipline, and class participation.

The equalising effect of attending preschool

Kulic et al. (2019) stress that the effect of early education programmes on social equality depends on the social background-related use gap. In most countries, however, children from disadvantaged backgrounds are less likely to attend formal child-care (Adema et al., 2016), as was also the case with early schooling in France in the 1980s (Jarousse et al., 1992). Preschool can also contribute towards reducing social

inequalities if socially disadvantaged children derive more benefit from the experience. One large cross-comparative study concluded that in 28 high-income countries, preschool attendance benefits more children with less involved or less educated parents (Cebolla-Boado et al., 2017). This correlational finding is confirmed by several quasi-experimental studies (Apps et al., 2013; Becker, 2011; Dumas & Lefranc, 2010; Leuven et al., 2010; Suziedelyte & Zhu, 2015), and also applies to children living in disadvantaged areas (Berlinski et al., 2009). In an area of extreme urban deprivation in the US with a predominantly African American population, attending preschool had beneficial effects on language and general cognitive abilities after two years as wide as the typical Black/White test score gap. These positive effects also proved to be long-term, including on non-cognitive outcomes (Barnett, 2011). Targeted preschool programmes can therefore have positive impacts (Szabó-Morvai et al., 2023). This effect may not be systematic (Heim, 2018), however, as the quality of preschool programmes appears to be a crucial factor (Biedinger et al., 2008; Hall et al., 2009). Apart from school, high-quality childcare appears to be beneficial for children's development and for cognitive, language, and social development skills. This effect may be greater when childcare compensates for a shortage of cognitive stimulation at home, but the findings on this compensatory effect are mixed (Carbuccion et al., 2022; Melhuish et al., 2015).

The question of whether early schooling contributes towards reducing social inequality is not a new one in the French context. Previous studies have found that in the 1980s and 1990s, disadvantaged students had less access to early schooling, but its effect was similar (and beneficial) for all social strata (Jarousse et al., 1992). Other studies found that the effect was greater for both upper-class and working-class children but null for the intermediate social groups (Caille, 2001; Jeantheau & Murat, 1998). However, not only has the context of early schooling changed since that time (see below), but also none of these earlier studies addressed the potential selection bias caused by differences in child development prior to early schooling.

The French context

In France, attendance at preschool from ages 3 to 6 has been universal for many years¹ and became compulsory in 2019. Children usually start preschool in September of the year of their third birthday, but they can be admitted earlier, after their second birthday. There are no formal criteria for being granted access at age 2, but since three-year-olds are given priority, the availability of preschool space for 2-year-olds is a crucial factor. In addition, children born in the first six months of the year are more likely to enter preschool early because they will have already passed their second birthday by September. However, children can also access preschool later in the school year (deferred access).

The preschool sector is administered at a national level and children overwhelmingly go to public preschools.² In the 2000s, under the influence of international comparative surveys, French preschools were accused of not adequately preparing children for primary education. Since that time, they have focused more on formal activities aimed at developing academic skills, and have been treated as a formal stage in the school system (Leroy, 2020). A national curriculum for language, motor, and numeracy skills has been established by the Ministry of Education. This curriculum is common to all children at preschools, with some suggested age-based adaptations. Children receive 24 hours

a week of instruction, although part-time attendance is common during the first year. Preschool teachers are civil servants recruited at an undergraduate degree (prior to 2010) or master's degree (as of 2010) level who have usually had two years of specific teacher training. They are recruited to work in either preschools or primary schools, although their professional training focuses more on primary school than preschool pupils, and rarely includes training specifically for teaching two-year-olds. Class sizes in public preschools decreased during the 2010s, averaging 23 in 2020 (Ministère de l'Éducation, 2021). Finally, while 2-year-old children can be together in a specific class, in public schools, 93% join a mixed-age class with older children (Abdouni, 2016).

