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Early schooling and later outcomes :
Evidence from pre-school extension in France

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Abstract

Over the 1960s and 1970s, France undertook a large-scale expansion of preschool enrollment. As a result, during this period, the enrollment rate of 3 years old children rose from 35% to 90% and that of 4 years old rose from 60% to virtually 100%. This paper evaluates the effect of such an expansion on subsequent schooling outcomes (repetitions, test scores, high school graduation) and wages. We find some sizeable and persistent effect of preschool and this points to the fact that preschool can be a tool for reducing inequalities. Indeed, the analysis shows that children from worse-off or intermediate social groups benefit more from preschool than children from better-off socioeconomic backgrounds.

1 Introduction

Educational policy is usually seen as the means *par excellence* to foster equality of opportunity and reduce the intergenerational transmission of inequality. Among the various policy instruments, pre-primary schooling programs have recently received considerable attention, notably among economists (Cunha, Heckman and Lochner, 2006). The main argument in favor of such programs lies in the likely existence of dynamic complementarities in the process of human capital accumulation, which strongly enhances the efficiency of early interventions that occur very early in the process of skill acquisition. Indeed, preschool programs are often thought to be able to compensate the detrimental influence of a disadvantaged family background, as has been argued in the educational policy debate since at least Plato's *Republic*.

Evidence on the effect of early education programs for schooling and labor market outcomes is much more recent and indeed rather limited. Much has been learned recently on the effect of intensive and comprehensive intervention programs targeted at groups facing obvious learning impediments. But despite renewed political interest in these programs worldwide, much less is known about the impact of large scale universal pre-schooling programs. The objective of this paper is to provide evidence on the impact of these programs on educational and labor market outcomes in the case of France.

France offers an an interesting case for assessing the impact of universal preschool programs. Preschool education programs in France take the form of a universal, public, free, full-fledged schooling program, with warranted access from the age of three and possible access from age two. Nowadays, virtually all children are enrolled in preschool at the age of three and a significant share are already enrolled at the age of two. Given the current situation of full participation at the age of three, it is only possible to evaluate, from

contemporary data, the effect of early preschool enrollment at the age of two, as done in Caille (2001) and Goux and Maurin (2008). But the marginal effect of extending access to preschool by one more year, from enrollment at age three to age two, may presumably differ from the effect of extending preschool from age four to age three, which is probably closer to the policy changes that most developed countries may think of introducing.

Despite a very old tradition in the promotion of preschool education, the current situation of universal access mostly results from the take up of enrollment that occurred in the 1960s and 1970s. During this period, the enrollment rate for three years old rose, according to official statistics, from around 35% to more than 90%. In this paper, we explore this rise in enrollment to assess the impact of preschool participation.

Our main analysis amounts to estimate the impact of the time spent in preschool on a variety of short- and long-term educational and labor market outcomes. We rely on individual data covering cohorts born between the 1950s and the 1970s that provide a measure of the duration of preschool participation as well as a wealth of information on individual subsequent outcomes. In this paper, we focus on assessing the impact of the age of preschool enrollment on the educational success measured by three main variables: grade repetition throughout the individual school career, test scores in secondary school, and final educational attainment. We also examine the long-term effect of preschool enrollment by measuring its impact on wages earned when adult. Given our concern for the potential impact of preschool at reducing the intergenerational transmission of socioeconomic inequality, we also estimate heterogenous effects of preschool by family background, in order to test for the potential negative complementarity between preschool enrollment and family socioeconomic resources.

Since preschool participation is voluntary, it may be endogenous with respect to unobserved family characteristics that have an independent influence on individual outcomes.

The direction of the resulting bias will of course depend on the type of selection going on. In the case of France, preschool participation was for a long time concentrated on the urban lower class, which suggests potential underestimation of the effect of preschool. We deal with selection in preschool participation, in two ways. First, we rely on a control strategy that uses information on family socioeconomic status as well as school fixed-effects to capture heterogeneity in individual background. Second, we implement an instrumental variables estimation strategy that exploits regional variation in access to preschool.

The rest of the paper is organized as follows. Section 2 describes preschool programs in France, as well as trends in preschool participation. Section 3 reviews the results of previous research on the effect of preschool. Section 4 describes our data. Sections 5 and 6 discuss our results.

2 Preschool in France : institutional arrangement and history

2.1 Institutional arrangement

Since the 1960's France has developed the provision of preschool education within the context of a universal-access, publicly-organized, free of charge schooling system.

Pre-elementary education in France is offered nationally within *école maternelle* (literally maternal school) to children between two and five years old, before they enter elementary school at the age of six. Contrary to elementary school attendance, which is compulsory[1], participation to pre-elementary school is voluntary. Access to preschool is granted by law to all children who have reached the age of three and is in most cases free of tuition fees. Currently almost all French children attend preschool from the age of three onwards.

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[1]Elementary school attendance is compulsory from the beginning of the academic year that starts in the (calendar) year in which a child turns six years old

Preschool in France is centrally administered by the ministry of Education and is to a very large extent offered within public schools.[2] The stated objective of *école maternelle* is to help children reach autonomy and acquire knowledge and skills in order to promote their readiness for elementary school.[3] To reach these goals, preschool follows a standardized and integrated curriculum, for a duration of three years. According to the official presentation, the curriculum emphasizes language acquisition, socialization to group interactions, psychomotor development, and the promotion of individual creativity and attitude towards learning.

