From Birth to School: Examining the Effects of Early Childhood Programs on Educational Outcomes in NC

Update with Preliminary Results
March 16, 2011

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Purpose and Motivation

Goal: To use rich administrative data over time in NC to measure the effects on student outcomes of access to a variety of early childhood programs (measured at the county level)

Approach: Differs from much of the existing literature

Typically small-scale programs with random assignment or a comparison group (e.g., Perry Preschool, Abecedarian)

Advantages of our approach:

- Minimizes the selection problem found in studies that measure effects only for children enrolled in the programs
- Focuses on the community, incorporating collaboration across programs, and spillovers to non-participants

Overview– Time Line

Birth => **Programs (0-5)** => Schooling (K-3) => Outcomes

individual   **county level**   school-level   individual

birth records   **program data**   characteristics   (e.g. 3rd grade tests)

(plus some individual

characteristics)

Many cohorts of students, starting with births in 1988 and outcomes as recent as 2008/09 or 2009/2010 (available spring 2011)

Smart Start

- Statewide initiative focusing on early childhood development
    - Variety of services: day care, health care, family support
    - Focus on all children, not just low-income
    - Designed to promote collaboration among local agencies
    - A lot of flexibility at the local level on how to use the money

- Introduced in 1993 in 12 pilot partnerships representing 18 counties
    Specifically chosen to be representative of the state

- Some restrictions on use of funding beginning 1996
    e.g., at least 30 percent for child care

