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Reading Aloud to Children, Social Inequalities, and Vocabulary Development: Evidence from a Randomized Controlled Trial

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ABSTRACT

Reading Aloud to Children, Social Inequalities, and Vocabulary Development: Evidence from a Randomized Controlled Trial*

This study presents the results of a randomized controlled trial assessing the impact of a shared-book reading (SBR) intervention that targeted children aged 4 living in socially mixed neighborhoods of the city of Paris. We selected a large, random sample of families and provided parents with free books, information on the benefits of SBR and tips for effective reading practices. We measured SBR frequency and children's vocabulary before and after this intervention, among treated and control children. The intervention had a large effect on SBR frequency. At the pre-test, SBR on a daily basis involved 41.2% of the families, and the treatment fostered this practice by 8 percentage points. SBR on a weekly basis was fostered by 14 percentage points. The intervention fostered SBR frequency only in low-educated households. This equalising impact is an important finding against the background of previous research reporting that disadvantaged families tend to benefit less from SBR programs. The intervention also significantly enhanced children's language skills measured with standardized tests of receptive vocabulary. The effect size for the main treatment effect ranges from 0.12 at the post-test to 0.16 at the follow-up. Treatment effects are persistent six months after the end of the intervention. Children from low-educated and immigrant families improved their vocabulary as much as those from high-educated, native families. Moreover, the persisting positive impacts on vocabulary growth detected at the follow-up also involve children from disadvantaged families. Furthermore, these children more often attend schools with lower educational resources. It is therefore encouraging that the intervention has strong impacts in schools with initially low involvement in reading-related activities and with low educational resources.

JEL Classification: I21, I24, J13, C93

Keywords: early childhood, language skills, parental reading, field experiment

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1.Introduction

Skill development processes in the preschool years are of pivotal importance for school success (Hulme, Snowling 2015). Core language skills such as active and receptive vocabulary, phonemic awareness, and knowledge of print, have been identified as strong predictors of academic performance across several domains (Whitehurst, Lonigan 1998; NELP 2008). Unfortunately, research on emergent literacy reports that children from low-educated and immigrant families are highly overrepresented among low achievers since the preschool years, with long-term consequences for their school performance and dropout risks (Park 2008; Potter, Roksa 2013). These social inequalities in educational opportunities are stronger for boys, who face higher risks of educational failure (Di Prete, Buchman 2013).

Public investments to foster language skills in early childhood and reduce the related social inequalities can thus be justified on both efficiency and equity grounds (Doepke, Zilibotti 2019). In particular, several scholars advocate a social investment strategy promoting access to high-quality child-care, anticipating entry into kindergarten and offering supplementary learning activities to low-achievers in primary education (Esping-Andersen 2012; Palier et al. 2017; Blossfeld et al. 2017; Heckman et al. 2013). While these school-based interventions are potentially important, they tend to leave the family environment virtually unchanged. This limitation significantly reduces their scope, since children spend at least half of their daytime under the supervision of their parents (Oecd 2012). Hence, parenting interventions have been increasingly advocated as a complementary approach to boost early skill accumulation (Sylva et al. 2008; York, Loeb 2018).

The informal learning processes taking place in the home environment, such as Shared Book Reading (SBR), are strong predictors of emergent literacy and school success (Myrberg, Rosen 2009; Notten, Kraaykamp 2013). Since these informal activities are socially stratified (Damhrich, Triventi 2018; Dotti Sani, Treas 2016), parenting interventions empowering disadvantaged families are of crucial importance (Sylva et al. 2008). Moreover, parenting programs may provide a light-touch, cost-effective complement to school-based interventions, which can be very costly (York, Loeb 2018).

However, boosting effective parenting practices is a major challenge. While promoting parental involvement in school success is a ‘mantra’ among educational experts, systematic reviews on these parenting interventions report mixed findings, suggesting that economic, cultural and social barriers may hinder parental receptivity to these interventions (Avvisati et al. 2010; Gorard, See 2013). Fostering SBR in early childhood is often regarded as one of the most promising intervention strategies to foster parental involvement and emergent literacy (Lay See et al. 2014; Oecd 2012; Bradley, Corwyn 2004). This activity demands limited time investments to the parents and is accessible to families with limited socio-economic resources, since free or cheap storybooks for children are easy to find (e.g., in public libraries), and their contents and language register are simple (Sénéchal 2006). Unsurprisingly, educational experts

recommend SBR as a highly beneficial parenting practice (Partridge 2004). Large-scale home-visiting interventions, such as Bookstart, have been developed in several countries over the past two decades to encourage this practice by providing free books to parents as well as information on the beneficial effects of SBR for children (Moore, Wade 2003). Pediatric interventions have become increasingly widespread, too. The best-known example is the Reach-Out-and Read model, where pediatricians provide free books together with information and encouragement to read, while a volunteer in the waiting room may show to the parents how to effectively read storybooks to their children (Mendelsohn et al. 2001).

A large consensus on the efficacy of SBR interventions emerged in the 1980s and 1990s (Bus et al. 1995; Bus et al. 1995; Scarborough, Dobrich 1994). An extensive literature based on matched case-control studies and other correlational research designs reported that these interventions have positive effects on SBR frequency and, at least in some studies, on children's emergent literacy (High et al. 1998; Sharif et al. 2002; Dickinson et al. 2012). However, an increasing number of randomized controlled trials carried out over the past two decades has reported more elusive evidence (Golova et al. 1999; Auger, Penner 2014; O'Hare, Connolly 2010). A recent meta-analysis (Barone et al. 2019) of 30 experiments on the impact of SBR interventions on children's vocabulary reports positive impacts only for one specific intervention methodology, namely dialogic reading (average Cohen's effect size=0.26), while other SBR programs are found to be ineffective (average Cohen's effect size =0.06).

