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Eliana Garces; Duncan Thomas; Janet Currie

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Longer-Term Effects of Head Start

By ELIANA GARCES, DUNCAN THOMAS, AND JANET CURRIE*

Specially collected data on adults in the Panel Study of Income Dynamics are used to provide evidence on the longer-term effects of Head Start, an early intervention program for poor preschool-age children. Whites who attended Head Start are, relative to their siblings who did not, significantly more likely to complete high school, attend college, and possibly have higher earnings in their early twenties. African-Americans who participated in Head Start are less likely to have been booked or charged with a crime. There is some evidence of positive spillovers from older Head Start children to their younger siblings. (JEL J24, I38)

Head Start, a public preschool program for disadvantaged children, is designed to close the gaps between these children and their more advantaged peers. Begun in 1965 as part of the “War on Poverty,” Head Start has enjoyed widespread bipartisan support along with increasing budgets. It is now a \$4.7 billion program serving more than 800,000 children and it is a model for separate state-funded programs.

Head Start is an investment in children that is intended to help them through the rest of their lives. Although there is evidence suggesting significant short-term benefits associated with participation in the program, critics point out there is no evidence that the program has lasting benefits. Studies suggest short-term gains in test scores “fade out” for many Head Start children. Evidence cited in support of the long-term effectiveness of early interventions comes from analyses of other programs, such as the famous

Perry Preschool intervention, most of which bear little resemblance to the Head Start model.

This paper addresses the important question of whether the Head Start program confers longer-term benefits on participants. We use questions from a supplement to the Panel Survey of Income Dynamics (PSID) which were specifically designed for this study. There are three features of these unique data that are key for our purposes. First, in 1995, questions about participation in Head Start and other preschools were included in the interviews and asked about all adult household members age 18 through 30. These questions make it feasible, for the first time in population-based survey data, to measure the economic and social success of Head Start participants when they have reached adulthood. Second, because the PSID is a panel which stretches back over a quarter century, we are able to control for family background and the environment in which each respondent grew up in great detail. Third, the PSID provides a nationally representative sample of children who participated in actual Head Start programs rather than experimental model programs.

We examine four indicators of economic and social success in adulthood. We find that, for whites, participation in Head Start is associated with a significantly increased probability of completing high school and attending college as well as elevated earnings in one’s early twenties. African-Americans who participated in Head Start are less likely to have been booked for or charged with a crime. We also find suggestive evidence that African-American males who attended Head Start are more likely than their siblings to have completed high school.

* Garces: Economic Analysis LLC, 2049 Century Park East, Suite 2310, Los Angeles, CA 90067 (e-mail: egarces@econanalysis.com); Thomas: Department of Economics, UCLA, Box 951477, Los Angeles, CA 90095 (e-mail: dt@ucla.edu); Currie: Department of Economics, UCLA, and National Bureau of Economic Research, Box 951477, Los Angeles, CA 90095 (e-mail: currie@simba.sscnet.ucla.edu). Currie and Thomas thank the National Science Foundation (SBR-9512670) and National Institute for Child Health and Human Development (R01-HD3101A2) for financial support. Greg Duncan, Peter Germanis, Judith Seltzer, Jeanne Brooks-Gunn, and anonymous referees provided very helpful comments. The authors are solely responsible for the contents of the paper. We are grateful to Greg Duncan, Sandra Hofferth, and the Advisory Board of the Panel Survey of Income Dynamics for including the questions used in this study.

Finally, we uncover some evidence of positive spillovers from older children who attended Head Start to younger siblings, particularly with regard to being booked or charged with a crime.

While an experiment in which children were randomly assigned to the program or to a control and then tracked for 30 years might be the ideal way to evaluate the long-term effects of Head Start, such experimental evaluations of the program do not exist. We view our analysis of these nonexperimental data as an important complement to random assignment evaluations. The results presented below provide a first step toward establishing whether Head Start confers long-term benefits on participants. For reasons spelled out in detail below, our methods likely provide lower bound estimates of any positive effects of Head Start.