Enrolment for early schooling reached a peak in 2000, when 35% of 2-year-olds were enrolled into preschools, but this proportion has been decreasing ever since. The decrease has been greater in public schools, and is partly explained by an increase since 2000 in the number of children aged between 3 and 5 who are given priority (Ben Ali, 2012). Between 2011 and 2015, approximately 11% of 2-year-old children were enrolled in preschools. Recent legislation specifies that early schooling is organised as a priority in socially disadvantaged areas because it is 'an efficient way to promote school success, especially where the family is distant from a school culture for social, cultural, or linguistic reasons' (Ministère de l'Éducation, 2012). A legislative framework and national guidelines to clarify how this target should be implemented are absent, however: it is the municipalities that decide how they select children for early schooling, and the criteria vary greatly depending on the local context (Inspection générale de l'éducation nationale [IGEN], 2014). Research suggests that the enrolment of 2-year-old children in schools can vary at a local level based on demographic or financial constraints (Garnier & Brougère, 2017). Administrative data confirm that early schooling is more common in urban and socially disadvantaged areas (Abdouni, 2016).

Other formal child-care provisions apart from preschool are available in France for children under the age of 3. It is most common for these young children to be cared for by a childminder (*assistante maternelle*) or to attend a centre-based childcare programme (*crèche*). Both options are regulated at the state level, including staffing requirements. It is important to note that these childcare alternatives are partly publicly funded (through direct subsidies or tax credits), but still entail higher costs for families than attending preschools, which are completely free in the case of public schools.

Data and method

Data

Our analysis draws on the Elfe survey, a national longitudinal survey following 18,329 French children born in 2011. The children involved were chosen at birth from 320 randomly selected maternity units across Metropolitan France (Charles et al., 2020) over four time periods, in early April, early July, early October, and early December. The survey includes telephone interviews of both parents when the children were 2 months and 1 and 2 years old, and an interview of one of the parents (the mother or, if she is not available, the father) when the child was age 3.5.³ In addition, a home visit was organised when the child was the same age. Of the children who were initially selected at birth,

10,724 took part in all the waves between birth and age 3.5. Those families who dropped out of the survey were more likely to be socially disadvantaged (Charles et al., 2020), which means that on average, the families in our analytical sample have a higher education and income level than in the original Elfe representative sample. Because our analytical strategy relies on controlling for the baseline level of skills, we have excluded a further 46 children who were already enrolled in preschool when their parents were interviewed when the child was age 2.

Variables

Our main variable of interest is participation in early schooling, coded as a binary variable indicating whether a child entered preschool before September 2014, which is the normal admission date for this cohort. We used information on the age of the child on admission to preschool as reported by the parent at age 3.5 and the month of birth to identify whether he or she entered before September 2014. Based on this information, we were only able to identify children who joined preschool in September 2013 or January 2014, so this article focuses on the effect of six months or more of early schooling. This should only introduce a small bias in the analysis, as the administrative data show that 93% of children entering preschool early do so either in September or January (Abdouni, 2016). In our analytical sample, 9% of children entered preschool before the age of 3.

Child development outcomes were assessed at age 3.5. One of the parents (usually the mother) was asked 44 questions on items about what their child could do, using a French version of the Child Development Inventory (CDI; for psychometric properties, see Duyme & Capron, 2010). We looked at the total score of development and the specific skill domains separately: language skills (expressive language and language comprehension; 15 items), motor skills (gross and fine; 13 items), social and self-help skills (12 items), and four items measuring the child's knowledge of letters and numbers, for example, whether the child could write his or her name and count to 10. In addition, non-verbal reasoning was measured using British Ability Scales (BAS) test picture similarities sub-test, which was administered by an interviewer during the home visit. This test measures the ability to solve non-verbal problems, and to identify and attach meaning to pictures (Charles et al., 2020). All dependent variables were standardised to facilitate the comparison of effect sizes.

