# Will Sooner be Better?
# The Impact of Preschool Enrollment on Cognitive and Noncognitive Achievement of Children

**AXE POLITIQUES EDUCATIVES**

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## Objective

In this paper, we estimate the impact of early pre-elementary school enrollment (age 2 vs age 3) on cognitive and noncognitive skills.

## Literature review

- Leuven et al. (2010) find that the expansion of school opportunities to age 4 in the Netherlands had a positive impact for disadvantaged children
- Black, Devereux, and Salvanes (2011) find that young Norwegians starting school at 7 rather than 6 have both better cognitive and noncognitive outcomes
- Datar (2006) finds that a one year delay when entering kindergarten (6 vs 5) in the US is associated with an increase in maths and reading test scores
- Bernal and Keane (2011) find different impacts of childcare types between 0 and 5 on future test scores

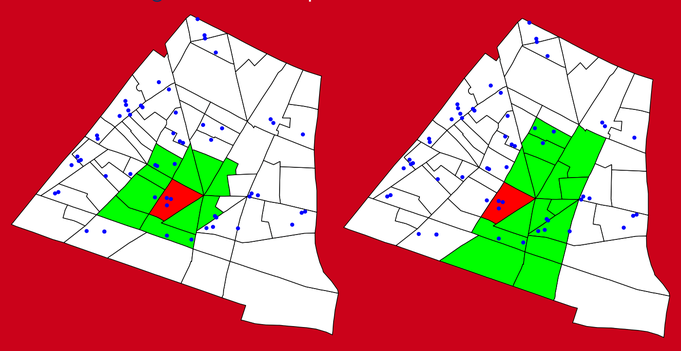
## Institutional context

- Almost all children are enrolled in pre-elementary school at age 3
- The proportion of children enrolled at age 2 decreased from 1/3 in the 90s to about $13\%$ in 2010
- Children aged 3 and children with low social family background are given priority
- Supply of alternative formal childcare is scarce
- There are 3 pre-elementary grades
- Children entering preschool at 2 repeat the first grade
- Children assignment to pre-elementary school is made at the municipality level
- Pre-elementary schools are integrated within elementary schools

## Data

- Main source is **Panel DEPP 1997**; children born in 1991 entering first grade in 1997:
  - Final sample: 5,494 children
  - Cognitive test scores and teacher assessments of children behavior
  - Children characteristics : month of birth, gender, rank of birth
  - Parents characteristics: socioeconomic category, labor market situation, education, national origin
  - Family context : household type, number of children, language spoken at home
  - School context : disadvantaged schools, urban vs rural
- **Administrative data on schools**:
  - Geographical coordinates
  - School capacities: number of pupils in schools by grade (years 1992-94)
- **National Census** conducted in 1999:
  - Children eligible for school enrollment: Population by age at the Iris level (Census Tract)

Figure: Two local perimeters are considered



Instruments are built at a local level. The smaller perimeter (in red in the exemple) is the Census Block (Iris). For a school located in the Census Block colored in red, we also consider two alternative perimeter based on contiguity (left figure) or the Large District level (right figure).

## Introduction

- Recent literature has found an important impact of cognitive and noncognitive skills accumulated during childhood on adult outcomes, such as health, education or labor market income (Almond and Currie (2011), Heckman, Stixrud, and Urzua (2006)). Timing of school enrollment influences the formation of skills. However, findings are somewhat contradictory. They depend on the country and the age of enrollment. Our study contributes to this literature by providing new evidence of a positive impact of early enrollment on skills.
- Our contribution is original under several aspects: we propose a new identification strategy based on nonexperimental data. We measure the impact of early enrollment on both cognitive and noncognitive skills until grade 9; the French framework allows us to assess a very early intervention that occurs at age 2 whereas other contributions study the effect of school enrollment at older ages.

## Identification Strategy

- The identification strategy aims at identifying the causal impact of pre-elementary school enrollment at age 2 on later outputs. The simple correlation between the two variables can be misleading given the potential selection of children into pre-elementary school, which is based on unobserved characteristics that also influence later skills.
- To identify the effect, we use local geographical variation in tension between school capacities and the number of children who are eligible to be enrolled. This variation is supposed to be exogenous with respect to later achievement.
- To secure identification and avoid potential bias due to anticipation behavior by parents, we control for the value of instruments the year before the decision year (1992).

## Estimation Method

- To assess the impact of early pre-elementary school enrollment, we use two-stages least squares instrumenting early schooling enrollment ($S_i$) by the tension variables ($Z_i$):

$$\begin{aligned} Y_i &= X_i\alpha_1 + \alpha_2 S_i + \varepsilon_i \\ S_i &= X_i\delta_1 + Z_i\delta_2 + u_i \end{aligned}$$

- All estimations include controls (noted $X_i$) for child's month of birth, gender, household, parents, school characteristics and values of the instruments in 1992.
- Standard errors are clustered at the school level. T-test statistics are reported between parentheses.