I. Background

Head Start began as a summer program in 1965 with 561,000 predominantly African-American children. It expanded to serve almost three-quarters of a million African-American and white children in the summer of 1966 at which time about \$1,000 (in 1999 prices) was spent on each child. By the early 1970's, Head Start had become an all-year program that served considerably fewer children at a higher annual cost per child. For example, in 1971, the program served slightly less than 400,000 children at an annual cost of about \$4,000 per child. Children living in poor families are eligible to enroll in the program and, today, it serves more than 800,000 children at a cost of around \$5,400 per child. Most of the children in the program are three or four years old (Administration for Children and Families, 1999). While large, the program serves only about two-thirds of eligible children. This reflects the fact that the program, which is funded by appropriation, has never been fully funded. The program is administered at the local level (there are over 1,400 local programs) and is subject to federal guidelines. The guidelines specify that, in addition to providing a nurturing learning environment, Head Start should provide a wide range of services. These include, for example, facilitating and monitoring utilization of preventive medical care by participants, as well as providing nutritious meals and snacks.

Studies have shown that participation in

Head Start is associated with short-term benefits, as indicated by improved test scores. These benefits appear to "fade out" by around the third grade so that Head Start children are no better off than controls at that point (see Steven Barnett [1995] and Lynn A. Karoly et al. [1998] for reviews of this literature). Dissipation of test-score gains does not necessarily imply that Head Start children do not benefit from starting school "on the right foot." For example, avoidance of grade repetition and special education early in life may be associated with higher eventual schooling attainment. Head Start may also be associated with lasting improvements in non-cognitive skills that are important for future success in life (cf. James J. Heckman et al., 2000). These questions have not been directly addressed in the literature. Moreover, many of the studies have been criticized because they use ad hoc control groups, are subject to substantial attrition, or because sample sizes are small resulting in statistical tests that have limited power.

Most of the evidence on longer-term benefits of early intervention is drawn from three studies: The Carolina Abecedarian Project; the Perry Preschool Project; and the Chicago Child-Parent Centers (CPC). A more detailed summary of these studies is available in Currie (2001). For our purposes, the important point is that these programs were quite different from Head Start. For example, the Carolina Abecedarian Project randomly assigned children to the treatment or to nothing. Treatments were provided with an intensive center-based full-day, full-year child care program from three months through age 5. Then, all of the children were again randomly assigned to a follow-up program of support in school for an additional three years. Evaluations report positive effects on schooling attainment at age 21 among children who received the preschool treatment (Frances A. Campbell et al., 2001; 2002). The Perry Preschool intervention was more similar to Head Start in that it involved a half-day preschool every weekday and a weekly 90-minute home visit for eight months of each year for two years while the child was age three and four years old. However, the preschool component was of much higher quality than the average Head Start program in existence during our study period. This intervention had positive effects on achievement test scores, grades, grad-

uation from high school and earnings, as well as negative effects on crime and welfare use (as of age 27).

Both the Carolina Abecedarian Project and Perry Preschool intervention were funded at higher levels than Head Start. For example, in 1998 it cost slightly over \$5,000 to keep a child in a part-day Head Start program for 34 weeks a year. The two-year, part-day Perry Preschool intervention cost nearly \$13,000 per child (in 1998 dollars) (Karoly et al., 1998).¹ The preschool component of the Abecedarian intervention (which was full-day) cost about \$15,000 per child, per year, and this part of the intervention lasted five years.² Thus, the results of these programs probably provide an upper limit on what one could reasonably expect from Head Start. These two programs also involved small, localized interventions, and thus their findings may not generalize.

Arthur J. Reynolds (1998), Reynolds (2000), and Judy Temple et al. (2000) study the Chicago CPC program. Unlike Carolina Abecedarian and Perry Preschool, this is a large scale publicly funded intervention. All of the children in this study attended an enriched preschool program for two years starting at age 3. The treatment children then received an additional enriched program up to age 9 while the control children did not. Thus, while these evaluations deal with a public early intervention program, the actual intervention being evaluated is for school-aged rather than preschool children. Still, it is worth noting that the CPC program has been shown to reduce the incidence of high-school dropout, delinquency, and crime.