As regards dialogic reading interventions (Whitehurst et al. 1994, 1999), they involve training parents to a highly interactive SBR style, where children comment and even retell the story, following a well-defined protocol (the so-called PEER rule). However, children from high-educated families display higher language gains (Mol et al. 2008; Barone et al. 2019), possibly because their parents are more familiar with interactive communication styles (*ibidem*). Hence, dialogic reading may foster social inequalities in skill development when it is not targeted to disadvantaged populations.

This recent experimental evidence is a matter of concern, considering the large amounts of human and financial resources invested in SBR interventions. Understanding what can go wrong and what can be done to enhance the efficacy of SBR interventions is thus important. However, while experimental studies on SBR programs mark a significant improvement in terms of causal inference, their conclusions should be taken with caution, since they most often rely on small, *ad hoc* samples of highly selected populations (Barone et al. 2019). Hence, their external validity is limited. Moreover, these limitations may affect their conclusions: for instance, a study may report null effects because of a lack of statistical power. Furthermore, most of these studies were carried out in the US or in other Anglo-Saxon countries and their degree of generalizability remains unclear.

This article presents the results of a randomized controlled trial assessing the impact of a SBR intervention that targeted children aged 4 living in socially mixed neighborhoods of the city of Paris. We selected a

large, random sample of families and provided parents with free books, information on the benefits of SBR and tips for effective reading practices. We measured SBR frequency and children's vocabulary before and after this intervention, among treated and control children. In the next section, we present the rationale and the main features of the intervention, stressing the specific adjustments that we adopted to promote the involvement of low-educated and immigrant parents. Section 3 illustrates the sampling, randomization and data collection design. In section 4, we present the modeling strategy and in section 5 we report the results of the statistical analyses. Section 6 concludes with a discussion of the policy implications of this study.

2. Intervention design

SBR interventions are based on the theoretical premise that parents are often unaware of the benefits of this activity for their children (Auger et al. 2014). These information gaps are particularly strong for low-educated and immigrant parents, who enjoy limited access to newspaper articles, books or web materials reporting expert recommendations on effective parenting practices, such as SBR (Baker et al. 2007; Radey, Randolph 2012). The socio-economic segregation of neighborhoods and of friendship networks reinforces these information inequalities among social groups (Minh et al. 2017). In France, pre-primary schools sometimes organize book loan initiatives for the families, but they seldom provide information and guidance on SBR, thus tacitly assuming that parents are aware of the benefits of this activity and practice it effectively. If this assumption is misplaced for many disadvantaged families, a SBR intervention may foster language development and reduce the related social inequalities.

Given that the participation in pre-primary schools is compulsory for children aged 3 to 5, we opted for a school-based intervention, which reduces the selectivity issues affecting studies that target families visiting libraries or pediatric clinics. However, effectively reaching parents to deliver information on SBR is a challenging task, particularly in low-income schools with limited parental involvement or even conflictual relations between families and the teaching staffs (Gorard, See 2013). We carried a preliminary qualitative study to design the information treatment, using semi-structured interviews with parents, teachers and school principals. We could thus confirm that very few schools developed book loan initiatives and that teachers in these schools did not inform parents of the benefits of SBR. Moreover, it soon became clear that a major hurdle to communicate with parents was their low (and socially biased) participation at collective school meetings. An intervention delivering information on SBR in the context of a school meeting with parents would result in low attendance and a large underrepresentation of disadvantaged families. We thus decided to deliver the main information contents with a weekly flyer that children would bring home during the first two months of the intervention. These flyers contained several images and short texts that could be read in a couple of minutes. However, assuming that some parents

would not read them, we hired a team of four interviewers to reach each family with a short phone call that would summarize the main messages of the flyers and encourage parents to read them.

Language barriers for immigrant parents constitute another important hurdle. Several studies screen out allophone parents, since delivering books in different languages can be practically difficult and costly. This option is unfeasible in the context of a school-based intervention since it would be perceived as discriminatory. In France, immigrants most often come from former French colonies. Hence, parents who do not speak any French a tiny minority: 4.5% according to a recent study (Ined 2016). However, bilingual parents may not be very fluent in French. Hence, we adopted four expedients. First, the phone calls could be delivered in four languages (French, Arabic, English, Spanish). Second, we used a simple language in the flyers. Third, we selected books in French but with short texts and with several images that parents could use as a support to tell the story. Fourth, parents were encouraged to read in French if possible, but they were also informed of the benefits of reading books in their native language and they received detailed information on public libraries with books for children in foreign languages located in the neighborhoods surrounding the selected schools. Overall, a focus on *accessibility* for disadvantaged families was a key feature of the treatment design, in line with the recent literature suggesting that a failure to effectively reach parents, particularly those who are less familiar with SBR and thus more in need for this type of intervention, is a major hurdle hindering the efficacy of SBR initiatives and, more generally, of parenting interventions (Gorard, See 2013).