In many ways, instruction in preschools takes place in conditions that are similar to primary education instruction. Preschool teachers are national civil servants and receive the same level of training as primary school teachers, typically a bachelor's degree level. As a consequence, preschool teacher are significantly more skilled than the average early child care personnel. Annual instruction time is also substantial and amounts to 864 hours, i.e 6 hours per day, 4 days a week, 36 weeks per year. Average class size is around 25 children. The annual cost per pupil of pre-elementary education is 4,970 euros, against 5,440 euros for primary education.[4]

Attendance to *école maternelle* is possible from the age of two. Nowadays, the enrollment rate at the age of two is around 25%. Enrollment at the age of two depends on the availability of vacant places and priority is given to three-years old. The development of preschool capacity aimed at enrolling two-years old has been targeted at disadvantaged areas, be it for poor socio-economic environment or geographic secludedness.

Apart from the preschool program, the public provision of early child care is much more limited and rests to a large extent on family care. For instance, 67% of children below the

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[2]Around 20% of children attend private preschools.
[3]*Bulletin officiel de l'éducation nationale*, hors série n° 3, juin 2008
[4]Ministère de l'éducation nationale, *Repères et références statistiques*, 2009.

age of three are primarily taken care of by one of their parents or a relative during the day. Among children attending preschool, 84% are taken care of by one of their parents or a relative on Wednesdays when preschools do not operate.[5] Consequently preschool education appears first as an alternative to family-based child care.

2.2 Participation and historical trends

Enrollment rates in preschools, by age and year, are given in table 1. Current participation to preschool in France is very high by international standards and almost all children aged 3 and older attend preschool. This results from the gradual generalization of preschool enrollment between the 1960s and the 1980s.

There is an old tradition of preschool education in France. *Ecole maternelle* was created in 1882, by the same law that introduced free and compulsory primary education. From the origin, it fell within the scope of intervention of the ministry of Education. Its objective was to offer child care and education to working class children and remedy the negative consequences of a deprived family environment, for intellectual and moral development. During this period, the social recruitment of preschools was selective originally and mostly concentrated among urban lower class children. It stayed so until the 1950s.

The expansion of preschool participation occurred mainly in the 1960s and 1970s. The enrollment rates rise from 35% of the children aged 3 and 65% of children aged 4, in 1960, to respectively 90% and 100 % in 1980. By the beginning of the 1990's virtually all children in their third year attend preschool. Historically, this expansion occurred through a general rise in the demand for preschool enrollment across all social groups and geographical areas (Prost, 1981).

During the same period, the enrollment of two-years old children rises also markedly

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[5]Ananian and Robert-Bobée (2009)

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from 10% to 35%. To some extent, this extension reflects the low provision of public child care services. Of course, two-year old benefit from special programs. In principle, the instruction time is similar for two years old, to what it is for older children but part of it is devoted to rest in afternoon. Sometimes very young children can also be welcomed in specific classes.[6] As already discussed, very early enrollment in preschool is concentrated heavily on disadvantaged group. Recently, the enrollment has fallen to about 25% under the joint influence of the recent demographic boom of the early 2000's and the rise in the supply of daycare facilities.

3 Prior research

An abundant literature, surveyed for instance in Barnett (1992), has documented the largely positive impact of targeted early intervention programs. But whether lessons can be drawn from these targeted experiment regarding possible benefits of universal access preschool programs, such as *école maternelle*, is highly unlikely, for at least two reasons. First, targeted intervention are usually more intensive than universal access programs. Second, model interventions are usually targeted at sub-populations whose responsiveness to the program may be unrepresentative. There are, however, relatively few evaluations of the impact of universal access preschool programs. Existing studies typically face two main challenges. The first one, as in any non-experimental setting, is the possible endogeneity of preschool enrollment *vis-à-vis* other family determinants of child achievement. The second one is the restricted time span that often prevents from assessing the long-term impact of preschool enrollment.

For the United States, the analysis has focused mainly on the impact of kindergarten and

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[6]These classes are denoted *Très petite section*(Very young section), and are added to the usual three-sections division (*Petite section, Moyenne section, Grande section*, i.e. Young section, Middle section, Old section.

prekindergarten programs. Since these programs are targeted at children aged 4 to 5 years old they correspond to educational interventions that occur later than the typical maternal school enrollment in France. Magnuson, Ruhm and Waldfogel (2007) evaluate the short term impact of prekindergarten enrollment on primary school readiness, using a control strategy. They show that preschool enrollment is positively associated with reading and mathematics readiness at the time of entry into first grade, once family characteristics are taken into account. This result is confirmed by Gormley and Gayer (2005) and Fitzpatrick (2008). Furthermore, both studies indicate a larger impact for children from disadvantaged or minority background. However, the results in Magnuson et al. (2007) also suggest that prekindergarten tends to be associated with behavioral problems and that the positive academic impact may quickly dissipate. Cascio (2009) uses Census data to examine the long-term impact of the adoption of universal kindergarten by several US states in the 1960s and the 1970s. She finds no effect of kindergarten enrollment on long term labor market outcomes. As for educational outcomes, the only positive influence of kindergarten is on the probability of dropping out of high school. Furthermore, her estimates indicate that only white children benefit from kindergarten. The lack of effect on black children may likely reflect the substitution of kindergarten for higher intensity programs such as Head Start. Lastly Elder and Lubotsky (2009) provide related evidence on the negative effect of delayed entrance into kindergarten on children's attainment.