Smart Start
State Funding
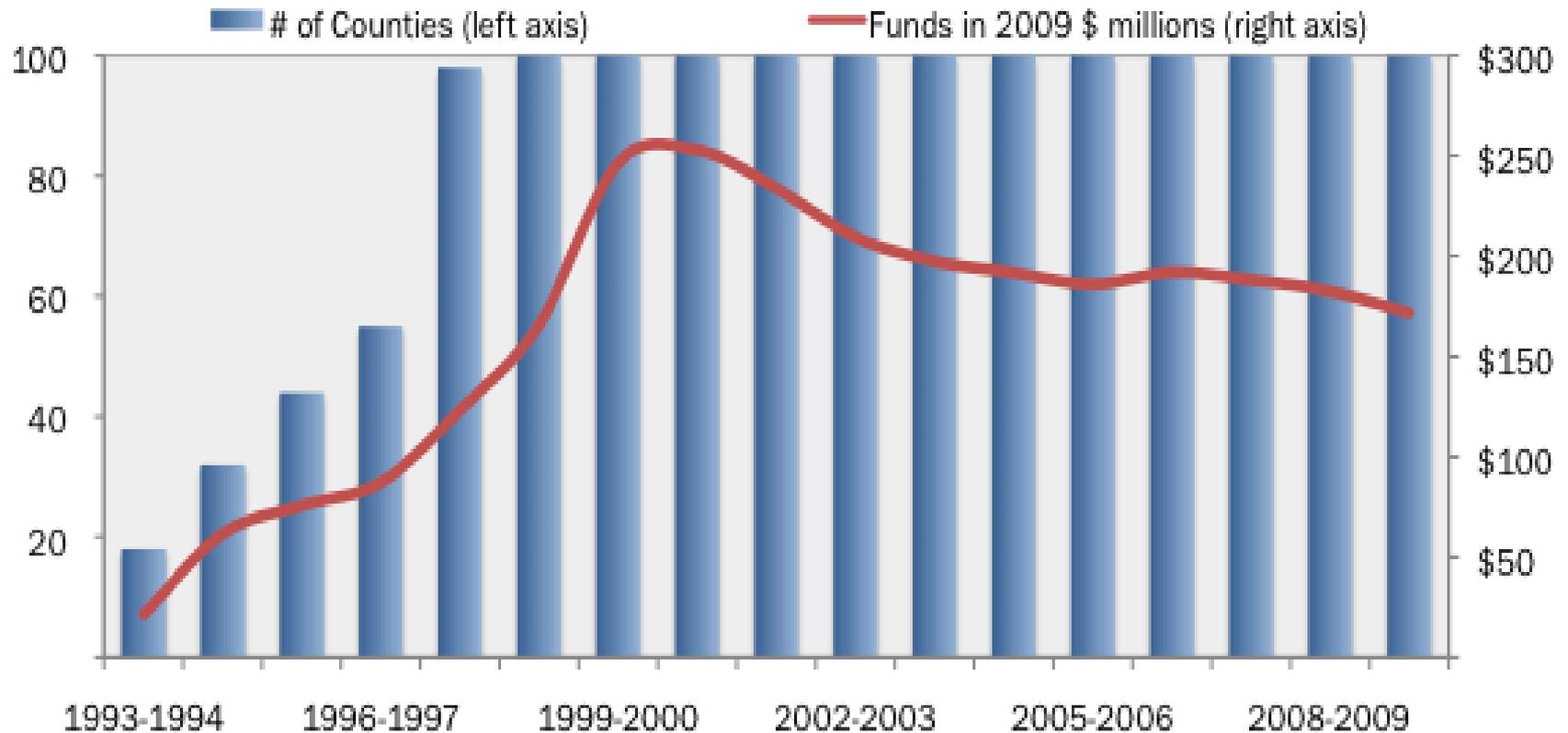
1 - Data Sources:
   (a) Yearly Smart Start Funding data provided by North Carolina Partnership for Children FY 1998-2009, NC Division of Child Development FY 1993-1997
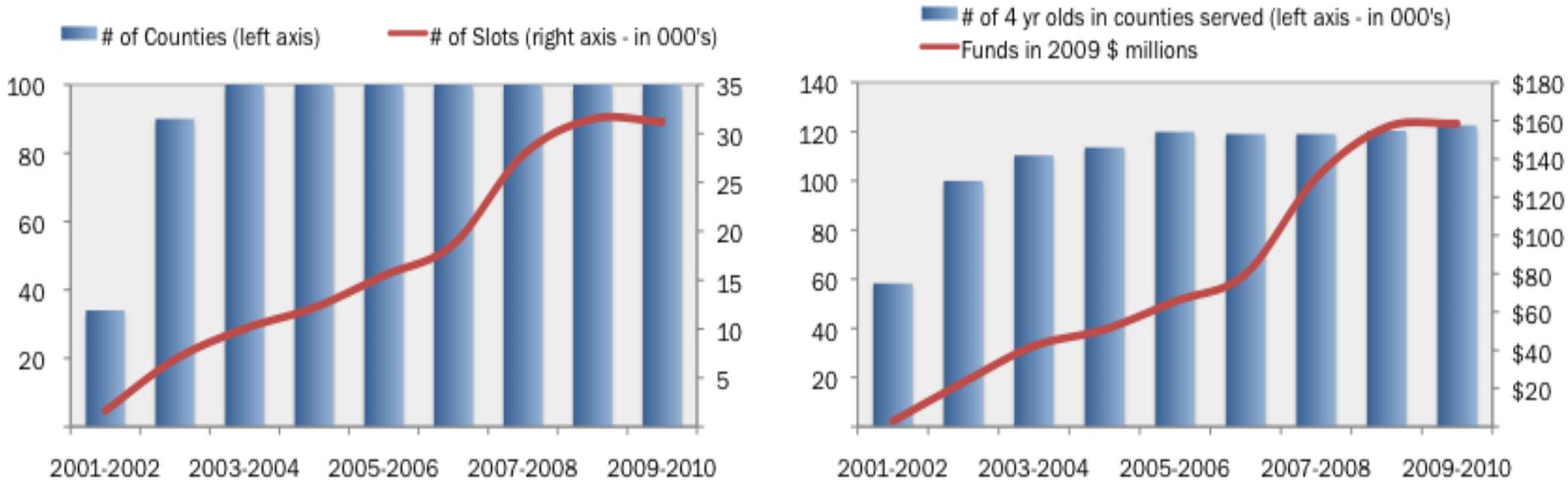   (b) Monthly CPI data provided by US Department of Labor - Bureau of Labor Statistics
2 – All $ figures are in July 2009 dollars using the CPI as of July in each year as an inflator

More at Four

- ## State funding for pre-K children aged 4
  - For classroom-based programs in various settings (includes public schools, for-profit and not-for-profit child care centers, and Head Start Programs)

- ## Targets "at-risk" 4-year olds
  - Eligibility based on poverty status and other risk factors

- ## Requires collaboration with other local groups – public schools, Smart Start office, child care providers, referral agencies

More at Four
Slots and State Funding

1 - Data Sources:
  (a) Yearly More at Four Funding and Slot Allocation data provided by North Carolina Office of Early Learning
  (b) Yearly, county-level 4 year old population estimates provided by North Carolina Office of State Budget and Management
  (c) Monthly CPI data provided by US Department of Labor - Bureau of Labor Statistics
2 – All $ figures are in July 2009 dollars using the CPI as of July in each year as an inflator
3 - 2001-2004 Funding Allocations: A proportion of the funding in any contractor's initial year is used as "start up expenses", hence, the $/slot figures may be slightly overstated in the first few years of the program.

Who is treated ?

We include all children of the appropriate age in a county when the program is available, regardless of whether a child participated directly. This strategy permits us to estimate total effects -- direct effects and spill-over effects to non-participants.