A second type of barrier, at least for some well-known SBR programs like ‘Bookstart’ and ‘Reach Out and Read’, is that they involve one-shot interventions that may fail to change parenting practices. Even if parents access transparent information on the benefits of SBR, they may not adjust their parenting routines, as documented by an extensive literature on inertial biases (Thaler, Sunstein 2008; York, Loeb 2018). Parenting for school success is a typical example of time-consuming investment in a distant future that is subject to present biases. Hence, even if parents learn that SBR is beneficial to their children’s development and school success, books for children may not be available at home, and parents may not take the time to borrow them in public libraries, even though this demands a limited time investment, at least in Paris where a widespread network of libraries operates also in disadvantaged neighborhoods. We adjusted the intervention design accordingly, in three ways. First, we asked teachers to organize a school-based book loan: they received a selection of 18 book titles and each week children brought home one of them together with the information flyers. Second, the qualitative study had indicated that letting children choose the books was important because if the child is interested in the book, he or she will ask the parents to read it, which is possibly the best layer to persuade parents to take the time to read the story. Hence, teachers let the children choose the books, monitoring that they chose a variety of titles. Every week the teacher put the books on a table and invited the toddlers to choose a book, to pick up the weekly flyer and to put them in a coloured project bag that they would bring home. Finally, during the last two months of

the intervention, parents received a weekly text message that succinctly reiterated the contents of the flyers and stressed the importance of their involvement in the project. Hence, during these four months, families received one book per week together with regular information materials via flyers, phone calls and text messages.

The contents of these messages involved three main clusters. A first set of messages focused on the importance of cognitive and language development in the preschool years for school success. The information materials explained to the parents how reading a storybook can enrich the vocabulary of their children, which is in turn essential to learn reading and writing in primary school. Parents learn that even only few minutes before bedtime can be beneficial, if done on a regular basis. The messages to the parents stressed also the emotional value of this activity for parent-child relations and children's attachment.

The efficacy of dialogic reading interventions, as well as the deceiving results for other SBR programs, suggest that the *quality* of SBR experiences is as important as their frequency. A more interactive reading style, where parents communicate with their children around the story, is more beneficial to emergent literacy: children are thus induced to actively use the words of the books (Sénéchal 2006; Partridge 2004). Parents received suggestions on how to propose (and not to impose) this activity and how to manage it effectively, including tips to encourage children to talk about the story. Moreover, if parents take the time to explain unknown words and use images to facilitate the comprehension and retention of new words, children will follow the story more easily and they will learn more words. The information materials explained also how to effectively 'play the story' using voice and gesture to mimic the behaviour of the characters and to express their emotions. Hence, a second cluster of messages revolved around effective practices to foster parent-child interactions around books. We suspect that the failure to incorporate this qualitative dimension of SBR is a major limitation of some existing programs explaining why an increased SBR frequency may result in negligible language gains (Avvisati et al. 2010, Oecd 2012).

Finally, a third set of messages promoted an understanding of SBR as a 'family affair'. SBR is a highly gendered activity that is predominantly practiced by mothers (Chacko et al. 2017; Oecd 2012). The flyers stressed the importance of fathers as role models, as well as the potential role of elder siblings and grandparents; the selection of pictures of SBR activities in the flyers visually translated these messages. Parents were encouraged to organize a 'family reading time' in the weekends and to propose some playful activities around book contents. The intervention thus aimed at reducing the gender-stereotypical character of this activity, which can be particularly detrimental to boys, while at the same time fostering the involvement of the broader family network.

The contents of this information intervention were thus articulated following a sequential logic: the initial focus was on motivating parents to establish a regular SBR routine, then we introduced suggestions to foster interactions around books and finally the messages aimed at broadening the involvement of the

family network. For the selection of recommendations and tips for the parents, we relied on the expert literature on effective book reading (Partridge 2004) and on the preliminary qualitative study.

Overall, this discussion has identified three factors of pivotal importance for the success of SBR interventions: fostering real accessibility to the information contents, particularly for disadvantaged parents; breaking the inertial routines that can hinder SBR even when parents access this information; fostering the involvement of children and of their families in this activity, bringing them to interact around book contents.

Finally, we should note that previous studies on SBR initiatives seldom discussed the criteria used to select the books provided to the parents. We believe that this is a relevant component of the intervention design. In particular, the appropriate balance between the accessibility of book language for culturally disadvantaged families and vocabulary enrichment is a delicate yet essential factor. If a book contains several unknown words, children may have a hard time following the story, but if the language is too basic, they will not learn new words; it is also important that at least some words are repeated across different sentences. Moreover, research using video recordings of SBR activities reveals that parents tend to exclusively focus on reading the text, while children are more interested in the book images and may stay quite disconnected from verbal contents (Evans and Saint-Aubin, 2005; Vandermaas-Peller et al. 2009). Books with relatively short texts, rich in images and displaying straightforward connections between the text and the images that illustrate it are thus more likely to foster interactions around books. These criteria guided the selection of book titles, which covered a variety of topics and of language domains, prioritising subjects that are gender-neutral and appealing to children.

3. Evaluation design

3.1 Targeting, sampling, and randomisation

In France, children attend pre-primary schools from age 3 to 6. Participation is compulsory since the school year 2019-2020; when this study started in 2016, the attendance rate was 98% by the age of 3 (Oecd 2015). The experiment targeted the less affluent districts of the city of Paris (12th, 18th, 19th and 20th *arrondissements*)ⁱ. Their median income is between 45% and 55% of the corresponding values for the rich districts of the city center (Apur 2019). However, owing to the rapid gentrification process, some neighbourhoods in these districts display a large presence of high-educated, middle class families (e.g., Montmartre is in the 18th district). Hence, within these city districts, we targeted the so-called priority education schools (*REP* and *REP+*), located in the socially mixed neighbourhoods of these districts. In order to avoid treatment replacement bias, we targeted schools not implementing any book loan initiative.