## First stage

Table: First stage estimation: impact of the instruments on the preschool enrollment age (2 vs 3) at the large district level

| | IV1 | IV2 | IV3 | IV4 | IV5 |
|---|---|---|---|---|---|
| $Z_1^{\ell(i)}$ | -0.226*** | -0.135*** | -0.227*** | -0.279*** | -0.294*** |
| | (-7.90) | (-2.74) | (-4.46) | (-5.20) | (-5.76) |
| $Z_2^{\ell(i)}$ | | -0.112** | -0.265*** | -0.270*** | -0.264*** |
| | | (-2.29) | (-4.97) | (-5.09) | (-5.00) |
| $Z_3^{\ell(i)}$ | | | 0.321*** | 0.226*** | 0.208*** |
| | | | (8.73) | (5.63) | (4.85) |
| $Z_4^{\ell(i)}$ | | | | 0.186*** | 0.154*** |
| | | | | (4.83) | (3.33) |
| $Z_5^{\ell(i)}$ | | | | | 0.061 |
| | | | | | (1.42) |
| r2 | 0.138 | 0.140 | 0.174 | 0.184 | 0.185 |
| N | 5494 | 5494 | 5494 | 5494 | 5494 |
| F-Stat | 62.41 | 32.79 | 35.11 | 25.47 | 25.16 |

## Building Variables

- Outcomes are built from tests scores and teacher assessment using factor analysis.

| Skills | Measurements (Test scores) |
|---|---|
| Literacy | "Knowledge of writing" |
| | "Reading (phonologic tasks)" |
| | "Reading (morphosyntactic tasks)" |
| | "Writing" and "Reading" |
| Numeracy | "Mathematics (simple calculations)" |
| | "Mathematics (numbers and geometry)" |
| Language | "Actively participates in discussions" |
| | "Consciously intervenes in discussions" |
| | "Linguistic level compared to class" |
| | "Oral comprehension" |
| Sociability | "Actively participates in group activities" |
| | "Actively participates in discussions" |
| | "Consciously intervenes in discussions" |
| | "Integrates herself/himself well in class" |
| School activities | "Self-confident during school activities" |
| | "Fails due to excessive confidence" |
| | "Capable of regular attention" |
| | "Rapidly completes tasks", "Autonomous" |
| | "Efficiently completes tasks" |
| | "Difficulty involving gestures" |
| | "Fatigues during school activities" |
| | "Anticipates and is organized" |
| | "Adaptation to the rhythm of her class" |

- We build five tension variables, respectively as the ratio between children aged 2 to 6 and the corresponding number of children enrolled in pre-elementary school.

## Second Stage: First Grade

Table: Impact of early schooling enrollment on the 1st grade achievement using instruments constructed at the Large District level

| | OLS | IV 1 | IV 2 | IV 3 | IV 4 | IV 5 |
|---|---|---|---|---|---|---|
| Literacy | 0.035 | -0.042 | 0.178 | 0.183 | 0.180 | 0.187 |
| | (1.12) | (-0.16) | (0.77) | (0.88) | (0.88) | (0.93) |
| Numeracy | 0.045 | 0.397* | 0.349* | 0.322* | 0.345** | 0.343** |
| | (1.57) | (1.72) | (1.78) | (1.90) | (2.05) | (2.05) |
| Language | 0.056** | 0.288 | 0.244 | 0.187 | 0.176 | 0.165 |
| | (1.99) | (1.31) | (1.36) | (1.22) | (1.16) | (1.08) |
| Sociability | 0.059* | 0.444* | 0.353* | 0.271 | 0.259 | 0.248 |
| | (1.93) | (1.84) | (1.78) | (1.61) | (1.56) | (1.47) |
| School activities | 0.060** | 0.183 | 0.028 | 0.137 | 0.143 | 0.140 |
| | (2.05) | (0.93) | (0.17) | (0.92) | (0.97) | (0.96) |

## Second Stage: Later Outcomes

Table: Impact of early schooling enrollment on later cognitive achievement using instruments constructed at the Large District level

| | OLS | IV 1 | IV 2 | IV 3 | IV 4 | IV 5 |
|---|---|---|---|---|---|---|
| Literacy 3rd Grade | 0.027 | 0.173 | 0.283 | 0.346** | 0.336** | 0.374** |
| | (0.91) | (0.95) | (1.60) | (2.16) | (2.16) | (2.34) |
| Literacy 6th Grade | -0.045 | 0.113 | 0.156 | 0.219 | 0.229 | 0.235 |
| | (-1.42) | (0.54) | (0.84) | (1.33) | (1.40) | (1.41) |
| Literacy 9th Grade | -0.002 | 0.215 | 0.360** | 0.374** | 0.377** | 0.383** |
| | (-0.05) | (1.15) | (2.02) | (2.29) | (2.32) | (2.31) |
| Numeracy 3rd Grade | 0.081** | 0.105 | 0.194 | 0.348** | 0.352** | 0.363** |
| | (2.51) | (0.52) | (1.06) | (2.12) | (2.19) | (2.27) |
| Numeracy 6th Grade | 0.005 | 0.327 | 0.297 | 0.258 | 0.271 | 0.276 |
| | (0.15) | (1.40) | (1.46) | (1.52) | (1.61) | (1.62) |
| Numeracy 9th Grade | 0.046 | 0.261 | 0.300 | 0.389** | 0.409** | 0.409** |
| | (1.29) | (1.30) | (1.64) | (2.15) | (2.28) | (2.28) |

## Results

- Instruments have a significant impact on the decision to enter pre-elementary school at age 2
- Early preschool enrollment has an important impact on both cognitive and noncognitive outcomes, mainly on numeracy and sociability
- The impact of early pre-elementary schooling lasts until grade 9.