



## Do the short-term effects of a high-quality preschool program persist?



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### ABSTRACT

We investigate the persistence of short-term effects of a high-quality school-based pre-kindergarten program in Tulsa, Oklahoma. We analyze third-grade reading and math scores for two cohorts of students eligible to participate in pre-kindergarten in 2000–2001 and 2005–2006, using boosted regression and propensity score matching to select a comparison group of local students who did not participate in the pre-K program. For the early cohort, we find no evidence of persistence of early gains. For the late cohort, we find that early gains persist through third grade in math but not reading, and for boys but not for girls. We discuss possible reasons for the pattern of findings, though our study design does not allow us to identify the causal mechanisms of persistence.

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### Introduction

State-funded preschool programs have grown dramatically over the past decade. From 2002 to 2012, state-funded pre-K program enrollment doubled, with a total of 40 states now serving more than 1.3 million children. During the same time period, Head Start program enrollment has remained relatively constant, at more than 800,000 children. Approximately 28 percent of all 4-year-olds are now enrolled in state-funded pre-K programs, and an additional 10 percent are enrolled in Head Start (Barnett, Carolan, Squires, & Brown, 2013a). President Obama called for an expansion of high-quality preschool programs to all children in his 2013 State of the Union address, and reiterated his support in the same address a year later.

Given the increasing participation in preschool programs, and the increased policy interest in expanding pre-K opportunities, the longer-term benefits to such early investments are of interest. In this paper, we examine whether the short-term effects of a high-quality state-funded preschool program in Tulsa, Oklahoma, operated at scale, persist over time. For two cohorts of children, we examine whether test score differences between children who participated in public pre-K and a comparable group of local children who did not participate are still evident by the end of third grade. Previous research has shown large short-term gains

(at kindergarten entry) in pre-reading, pre-writing, and pre-math skills for three different cohorts of students who participated in Tulsa's school-based pre-K program (Gormley & Gayer, 2005; Gormley, Gayer, Phillips, & Dawson, 2005; Gormley, Phillips, & Gayer, 2008). A statewide study of the Oklahoma pre-K program, using fall 2004 test scores, found statistically significant effects on literacy (the PPVT) but not for math (Wong, Cook, Barnett, & Jung, 2008).

Understanding whether short-term gains of early childhood programs persist, or whether they fade out over time, is of considerable interest to policymakers, educators, and parents who make decisions about funding and placement. Effects of any particular intervention might fade out over time if learning rates stagnate or decline for students who participated in pre-K, if investments are made for students who did not participate that enable them to catch up to participants, or if students forget the material they learn or skills they develop (Jacob, Lefgren, & Sims, 2010). Fade out effects might be observed as well if measurements are not appropriate or robust in a particular year or over time.

Three main factors suggest that effects of a mature, high-quality pre-K program operated at scale are likely to persist. First, the brain's early wiring is critically important to its later development (Shonkoff & Phillips, 2000). Language and other basic skills are more easily acquired at a younger age, and advanced skills can more readily be acquired with a strong foundation in basic skills. In short, "learning begets learning, skill begets skill" (Heckman, 2000, p. 50).

A second, related, reason to expect persistence of effects for a high-quality preschool program is that kindergarten and early elementary teachers may respond to the increasing number of students who have been exposed to preschool education by increasing

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the intensity or level of instruction. Kindergarten pedagogy has become more rigorous in recent years (Bassok & Rorem, 2012). Combined with gains in cognitive development, children who participated in preschool may reinforce their learning gains in these more challenging environments. Indeed, Claessens, Engel, and Curran (2014) find higher kindergarten performance on math and reading assessments for all students (regardless of their experiences prior to kindergarten) in classrooms where they were exposed to relatively more advanced content as compared to more basic content.

A third reason to expect persistence is that participation in high-quality pre-K programs is associated with positive social-emotional outcomes, including character building, higher attentiveness, and stronger executive functioning skills (Gormley, Phillips, Newman, Welti, & Adelstein, 2011; Heckman & Kautz, 2013; Weiland & Yoshikawa, 2013). These socio-emotional effects may prove important in elementary school as children define their personal identities, and later on as they choose between high-risk and low-risk behaviors.

Yet at least three factors might explain why pre-K program effects could fade out. First, early elementary teachers may not have adapted the level of instruction to reflect the growing presence of students who experienced high quality pre-K. Kindergarten teachers often emphasize basic counting and shapes when teaching math, even though former pre-K participants (and other children) have already mastered such skills (Engel, Claessens, & Finch, 2013). In such an environment, early gains might dissipate if students do not have opportunities to build on their earlier skills and knowledge.