Finally, within each school, we targeted children aged 4, who could be expected to attend the same school in the following year and could thus receive the delayed treatmentⁱⁱ (*see* below).

We carried out a first wave of data collection in the school year 2016-2017, but we then obtained funding for a second experiment in 2017-2018, and we opted for a strict replication of the first year in terms of population of reference (i.e., targeting the same city districts and only children aged 4 attending educational priority schools), sampling and randomisation design, as well as intervention design, in order to enhance sample size and statistical powerⁱⁱⁱ. We drew a first sample of 22 schools in the first year and then a second sample of 25 additional schools in 2017-2018.

In order to select schools in the target population, we used random sampling with probability of selection proportional to the student size of the school. Overall, 11 schools out of 47 refused to participate in the study and were replaced via random draws of additional schools in the same districts. Moreover, 96% of the parents signed the parental consent form (this value is identical across treated and control families), resulting in an initial sample of 1985 children. We did not screen out families where parents could not speak French (2.7% of the sample), nor children with learning disability (2%): in the context of a school-based study, such screening would be perceived as discriminatory. However, children with learning disability were screened out *de facto* from the analyses, either because their parents did not sign the consent form or because we could not administer the vocabulary tests presented below.

Within each school, half of the second-year classes (*classes de moyenne section*) were randomly assigned to the treatment and half to the control status (cluster randomisation with blocking across schools). We carried out the randomisation after school principals and parents had decided to join in the study. However, we agreed with the schools that control classes would be assigned to a waiting list to receive a delayed treatment at the end of the study. While this agreement was necessary to conduct the experiment in the schools, it restricted the observation window of treatment impacts. Thanks to the delayed treatment, no school or class left the project when we communicated the results of the randomisation.

A class-level randomisation entails higher risks of contamination between treated and control groups than a school-level cluster randomisation. We carried out a statistical power analysis to consider the feasibility of this second option, but the results indicated that the minimum detectable effect size would be too high with this alternative randomisation design. Because of the delayed treatment, teachers had no incentive to contaminate the treatment. However, treated and control parents of different classes could communicate about the intervention. Our anecdotal observations outside the schools during the implementation of the intervention suggest that these instances were too occasional and superficial to produce any significant bias. At any rate, since we cannot entirely discard these spillover effects, our results may be regarded as conservative estimates of treatment impacts.

3.2. Data collection

The primary outcome of the experiment is children's receptive vocabulary. This is the most common outcome in SBR interventions, and it is a strong predictor of reading comprehension, writing and academic achievement at school (NELP 2008). We administered to treated and control children two standardised tests of receptive vocabulary. The first one is the French translation of the PPVT (Peabody Picture Vocabulary Test, Dunn & Dunn 2007). For its administration, the examiner speaks a word, presents a series of four pictures, and asks the respondent to point to the picture corresponding to the named word. The test consists of 175 items of increasing difficulty, but testing stops when the respondent makes six errors out of eight consecutive items. We selected this test because it is the standard measure of receptive vocabulary in field experiments assessing SBR programs. Moreover, its construct validity and reliability of this test have been extensively documented (*ibidem*). Furthermore, PPVT is available in two parallel forms (PPVT-A and B) which can be used in experimental studies like ours based on test-retest longitudinal designs.

However, a major limitation of PPVT is its limited sensitivity to *changes* in children's vocabulary driven by educational interventions (Hofman et al. 2014). This is because, given the above-described stopping rule, for children aged 4 the final score depends on their mastery of the first 40-50 words tested in PPVT. If the books used for SBR interventions do not contain these words, PPVT cannot detect any treatment impact (unless the books for the SBR intervention are chosen *ad hoc*). Hence, following common practice (*ibidem*), we built a second test ('PPVT-C'), which relies on the same methodology as the PPVT, but tests 16 words used in the books. The Cronbach's alpha for the two canonical forms and PPVT-C is 0.72. We ran also a factor analysis for these three vocabulary measures which yielded strong evidence that they tap into the same latent construct (the three factor loadings range between 0.90 and 0.92). However, the more context-sensitive measure (PPVT-C) cannot be regarded as a measure of general vocabulary (*ibidem*). For this reason, we followed the good practice of employing both types of measures. Interviewers were blind to the experimental status of children.

Unfortunately, we could not assess the impact of the treatment on other language skills which are relevant predictors of school achievement, such as knowledge of print and phonemic awareness (NELP 2008). However, the parental consent form contained a question on the frequency of SBR at home that was administered also at the end of the SBR intervention. However, this measure is based on parental self-reports, and may therefore be flawed by social desirability bias.

Moreover, in the consent form parents were surveyed on the highest level of education in the household, the language spoken with their child and the gender of the child. These three variables will be used for the analyses of the heterogeneity of treatment impacts. The consent form had to be filled up when parents

dropped children at school. Therefore, a longer questionnaire (e.g., with information on household income, migration background, etc.) was unfeasible.

