The Behavioral Consequences of Pre-kindergarten Participation for Disadvantaged Youth

David Figlio, Department of Economics, University of Florida and NBER
Jeffrey Roth, Department of Pediatrics, University of Florida

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This paper investigates the effects of public pre-kindergarten participation on the subsequent behavioral outcomes of disadvantaged youth. We utilize a unique longitudinal dataset that links student birth records to pre-kindergarten participation for every child born in Florida in or after 1994 who subsequently attended public school in Florida. Because pre-kindergarten participation is endogenous, we employ a novel identification strategy to estimate the effects of pre-kindergarten participation by comparing siblings within the same family. We demonstrate that, within a family, the sibling with easier access to public pre-kindergarten – measured by the fact that his or her locally-zoned elementary school offers a pre-kindergarten program when he or she is four years old – is considerably more likely to attend, and use this differential access within a family as an instrument to predict public pre-kindergarten attendance.

The vast majority of the economics literature on the efficacy of pre-kindergarten has concentrated on academic outcomes. This topic has been studied extensively with regard to school readiness and student cognitive performance, with mixed evidence to date. The most compelling of these studies exploit cross-sibling comparisons (Currie and Thomas, 2000; Garces et al., 2002) and regression-discontinuity designs that take advantage of discontinuities in Head Start funding (Ludwig and Miller, 2007). These studies find general evidence that Head Start participation has long-term benefits in terms of schooling outcomes.

But from the inception of federal support to extend educational opportunity to 3- and 4-year-old low-income children, there has been a consistent dual emphasis on cognitive and social development. To the planners of Head Start in 1964, preparing disadvantaged youth to succeed in school required a "whole child" approach, one in

which not only academic knowledge but also behavioral competence would be emphasized (Zigler and Styfco, 2004). In addition to Head Start, the federal government also began to aid state efforts to provide local community-sponsored preschools through the mechanism of the Child Care and Development Block Grant program. This flow-through program subsidized child care programs whose quality standards were allowed to vary a great deal more than Head Start's. To supporters of Head Start, these state-subsidized early childhood programs "do not pretend to have anything to do with school readiness. They are essentially custodial programs whose only purpose is to enable poor parents to enter the work force" (Zigler and Styfco, 2004, p. 53).

This issue—that preschool separates parents from children during crucial years of their development as a result of either an elective or required return to the workforce — remains at the heart of the debate over its potentially zero-sum benefit/harm ratio: disadvantaged children may receive sufficient academic stimulation to compensate for missing or insufficient parental instruction yet this cognitive benefit may be offset by two negatives: (1) low income children congregate in poor quality child care settings where unfamiliarity with appropriate social interaction is mutually reinforced; and (2) initiation into socially acceptable norms of behavior is conducted not consistently by family members but intermittently by a stranger. The preferred alternative outcome of preschool for disadvantaged youth is that it teaches school acculturation behavior in ways that improve student academic and behavioral outcomes once at school.

Research suggesting the possibly negative impact of preschool participation on children's subsequent elementary school behavior is embedded in the larger debate about the psychological consequences of children of any income level being separated from

their parents in the first years of life. In the early 1980s educational psychologists began employing attachment theory (Bowlby, 1973; Ainsworth, 1978) in their study of increasing numbers of infants and toddlers being placed in public or private child care as a result of mothers rapidly returning to the workforce. Attachment theory posited that for humans to become trusting and caring individuals they must, as infants, bond with their mothers in the first year of life. The theory predicted that disruption of this attachment process (primarily to a nurturant female) would result in a child who is unable to develop self control or form stable relationships. Jay Belsky was one of the first educational psychologists to claim to have found evidence confirming this prediction. Staring in the mid 1980s, Belsky issued a series of warnings (1986, 1988, 1990) that "early and extensive nonmaternal care carried risks in terms of increasing the probability of insecure infant-parent attachment relationships and promoting aggression and noncompliance during the toddler, preschool, and early primary school years" (Belsky, 2002). The research that Belsky cited was criticized on the grounds that it did not take into account the quality of the childcare setting or the background characteristics of the children.

The decade of the 1990s saw a two-prong response to anxiety among both poor and non-poor families that leaving their infants and toddlers in a group child care setting might promote adverse behavioral outcomes such as non-compliance and aggression. In the legislative arena, the National School Readiness Task Force issued a report in 1991 affirming that school readiness involved not only academic knowledge but also social competence. In 1994, Congress set school readiness to be first among the nation's eight education goals. By the year 2000, all children would have access to high-quality,

developmentally appropriate preschool programs and would arrive at school able to "to maintain the mental alertness necessary" to learn (P.L. 103-227).

In the research arena, the National Institute of Child Heath and Human Development commissioned a multi-center study of early child care and youth development. Since 1993, the NICHD Early Child Care Research Network has produced over 60 publications, many of which reach conflicting conclusions about the relationship between early childcare and socio-emotional development. Since the early 1990s, a great deal of research has been conducted on short- and long-run effects of children's early preschool experiences. Given that early childhood education represents a nexus of psychological theory, employment exigency, and cultural transmission, it is not surprising that findings in this body of research using nationally representative samples are decidedly mixed:

- The National Institute of Child Health and Development [NICHD] Study of Early Child Care and Youth Development (1998a) found no difference in problem behavior during the first three years among children reared exclusively at home and those who spent more than 30 hours per week in non parental care.
- The NICHD Study of Early Child Care and Youth Development (1998b) found that mothering was a stronger and more consistent predictor of child outcomes than child care. There was little evidence that early, extensive, and continuous care was related to problematic child behavior. Child-care quality was the most consistent predictor of child functioning.
- The NICHD Study of Early Child Care and Youth Development (2001) found that when quality and quantity of child care were controlled, the association between

family factors and children's social-emotional development remained significant, thereby affirming that parents continue to have a meaningful effect on children's behavior despite considerable child care experience in the earliest years.