Several papers have documented the impact of preschool enrollment in a variety of other countries. Estimates obtained for developing countries indicate large and lasting effects of preschool enrollment. Berlinski, Galiani and Gertler (2009) find that one year of preschool raises third grade test scores by about one fourth of a standard deviation. Berlinski, Galiani and Manacorda (2008) suggest that the effect of preschool attendance may magnify as children grow older, resulting in a sizeable rise in school enrollment by

age 15. For developed countries, several studies also find positive short and long-run effects. Leuven, Lindahl, Oosterbeek and Webbink (2010) find positive short-term effect of early enrollment in preschool in the Netherlands but only for children from disadvantaged families.[7] Havnes and Mogstad (2009) find that the development of child care for children aged 3 to 6 years old, that occurred in Norway in the 1970s had strong positive effects on children's educational attainment and labor market participation. For Great-Britain, Goodman and Sianesi (2005) reach a similar conclusion and find significant positive effects of pre-compulsory education on long-term educational and labor market outcomes. Lastly, Bauer and Riphahn (2009) study the impact of preschool extension in Swiss cantons from the perspective of educational mobility and show that the take up of preschool enrollment fosters intergenerational educational mobility. In other terms, children from disadvantaged family background seems to benefit more from preschool enrollment.

Lastly, a limited number of studies have examined the impact of preschool participation in France. The focus of our study is close to that of Goux and Maurin (2008) and Caille (2001). Caille (2001) examines the effect of early preschool enrollment on primary school outcomes among children born in the early 1990s. He finds that preschool participation significantly reduces the probability of grade retention, once family characteristics are controlled for. He also indicates significant heterogeneity, with children from disadvantaged families benefiting more from preschool. Goux and Maurin (2008) examine the impact of preschool enrollment on test scores in primary school and later school dropout rate for children born in the early 1980s, using a difference-in-difference approach. Contrary to Caille, they find no significant effect of early preschool enrollment. In both cases, it should be noted that, contrary to our study, the analysis conducted in these two paper essentially amounts to estimate the effect of preschool enrolment at age 2 instead of age 3, since the

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[7] The outcome considered is age 6 test scores.

cohorts studied in these papers have an enrollment rate at age 3 that is close to 100%. By contrast, we are able to study the impact of preschool enrollment at different ages, and in particular around age 4, which in many respect comes closer to policy objectives discussed in most countries.

4   Data

Our paper makes use of several data sets. This section describes the information available in each of them (summarized in Table 2) and discusses its quality.

4.1   Data sets

The analysis relies on two main data sources. The first one is a set of panel data sets, known as the DEPP panels, that have been collected by the French ministry of education and follow French pupils over the course of their school years. These panel start following individuals either in primary school or in secondary school, depending on the cohort. In this paper we use three cohorts of these panels. The first two come from the secondary school panels. They sample pupils at the beginning of secondary education (6th graders) in two years, 1980 and 1989 and follow them for about 12 years. The third cohort comes from the primary school panels. It samples pupils who were enrolled in first grade in 1978 and follows them over seven years. These panels include detailed information on schooling careers (grade, tracks, school identifier), together with assessments of individual achievement at various points. Most data sets include a rough description of family background.

Since most children enter primary school the year they turn 6 and secondary school the year they turn 11, our surveys mostly correspond to birth cohorts 1969, 1972 and 1978. Given the timing of preschool expansion, this corresponds to cohorts that exhibit large

variations across individuals in the exposure to pre-primary education, as shown in Table 1.

Our second data set is the FQP ((*Formation, Qualification, Profession*, i.e. Education, Training, Occupation)) survey, which is a labor force survey collected by the French national statistical agency. The population sampled is the French population between 20 to 65 years old. The data focuses on three main dimensions : (i) current labor market outcomes (employment status, job characteristics, earnings), (ii) family background , (iii) schooling history (yearly calendar for the entire schooling period from primary to tertiary education, including detailed information on class level, tracks specialization (eg. Vocational vs general), class repetition). We use the 1993 wave that provides information on pre-school attendance. In the analysis of the impact of preschool participation on educational and labor market outcomes, we focus on cohorts born between 1950 and 1973, which corresponds, again, to the expansion of preschool enrollment.

4.2   Preschool participation

Both data sets provide information of the duration of exposure to preschool. It is of course crucial, for our analysis to rely on accurate information regarding this variable. In this section, we describe the information available in each data set and discuss its reliability.

The information on preschool participation varies between the two data sources. In the DEPP panels, preschool experience is reported by the principal of the school attended in the first interview year. In the case of the primary school panel (1978 pupils cohort) the information is usually made available to the school principal by the principal of the preschool where the pupil was enrolled. In the case of the secondary school panels (1980 and 1989 pupils cohorts), the school principals typically obtain this piece of information from the pupils' parents. In both cases, the information reported is the duration of preschool

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and the age when the pupil started attending preschool. In the FQP survey, preschool participation is reported *a posteriori*, at the time of the survey. Respondents are asked to report whether they attended preschool at all and the duration of preschool participation.

To assess the quality of our preschool participation data, Table 1 reports the enrollment rates computed from the DEPP surveys to the official enrollment rates published by the ministry of education. Enrollment rates computed from the primary school 1978 panel fall short of the official statistics by about 10 percentage points. For the secondary school panels, the gap can be larger but remains lower than 20 percentage points. In fact, official enrollment rates are notoriously overestimated. This occurs for two main reasons. First, the official enrollment rates is based on the number of children registered in preschool. This number may in fact differ from actual enrollment in the case of registered children entering after the beginning of the school year or attending part-time. Second, while the number of registered pupils is directly observed, the total number of children of a given age is estimated in the official statistics, which represent another source of error. As a consequence, official enrollment rates can sometimes be above 100%. Overall, the quality of information contained in the primary school panel is good and the information from the secondary school panels is not too far off the mark: the lower enrollment rate found in the DEPP panel, which reflect reported effective preschool experience should not be over-interpreted.