Furthermore, before delivering the intervention, we administered a questionnaire to the school principals in order to measure two contextual characteristics that could moderate treatment impacts. First, we collected information on the degree of school involvement in reading-related activities. Hence, school principals were asked to report on the presence of a school library, the frequency of book reading activities with children during school time, the frequency of these activities during the extra-curricular activities in the afternoon (*temps periscolaire*), the frequency of visits to local public libraries organised by teachers, the presence of school initiatives to foster access to cheap storybooks for children (e.g., via second-hand books) and the development of projects related to book reading in collaboration with local associations (e.g., volunteers reading books to the children). Secondly, we collected information on four indicators of educational resources: principals rated to what extent they had problems with recruiting motivated teachers, developing effective teamwork with them, communicating with families, dealing with children's discipline. For both dimensions, we used Lickert scales with four response categories for each item and we generated additive indexes to summarise this information.

We administered the PPVT tests and the parental questionnaires one month before the start of the intervention (pre-test) and one month after its end (post-test). Only 3% of the toddlers attending the selected schools could not be assessed at the pre-test because they were absent or because they could not understand the test rules. Moreover, 10% of the children with pre-test data were either absent at the post-test or, more often, mobile across schools (these values are identical across treated and control classes). The analytical sample thus consists of 1725 cases.

Moreover, in the second year we managed to negotiate with the schools a follow-up assessment, which was carried out six months after the end of the intervention, right before delivering the delayed treatment. We will present also the results for this follow-up. However, it is important to recognise that our study shares with previous research on SBR interventions the important limitation of not assessing long-term impacts, as a consequence of the agreement to deliver a delayed treatment to the children of the control group.

3.4. Modeling

We merge data for the two years after having carried out separate analyses showing that their estimates overlap systematically (AUTHOR 2019). The vocabulary score at the post-test is regressed on a dummy indicating assignment to treated or control classes (intention-to-treat estimators), on the vocabulary score at the pre-test and on a dummy for school year. The estimation equation is:

$$VOC_{t1i} = T_d + VOC_{t0i} + YEAR_c + \epsilon_i$$

We specify OLS regression models with robust standard errors clustered at the school level, and we report standardized coefficients. For estimates of the treatment impact on SBR frequency at the post-test, in the estimation equation we replace vocabulary score at the pre-test with SBR frequency at the pre-test. Having dichotomized this variable (SBR on a daily basis vs. lower frequency), we use linear probability models and report probability differences. We have checked that alternative modelling specifications (omitting pre-test variables from the estimation equation, or adding gender, parental education and language spoken at home as additional predictors) lead to the same substantive conclusions (results available upon request).

4. Results

4.1 Descriptive statistics

Table 1 reports some descriptive statistics by experimental status at the pre-test to assess the initial equivalence of treated and control children. Pointwise estimates for all variables are systematically close for the two groups. Importantly, the average vocabulary scores of treated and control children are virtually identical. We tested the statistical significance of differences between the two groups using regression models where the variables displayed in table 1 were regressed on a dummy variable for experimental status, and we did not detect any significant difference. Hence, we can be confident that any difference between the two groups observed at the post-test reflects treatment impacts.

TAB. 1 HERE

As can be seen on table 1, one parent out of three reports that French is the only language spoken with their children, an indication of the high share of immigrant families in Paris and, more specifically, in the targeted districts. However, parents speaking only a language other than French with their children are a tiny minority (2.3% to 3.3%). This reflects the large share of second-generation immigrants and of immigrants from former French colonies (Ined 2016). Hence, bilingualism is the modal language practice in the targeted population.

In one family out of two (49.5%) of the sample, at least one parent has a tertiary degree. This value is in line with population estimates indicating that the share of the tertiary-educated varied between 45% and 52% across the selected districts in 2017 (Apur 2019); these values ranged between 31% and 42% only five years earlier, testifying to the rapid gentrification of these districts. For comparison, the corresponding values for the affluent districts of the city center were around 70% in 2017, and in France the share of the tertiary-educated among adults aged 25-34 years old was 44.7%.

According to the parental reports, SBR was a common practice before the intervention: in four households out of ten, SBR was practiced on a daily basis and in two out of ten on a weekly basis.

TAB. 2 HERE

In table 2 we present the distributions of the pre-intervention outcomes by gender of the child, language spoken at home and parental education. Gender differences are negligible. The language spoken at home displays strong associations with the vocabulary score and the frequency of SBR: children who speak only in French with their parents are in a better position than bilingual children, who are less disadvantaged than children speaking only in another language with their parents. Parental education has a marked effect on children's vocabulary score at the pre-test, as well as on the frequency of SBR. For instance, two thirds (65.3%) of tertiary-educated parents report reading to their children daily, but only 17.5% of the parents with lower secondary education. This confirms the existence of the strong social gradients in SBR practices documented in previous research. In a separate paper (Barone, Fougère & Pin, 2019), we show that SBR frequency mediates 42% of the association between parental education and vocabulary score at the pre-test and 26% of the association between language spoken at home and vocabulary score. This correlational evidence suggests that socio-economic gaps in SBR may significantly contribute to social inequalities in language development in early childhood.

4.2 Treatment impacts on shared book reading frequency

Table 2 reports the estimated treatment effects on the probability of SBR on a daily basis by gender of the child, language spoken at home, parental education and vocabulary score at the pre-test. Overall, the treatment significantly enhanced SBR frequency by 8.1 percentage points at the post-test^{iv}. However, this positive main effect conceals significant variations between categories. Importantly, the treatment impact is five times larger for low-educated families (+16.2%) than for tertiary-educated families (+2.9%). Indeed, the small effect for the latter is not statistically significant. As reported above, SBR frequency was high already before the intervention among tertiary-educated families, but one third of them had reported not reading on a daily basis. The confidence intervals around the point estimates for treatment impacts on high- and low-educated families do not overlap, indicating that the intervention significantly reduced socio-economic inequalities in access to SBR^v.