- The NICHD Study of Early Child Care and Youth Development (2003) found that children spending longer hours or more months in center care each year exhibit elevated levels of aggression and less effective impulse control.
- The national evaluation of Early Head Start (Love et al., 2005) found that children randomly assigned to the program (compared to a control group that could access any community service except Early Head Start) showed fewer problem behaviors and lower levels of aggressive behavior at 24 and 36 months. No evidence was found that more time in child care was associated with higher rates of aggressive behavior.
- First year findings from *The Head Start Impact Study* (U.S. Department of Health and Human Services, 2005) reported effect sizes of -0.13 for total behavior problems and -0.16 for hyperactivity as reported by parents whose children were randomly assigned to Head Start. Control group could enroll in available community non-Head Start services.
- Summarizing effect sizes, The NICHD Study of Early Child Care and Youth Development (2006) concluded that more child-care hours predicted more behavior problems and conflict, according to care providers.
- Using Early Childhood Longitudinal Study data, Loeb et al. (2007) found that center-based care had a negative effect on socio-behavioral measures (with the exception of English proficient Hispanic children). Across the family income

distribution, the younger the start age, the larger the negative effect. Intensity effects (more hours per day lead to more kindergarten teacher-report behavioral effects—measures of self control, interpersonal skills, and externalizing behavior) are moderated by family income and race.

- Also using Early Childhood Longitudinal Study, Magnuson et al. (2007) found that participation in pre-kindergarten was associated with higher levels of behavior problems noted in the spring of first grade. This adverse relationship was somewhat attenuated for public school-located pre-kindergarten, particularly for students who continued to kindergarten in the same public school where they attended pre-kindergarten.

Parallel to the legislative and research activity at the national level, the decade of the 90s saw states acting to extend pre-kindergarten into their K-20 educational framework. In Florida as in other states, this downward extension of public schooling to include three and four year olds was partly to accommodate provisions of the Individuals with Disabilities Education Act (PL 99-457). Since disproportionate numbers of incoming low-income children were classified early in elementary school with special education exceptionalities such as speech and language impairment or emotional handicap, it was considered a worthwhile investment to provide these services in the context of a pre-kindergarten early invention program (PKEI). The subsequent history of Florida's PKEI program lies outside the school of this paper. Suffice it to say that after our data collection period ended (2003), the program was first transferred out of the Department of Education to the quasi public-quasi private Partnership for School Readiness housed directly inside the Governor's Office. It has since been transferred to

the Agency for Workforce Innovation, lending partial support to Zigler and Styfco's contention that the mission of many state-supported preschool programs is primarily to serve as daycare for mothers on welfare who are required to enter the workforce.[1]

So far we have been focusing on potentially negative behavioral consequences of preschool participation. To look at the glass half-full, considerable evidence has been accumulated that "emotional development and academic learning are far more closely intertwined in the early years. . . . Across a range of studies, the emotional, social, and behavioral competence of young children (such as higher levels of self-control and lower levels of acting out) predict their academic performance in first grade, over and above their cognitive skills and family backgrounds" (Raver and Knitzer, 2002, p. 3). The collocation of academic knowledge and self regulation in the brain is the basis for both conceptual and empirical support in favor of preschool education. To life-span economists such as James Heckman, estimated rates of return to investment in preschool programs far exceed their opportunity costs. This ROI is due in part because younger persons have a longer horizon over which to recoup the fruits of their investments. In Heckman's human capital model (2000), non-cognitive skills and informal learning play important roles in lifetime earnings (see also Heckman, 2006; Heckman and Rubinstein, 2001; Heckman, Stixrud and Urzua, 2006). Most long-run studies that find support for investment in high quality early childhood programs (e.g., High/Scope Perry Preschool, Carolina Abecedarian Project, Chicago Child-Parent Centers) do not make the economic case that disadvantaged program participants caught up to earning levels of more advantaged age peers but rather that society saved money through lower rates of anti-

[1] Cascio (2006) shows that mothers entered the workforce as a result of increased availability of state subsidized kindergarten.

social, cost-positive behavior such as juvenile arrest, welfare dependency, and adult incarceration (Schweinhart et al. 2005; Campbell et al. 2002; Reynolds et al, 2002). Indeed, Belfield et al. (2006) argue that the long-term effects on crime account for a very large share of the dollar-value benefits of the Perry Preschool treatment. On the other hand, Duncan et al. (2006), utilizing data from six longitudinal data sets in the United States, Canada and the United Kingdom, found very limited evidence that self-regulation skills at kindergarten had lasting import for long-term academic and behavioral success.

In the opening years of the present accountability-driven decade, early childhood programs were not spared the press to quantify effects of participation. Head Start adopted a Child Outcomes Framework, and commissioned an impact study as did Early Head Start, both involving random assignment. Some state pre-kindergarten programs were evaluated on the basis of their graduates' performance in elementary school. It has become commonplace to find multilevel and growth curve models being used to investigate the relationship between treatment and proficiency. Calls for "analytical strategies aimed at explaining interindividual differences in intraindividual change" proliferate (Granger and Kivilighan, 2003; Kaplan, 2002). Adding to the need to be able to demonstrate value added results, the lingering controversy over possible detrimental behavioral effects of early non-maternal, collective care has galvanized efforts to better measure and treat mental illness in children (Currie and Stabile, this volume).

In the forty years since the US launched a nationwide program to extend equal opportunity to disadvantaged 3- and 4- year-olds, the mandate to provide instruction in both the cognitive and socio-emotional domains has become subject to increased specificity. In Head Start's performance appraisal goals for 2007, "identifying behavioral

problems in pre-school children" is listed as a specific performance measure (DHHS/ACF/OHS, 2007). A history of difficulty in adhering to the behavioral norms expected by schools is frequently used to explain students' poor academic performance (sometimes culminating in their exclusion from the testing pool). Thus, the burden on public pre-kindergarten programs to initiate students into socially acceptable forms of interaction has never been higher. Our study examines whether children who attended public school pre-kindergarten in Florida acquired a better grasp of socially acceptable behavior than their 4-year-old peers who attended either a non-public preschool or no preschool at all.