Table 1 displays our control variables and their distribution in the analytical sample. We controlled for a number of variables, including the child's demographic characteristics, the family's socio-economic background, schooling conditions, and parental involvement. Some variables were collected at age 2 (for example social background) and we expect that they might influence both participation in early schooling and child development. The variables regarding schooling conditions and parental involvement were collected at age 3.5 and are expected to influence developmental levels at this age. In order to take into account baseline development levels, we controlled for language and motor skills when the child was 2, just before it became possible to be enrolled in preschool. Language skills were assessed using a French short version of the MacArthur-Bates inventory (Kern et al., 2010). Mothers were asked whether the child was able to produce words used in daily life from a proposed list of 100 words. Motor skills were measured using the sum of seven items indicating the child's ability to walk up stairs, kick a ball, run, use a tricycle, put on slippers or socks, eat alone, and drink alone.

Table 1. Descriptive statistics of the control variables (analytical sample).

Variables measured at birth		
Sex	Boys	50.7%
	Girls	49.3%
Twin birth	No	98.5%
	Yes	1.5%
Month of birth	Early April	22.0%
	Early July	27.5%
	Early October	26.0%
	Early December	24.5%
First child of the mother	No	56.2%
	Yes	43.9%
Foreign language spoken at home	No	92.5%
	Yes	7.6%
Variables measured at age 2		
Highest qualification obtained by the mother	Less than high school degree	27.1%
	High school degree	18.9%
	Higher education	54.0%
Mother's working status	Not working	25.1%
	Working part-time	29.1%
	Working full-time	45.7%
Family structure	Parents live together	92.2%
	Parents do not live together	4.0%
	Single mother	3.8%
Priority Neighbourhood (QPV)	No	93.3%
	Yes	6.7%
Main childcare	Family care	39.4%
	Private nanny at home	1.5%
	Childminder	37.5%
	Crèche	20.0%
Preference for early schooling	Other	1.5%
	No	75.5%
Standardised language score by age in months, tertile	Yes	24.5%
	1st tertile	35.2%
	2nd tertile	33.9%
Standardised motor skills score by age in months, tertile	3rd tertile	30.9%
	1st tertile	35.1%
	2nd tertile	38.3%
	3rd tertile	26.6%
Variables measured at age 3.5		
Age in months at the interview	Mean	41.9
	SD	1.8
Number of siblings/step-siblings in the household	No sibling	23.5%
	1 sibling	49.0%
	2 siblings or more	27.6%
Chronic disease between 2.5 and 3.5 years old	No	71.6%
	Yes	28.4%
Intensity of schooling	Full-time	70.8%
	Less than full-time	28.0%
	Not at school	1.3%
School sector	Public	79.6%
	Private	13.1%
	Do not know	7.3%
Class size, quintile	1st quintile	26.5%
	2nd quintile	25.9%
	3rd quintile	16.9%
	4th quintile	14.4%
	5th quintile	16.3%
Number of times per week the child attends before- and/or after-school activities (out of 9)	Never	55.6%
	1–3	16.3%
	4–6	19.9%
	7–9	8.1%
Regular participation in an out-of-school activity	No	83.0%
	Yes	17.0%

(Continued)

Table 1. (Continued).

Parents talk with the child about their school day	Never/less than once a week	3.1%
	More than once per week	16.5%
	Every day	80.5%
Parents have missed the parent-teacher conference	No	88.9%
	Yes	11.1%
Number of home learning activities done over last month (out of 7)	Mean	5.6
	SD	1.0
Atmosphere at home is quiet	Agree	51.6%
	Neither agree nor disagree	25.1%
	Disagree	23.3%
Home is tidy	Agree	72.3%
	Neither agree nor disagree	17.4%
	Disagree	10.4%
Total screen use in hours per day, standardised	Mean	-0.06
	SD	0.93
Observations		9,809

Source: ELFE. Children with questionnaire at 2 years of age administered before starting school. Weighted proportions.