TABLE 3 HERE

Table 3 indicates that the treatment had stronger effects (+12.8%) on children with intermediate levels of vocabulary at the pre-test (second tertile), followed by children with low vocabulary scores (+7.1%, first tertile) and by high-performing children (+4.5%). The confidence intervals of treatment impacts for the

three tertiles overlap, but there is evidence that the treatment was more beneficial for children who needed it more^{vi}, in line with the patterns for parental education.

Moreover, the positive treatment effects on SBR frequency are large and statistically significant in households where French is the only language spoken between parents and children (+6.9%), as well as in households where another language is present or exclusively spoken (+9.8%). The confidence intervals for these two groups overlap. This pattern is unchanged if we contrast instead families where parents and children speak only or mainly in French with families where another language is prevalent^{vii}, or if we contrast bilingual and monolingual families (results available upon request). Due to sample size constraints, we cannot analyse treatment impacts separately for each distinct category of language spoken at home. Overall, we conclude that the positive effects on SBR frequency involve families with immigrant origins as much as native families.

Finally, the positive treatment effects on SBR frequency are stronger for boys (+12.3%) than for girls (+4.3%); for the latter, the null hypothesis of no treatment effect cannot be rejected. The intervention stressed the importance of also involving the fathers in this activity, and they may be particularly relevant role models for boys but, unfortunately, we have no information on who reads to the children. We have noted above that, before the intervention, girls and boys displayed similar vocabulary scores and similar exposure to SBR. However, it is well known that, since the first years of primary education, girls develop higher language skills as well as a stronger preference for reading activities (Oecd 2012).

4.3 Treatment impacts on receptive vocabulary

We now examine treatment impacts on children's receptive vocabulary scores. The effects on the canonical PPVT test (form B) are small and not statistically significant. However, the impact of the treatment on the second, context-specific measure of receptive vocabulary (PPVT-C) is positive (0.12) and statistically significant. This confirms that, as discussed above, the standard measure of general vocabulary (PPVT-B) is weakly sensitive to treatment impacts, at least in the short-run. In the next columns of table 4, we examine the heterogeneity of treatment impacts for PPVT-C.

TABLE 4 HERE

Children from low- and high-educated families display similar vocabulary gains, with effect sizes of 0.13 and 0.11, respectively. For the latter, treatment impacts are not statistically different from zero, but of course, the confidence intervals for the two groups overlap. Hence, although low-educated parents increased SBR frequency more than high-educated parents, their children display similar vocabulary gains. Similarly, treatment impacts do not differ by children's initial vocabulary scores, even though children with lower vocabulary skills were more exposed to SBR as a result of the intervention.

Children speaking only French with their parents display similar vocabulary gains (0.11) as those speaking (also) another language (0.13). This indicates that overall children with immigrant origins benefited from the intervention as much as native children. However, if we contrast instead children speaking only or mainly French with their parents with those speaking only or mainly another language, we find that only the former display positive and significant gains (0.14), while we detect a null effect (-0.02) for the latter. This suggests that, while bilingual families can benefit from the intervention, a low familiarity with French inhibits its efficacy.

Finally, in line with the results for SBR frequency, treatment impacts are positive and significant for boys (0.19), but small and non-significant for girls (0.03).

4.4 Additional results

In table 5 we report the treatment effects on SBR frequency and vocabulary scores by the two school-level indexes based on the reports of the school principals. The first one refers to the school engagement in reading-related activities (e.g., using the school library during school hours, organizing visits to the local libraries), while the second index measures school educational resources (e.g., lack of learning materials). Treatment effects are separately estimated for tertiles of these indexes. The treatment has large, positive and statistically significant impacts in schools where previous involvement in reading-related activities was low (+10.7%) or medium (+8.8%) before the intervention, while in schools where it was high the effects are smaller (+4.1%), and they are not statistically significant. Similarly, the intervention has large, positive effects in schools displaying low (+9.3%) or intermediate (+8.4%) educational resources, while its impact is smaller and not statistically different from zero in more favourable school contexts. The patterns for treatment impacts on vocabulary scores closely replicate those for SBR frequency: the intervention displays the largest effects in schools with low involvement in reading-related activities (0.28) and with low educational resources (0.195). The confidence intervals for tertiles of the two indexes overlap, but the pattern of point estimates is systematic and, crucially, there is unequivocal evidence that the intervention is effective in the most disadvantaged schools.

Finally, we have commented so far on treatment impacts on children's vocabulary at the post-test assessment, carried out in the month following the end of the intervention. However, for the sub-sample of students of the second school year, we could carry out a follow-up six months afterwards. We detect a statistically significant, positive effect size (0.16), with the same patterns of treatment heterogeneity by parental education (0.23 and 0.05, respectively, for high- and low-educated families), gender (0.25 for boys and 0.07 for girls) and language spoken at home (0.17 if parents and children communicate only or mainly in French, and 0.16 if they use mainly or only another language)^{viii}. Hence, there is evidence that

treatment impacts persist beyond the end of the intervention, and that disadvantaged groups benefit as much as more advantaged groups.

5. Concluding remarks

This work has presented the results of an information experiment designed to foster children's language skills by enhancing the frequency and the quality of parent-child interactions around books. This randomized experiment involved a large, random sample of children aged 4 attending 47 kindergarten located in the city of Paris. Hence, the results of this study are not based on a nationally representative sample, but its evaluation design marks a significant improvement over previous SBR experiments in terms of external validity, owing to its sampling method and sample size, matched by high participation rates of schools and families, and low longitudinal attrition.