Contributions

This analysis makes several key advances over the existing literature. First, this is the first large-scale study to utilize administrative data on pre-kindergarten participation. This has the advantage of size: We observe the entire population of income-eligible students in the state of Florida born in or after 1989. Using administrative data also eliminates the potential for recall bias in measuring program participation; any student who participated in a public Head Start or school-based pre-kindergarten program in the state of Florida is observed in our data. Also, because we have matched child birth records, school-based pre-kindergarten participation records, and subsequent school behavior records for the entire state of Florida, we can rely on administratively-observed background factors and behavioral problems. (We measure behavioral problems by whether the child is referred for disciplinary action by their teachers.) Furthermore, our

matching of birth vital records with school records allows us to compare within families, a strategy shared by Garces et al. (2002).

Second, the use of population-based data allow us to stratify the estimated effects of pre-kindergarten participation in a number of different ways. With tens of thousands of income-eligible families with multiple children, we can estimate with confidence the differential effects of pre-kindergarten participation within families along a variety of dimensions, including birth conditions, maternal age and education.

Third, and most importantly, this analysis introduces a novel identification strategy. In addition to within-family comparisons, we exploit the fact that local policy conditions outside of the control of specific families generate different effective prices of attending public pre-kindergarten for different siblings. Whereas all students who meet certain family income or health criteria are eligible for public pre-kindergarten participation, not all students have the same ease of access. For around 60 percent of income-eligible Florida students, the student's local zoned elementary school does not offer a public pre-kindergarten program. These students must in turn attend a pre-kindergarten site farther from their home, and perhaps without public transportation.

We argue that the presence of a pre-kindergarten program in the zoned elementary school should promote public pre-kindergarten participation for several reasons. One major reason is informational: Parents are more likely to be aware of pre-kindergarten options when they have a child who attends a school that offers such a program, or when their neighbors have children who attend such a school. But transportation costs may also be a factor, even in cases when transportation to preschool is provided. This may be true for several reasons. Parents may not wish for their young children to be bused long

distances, especially if they are alone. And it may be easier for parents to send their young children on a bus if they are accompanied by an older sibling or older neighbor whom the child knows; these are more likely to be the case if the pre-kindergarten is attached to the local zoned school. For all of these reasons, we suspect that it is the public school zone, rather than crow's flight distance, that matters most in determining whether children attend public pre-kindergarten programs.

We demonstrate that income-eligible students are highly responsive to the presence of a pre-kindergarten program at their zoned elementary school. Families with a pre-kindergarten program at their zoned elementary school are more than 60 percent more likely to send their children to a public pre-kindergarten program than are families without a pre-kindergarten program at their zoned school. And this pattern holds up within families as well: Around 40 percent of families live in elementary school zones with a public pre-kindergarten program when one sibling is four but not when another sibling is four. This happens either because the family changes residence, because the zoning lines are redrawn, because a school with a pre-kindergarten program dropped it, or because a school without a pre-kindergarten program added it. Regardless, within the same family, the sibling whose zoned elementary school has a pre-kindergarten program is 60 percent more likely to attend than the sibling without such a program at the zoned school. This is true when we exclude families who move, and look only at families with different access to public pre-kindergarten because of exogenous changes in local school policy.

Raw unadjusted relationship between pre-kindergarten and disciplinary problems

Table 1 presents some basic facts about the rates of disciplinary problems in the first three years of school. Here and throughout the analysis, we restrict our attention to students who are income-eligible at the time of potential enrollment in pre-kindergarten. We do not actually measure income eligibility with certainty; to be income-eligible, a family must have income below 100 percent of the poverty line. However, we only observe free lunch eligibility – less than 130 percent of the poverty line. We therefore restrict our analysis to the set of families where all students are consistently observed being eligible for free lunch in every potential time period – about 60 percent of the students who are free lunch eligible at any given time. We hope that this more restrictive measure of income eligibility will nearly approximate the true eligible population. Our analysis sample consists of 59,418 children in 29,087 families where all students in the family are consistently observed to be free lunch eligible.

Note also that we cannot observe private pre-kindergarten (or private Head Start) participation, and therefore are comparing public pre-kindergarten attendees with all other income-eligible students. Later in this paper, we attempt to draw some potential inferences from the fact that some communities have private Head Start programs and others do not.

One observes that students who attended public pre-kindergarten have slightly higher rates of disciplinary problems than students who did not attend public pre-kindergarten in their early years of school. One further observes that the same patterns hold up within families. The finding in the raw data that public pre-kindergarten attendees are slightly more likely than non-attendees to have later discipline problems in

the early grades could indicate that public pre-kindergarten is either ineffective in terms of engendering positive behavior or perhaps promotes non-compliant, acting-out behavior. But it could also indicate that students, even within a family, are negatively selected into public pre-kindergarten programs: The siblings most in need of socialization may be the ones that families choose to send to pre-kindergarten, while those who are reasonably well-socialized might not be sent. It could also be the case that families are transitioning in a manner that is unobservable to the researcher. The potential presence of endogeneity bias indicates the necessity of conducting instrumental variables regression.