Figure 2 shows the distribution of preschool duration by birth cohort, computed from the FQP surveys. The survey reports markedly lower enrollment rates than the ones published in official statistics and reported in Figure 1. For instance, among children born in 1973, 40% report having attended preschool for three years of more, while the official enrollment rate at the age of three (i.e. year 1976) for this cohort is about 80%. This suggests important measurement error and systematic under-report of preschool participa-

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tion, which is not particularly surprising given that the survey information is retrospective, collected in adulthood and relative to the very early school experience. At the same time, beyond the overall underestimation of enrollment, the data establish sizeable differences across cohorts in their exposure to preschool which suggests that although error-ridden, the FQP records of preschool participation may be informative of actual exposure.

4.3   Educational and labor market outcomes

To assess the impact of preschool enrollment on later outcomes, our data provide useful information on both schooling and labor market experience when adult. We consider two main schooling outcomes : the number of grade repetitions and the highest degree attained. The number of repetitions can be built using the year-by-year calendar of school enrollment and grade participation that is available in both the DEPP panels and the FQP surveys. In the main analysis, we focus on the number of repetitions at the age of 11 and at the age of 16. Regarding the highest completed degree we distinguish two distinct variables. The first is an indicator for having passed the *Baccalauréat*. This is the degree taken at the end of secondary education and corresponds, especially among older cohorts to rather high level of education. The second variable is an indicator for having passed at least one secondary education degree, be it general or vocational. As for the labor market outcomes, we focus on the monthly wage earned on the current job at the survey date.

Table 3 provides descriptive statistics on our main variables of interest. It emphasizes two aspects of the French educational system that should be kept in mind. The first one is the relatively high rate of grade repetition. For instance, in the FQP survey, for cohorts born between 1950 and 1973, 30% of the respondents report having repeated at least once before the age of 11 and 64% before the age of 16. Multiple repetitions are frequent which results in the even higher average number of years repeated reported in the

table. Furthermore, repetition is a good predictor of later schooling success (or failure) which makes it an interesting outcome to look at. Second, the share of the population with a *Baccalauréat* is relatively small compared to many countries. In the FQP sample, this is the case of only 33%. In the younger cohorts surveyed in the DEPP panels, this rate is higher and reaches about 60%.

5   Main results

We now turn to the analysis of the effect of preschool enrollment on later outcomes. Our objective is to assess the impact of the duration of preschool participation on these outcomes. This impact is likely to depend on the timing of intervention, since children's responsiveness to preschool education is likely to change very quickly during early childhood. Similarly, there is no reason to expect the returns to one additional year of preschool education constant and independent of previous preschool enrollment. For these reasons, for each of our surveys, we regress educational and labor market outcomes on a set of dummy variables that indicate different levels of preschool participation.

The information on preschool participation varies between our two surveys. For the DEPP panel, the age of entry in preschool is available and will be used as the key explanatory variable. For the FQP survey, only the actual duration of preschool is available. For the purpose of assessing the benefits of early intervention, the age of entry in preschool, rather than the duration, is probably the most relevant measure. In fact duration may be endogenous since it depends on achievement in preschool. For instance, part of the benefits of early preschool enrollment may take the form of anticipated entry into primary school and similarly the penalties of delayed preschool enrollment may be delayed entry into primary school. However, one should note that anticipated or delayed primary school

enrollment are rare events.

One of the problems for assessing the impact of preschool on later outcomes is that preschool participation is likely to be correlated with family characteristics that have an independent effect on individual success. Our first strategy is to control for as much information on family characteristics as possible given the information available in our survey. Of course, the validity of this strategy depends on the quality of our controls. Hence, we perform several robustness checks on subsamples of our data that provide more detailed information on family characteristics. Next, to account for possible endogeneity biases, arising from omitted variable or measurement errors, we implement an instrumentation strategy based on the temporal variation within regions in access to preschool, so as to wipe out any endogeneity due to households' idiosyncracies. In both cases, the results do not differ markedly from those obtained with our base specification.

5.1 Base specification

In both surveys, we are able to control for the following characteristics : the father's occupational group (7 levels classification), family composition (number of siblings and birth rank), as well as cohort and regional fixed effects.[8] There are a number of discrepancies between DEPP and FQP specifications, regarding data availability. In DEPP, we have detailed information on the exact month of entry in preschool and month of birth, so we are able to precisely compute and control for the additional months spent in preschool. In the FQP survey, we also have detailed information on mother's education and therefore control for it. Regional variation in taken into account using the *département* of birth in FQP and school regional district in DEPP. *Départements* correspond to a geographical

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[8]In most of the analysis based on the DEPP data, we pool the three surveys. A cohort is defined as all children entering the survey in a given wave. We refer to them by the most common year of birth in this cohort, i.e the year of birth of those who haven't repeated a grade.

and administrative division. There are 26 school regional districts and 95 *départements* in metropolitan France.

Table 4, panel A, shows the effect of entering preschool at age 2 or 4 rather than at age 3 on later schooling outcomes. The effect of earlier enrollment in preschool are always positive. Delaying preschool enrollment by one year leads to a higher occurrence of repetitions : the increase is 0.09 year of delay at age 11 and 0.11 at age 16. This represent between one fourth and one third of mean repetition at these ages. The 1989 secondary school panel also provides individual test scores at the entry into 6th grade and show that delayed preschool enrollment leads to test scores that are 0.10 of a standard deviation lower. Lastly, children with late enrollment also have a lower probability of graduating from high school (-4% points). All in all, this indicates that the effect of preschool participation are long lasting.