Empirical strategy

The effects of early schooling on the different domains of child development were estimated by ordinary least squares (OLS) regressions. In the first model, we included all the control variables described in [Table 1](#) except those that measured language and motor skills when the child was 2 years old. These two variables were added in a second model, and the comparison between the two models indicated the importance of the selection bias due to differences in child development for access to early schooling. White-Huber heteroscedasticity robust standard errors were used in all models to correct for dependence among the repeated observations. Eight per cent of children with data on the development outcome variables had missing data on one of the covariates, and listwise deletion was used for all our analyses. We only used survey weights in the descriptive analysis because they were not a function of our dependent variables (Winship & Radbill, 1994).

In order to test whether access to early schooling is efficiently targeted towards disadvantaged children, we ran a logistic regression model with independent variables relating to the children's demographics, situation, and skills measured at birth and at age 2 (see [Table 1](#)). Finally, we modelled the differential effect of early schooling by running separate OLS models on children with a lower- or higher-educated mother and on children with a lower or higher level of language skills at age 2. Since we were interested in the total differential effect of early schooling for these groups, we did not control for any potential mediating variables in these models (such as parental involvement, childcare at age 2, and screen use). We only controlled for the month of birth and age in months when skills were measured since these two variables are strongly correlated with scores at age 3.5, but not with the mother's level of education.

Results

The effects of early schooling participation on child development outcomes at age 3.5

[Table 2](#) displays the OLS results on the effects of early school participation on the different development outcomes at age 3.5.

Table 2. OLS coefficients of early schooling participation on development outcomes at 3.5 years of age.

Outcome (standardised)		Model 1	Model 2
Child Development Inventory score, total	Early schooling	0.24*** (0.03)	0.17*** (0.03)
	Controls for language & motor skills at 2 years of age	No	Yes
	R-squared	0.241	0.356
	Adjusted R-squared	0.237	0.353
	Observations	9,809	9,809
Language score from the Child Development Inventory	Early schooling	0.16*** (0.03)	0.09*** (0.03)
	Controls for language & motor skills at 2 years of age	No	Yes
	R-squared	0.123	0.270
	Adjusted R-squared	0.119	0.267
	Observations	9,809	9,809
Motor skills score from the Child Development Inventory	Early schooling	0.27*** (0.04)	0.23*** (0.04)
	Controls for language & motor skills at 2 years of age	No	Yes
	R-squared	0.175	0.222
	Adjusted R-squared	0.172	0.218
	Observations	9,809	9,809
Social & self-help skills score from the Child Development Inventory	Early schooling	0.10*** (0.03)	0.06* (0.03)
	Controls for language & motor skills at 2 years of age	No	Yes
	R-squared	0.128	0.171
	Adjusted R-squared	0.124	0.167
	Observations	9,809	9,809
Letters & numbers score from the Child Development Inventory	Early schooling	0.15*** (0.04)	0.12*** (0.04)
	Controls for language & motor skills at 2 years of age	No	Yes
	R-squared	0.243	0.270
	Adjusted R-squared	0.239	0.267
	Observations	9,809	9,809
Non-verbal reasoning score from the British Ability Scale	Early schooling	0.05 (0.05)	0.03 (0.05)
	Controls for language & motor skills at 2 years of age	No	Yes
	R-squared	0.053	0.067
	Adjusted R-squared	0.047	0.061
	Observations	7,847	7,847

Notes: White-Huber heteroscedasticity robust standard errors in parentheses. All models control for a set of covariates on the demographic characteristics of the child, the family socio-economic background and aspirations, the local context, schooling and care experiences, parental involvement, screen use, and home atmosphere at age 3.5.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Elfe. Children with questionnaire at age 2 administered before starting preschool.