Evidence of instrument relevance

As mentioned above, our instrumental variable is the presence of a public pre-kindergarten program in the public elementary school for which the student would be zoned at the time that he or she is four years old. Table 2 demonstrates that, in cross section, income-eligible children are much more likely to attend public pre-kindergarten when they have more direct access to it. Even though all students in our data set are eligible for public pre-kindergarten, typically with free transportation, the presence of a public pre-kindergarten program housed locally, in the same elementary school where older siblings and neighbors already attend, appears to have a powerful effect on public pre-kindergarten take-up. Comparing zip codes without private Head Start options, nearly 55 percent of income-eligible students attend public pre-kindergarten when the local zoned school offers pre-kindergarten, while only 26 percent attend public pre-kindergarten when this is not the case. Note also that while the presence of a private

Head Start program in the zip code area slightly reduces the likelihood that a child will attend a public pre-kindergarten program (53 percent when the zoned school offers pre-kindergarten, and 22 percent when it does not), it is clear that the overwhelming determinant of public pre-kindergarten entry is not the private Head Start option, but easier public pre-kindergarten access.

But Table 2 also makes clear that a cross-sectional analysis of participation, using geographic location as an instrument, is not appropriate. This table provides basic descriptive information, culled from the full set of students whose birth records and school records are matched in Florida, on the family attributes of students across geographic locations with differing levels of access to public pre-kindergarten and private Head Start programs. Comparing across the columns, one observes that the school zones where public pre-kindergarten is locally offered tend to be poorer (in terms of a higher percentage "eligible" for publicly-funded pre-kindergarten[2]), with larger fractions black and Hispanic, more mothers who are not high school graduates, and fewer married parents than are the school zones where public pre-kindergarten is not locally offered. Private Head Start programs tend to operate in zip code areas that are poorer still, with even higher eligibility rates, more black families (though not Hispanic families) and lower rates of parental marriage and maternal high school graduation. The same patterns hold whether one looks at the attributes of the entire population of families in the school zone or whether one looks only at the attributes of income-eligible families in the school zone.

[2] We put the word "eligible" in quotation marks because we do not observe eligibility per se. We estimate eligibility based on the student's family's history with free lunch eligibility in the school. We are likely understating the true rate of eligibility in Florida, but this understatement does not seem important for this comparison or for the empirical analysis that follows.

Clearly, families residing in these different types of geographical locations differ in many measured and unmeasured aspects that are independent of whether they attend public pre-kindergarten, and in fact, it makes sense that public pre-kindergarten programs (and private Head Start programs) would tend to locate in communities where the need for these programs is greatest. This cross-sectional heterogeneity necessitates the use of a fixed effects model that compares outcomes across students who are considerably more similar in terms of unmeasured characteristics. For that, we turn to a within-family comparison.

In order to compare within-families, it must be the case that siblings' public pre-kindergarten take-up varies within a family based on differences in local access to pre-kindergarten. Table 3 shows that many students without a public pre-kindergarten program immediately available still go to pre-kindergarten, but the probability of attending increases dramatically if the zoned school has a program.[3] Among families where the zoned school offered a pre-kindergarten program to all siblings observed in the data, 56 percent of income-eligible students attended public pre-kindergarten. On the other hand, among families for whom the zoned elementary school never offered pre-kindergarten just 35 percent of income-eligible students attended pre-kindergarten. Table 4 shows again that families in the three groups presented in Table 3 are very different, further underscoring the importance of conducting within-family comparisons.

[3] Note that the public pre-kindergarten attendance rate is somewhat higher in the first row of Table 3 than in the last two columns of Table 2. This is due to differences in sample between the two tables. In Table 2, all families, including those with just one child observed, are included, while in Table 3, only families with two or more children observed are included. In addition, these sibling comparisons tend to be for more disadvantaged families (or families who are more consistently disadvantaged) than the potentially eligible population as a whole.

Table 5 presents within-family information on public pre-kindergarten take-up, by access levels. For the 12,107 "mixed" families, the sibling with the easier access to public pre-kindergarten attended these programs 52 percent of the time, while the sibling without such access attended these programs 33 percent of the time. These same differences are apparent when we compare within families of different types, stratified by maternal education, maternal age, and race. This evidence indicates that our instrumental variables strategy has a very strong and consistent (across subgroups) first stage.

Regression estimates

Table 6 presents regression analysis of the estimated effects of attending public pre-kindergarten on the probability of being disciplined. Each cell in the table represents a different regression specification; the columns reflect different years in school. (Typically a student in "year 2" would be in first grade, but we chose to treat kindergarten repeaters and "natural" first graders the same way.) The regression results presented in Table 6 include controls for school fixed effects, as well as for student race, sex, free/reduced price lunch status (though in practice, all students will show up as free lunch eligible), maternal age at birth, maternal education at birth, maternal marital status, Medicaid status at birth, prenatal care, complications of labor and delivery, and indicators for whether the student's birth weight is less than 1000g, 1000-1500g, 1500-2500g, or >2500 g (extremely low, very low, moderately low, or normal birth weight) . The school fixed effect controls are important because schools may vary systematically in how they dispense and report discipline. As can be seen in the first row of Table 6, one observes no apparent cross-sectional relationship between public pre-kindergarten participation

and disciplinary problems in the first three years of school. The second row of the table presents the same analysis but with family fixed effects. The (non-)results remain robust; while there exist some sign changes between years, the magnitudes of the point estimates are trivial.

The third row of Table 6 presents the instrumental variables regression results. As can be seen, there exists a negative and sizeable estimated effect of pre-kindergarten participation and behavioral problems in the first two years of school, and the estimated effect is no longer statistically significant in the third year of school. This evidence suggests that students who participated in public pre-kindergarten programs are less likely to be referred for disciplinary problems later than are non-participants. This result is at odds with much of the existing cross-sectional literature that demonstrates a positive relationship between pre-kindergarten participation and subsequent misbehavior.

However, there is reason to be skeptical of this finding. Our sample of within-family access changers consists of families who moved, families who did not move but who were rezoned from one school to another, where one school offers a pre-kindergarten program and the other does not, and families who did not move and were not rezoned, but the zoned school changed its pre-kindergarten offerings between siblings. The second source of variation – rezonings – is arguably the most exogenous source of variation, but fewer than one percent of these families changed access status as a consequence of rezoning. However, 45 percent of families did not move and were not rezoned, but had their access status change when their zoned elementary school either added or dropped its pre-kindergarten program. These students provide more plausible variation, and the last row of Table 6 restricts the analysis to this set of students. We

observe similar findings when we exclude students who changed access status because they changed residences, suggesting that endogenous location choice is not driving our within-family estimates.