A second reason that fade-out might occur relates to compensatory investments. Remedial and additional supportive services for lower-performing children can lessen the longer-term gains of early childhood interventions if these supportive services differentially benefit children who did not participate in Tulsa pre-K. While preschool enrollments have been growing in recent years, remedial and supportive services for children have grown as well for children in special education (through the Education for All Handicapped Children Act of 1975 and subsequent legislation) and for children enrolled in after-school services (through the Child Care and Development Block Grant and other programs).

Third, short-term effects of a high-quality preschool program may fade over time if lack of parental investments and other family factors offset or fail to reinforce early gains (Todd & Wolpin, 2003). Poorer outcomes are associated with being in poverty (Duncan & Brooks-Gunn, 1997), living in a single-parent home (McLanahan & Percheski, 2008), having low birthweight (Currie & Hyson, 1999), and having poorly educated parents (Magnuson, 2007). Other factors, such as a rise in the percentage of households where English is not the primary language, make it less likely that educational programs at school will be reinforced at home, perhaps eroding gains in student achievement.

In this paper, we first summarize findings on persistence of effects from other studies of early childhood education programs, in particular those from demonstration projects, Head Start, and preschool programs. Next, we describe the data and methods we use to estimate reading and math test score effects by the end of third grade for two cohorts of children who could have participated in public pre-K in Tulsa, Oklahoma. After presenting the results, we offer further interpretation of our findings.

### Demonstration projects

Two random assignment studies in particular have shown the potential of high-quality early childhood education programs to improve long-term outcomes for economically disadvantaged

children. Both were targeted programs that focused on a small number of children born in the 1960s and 1970s. The Perry Preschool Study randomly assigned 123 economically disadvantaged black children in Ypsilanti, Michigan either to a two-year high-quality preschool program (the treatment) or to a control group. Researchers tracked both treatment and control group subjects through age 40. Perry participants had higher achievement test scores and homework completion rates in their middle teen years; higher high school graduation rates; higher employment rates in their late twenties, and lower arrest rates and higher earnings at age 40 (Schweinhart et al., 2005). Heckman, Moon, Pinto, Savellyev, and Yavitz (2010) estimate the program's benefit–cost ratio, using a 3 percent discount rate, to be 7.1–12.2 (see Barnett & Masse, 2007, for a higher estimate).

The Carolina Abecedarian Project was a random assignment study of 111 mostly black economically disadvantaged children in Chapel Hill, NC. Born between 1972 and 1977, children in the treatment group received high-quality care from infancy through preschool. In addition to testing in kindergarten and the early elementary school years, follow-ups were conducted at ages 12, 15, 21, and 30. Higher scores on reading and math achievement test scores for treatment group children surfaced early and persisted over time (Campbell, Pungello, Miller-Johnson, Burchinal, & Ramey, 2001). Treatment group members were more likely to graduate from a four-year college or university, more likely to have full-time jobs, and less likely to be on welfare than control group members (Campbell et al., 2012). On the other hand, no differences in criminal activity, self-reported substance abuse, or adult earnings were found. Barnett and Masse (2007) estimate a benefit–cost ratio for society, using a 3 percent discount rate, to be 2.5. Both the Perry and Abecedarian Projects were targeted, intensive programs that served a small number of children. In contrast, the pre-K program we analyze is offered to all children in a public school setting.

### Head Start

Head Start, a federally funded program begun in 1965, provides a comprehensive set of services including education, health, nutrition, and parent involvement to children and families with low incomes. An early, much-criticized study found early fade-out of Head Start's effects, with no differences in third grade (Westinghouse Learning Corporation & Ohio University, 1969). More recently, Currie and colleagues compared children who participated in Head Start with brothers and sisters who did not. White and Hispanic Head Start program participants scored higher than their sibling nonparticipants on standardized verbal and reading achievement tests, both immediately and as their schooling progressed (Currie & Thomas, 1995, 1999; Garces, Thomas, & Currie, 2002). Hispanic participants were much less likely to repeat a grade, and white participants were much more likely to graduate from high school. For black participants, test score effects faded out over time, but arrest rates and booking rates for crime were lower for participants than nonparticipants. Deming (2009) also uses sibling comparisons, finding overall test scores gains at ages 5–6 of about 0.15 standard deviation, fading to 0.05 standard deviation (though not statistically significant) by the early teen years; yet longer-term effects on a scale of early adult outcomes were estimated to be 0.23 standard deviation. Ludwig and Miller (2007) used a regression discontinuity design to compare health outcomes for students who lived in counties where the county just qualified (based on aggregate poverty rates) for grant-writing assistance for Head Start, with those for students in counties that just missed the cutoff. They found substantial reductions in mortality for children aged 5–9 in the Head Start assistance counties compared to those not in the assistance counties. They also found suggestive evidence of positive

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