Our results show that early school participation has a positive effect on the total CDI score. When we control for the child's demographic characteristics, family socio-economic background, local context, schooling and care experiences, parental involvement, and home atmosphere, early schooling is associated with an increase of a quarter of a standard deviation (SD) in the total CDI score (Model 1). Controlling for language and motor skills at age 2 reduces this effect, but it still amounts to 17% of a SD. The 30% decrease in the effect size between Models 1 and 2 confirms that children who participate in early schooling have higher levels of development before enrolment, and that this partly explains the positive association between early schooling and child development. As regards the specific developmental domains assessed in the CDI test, our results show that the effect of early schooling participation is higher for motor skills (+23% of a SD in Model 2) and knowledge of letters and numbers (+12% of a SD), followed by language skills (+9% of a SD). In the case of social and self-help skills, the association with early schooling is only significant at the 10% level and amounts to

6% of a SD. Further analyses (available upon request) reveal that early schooling has a greater effect on social skills (+12% of a SD in Model 2, significant at the 1% level) but the effect is null for items related to self-help skills. Ignoring the positive selection of children in early schooling leads to an overestimation of the estimated effect of early schooling, which is greater for language and social and self-help skills (around -40% between Models 1 and 2) but less important for knowledge of letters and numbers (-20%) and motor skills (-15%).

Finally, the results relating to non-verbal reasoning measured by the BAS show that early schooling does not affect this skill domain. Whether we control for skills at age 2 or not, the association between early schooling and non-verbal reasoning is not statistically significant and is close to 0.

Access to early schooling

Table 3 displays the results of the logistic regressions regarding participation in early schooling. The results of Model 1 (not taking into account the baseline level of skills) show that a child's month of birth has by far the largest effect on participation in early schooling, as children born in December are 20 percentage points (p.p.) less likely to join preschool before the regular entry age than children born in April. This is not surprising, given that most children enter preschool in September, which means that children who have already had their second birthday at this time are much more likely to enter preschool early.

Other variables slightly increase the probability of entering preschool early, such as having two or more siblings (+3 p.p.), suffering from a chronic disease (+1 p.p.), having a working mother (+2 p.p.), or being cared for by the family at age 2 (+4 p.p. compared to children in *crèches*). Unsurprisingly, children whose parents express a preference for early schooling are also more likely to enter preschool early (+4 p.p.).

The results on the effect of the socio-economic variables are more mixed. We find that children living in priority neighbourhoods and those with a lower-educated mother are slightly more likely to access early schooling, whereas the opposite is true for children who speak a foreign language at home and children with a single mother.

Finally, Model 2 confirms that children with better language and motor skills at age 2 are more likely to enter preschool early, and the effect size is equivalent for both skill domains (+2 p.p. for children in the third tertile of performance). Because the proportion of children entering preschool early is relatively low in this cohort (9%), these effects are not negligible.

The effects of early schooling participation for different subgroups

The results on the differential effect of early schooling depending on the mother's level of education and the child's language skills at age 2 (Table 4) suggest that the association between early schooling and development outcomes is far from homogenous for these different groups. Overall, children with a lower-educated mother and children with language skills below the median at age 2 benefit more from early schooling. The effect of early schooling on the total CDI score for children with a lower-educated mother is 50% higher than it is for children with a higher-educated mother (columns 1 and 2). The gap is

Table 3. Logistic regression of participation in early schooling (average marginal effects).