Is this evidence of a short-term benefit only of public pre-kindergarten participation? It may be the case that the absence of behavioral problems in the first two years of schooling puts a child on a different trajectory. Table 7 shows that students who had behavioral problems in kindergarten were much more likely to be classified as emotionally disabled or severely emotionally disturbed later on. And Table 8 also presents instrumental variables regression analysis to show that public pre-kindergarten participation reduces the likelihood that a student, all else equal, will be classified as emotionally disabled in year 2 or year 3 of school. And in fact, we observe this even when we control also for a student's actual observed behavior. This finding suggests that public pre-kindergarten participation not only appears to reduce the degree of problem behavior, relative to the alternative of private preschool or no preschool for disadvantaged youth, but it also seems to further reduce the likelihood of later classification into special education classes for students with serious social-emotional handicaps – above and beyond the degree of behavioral problems observed.

Falsification exercise

Especially given the fact that the estimated effects of public pre-kindergarten are considerably different depending on whether or not we instrument for pre-kindergarten participation, one might be concerned that our instrumental variables findings are being driven by the identification strategy employed. We therefore propose a falsification

exercise, in which we utilize an indicator for low birth weight (i.e., less than 2500 grams at birth) as our replacement dependent variable. Pre-kindergarten participation cannot influence low birth weight, but an unmeasured third variable (e.g., exposure to an environmental toxin) could be associated with birth weight, pre-kindergarten participation and behavioral outcomes. Medical research indicates that low birth weight infants have a higher incidence of behavioral problems, so this could be seen as a strong falsification test in the event of a finding of zero effect. Therefore, in Table 9 we conduct this falsification test. Because birth weight is a covariate in our regular regression models, we estimate this model without any covariates except for school and family fixed effects. In order to compare apples to apples, we also repeat our instrumental variables regression with discipline as a dependent variable to make certain that differential treatment of covariates is not responsible for the differences in results. We conduct these tests both for the full sample of families and for the set of families where all observed children were zoned for the same school.

We observe that the results are quite similar with regard to discipline as a dependent variable, regardless of whether or not we include the covariates in the model. There remains the general pattern of a negative relationship between pre-kindergarten participation and discipline in the first two years of school, with less evidence of a relationship in the third year. In the falsification exercise, however, there is no evidence of a relationship between low birth weight and pre-kindergarten participation in our instrumental variables models, providing further support for our instrumental variables identification strategy. Indeed, given the positive correlation between low birth weight

and behavioral problems, the positive insignificant coefficient in the low birth weight specification is reassuring.

Availability of private Head Start options

Our administrative data set observes only children who participate in pre-kindergarten and Head Start programs located in public schools, but as mentioned above, income- eligible students have private Head Start options as well. Ideally, we would have administrative data on all Head Start and pre-kindergarten participants, regardless of whether they attended public or private facilities, but these data are unavailable in a form that can be matched to birth records and subsequent school records. Therefore, we are limited in our analysis to compare public pre-kindergarten participants to all other income-eligible children – both those who did not participate in preschool and those who attended a private Head Start facility. Evidence of a negative relationship between public pre-kindergarten participation and behavioral problems, therefore, could be either upward or downward-biased, depending on the quality of private Head Start facilities.

While we cannot directly observe private Head Start participation, we can stratify communities on the basis of differential ease of participating in private Head Start. We matched all private Head Start facilities to students at the zip code level, and found that 52 percent of students whose zoned elementary school has a public pre-kindergarten program also have a private Head Start facility in their zip code, while 45 percent of students whose zoned elementary school does not have a public pre-kindergarten program also have a private Head Start facility in their zip code. Twenty-three percent of income eligible students have a private Head Start facility in their zip code as well as

have a zoned elementary school with a public pre-kindergarten program, while 32 percent of income eligible students have neither a local private facility nor a public program in their zoned elementary school.

In Table 10 we stratify our estimated effects of public pre-kindergarten programs into those for students in zip codes with and without private Head Start facilities. We observe a striking pattern: The estimated effect of public pre-kindergarten participation in neighborhoods without a local private Head Start option (where, presumably, students are less likely to be participating in private Head Start programs) is consistently less negative (and is actually positive and statistically significant in the third year of school) than is the case when a private Head Start facility is available nearby. These results indicate that in the situations where students are relatively unlikely to attend private Head Start (and therefore, that the estimated effect of public pre-kindergarten can more comfortably be viewed as a comparison with no preschool) there is little evidence of a reduction in disciplinary problems, and if anything, by the third year of school, there is evidence of an increase in disciplinary problems associated with public pre-kindergarten participation.

However, when the comparison group is more likely to be a hybrid of no preschool and private Head Start facilities, the negative, significant (and consistent through year three) estimated effect of public pre-kindergarten returns. There are a number of potential explanations for this finding: One is that private Head Start participation is strongly associated with later behavior problems in school, while another explanation is that the presence of private Head Start programs puts competitive pressure on public pre-kindergarten programs to be higher quality. A third possibility is that private Head Start programs may be uptaking worse-behaving children as well, which

could be the case if public pre-kindergarten programs enforce higher behavior standards. It is impossible to know which of these explanations might be at play here.