Panel B provides comparable estimates of preschool using the FQP data set. It can be seen that staying one more year in preschool reduces repetitions, increases graduation from high school but also increases the probability of dropping out of school with a secondary degree (+2% points) and increases wage earnings when adult by 3%. However, the estimates are slightly lower than what is obtained in Panel A. These lower values could reflect the incidence of an attenuation bias arising measurement error in the FQP data, as documented in the previous section.

Lastly in the case of DEPP, the table seems consistent with a linear effect of preschool duration on later outcomes. For instance, in panel A, the coefficients on the dummies for enrollment at 2 and at 4 are often comparable in absolute value. We will proceed with a linear specification for the remainder of the paper.

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5.2 Additional controls and fixed-effects estimation

One of the limitations of the estimates previously reported is that they rely on a rather coarse description of family background. As a consequence, the association between preschool duration and individual outcomes discussed so far may partly reflect the confounding influence of unmeasured family characteristics. This is especially true for the DEPP panels where the major conditioning variable available in all waves is father's occupation. In this section, we perform several robustness checks by including more detailed control variables using subsamples of our data. Results are presented in Table 5.

Parental education is a likely source of bias since parents' education might affect both their preferences regarding preschool and their child's later outcomes. Parental education is available for DEPP 89 and we therefore restrict the analysis to this subsample to check that the results are robust to the inclusion of this additional variable. It turns out that this hardly changes anything, given that we were already controlling for parental occupation. The decrease in the estimate is notable only for test scores (see change from column (1) to (2), Table 5). This is also suggestive of the fact that there remains little households' heterogeneity to control for in these estimations.

Other variables are likely to jointly affect early schooling decisions and later schooling outcomes. This may include unobservable aspects of the family background or the broader socioeconomic environment as well as the quality of schooling infrastructures. In the 1980 DEPP panel, sampled children were clustered at the level of the school they attended in 6th grade, which depends on their place of residence at that time. Controlling for schools fixed effects is therefore a good way to control for most of the heterogeneity in the child's socioeconomic environment and for most of the heterogeneity in the quantity and quality of school supply the child faces. This will lead to unbiased estimates of the effect of

preschool, under the assumption that preschool enrollment is exogenous within catchment areas. In Table 5, we therefore compare column (4), with schools fixed effects, to column (3), without fixed effects but on the same subsample. Results indicate that controlling for schools effects leads to a systematic increase in the preschool effect. This suggests that there is a negative correlation between preschool openings and the socioeconomic environment. This is consistent with the evidence that preschools were at first intended for worse-off urban worker's children. As a consequence, neglecting this for the other waves only allows to estimate a lower bound of the impact of preschool on later outcomes. Classical measurement error is another reason why we expect our estimate to be a lower bound.

5.3 Instrumental variable estimation

Lastly, we check that when instrumenting preschool attendance, we find consistent results. Our identification strategy relies on the variation in access to preschool during the 1970s within regions. Municipalities have benefitted from openings of preschool classes during the 60's and 70's at different rates and this translated into different preschool participation at the municipal level, and also at the level of the *départements*. Controlling for cohort and school district, we instrument age of entry in preschool by the average age of entry in a given *département* for a given cohort. The assumption is therefore that temporal variation within departments in average access to preschool is not related to temporal variation in schooling or labor market outcomes besides any effect preschool may have on these outcomes. Results are provided in column (6) of Table 5. Estimates tend to be lower than those obtained in the base specification (see column (5)) but we identify significant and positive effects of preschool and we systematically fail to reject exogeneity[9], which is consistent with the

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[9]The instrument is highly significant for the 1st stage regression and we do not face a weak instrument issue.

view that access to preschool has increased regardless of children's, parents', schools' and environments' characteristics.

6   Complementary results

Beyond the estimation of the mean impact of preschool enrollment, two questions may arise. The first one pertains to the dynamics of the impact of preschool enrollment. To some extent, previous research suggests that the effect of preschool participation may be short lived. This view is not supported by our estimates. But in the case where the effects are persistent, this persistence needs to be further investigated. Does preschool provide a one shot advantage very early during the school year or does it make children more likely to succeed at each subsequent step of their schooling career, and even beyond, on the labor market ?

The second question consists in understanding who benefits the most from preschool. Does preschool affect success independently of family background ? Does it mostly help remedy the negative impact of a disadvantaged family environment and first and foremost benefit the most disadvantaged children? In a context where intergenerational transmission of inequalities tend to exacerbate when progressing through education levels, it is important to understand whether a public policy such as universal preschool can really help disadvantaged children catch up with better-off children.

6.1   The dynamics of preschool advantage

To assess the dynamics of effect of preschool participation we first focus on the timing of grade repetition in primary schools. The reason for focusing on primary school is that information is available in all waves of the DEPP panels. Table 6 provides the marginal

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effects of entering preschool one year later on the probability of repeating each grade. We see that the largest effect occurs for the 1st grade: one more year of preschool reduces by 2% points the probability of repeating 1st grade. However, even if the effect is approximately half lower for higher grades, it subsists and is significantly different from zero. Preschool seems to help individuals not only when they are very young but also later on.

The persistence of preschool enrollment effects is best illustrated by our results on the positive impact of preschool exposure on subsequent wages. The channel through which preschool affects labor market needs to be investigated. The question is whether all the effect runs through higher educational attainment or whether an independent residual effect remains once educational outcomes have been taken into account. Table 7 compares estimates of the impact of preschool on monthly wage without controlling for final level of education (column (1)) and with such a control (column (2)). It is striking to see that even though the coefficient for 3 years of preschool decreases a bit, the order of magnitude of the effect remains the same. Preschool has an effect on wage earnings in addition to the effect it has through education. This could reflect the acquisition of non-cognitive skills that are rewarded on the labor market.