		Model 1		Model 2	
Demographic characteristics of the child					
Sex	Boys (ref.)				
	Girls	0.01	(0.00)	0.00	(0.00)
Twin birth	No (ref.)				
	Yes	-0.00	(0.02)	-0.00	(0.02)
Month of birth	Early April (ref.)				
	Early July	-0.13***	(0.01)	-0.13***	(0.01)
	Early October	-0.20***	(0.01)	-0.20***	(0.01)
	Early December	-0.20***	(0.01)	-0.21***	(0.01)
First child of the mother	No (ref.)				
	Yes	-0.00	(0.01)	-0.00	(0.01)
Number of siblings/step-siblings in the household at age 3.5	No sibling (ref.)				
	1 sibling	0.01*	(0.01)	0.01*	(0.01)
	2 siblings or more	0.03***	(0.01)	0.03***	(0.01)
Chronic disease between age 2.5 and 3.5	No (ref.)				
	Yes	0.01**	(0.01)	0.01***	(0.01)
Social background at age 2					
Highest qualification obtained by the mother	Less than high school degree (ref.)				
	High school degree	0.00	(0.01)	0.00	(0.01)
	Higher education	-0.01**	(0.01)	-0.02**	(0.01)
Mother's working status	Not working (ref.)				
	Working part-time	0.02***	(0.01)	0.02***	(0.01)
	Working full-time	0.02**	(0.01)	0.01**	(0.01)
Foreign language spoken at home	No (ref.)				
	Yes	-0.02***	(0.01)	-0.02***	(0.01)
Family structure	Parents live together (ref.)				
	Parents don't live together	0.00	(0.01)	0.00	(0.01)
	Single mother	-0.02*	(0.01)	-0.02*	(0.01)
Residence of the child at age 2					
Priority Neighbourhood (QPV)	No (ref.)				
	Yes	0.02*	(0.01)	0.02*	(0.01)
Child's situation at age 2					
Main childcare	Family care (ref.)				
	Private nanny at home	-0.05***	(0.01)	-0.05***	(0.01)
	Childminder	-0.02**	(0.01)	-0.02***	(0.01)
	Crèche	-0.04***	(0.01)	-0.04***	(0.01)
	Other	-0.01	(0.02)	-0.01	(0.02)
Preference for early schooling	No (ref.)				
	Yes	0.04***	(0.01)	0.04***	(0.01)
Skills at age 2					
Standardised language score by age in months, tertile	1st tertile (ref.)				
	2nd tertile			0.01**	(0.01)
	3rd tertile			0.02***	(0.01)
Standardised motor skills score by age in months, tertile	1st tertile (ref.)				
	2nd tertile			0.01**	(0.01)
	3rd tertile			0.02***	(0.01)
	Log likelihood	-1954		-1939	
	Pseudo R2	0.191		0.197	
Observations		9,809		9,809	

 Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Elfe. Children with questionnaire at age 2 administered before starting preschool.



Table 4. OLS coefficients of early schooling participation on development outcomes at 3.5 years, by maternal education and language skills at age 2.

Outcome (standardised)	Maternal education			Language skills at age 2		
	Less than higher education (1)	Higher education (2)	Low (3)	Low (3)	High (4)	High (4)
Child Development Inventory score, total						
R-squared	0.35***	0.23***	0.30***	0.13***	0.06	0.13***
Adjusted R-squared	0.059	0.061	0.050	0.087		0.087
Observations	2,960	6,849	4,773	5,036		5,036
Language score from the Child Development Inventory						
R-squared	0.23***	0.12***	0.16**	0.06	0.06	0.01
Adjusted R-squared	0.021	0.011	0.015	0.009		0.009
Observations	2,960	6,849	4,773	5,036		5,036
Motor skills score from the Child Development Inventory						
R-squared	0.36***	0.29***	0.35***	0.06	0.06	0.21***
Adjusted R-squared	0.063	0.063	0.054	0.068		0.068
Observations	2,960	6,849	4,773	5,036		5,036
Social & self-help skills score from the Child Development Inventory						
R-squared	0.18***	0.14***	0.22***	0.06	0.06	0.06
Adjusted R-squared	0.016	0.013	0.013	0.014		0.014
Observations	2,960	6,849	4,773	5,036		5,036
Letters & numbers score from the Child Development Inventory						
R-squared	0.27***	0.10*	0.13**	0.06	0.06	0.12**
Adjusted R-squared	0.084	0.097	0.093	0.090		0.090
Observations	2,960	6,849	4,773	5,036		5,036
Non-verbal reasoning score from the British Ability Scale						
R-squared	0.09	0.03	-0.00	0.08	0.08	0.03
Adjusted R-squared	0.026	0.031	0.024	0.033		0.033
Observations	2,227	5,620	3,743	4,104		4,104

Notes: White-Huber heteroscedasticity robust standard errors in parentheses. All models control for month of birth and age in months when development outcomes are measured.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: Effe. Children with questionnaire at age 2 administered before starting preschool.

even larger based on language skills at age 2, as the effect for lower-skilled children is more than twice as large as it is for higher-skilled children (columns 3 and 4).