Of course, another possible explanation is that zip codes with private Head Start facilities are simply different. There exists strong evidence to suggest that this is the case: Recall from Table 2 that private Head Start programs tend to locate in zip codes with more eligible students, and where students in general tend to be more disadvantaged – coming from households with unmarried mothers or with mothers who did not graduate from high school. Even the eligible students in these neighborhoods tend to be more disadvantaged on average along measurable dimensions. So it might be the case that the differences observed between locales where private Head Start is an option and those where it is less of an option could merely reflect these neighborhood differences. In an attempt to gauge the degree to which these neighborhood differences might be at play, we control for the percentage of children in the neighborhood who are eligible for public pre-kindergarten and the percentage of children in the neighborhood whose mothers are not high school graduates. These results, reported in the bottom panel of Table 10, indicate that the estimated effects of public pre-kindergarten in these different settings are relatively unchanged by the inclusion of these neighborhood attributes as covariates.[4] Hence, the differences in estimated public pre-kindergarten performance between neighborhoods that have private Head start programs and those whose access to private Head Start programs do not seem to be due to the fact that these neighborhoods are different along key dimensions. However, the estimates should still be treated with some caution.

[4] We have also stratified these neighborhoods by fraction eligible and found very similar results.

We next stratify the estimated effects of public pre-kindergarten based on a series of family attributes – the mother's age, mother's education level, the child's birth weight and the mother's race. The results of this exercise are presented in Table 11. We observe relative consistency across the various strata by Year 2 along a series of dimensions: We find that public pre-kindergarten is associated with increased estimated rates of behavioral problems when there is no private Head Start facility nearby and decreased estimated rates of behavioral problems in communities with a private Head Start facility present. The differences between these two rates tend to be statistically significant in Year 2. While the results are rather noisy, therefore, the general pattern of findings remains consistent with those presented above: when no alternative is available in a zip code, the beneficial effect of public pre kindergarten participation on behavior is attenuated.

Other outcomes

We next turn to other outcomes besides basic discipline and behavioral disability classification. Specifically, in Table 12 we consider the likelihood that a student will, by the end of his or her third year, either have been suspended out of school or repeated a grade.[5] These arguably represent more serious behavioral outcomes than referral to the principal's office for a rule infraction.

As can be seen in Table 12, patterns similar to disciplinary problems emerge with regard to suspension and grade repetition: Students participating in public pre-kindergarten programs are estimated to be significantly more likely to be suspended than

[5] We present outcomes at the end of year 3 because grade repetition and suspension are low-probability events, particularly in the first year or two of school.

are non-participants in neighborhoods that do not have a local private Head Start option, and are significantly less likely to be suspended than are non-participants in neighborhoods that have a local private Head Start option. The difference between the two is statistically significantly different from zero as well. The patterns of signs are the same for grade repetition, but neither point estimate is statistically significant; the difference between the two, however, is statistically significant at the seven percent level. These results, while suggestive, provide further evidence that there exist substantial differences in results between communities with private Head Start options and those that have less access to private Head Start, suggesting either that private Head Start provides positive competition for public pre-kindergarten programs or that private Head Start programs enroll less socialized students and/or are less successful in teaching appropriate school behavior . With the available data it is impossible to know for certain which explanation is more valid, but these results suggest future directions for research.

Conclusion

We utilize a unique matched administrative data set and a novel identification strategy to study the effects of public pre-kindergarten participation on student behavioral outcomes. A first pass at the data would indicate that public pre-kindergarten leads to reduced student disciplinary problems and reduced rates of being classified emotional disabled or severely emotionally disturbed.

However, the comparison group in question includes both private Head Start participants and income eligible students who did not participate in preschool. While we lack the ability to identify which members of our comparison group are private Head

Start participants, we can stratify neighborhoods based on whether there exists a private Head Start facility in the zip code. While this is a crude stratification, it provides some evidence on the performance of public pre-kindergarten programs as we can make an attempt to tease out the estimated effects of private Head Start participation. We find that the favorable estimated effects of public pre-kindergarten programs are concentrated in the communities where there exist private Head Start programs. There exist both favorable and unfavorable explanations for this result: It could be the case that private Head Start programs recruit more non compliant children and therefore the overall public pre-kindergarten results are biased in favor of positive behavioral outcomes. But it could also be the case that private Head Start programs provide a competitive spur for public pre-kindergarten programs. We cannot disentangle these two candidate explanations for the results found in the presence of a private Head Start program. However, we note that the lack of a finding of behavioral benefits (and, indeed, the general finding of worsened behavior) associated with public pre-kindergarten participation in settings where there is less of a private Head Start option provides some additional confirmation of several results in the existing literature. Public and private preschool programs operate with different resources and different standards. Our evidence is consistent with the notion that public pre-kindergarten programs lead to either positive behavioral outcomes or negative behavioral outcomes, depending on the availability of private alternatives. We will continue to investigate these differences in our future work.

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Table 1: Rates of disciplinary problems, by pre-kindergarten participation

	Year in school		
	first (kindergarten)	second	third
Non-participants	0.036	0.050	0.073
Pre-kindergarten participants	0.037	0.058	0.075
Within-family comparisons			
Non-participants	0.035	0.052	0.075
Pre-kindergarten participants	0.035	0.054	0.077

Note: Disciplinary problems are defined as having been referred to the principal's office for disciplinary reasons at least once during the year. To be included in the analysis, students must be in families with at least two children who were born after 1989 and enrolled in school before 2002, and where all children in the family are recorded as being eligible to receive free lunch (i.e., self-reported income less than 130 percent of the poverty line) in every observed period in school. Families are defined as two or more children who share the same birth mother. Analysis sample: 59,418 children in 29,087 families.