6.2   Heterogeneity in the effect of preschool

To assess the heterogeneity in the effect of preschool, we interact our measures of preschool participation with characteristics of the family background. We distinguish three social groups, on the basis of the occupation of the father : the first one are children of farmers or manual workers, the second group gathers children of non-manual workers, lower-grade professionals and artisans, and the last group is composed of the children of higher-grade professionals. Table 8 provides estimates for preschool interacted with these dummies. Our main explanatory variable is age of entry for the DEPP data and whether the child

attended preschool for 2 years at least for the FQP data. The reference category is the second social group. As a consequence, the coefficient for the preschool variable measures the effect of preschool for children in the second group and the interacted variables give the differential effect when the child belongs to another social group.

The results indicate significant heterogeneity in the effect of preschool exposure. The children of higher grade professionals systematically get lower returns to preschool than the reference category, i.e. the children of farmers and manual workers. In fact, the global effect of preschool for the children of higher-grade professionals is not significantly different from zero. The exception is for test scores where all groups benefit from preschool in the same way. Manual workers' and farmers' children gain as much as the reference category from preschool (in most of the specifications, the coefficient in the second line is not significantly different from zero). As a consequence, preschool is an intervention that tends to close the gap between children from lower and upper social groups and therefore play a role in reducing intergenerational transmission of inequalities.

To get a grasp of the inequality reduction effect of preschool it may be useful to compare for each subgroup the impact of preschool attendance with the overall advantage or disadvantage of each category in terms of outcomes. Let us quantify this with some examples. Regarding the probability of repeating first grade: preschool has the same effect for children from the lower social group and from the middle one. As a consequence, universal preschool cannot close the gap between the two groups. However, it can be computed that an additional year of preschool offered to children from the lower social group and not to children from the middle social group would compensate for 1/3 of the effect of gap between the two groups in terms of grade retention. In addition, given that preschool does not affect outcomes of children from the better-off social group, it does reduce inequalities between groups. For instance, we compute that one year of preschool compensates children

from the middle (resp. the lower) social group by 1/3 (resp. 1/6) of the effect of their origin, compared to children from higher social group. This exercise can be performed for all the variables under study. We find that the reduction in inequality between social groups of origin brought by preschool diminishes for later schooling outcomes. For instance, one additional year of preschool compensates for one tenth of the gap between the middle and lower social groups when it comes to the probability to graduate from high school. For wages, the positive effect of having attended preschool at least two years makes up for about one fourth of the wage gap between the middle social group and the upper group but only 8% of the gap between the lower and the upper social group.

7 Conclusion

In this paper we find evidence that preschool have significant and lasting positive effects and helps children succeed in school and obtain higher wages in the labor market. The effects of school performance are observed at different ages and through a variety of outcomes (number of repetitions, test scores, diplomas). Having identified long-lasting effects contradict the results by Magnuson et al. (2007) on the US. More precisely, preschool does not provide a one shot advantage but rather makes children more likely to succeed at each step of their schooling career and on the labor market. This suggests that this early intervention manages to affect more than just the cognitive level of the children. Unfortunately, the data do not allow us to identify what changes for the children who have attended preschool: are they more able to concentrate? have they developed social skills? do they assimilate rules more easily? probably a mix of these mechanisms but this has to be left for future research.

Another key result of the paper is the fact that the effect is not quite the same between

social groups: the effect is almost entirely driven by children from middle and lower social classes while those from upper social groups hardly gain anything from preschool (but do not suffer from it neither).[10]

The paper's results tend to confirm the view that early interventions can be both efficient and equalizing: preschool prepares children to primary schooling but also promotes equal opportunity by helping children from worse-off socio-economic environment catch up with their better-off classmates. By comparison, an analysis of intergenerational transmission of inequalities in France shows that trajectories from children with different socio-economic backgrounds tend to diverge. This suggests that, when progressing through education levels, school is less and less able to compensate for inequalities in background the children face. An equalizing intervention later in the life cycle is therefore likely to be more expensive and would not benefit to the children for as long as preschool does.

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[10]Upper social groups benefit from preschool since the cost for child care is close to zero; from that point of view, they probably benefit even more than the other social groups from preschool since their (implicit) cost for child care is expected to be higher (they have a higher opportunity cost of time).

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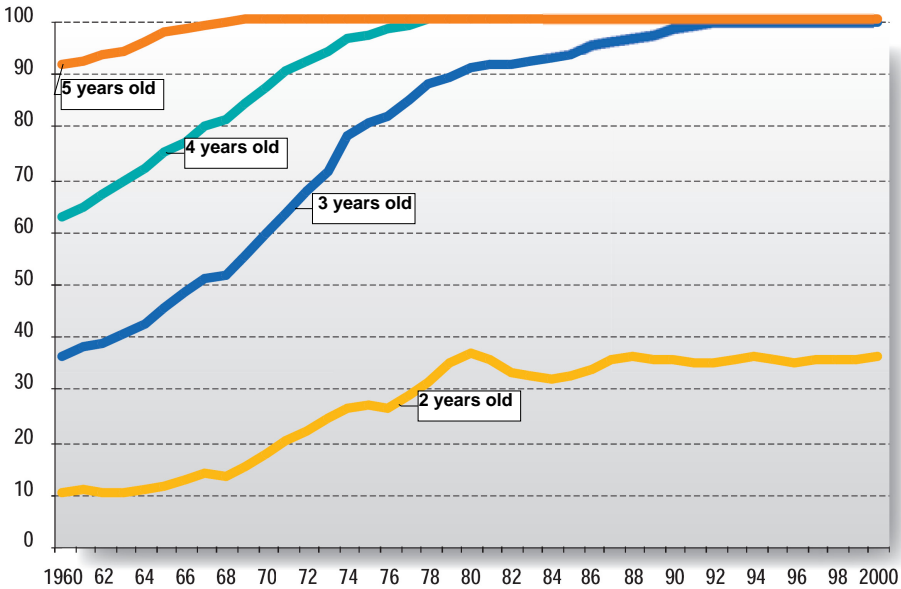Figure 1: Trends in preschool enrollment in France by age and year, 1960-2000