Within every school, half of the classes were assigned to the treatment and half to the control status. We employed this clustered, classroom-level randomization to enhance statistical power, arguing that the risks of treatment contamination are limited. Moreover, the blocking at the school level reduces the risks of random imbalances between the two groups, and indeed treated and control children display high *ex ante* equivalence, as well as similar attrition rates, thus adding to the internal validity of the study.

We designed a four-month intervention that integrated a school-based book loan with the provision of detailed information on the benefits of SBR for children as well as tips for effective SBR, using weekly flyers, a phone call and six text messages. Three features of the intervention design are particularly relevant in our view. First, its focus on the accessibility of information messages for low-educated and immigrant families. Second, its intensive and continued format, aimed at fostering a persistent change in parenting routines. Third, its focus on interactions around books and the quality of SBR experiences.

The intervention has a large effect on SBR frequency. At the pre-test, SBR on a daily basis involved 41.2% of the families, and the treatment fostered this practice by 8 percentage points. SBR on a weekly basis was fostered by 14 percentage points. We hypothesised that parents have unequal access to information about the potential of SBR for educational success. High-educated parents access this information more easily through privileged access to expert sources on parenting as well as the circulation of this information in their social networks. We found that indeed this intervention fosters SBR frequency only in low-educated households. This equalising impact is an important finding against the background of previous research reporting that disadvantaged families tend to benefit less from SBR programs.

Moreover, the intervention impacts SBR frequency to the same extent for native and immigrant families, despite the language barriers faced by the latter. Given the large presence of families with an immigrant background in the low-income districts of Paris, we decided not to screen out parents with low fluency in

French, as is often done in this kind of studies. We found that also these families can positively respond to SBR interventions, at least if they speak some French and the intervention is designed to foster accessibility of the information materials and of the books.

SBR frequency is a self-reported outcome, and parental reports may be affected by social desirability bias. It is therefore reassuring that the intervention also significantly enhanced children's language skills, measured with standardized tests of receptive vocabulary. The effect size for the main treatment effect ranges from 0.12 at the post-test to 0.16 at the follow-up.

These positive impacts are substantively important for three reasons. First, treatment effects are persistent six months after the end of the intervention. A limitation of this study is that, due to the obligation to deliver the delayed treatment to the children of the control group, we could not observe long-term impacts. A recent meta-analysis of 30 experiments on SBR indicates that in 29 of them the latest assessment was carried out within six months after the intervention, and that, even within this limited observation window, there is evidence of fade-out effects (Barone et al. 2019). The persistence of treatment impacts in our study thus holds particular significance against this background.

Second, the magnitude of treatment effects is far from negligible, if we consider the short duration of the treatment, as well as its low marginal cost: if this intervention was scaled up, it would approximately cost 3.50 euros per child. Moreover, once the information has been delivered, and parents have incorporated it in their SBR practices, the book loan can continue during preschool years at virtually no additional cost, thus further enhancing vocabulary growth. Furthermore, we have carried qualitative interviews with the school principals and the teachers of treated classes after the implementation of the SBR programme, and they consistently reported a positive reception of the intervention by children, parents and teachers. The workload for teachers is limited, which further enhances the scalability of this programme.

Third, the intervention was carried out in low-income districts with a strong presence of immigrant families. The literature stresses that several barriers can hinder parental receptiveness to SBR interventions among disadvantaged families, such as parental distress resulting from economic insecurity or family instability, a lack of familiarity with book reading activities, as well as language barriers (Notten and Kraaykamp, 2013; Klosterman et al., 2011; Lareau 2006; Karrass et al., 2003). However, we found that children from low-educated and immigrant families improved their vocabulary as much as those from high-educated, native families. Moreover, the persisting positive impacts on vocabulary growth detected at the follow-up also involve children from disadvantaged families. Furthermore, these children more often attend schools with lower educational resources. It is therefore encouraging that the intervention has strong impacts in schools with initially low involvement in reading-related activities and with low educational resources.

Low-educated families increased SBR frequency more than their high-educated counterparts did, but their children reaped similar vocabulary benefits. We speculate that the intervention focus on accessibility was more beneficial to the former, while the latter benefited more from the messages emphasizing the quality of interactions around books and tips for effective reading practices. Indeed, SBR frequency did not increase in high-educated households, yet their children displayed significant vocabulary gains. In line with this interpretation, we know that dialogic reading, which focuses on interactive reading styles, is more beneficial to upper class children. At the same time, randomized controlled trials often report null effects for non-dialogic interventions, as discussed above. The contribution of this study is to show that a balanced focus on accessibility and interactivity can result in socially unbiased vocabulary gains, thus avoiding any trade-off between equity and effectiveness.