Table 2: Attributes of families with different local pre-kindergarten options

	Families whose local zoned school **offers** a pre-kindergarten program and whose zip code **has** a private Head Start program	Families whose local zoned school **offers** a pre-kindergarten program and whose zip code **does not have** a private Head Start program	Families whose local zoned school **does not offer** a pre-kindergarten program and whose zip code **has** a private Head Start program	Families whose local zoned school **does not offer** a pre-kindergarten program and whose zip code **does not have** a private Head Start program
Probability of eligible student attending public pre-kindergarten	0.534	0.547	0.221	0.260
Percent "eligible" in school zone	0.293	0.183	0.256	0.167
Percent black in school zone	0.441	0.250	0.324	0.179
Percent Hispanic in school zone	0.180	0.198	0.154	0.149
Percent mothers in school zone without high school degree	0.377	0.285	0.302	0.216
Percent married parents in school zone	0.494	0.641	0.569	0.690
Percent **eligible** black in school zone	0.635	0.488	0.563	0.433
Percent **eligible** mothers in school zone without high school degree	0.534	0.513	0.469	0.460
Percent **eligible** married parents in school zone	0.297	0.381	0.336	0.390

Table 3: Between-family differences in pre-kindergarten attendance probabilities, by availability at zoned school

Family type	Number of families	Probability of attending pre-kindergarten
No siblings' local zoned school at age 4 offers pre-kindergarten	11458	0.346
Some, but not all, siblings' local zoned school at age 4 offers pre-kindergarten	12107	0.425
All siblings' local zoned school at age 4 offers pre-kindergarten	5522	0.562

Table 4: Differences in family attributes, by differences in availability at zoned school

Family attributes	No siblings zoned for a school offering pre-kindergarten at age 4	Some, but not all, siblings zoned for a school offering pre-kindergarten at age 4	All siblings zoned for a school offering pre-kindergarten at age 4
Teen mother	0.274	0.259	0.231
Mother with less than high school education	0.470	0.514	0.501
Black mother	0.544	0.658	0.671
Mother unmarried	0.649	0.714	0.685
Inadequate prenatal care for child	0.083	0.108	0.137

Note: The attributes reported above are those in place when the youngest observed child in the family was born.

Table 5: Within-family differences in pre-kindergarten attendance probabilities, by availability at zoned school

Family type	Sibling(s) whose local zoned school at age 4 offers pre-kindergarten	Sibling(s) whose local zoned school at age 4 does not offer pre-kindergarten
All eligible families	0.523	0.327
Mother teenaged at birth	0.537	0.345
Mother has less than high school education	0.515	0.320
Mother is black	0.562	0.355
Mother is non-black	0.445	0.270

Table 6: Estimated effects of attending pre-kindergarten on probability of being disciplined

Specification	Year 1 (kindergarten)	Year 2	Year 3
School fixed effects	-0.001 (0.002)	0.003 (0.002)	-0.004 (0.003)
School and family fixed effects	-0.000 (0.002)	0.000 (0.002)	0.003 (0.003)
School and family fixed effects with instrumental variable	-0.027 (0.009)	-0.035 (0.011)	-0.002 (0.015)
School and family fixed effects with instrumental variable – **families with children all zoned for the same school**	-0.021 (0.012)	-0.045 (0.015)	-0.008 (0.018)

Note: Standard errors adjusted for clustering at the school level are in parentheses beneath point estimates. Each cell represents a different regression specification. Regressions also include controls for race, sex, free/reduced price lunch status, maternal age at birth, maternal marital status, maternal education levels, Medicaid status at birth, prenatal care complications of labor and delivery, indicators for birth weight <1000g, 1000-1500g, 1500-2500g, >2500 g, and school fixed effects. The instrumental variable is an indicator for whether pre-kindergarten programs are offered at the student's zoned elementary school at age 4. Disciplinary problems are defined as having been referred to the principal's office for disobeying school rules at least once during the year. To be included in the analysis, students must be in families with at least two children who were born after 1989 and enrolled in school before 2002, and where all children in the family are recorded as being eligible to receive free lunch (i.e., self-reported income less than 130 percent of the poverty line) in every observed period in school. Families are defined as two or more children who share the same birth mother. Analysis sample: 59,418 children in 29,087 families. Analysis sample for last row in table: 31,149 children in 15,248 families.

Table 7: Relationship between disciplinary problems and subsequent classification of emotional disability

	Year 1 (kindergarten)	Year 2	Year 3
Probability of being classified as emotionally disabled or severely emotionally disturbed			
Students who were referred in kindergarten	0.016	0.025	0.026
Students not referred in kindergarten	0.001	0.001	0.002
Probability of being classified with any disability			
Students who were referred in kindergarten	0.049	0.064	0.056
Students not referred in kindergarten	0.025	0.028	0.031

Table 8: Estimated effects of attending pre-kindergarten on probability of being classified as emotionally disabled or severely emotionally disturbed: Instrumental variables regression with family fixed effects

Specification	Year 1 (kindergarten)	Year 2	Year 3
Probability of being classified as emotionally disabled or severely emotionally disturbed	-0.003 (0.001)	-0.019 (0.003)	-0.011 (0.004)
Probability of being classified, conditional on actual observed behavior	-0.002 (0.001)	-0.019 (0.003)	-0.012 (0.005)

Note: Standard errors adjusted for clustering at the school level are in parentheses beneath point estimates. Each cell represents a different regression specification. Regressions also include controls for race, sex, free/reduced price lunch status, maternal age at birth, maternal marital status, maternal education levels, Medicaid status at birth, prenatal care complications of labor and delivery, indicators for birth weight <1000g, 1000-1500g 1500-2500g, >2500 g, and school and family fixed effects. The instrumental variable is an indicator for whether pre-kindergarten programs are offered at the student's zoned elementary school at age 4. Disciplinary problems are defined as having been referred to the principal's office for disobeying school rules at least once during the year. To be included in the analysis, students must be in families with at least two children who were born after 1989 and enrolled in school before 2002, and where all children in the family are recorded as being eligible to receive free lunch (i.e., self-reported income less than 130 percent of the poverty line) in every observed period in school. Families are defined as two or more children who share the same birth mother. Analysis sample: 59,418 children in 29,087 families.