Table 1: Preschool enrollment rates - DEPP panels and official registry data

| | 1969 birth cohort | | 1972 birth cohort | | 1978 birth cohort | |
	DEPP 1980 report	Official statistics	DEPP 1978 report	Official statistics	DEPP 1989 report	Official statistics
Enrollment rate at						
2 years old	16%	25%	13%	25%	16%	35%
3 years old	54%	73%	61%	73%	69%	90%
4 years old	82%	85%	87%	95%	89%	100%

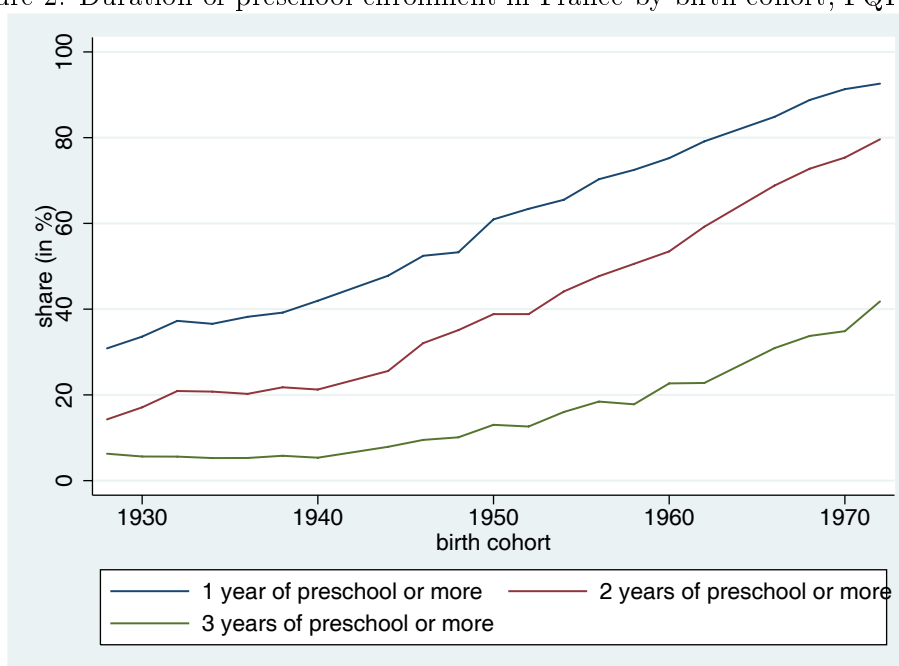Figure 2: Duration of preschool enrollment in France by birth cohort, FQP data

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Table 2: Datasets and variables

Variables	DEPP*			FQP
	69	72	78	
age of entry in preschool	x	x	x	
duration of preschool	x	x	x	x
repetitions in primary school	x	x	x	x
repetitions in 2ndary school	x		x	x
test scores in 6th grade			x	
high school graduation	x		x	x
wage				x
gender	x	x	x	x
number of siblings	x	x	x	x
rank among siblings	x	x	x	x
parental occupation	x	x	x	x
parental education			x	x
department of birth	x	x	x	x

* the figures for the DEPP panels stand for the birth cohorts.

Table 3: Descriptive statistics

	DEPP panels	FQP survey
number of repetitions at age 11	0.29	.34
number of repetitions at age 16	0.81	.92
some degree (indicator)		.73
Baccalauréat or more ((indicator)	0.58	.33
monthly wage (in euros 1993)		1262.49
1st grade repetition (indicator)	0.12	
2nd grade repetition (indicator)	0.06	
3rd grade repetition (indicator)	0.06	
4th grade repetition (indicator)	0.06	
5th grade repetition (indicator)	0.07	

Table 4: Effect of preschool in the base specification

Panel A: DEPP: effect of age of entry

	number of repetitions at 11	test score in 6th grade	number of repetitions at 16	graduate from high school
age of entry = 2	-0.0938***	0.0672**	-0.142***	0.0287***
	(0.0094)	(0.0266)	(0.0157)	(0.0101)
age of entry = 3	REF			
age of entry = 4	0.0843***	-0.105***	0.106***	-0.0405***
	(0.0071)	(0.0241)	(0.0125)	(0.0079)
Observations	51255	9607	29079	29581
Model	OLS	OLS	OLS	probit

Panel B: FQP: effect of preschool duration

	number of repetitions at 11	number of repetitions at 16	some degree	graduate from high school	monthly wage
Less than 1 year of preschool	REF				
2 years of preschool	-0.0366**	-0.0663***	0.0196*	-0.0106	0.0298**
	(0.0145)	(0.0239)	(0.0109)	(0.0134)	(0.0141)
3 years of preschool	-0.0680***	-0.0988***	0.0431***	0.0270*	0.0460***
	(0.0165)	(0.0271)	(0.0121)	(0.0153)	(0.0161)
Observations	8672	8672	8750	8761	5843
Model	OLS	OLS	probit	probit	OLS

Note: Coefficients reported are marginal effects and standard errors in parentheses. Panel A. Interpretation of the first coefficient: starting preschool at 2 rather than 3 decreases the number of repetitions at age 11 by 0.0938. Panel B: Interpretation of the first coefficient: staying in preschool 2 years than 1 decreases the number of repetitions at age 11 by 0.0366. Control variables include: father's occupational group, number of siblings, rank among them and cohorts fixed effects; school districts fixed effects are included in Panel A, birth département fixed effects and education of the parents are included in Panel B. ***, ** and * mean respectively that the coefficient is significantly different from 0 at the 1%, 5% and 10% level.