The differential effect depending on the mother's education is greater for language skills (with an effect almost twice larger for children with a lower-educated mother) and knowledge of letters and numbers (almost three times larger). Conversely, the gap is much smaller for motor skills and social and self-help skills. In addition, early schooling allows children with a lower level of language development to partially catch up, as early schooling leads to an increase of 16% of a SD compared to a null effect for higher-skilled children. Early schooling also develops social and self-help skills, albeit mainly for lower-skilled children. The effect here is almost four times larger whereas it is equivalent for both groups with respect to knowledge of letters and numbers. It is only in the case of non-verbal reasoning skills that the effect of early schooling is not statistically significant for any subgroup.

Discussion

The analyses presented in this article provide several important results relating to the effects of early schooling on child development. Firstly, early schooling has a positive effect on development at age 3.5 in line with the previous literature on the effects of preschool from age 3 (see above). This result is noteworthy because, in the French context, early schooling begins at age 2, and school-based programmes may not be well-suited to such very young children. We further show that the effects of early schooling differ considerably depending on the developmental domain, which expands our current understanding of the effects of preschool that are specific to 2-year-olds. It has a null effect on non-verbal reasoning, and a small effect on social and self-help skills, language skills, and knowledge of letters and numbers. The largest effect of early schooling at age 2 is found for motor skills. Additional analyses (available upon request) show that the effect of early schooling is larger for fine motor skills (+22% of a SD) than it is for gross motor skills (+13%). This is a promising result, because there is an extensive body of literature that has concluded that there is a positive relationship between motor skills and future academic performance in reading and mathematics, especially fine motor skills (for an overview, see Macdonald et al., 2018). According to the embodied cognition approach, fine motor skills and cognitive skills would be linked by shared internalised motor processes and neuronal circuits (Suggate et al., 2019). Thus, the positive effect of early schooling on motor skills – and especially on fine motor skills – is expected to translate into better academic abilities throughout the school career.

The heterogeneity analyses further suggest that early schooling is more beneficial for children with a lower-educated mother than for children with a higher-educated mother, although the latter still benefit from the policy. In contrast, other studies have found that early schooling at age 4 brings no benefit to socially advantaged children (Becker, 2011; Dumas & Lefranc, 2010; Leuven et al., 2010). Becker (2011) argues that early schooling may only benefit disadvantaged children because socially advantaged children would already be exposed to a stimulating environment at home and early schooling would not improve it. We do not find support for this hypothesis for children between the ages of 2 and 3.5. Thus, universal early schooling at age 2 can contribute to reducing some gaps in child

development but will not close them, which is, for example, consistent with the results obtained by Cebolla-Boado et al. (2017). This conclusion points to the need to target disadvantaged children in order to further equalise development outcomes. In the Elfe cohort, we find that socially disadvantaged children are slightly more likely to access early schooling, at least when considering children who live in disadvantaged areas and have parents with a lower education level. This represents noteworthy progress in the French context, as Jarousse et al. (1992) showed that in a cohort of children born in the mid-1980s, disadvantaged families had less access to early schooling. However, the greater access of socially disadvantaged children is not systematic: it depends on the nature of the disadvantage under consideration. Importantly, we find that children who speak a foreign language at home have less access to early schooling, even though they are expressly mentioned as expected beneficiaries of the policy (Ministère de l'Éducation, 2012). Children who speak a foreign language at home may be migrants or may have been born in France, but their parents are more likely to be unfamiliar with how schools work in the country (Audren et al., 2018) and may face structural constraints (the mother's work schedule, for instance), and lower proficiency in the language used in the school. The issue may also relate to cultural norms that favour informal childcare (Van Lancker & Pavolini, 2023). This result underlines the potential informational barriers to access to early schooling for children who may benefit the most from it.