More at Four (MAF) – Must be 4 by cut-off date.

Smart Start (SS) – Any child in the 0-5 age range. Treatment is the sum of the exposure to the SS program over the age range.

Who is treated (cont.)

Ideally, we would like to include in the sample all children who have access to the program, but we lose some of them and treatment status for some is unclear.

Our strategy:

Basic sample. All children born in each county (treated and untreated) whom we can match to elementary-school data in the **same county.**

Proposed extension. Expand the sample to include all births we can match in any county – Then use two extreme assumptions: 1. in county of birth during early childhood, or 2. in county of schooling during early childhood.

Basic Model

$O_{icst} = a + bSS^* + cMF^* + d\ X_{ib} + eY_{it} + fS_{it}$
+ county fixed effects + year fixed effects + county time trends.

O_{icst} -- educational outcome of student i, in county c, in school s, in year t

SS* and MF * See next slide

X_{ib} --   characteristics of children and parents at time of birth (Time invariant)
Y_{it} --   characteristics of children in year t (e.g. race of child)
S_{it} : -- school characteristics in year t

Specification of program variables

- More at four (MF* in previous equation)

  $PMF_{ic(age=4)}$

        -- penetration of More at Four (in slots or dollars per 4 year old) in the relevant county when the ith child was four years old.

- Smart Start (SS* in previous equation)

  $\Sigma_a\ PSS_{ic(age=a)}$

        -- *summation of penetration of Smart Start (dollars per child age 0-5) in relevant county when the child was a years old, where a = 0,.. 4.*

Summary of the analytic strategy

We examine for all children who attended elementary school in the county in which they were born the average effects of the two program initiatives on school outcomes **in third grade**.

Outcomes examined to date include test scores in math and reading and the probability of being identified as a special education student.

Analytical strategy (cont.)

The programmatic effects are identified after statistically controlling for: a) individual differences among children, measured at birth (such as birth weight and maternal education; b) differences among children, measured in third grade (such as the child's race); and c) differences in the characteristics of the schools in which each child is enrolled. In addition, we include county and year fixed effects to control for differences across counties and over time, and county time trends to control for county specific improvement over time.

Background on costs

- More at Four : average costs per year per 4-year old (all 4-year olds, not just participants) is about $1250.

- Smart Start: average costs per year per child aged 0-5 are about $250. Hence, the total cost during for a single child for five years of early childhood is about $1250.

The question is whether the average benefits per child are worth these costs

Background on costs (cont.)

- North Carolina currently spends about $8500 per pupil on elementary and secondary education.

- Using national benchmarks, we estimate that North Carolina spends an additional $8500 on average per special education student per year. These students typically spend multiple years in special education, increasing costs.

Point. Reductions in special education placements generate large savings.

Major Findings to Date (3-16-11)

I. Exposure to Smart Start at current funding levels leads to:

1. higher grade-3 standardized reading test score (equivalent to about 2 months of instruction)

2. higher grade-3 standardized math test score (equivalent to about 2 months of instruction)

3. lower probability of special education placement by grade 3 (about 10 percent)

Findings – 2

II. Exposure to More At Four at current funding levels leads to:

1. higher grade-3 standardized reading test score (about 2 months of instruction)

2. higher grade-3 standardized math test score (about 2 months of instruction)

3. a somewhat bigger effect on math than on reading scores

4. lower probability of special education placement by grade (about a 10 percent reduction)

Findings – 3

III. The favorable effects for each program are independent of each other and increment each other, so that the best outcomes hold for children exposed to more of each program.

IV. The favorable effects hold for families with low maternal education AND for families with high maternal education. The effects for both initiatives are larger for families with low maternal education than for families with high maternal education.

Conclusions

I. Investments in Smart Start: The benefits in the form of higher 3rd grade test scores and lower special education costs appear to be worth at least the state investment (about $1250 total per child over the 5 years of early childhood). Other benefits not measured in this study would increase the rate of return to the state's investment.

II. Investments in More at Four: The benefits in the form of higher 3rd grade test scores and lower special education costs appear to be worth at least the state investment of about $1250 per 4 year old. Other benefits not measured in this study would increase the rate of return to the state's investment.

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Next Directions

I. Understand whether SS and MAF have favorable impact for different groups, by ethnicity, background, and other factors.

II. Estimate the impact of SS and MAF on other educational outcomes and beyond elementary school.

III. Include information on elementary school teachers in our analysis, in order to control for the possible assignment of less qualified teachers to grades K-2.

IV. Include in the analyses the information on day care quality that we have already obtained.

V. Estimate effect sizes and rates of return to investment.

VI. Understand whether children who participate directly in a program benefit most. This analysis requires information about individual-level participation.