Table 5: Effect of preschool: robustness checks

dependent variable	subsample (1)	w/ Parental education (2)	subsample (3)	w/ Schools effects (4)	subsample (5)	instrumentation (6)
test score at 11	-0.0700***	-0.0544***				
	(0.0108)	(0.0105)				
repetitions at 11	0.123***	0.114***	0.0548***	0.0681***	0.0951***	0.00615
	(0.00427)	(0.00424)	(0.00540)	(0.00618)	(0.00335)	(0.0239)
repetitions at 16	0.112***	0.0998***	0.0815***	0.102***	0.0974***	0.0764*
	(0.00740)	(0.00723)	(0.00881)	(0.0102)	(0.00566)	(0.0446)
HS graduation	-0.0268***	-0.0224***	-0.0417***	-0.0430***	-0.0413***	-0.148**
	(0.00441)	(0.00439)	(0.00425)	(0.00491)	(0.00356)	(0.0698)
Parental education	no	yes				
Schools fixed effects			no	yes		
Instrumentation					no	yes

Note: The effect of preschool is assumed to be linear in the age of entry. Coefficients reported are marginal effects of starting one year later, standard errors in parentheses. Interpretation: entering preschool one year later decreases test score by 0.07 of a standard deviation without controlling for parental education and by 0.0544 of a standard deviation when controlling for it. Control variables include: father's occupational group, number of siblings, rank among them, cohorts fixed effects and school districts fixed effects. Column (2) adds parental education and has to be compared to column (1), which is on the same sample. Column (4) adds schools fixed effects and has to be compared with column (3). Column (6) instruments for age of entry in preschool and has to be compared with column (5). All models are OLS except for high school graduation estimated by a probit. ***, ** and * mean respectively that the coefficient is significantly different from 0 at the 1%, 5% and 10% level.

Table 6: Dynamics: Effect of preschool on probability of repeating each grade

	(1) 1st grade	(2) 2nd grade	(3) 3rd grade	(4) 4th grade	(5) 5th grade
age of entry in preschool	0.0248***	0.00750***	0.00729***	0.00727***	0.00559***
	(0.00156)	(0.00116)	(0.00115)	(0.00123)	(0.00130)

Note: The effect of preschool is assumed to be linear in the age of entry. Coefficients reported are marginal effects of starting one year later, standard errors in parentheses. Interpretation: entering one year later in preschool increases by 2.48% points the probability of repeating 1st grade of primary school. Control variables include: father's occupational group, number of siblings, rank among them, cohorts fixed effects and school districts fixed effects. All models are probits. ***, ** and * mean respectively that the coefficient is significantly different from 0 at the 1%, 5% and 10% level.

Table 7: Dynamics: Effect of preschool on monthly wage

	Monthly wage	
	(1)	(2)
Less than 1 year of preschool	REF	
2 years of preschool	0.0298**	0.0321**
	(0.0141)	(0.0130)
3 years of preschool	0.0460***	0.0361**
	(0.0161)	(0.0149)
Education level	no	yes

Note: Coefficients reported are marginal effects, standard errors are in parentheses. ***, Interprettaion: having attended preschool for 2 years rather than 1 increases by 2.98% one's monthly wage. ** and * mean respectively that the coefficient is significantly different from 0 at the 1%, 5% and 10% level.

Table 8: Heterogenous effects

Panel A: DEPP: effect of age of entry

	1st grade	2nd grade	3rd grade	4th grade	5th grade	test score	HS graduation
age of entry	0.0208***	0.0067***	0.0061***	0.0068***	0.0062***	-0.0754***	-0.0399***
	(0.0028)	(0.0017)	(0.0017)	(0.0018)	(0.0018)	(0.0168)	(0.0039)
age of entry x SG 1	-0.0040	-0.0025	-0.0011	-0.0043	-0.0069***	0.00855	0.0093
	(0.0037)	(0.0027)	(0.0026)	(0.0030)	(0.0032)	(0.0230)	(0.0077)
age of entry x SG 3	-0.0249***	-0.0065**	-0.0054*	-0.0110***	-0.0049*	0.0226	0.0243***
	(0.0045)	(0.0030)	(0.0030)	(0.0035)	(0.0033)	(0.0344)	(0.0084)

Panel B: FQP: effect of preschool duration

	monthly wage
at least 2 years	0.0457**
	(0.0204)
at least 2 years x SG 1	-0.00263
	(0.0261)
at least 2 years x SG 3	-0.0998**
	(0.0470)

Note: Coefficients reported are marginal effects and standard errors in parentheses. Interpretation: entering preschool one year later increases probability to repeat 1st grade of primary school by 2.08% for children belonging to social group (SG) 2. For children in SG 1, this effect is lower by 0.4%. SG equals 1 for farmers' and manuals workers' children; 2 for non-manual workers', lower-grade professionals' and artisans' children; 3 for higher-grade professionals' children. ***, ** and * mean respectively that the coefficient is significantly different from 0 at the 1%, 5% and 10% level.