Table 9: Falsification exercise: Instrumental variables evidence on low birth weight

	Discipline in year 1 (kindergarten)	Discipline in year 2	Discipline in year 3	Low birth weight
School and family fixed effects with instrumental variable	-0.033 (0.009)	-0.026 (0.011)	-0.002 (0.014)	0.005 (0.012)
School and family fixed effects with instrumental variable – **families with children all zoned for the same school**	-0.020 (0.012)	-0.048 (0.016)	-0.028 (0.018)	0.007 (0.018)

Note: Standard errors adjusted for clustering at the school level are in parentheses beneath point estimates. Each cell represents a different regression specification. To be included in the analysis, students must be in families with at least two children who were born after 1989 and enrolled in school before 2002, and where all children in the family are recorded as being eligible to receive free lunch (i.e., self-reported income less than 130 percent of the poverty line) in every observed period in school. Families are defined as two or more children who share the same birth mother. Analysis sample: 59,418 children in 29,087 families. Analysis sample for last row in table: 31,149 children in 15,248 families.

Table 10: Estimated effects of attending pre-kindergarten on probability of being disciplined, by availability of local private Head Start option:
Instrumental variables estimates

	Year 1 (kindergarten)	Year 2	Year 3
No private Head Start in zip code	-0.012 (0.014)	-0.011 (0.019)	0.067 (0.025)
Private Head Start in zip code	-0.039 (0.011)	-0.067 (0.013)	-0.025 (0.016)
p-value of difference	0.12	0.00	0.00
Controlling for percent in neighborhood who are eligible for public pre-kindergarten and percent in neighborhood whose mothers are not high school graduates			
No private Head Start in zip code	-0.011 (0.014)	0.000 (0.019)	0.058 (0.025)
Private Head Start in zip code	-0.039 (0.011)	-0.072 (0.013)	-0.028 (0.016)
p-value of difference	0.12	0.00	0.00

Note: Standard errors adjusted for clustering at the school level are in parentheses beneath point estimates. Each cell represents a different regression specification. Regressions also include controls for race, sex, free/reduced price lunch status, maternal age at birth, maternal marital status, maternal education levels, Medicaid status at birth, prenatal care complications of labor and delivery, indicators for birth weight <1000g, 1000-1500g, 1500-2500g, >2500 g, and school fixed effects. The instrumental variable is an indicator for whether pre-kindergarten programs are offered at the student's zoned elementary school at age 4. Disciplinary problems are defined as having been referred to the principal's office for disobeying school rules at least once during the year. To be included in the analysis, students must be in families with at least two children who were born after 1989 and enrolled in school before 2002, and where all children in the family are recorded as being eligible to receive free lunch (i.e., self-reported income less than 130 percent of the poverty line) in every observed period in school. Families are defined as two or more children who share the same birth mother. Neighborhoods are designed by public school zones.

Table 11: Estimated differential effects of attending pre-kindergarten on probability of being disciplined: Instrumental variables regression with school and family fixed effects

Family/student attribute	Year 1 (kindergarten)			Year 2		
	No private HS nearby	Private HS nearby	p-value of difference	No private HS nearby	Private HS nearby	p-value of difference
Teenage mother	-0.003 (0.039)	-0.047 (0.025)	0.28	0.013 (0.045)	-0.082 (0.031)	0.04
Mother's education less than high school	-0.032 (0.022)	-0.052 (0.018)	0.45	0.027 (0.029)	-0.091 (0.021)	0.00
Low birth weight	-0.017 (0.048)	-0.022 (0.028)	0.92	0.078 (0.072)	-0.032 (0.034)	0.11
Black mother	-0.003 (0.020)	-0.042 (0.012)	0.09	0.025 (0.027)	-0.081 (0.016)	0.00

Note: Standard errors adjusted for clustering at the school level are in parentheses beneath point estimates. Each cell represents a different regression specification. Regressions also include controls for race, sex, free/reduced price lunch status, maternal age at birth, maternal marital status, maternal education levels, Medicaid status at birth, prenatal care complications of labor and delivery, indicators for birth weight <1000g, 1000-1500g, 1500-2500g, >2500 g, and school and family fixed effects. The instrumental variable is an indicator for whether pre-kindergarten programs are offered at the student's local elementary school. Disciplinary problems are defined as having been referred to the principal's office for disobeying school rules at least once during the year. To be included in the analysis, students must be in families with at least two children who were born after 1989 and enrolled in school before 2002, and where all children in the family are recorded as being eligible to receive free lunch (i.e., self-reported income less than 130 percent of the poverty line) in every observed period in school. Families are defined as two or more children who share the same birth mother. Analysis sample: 59,418 children in 29,087 families.

Table 12: Estimated effects of attending pre-kindergarten on probability of being suspended or repeating a grade by year 3, by availability of local private Head Start option:
Instrumental variables estimates

	Probability of being suspended by year 3	Probability of repeating a grade by year 3
No private Head Start in zip code	0.108 (0.031)	0.056 (0.044)
Private Head Start in zip code	-0.054 (0.019)	-0.031 (0.028)
p-value of difference	0.00	0.07

Note: Standard errors adjusted for clustering at the school level are in parentheses beneath point estimates. Each cell represents a different regression specification. Regressions also include controls for race, sex, free/reduced price lunch status, maternal age at birth, maternal marital status, maternal education levels, Medicaid status at birth, prenatal care complications of labor and delivery, indicators for birth weight <1000g, 1000-1500g, 1500-2500g, > 2500 g, and school fixed effects. The instrumental variable is an indicator for whether pre-kindergarten programs are offered at the student's zoned elementary school at age 4. To be included in the analysis, students must be in families with at least two children who were born after 1989 and enrolled in school before 2002, and where all children in the family are recorded as being eligible to receive free lunch (i.e., self-reported income less than 130 percent of the poverty line) in every observed period in school, and where all included students are observed through year 3 of school. Families are defined as two or more children who share the same birth mother.