Another important result relates to access to and benefits from early schooling depending on a child's baseline level of skills. This question has not been addressed previously in the literature due to a lack of appropriate data. We find that the benefits of early schooling on development outcomes at age 3.5 are twice as large for children with a lower level of language skills at age 2 than for children with a higher level. This gap is much wider than the estimated differential effect based on the mother's education level. However, we find that children with a lower level of skills at age 2 are significantly less likely to have access to early schooling. This confirms that children who access early schooling are positively selected in terms of skills and that it is crucial to consider this selection bias if we wish to avoid overestimating the benefits of early schooling policies. It also suggests that in the cohort studied (children born in 2011), early schooling in France mainly welcomed the small proportion of higher-skilled children from disadvantaged backgrounds. In order to narrow the gaps in child development, children from disadvantaged backgrounds with lower skill levels should be taken into account when schooling and care policies are implemented. One solution would be to adapt the conditions and context of early schooling so as to welcome more children with lower levels of development. Alternatively, access to another form of care programme, such as *crèches*, should be offered to these children, as it also leads to significant improvements in child development (Berger et al., 2021). It is important to keep in mind, however, that the cost of a place at a *crèche* can be as high as €15,000 a year (Pora, 2020), which is more than twice as much as a year in preschool (which cost €7,110 in 2019, DEPP – Ministère de l'Éducation, 2021).

Some limitations of this study should be borne in mind when interpreting these results. First, the analyses rely on parents' answers regarding their children's abilities. Our measures of language and motor skills at age 2 and outcomes at age 3.5 are all based on parental questionnaires. Although these tests have demonstrated their validity, we cannot exclude the risk that a desirability bias might affect the answers given. This may be an issue for our estimates if parents who enrol their child in preschool at age 2 report differently on their

child's development. Second, we lack information on the child's environment between ages 2 and 3.5 so we cannot estimate the effect of early schooling participation on certain environmental variables, which may in turn influence a child's development at age 3.5. If participation in early schooling has a positive effect on parental involvement (for example, attendance at teacher-parent conferences or involvement in home learning activities) or on the intensity of schooling between ages 2 and 3.5 (by increasing the probability that school will be attended full-time instead of part-time), we may possibly have underestimated the effect of early schooling on child development at age 3.5.

Conclusion

This article estimates the effect of early schooling at age 2 on different skill domains at an early age, and has been able to account for many potential confounding factors, including children's baseline levels of language and motor skills. Overall, the results show a positive effect of early schooling on certain skill domains including motor skills, language skills, and knowledge of letters and numbers, but no effect on non-verbal reasoning skills. The positive effects are greater for socially disadvantaged children and children with the lowest skills level before enrolment. However, we find that the children who could benefit the most from early schooling are not systematically those who are more likely to access it. The objective of targeting disadvantaged children as a priority is met when parents' education and the area where the family lives are taken into account, but we find that children who speak a foreign language at home and those with the lowest skills level are less likely to access early schooling. Our results thus raise the question of how to target this policy to make a more effective contribution towards reducing developmental gaps among children in France. A political initiative launched in 2019 aims to widen preschool access for children under age 3 in certain priority neighbourhoods (*'cités éducatives'*; Inspection générale de l'éducation, du sport et de la recherche [IGESR], 2021), and it will be important to see whether its implementation has an effect on the enrolment of socially disadvantaged 2-year-olds.

This work also points to two important directions for future research. First, it remains unclear whether a school context with a class size of more than twenty children is well suited to children under age 3 (Brisset & Golse, 2006). We show that children benefit from this type of exposure in some skill domains, but this does not allow us to draw conclusions about its consequences in terms of well-being and social-emotional development. In addition, we have only measured the short-term effects of early schooling, and future research is needed to determine whether the positive effects we found at age 3.5 persist and translate into better primary school outcomes.

Notes

1. Since 1999, around 97% of three-year-old children are enrolled in preschool (DEPP – Ministère de l'Éducation, 2021).
2. In 2020, 87% of preschool-level children were enrolled in a public school (DEPP – Ministère de l'Éducation, 2021).
3. To be precise, the survey at 3.5 years was carried out in September 2014 or February 2015, and children were between 3.4 and 3.9 years old.

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