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Tab. 1: Descriptive statistics on the equivalence between treated and control children before the intervention (%; N=1,725)

		% control	% treated	p-value diff.
Socio-demographic variables				
Gender	Male	52.2	49.7	0.278
	Female	47.8	50.3	0.278
Age in months (mean)		54.1	54.2	0.777
Language spoken at home	Only French	36.1	35.8	0.907
	French + other language	36.7	39.4	0.312
	Only other language	3.3	2.3	0.256
	Other language + French	13.8	12.9	0.636
	NR	10.1	9.6	0.855
Parental education	Primary	5.2	4.4	0.516
	Lower secondary	13.6	13.3	0.849
	Upper secondary	22.3	23.8	0.503
	Tertiary	49.7	49.4	0.909
	NR	9.2	9.1	0.962
Pre-intervention measures				
Shared book reading frequency	Rarely or never	7.7	7.9	0.917
	Sometimes per month	24.8	21.6	0.142
	On a weekly basis	20.8	20.3	0.814
	On a daily basis	39.8	43.8	0.190
	NR	7.0	6.5	0.719
PPVT-A score	mean	-0.006	0.006	0.829

Tab. 2 Children’s vocabulary scores and shared book reading frequency by gender, language spoken at home and parental education before the intervention (%; N=1,725; treated and control children pooled together)

	Gender		Language spoken at home				Parental education			
	Male	Female	French only	French+ other language	Other language + French	Other language only	Primary	Lower sec.	Upper sec.	Tertiary
Standardized vocabulary score										
Mean value	-0.017	0.018	0.459	-0.146	-0.591	-0.842	-0.672	-0.464	-0.241	0.347
Shared book reading frequency										
Rarely or never	7.1	8.4	3.3	7.3	20.1	32.7	32.6	15.4	8.5	2.9
Sometimes per month	22.9	23.4	12.8	32.0	35.6	22.4	29.1	42.5	36.3	13.3
On a weekly basis	20.1	21.0	17.4	24.5	24.7	6.1	24.4	22.5	27.6	18.1
On a daily basis	42.4	41.3	65.6	34.7	17.1	36.7	11.6	17.5	26.9	65.3

Tab. 3: Treatment effects on shared book reading daily at the post-test (linear probability models; N=1,374)

Categories	Main effect	Gender		Language spoken at home		Parental education		Vocabulary score (pre-test)		
		Male	Female	Only French	Also, other	Less than tertiary	Tertiary	1st tertile	2nd tertile	3rd tertile
Treatment	0.081*** (0.022)	0.123*** (0.028)	0.043 (0.029)	0.069** (0.032)	0.098*** (0.030)	0.162*** (0.030)	0.029 (0.03)	0.071* (0.041)	0.128*** (0.030)	0.045 (0.036)
R-squared	0.39	0.418	0.384	0.444	0.316	0.357	0.420	0.195	0.446	0.340

Probability differences with robust standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Tab. 4: Treatment effects on children’s vocabulary scores at the post-test (OLS regression models; N=1,725)

Categories	Main effect EVIP-B	Main effect C	EVIP-	Gender		Language spoken at home (1)		Language spoken at home (2)		Parental education		Vocabulary score (pre-test)		
				Male	Female	Only French	Also, other	Mainly French	Mainly other	Less than tertiary	Tertiary	1st tertile	2nd tertile	3rd tertile
Treatment	-0.05 (0.049)	0.122** (0.053)		0.188*** (0.063)	0.033 (0.069)	0.111 (0.075)	0.127** (0.058)	0.141** (0.060)	-0.022 (0.106)	0.128* (0.069)	0.107 (0.066)	0.108 (0.076)	0.126 (0.084)	0.105 (0.068)
R-squared	0.355	0.376		0.394	0.362	0.297	0.336	0.331	0.388	0.293	0.337	0.092	0.052	0.109

Standardized coefficients with robust standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Tab. 5: Heterogeneity of treatment effects on shared book reading daily and vocabulary scores at the post-test by school-level variables (linear probability and OLS regression models; N=1,374/1725)

Outcome		Involvement in reading-related activities			Educational resources		
		Low	Medium	High	High	Medium	Low
Shared book reading	Treatment	0.107***	0.088***	0.041	0.057	0.084***	0.093**
		(0.029)	(0.026)	(0.049)	(0.051)	(0.024)	(0.036)
	R-squared	0.422	0.396	0.392	0.451	0.372	0.448
Vocabulary score	Treatment	0.288***	0.056	0.071	0.018	0.103	0.195*
		(0.094)	(0.072)	(0.150)	(0.140)	(0.065)	(0.100)
	R-squared	0.390	0.378	0.370	0.478	0.347	0.394

Probability differences and standardized coefficients with robust standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

ⁱ Before running the experiment, we registered the experimental protocol of the study in the Social Science Registry.

ⁱⁱ Some schools have mixed-age classes: children aged 3 or 5 in these classes were not involved in the study.

ⁱⁱⁱ However, access to the field took longer in the first year, so the intervention could last for only four months, while it lasted six months in the second year. At the same time, in the first year we distributed two books per week to the families, rather than one, as we did in the second year. These are the only differences between the protocols of the two years.

^{iv} Because 80% of the parents who had signed the consent form filled up both questionnaires, the analytical sample for reading practices comprises 1374 cases.

^v If we model SBR frequency on a weekly basis, rather than daily, the main effect is 14%, the values for the two groups are, respectively, 25.7% and 7.7%, and the patterns of statistical significance are unchanged. The same conclusion holds for the heterogeneity analyses for gender and language spoken at home that we report below.

^{vi} If we contrast the first and second tertiles altogether with the third tertile, we detect a difference of 5.4% that is marginally significant ($p=0.09$).

^{vii} We cannot estimate models contrasting families where parents speak only another language with all other families because there are only 35 cases in the first category.

^{viii} Due to longitudinal attrition, at the mid-term assessment we lost 21% of the children participating in the short-term assessment. However, attrition is unrelated to socio-demographic and outcome variables. Moreover, *ex ante* equivalence holds also for the subsample of 'survivors', and that there is no statistically significant difference between short- and mid-term impacts for this subsample.