The methodology used in this study follows Currie and Thomas (1995), who use nonexperimental data drawn from the National Longitudinal Survey's Child-Mother files (NLS-CM) to evaluate Head Start. They attempt to control for unobserved characteristics of children by comparing siblings who participated in Head Start

with those who did not. The idea is that by using siblings as the controls, any shared characteristics of family background will be controlled as long as they affect the outcomes examined in a linear and additive way. The Currie and Thomas study is one of a handful that includes a substantial number of Head Start children who are not African-American. This is important for two reasons. First, participants in experimental evaluations have been largely African-American and it has not been possible to separately identify program effects by race. This turns out to be a key distinction. Second, although African-Americans participate at higher rates than whites, the majority of Head Start children are not African-American.

Currie and Thomas report that for children of all racial and ethnic backgrounds, there are substantial and significant gains in test scores associated with attending Head Start. For African-American Head Start children, these gains "fade out" while they are still in elementary grades. For whites, the gains persist into adolescence and participation in Head Start is also associated with reduced grade repetition. It is worth emphasizing that since the initial gains in test scores are the same for whites and African-Americans, the racial differences in fade-out may have less to do with the Head Start program and more to do with the child's experiences after finishing the program.³ Moreover, the Currie and Thomas findings regarding fade-out for African-Americans closely mirror those of experimental studies which have generally been conducted using primarily African-American subjects. This lends additional weight to both sets of results as well as the methodologies underlying them.

In sum, there do appear to be short-term positive effects of participation in Head Start on outcomes such as grade repetition. That fact, in combination with evidence regarding positive longer-term effects of model early interventions

¹ Twenty percent of the children participated in the program for only one year. The cost figure given by Karoly et al. (1998) is a weighted average that takes this into account. These figures imply that the cost per year was about \$7,000 in 1999 dollars.

² Craig Ramey et al. (1998) state that on average the preschool component of the program cost about \$6,000 per year. Children entered the preschool component between 1972 and 1983. Six thousand 1978 dollars are worth approximately 15,000 1999 dollars.

³ Currie and Thomas (2000) find that African-American children who attended Head Start continue to schools of lower quality than other African-American children. However, the same is not true among whites. Thus, poor school quality offers a potential explanation for fade-out of Head Start benefits among African-American children but not among whites. The CPC results discussed above also suggest that improved school quality may help prevent fade-out.

make it reasonable to suppose that there may be lasting benefits associated with participation in Head Start programs. Whether there are any long-term benefits remains an open question and is the subject of this paper.

II. Data

The PSID began in 1968 with a survey of 4,802 households composed of 18,000 individuals. These households, and new households formed by the original head, spouse, and their children have been followed ever since. In 1995, special questions on early childhood education experiences were included in the interview on a one-time basis. Information was collected on all adult household members age 30 or below about whether they had ever been enrolled in Head Start and whether they had attended any other preschool or daycare program. Since our interest is in the longer-term effects of participation in Head Start, we focus on slightly less than 4,000 adults (age 18 and older in 1995) for whom this information is reported.

Some of the advantages associated with using PSID were noted above. They come at a price. First, because we are using nonexperimental data, we need to address the fact that children are not randomly assigned to Head Start. Second, because we are measuring the longer-term effects of Head Start participation, and that information was not collected prospectively, the questions on early childhood education are asked retrospectively and may be contaminated by recall error. We have conducted several experiments to evaluate the quality of the data and we describe these experiments before discussing the issue of nonrandom assignment. Sample summary statistics are reported in Table 1.

Overall, 10 percent of the 1964–1977 birth cohort sample in the PSID report having attended Head Start and 28 percent report having attended some other type of preschool program.⁴ If we take the same birth cohorts and

assume that the average child who participated was in the program for one year, then the numbers of participants reported by the Head Start Bureau for each year imply a national participation rate of slightly over 12 percent.⁵ National participation rates were high for those born in 1964–1965 (17 percent), fell to 13 percent for the 1966 cohort, to 11 percent for the 1967 cohort, and then declined slowly to 10 percent for the 1970 birth cohort. Enrollment rates subsequently rose for those born during the decade of the 1970's to slightly over 12 percent (among the 1977 birth cohort).

This pattern is replicated remarkably closely in the PSID sample with one important exception. Among the earliest two birth cohorts in our sample (1964–1965), reported participation rates are much lower than the national rates (6 percent in the PSID). Participation in the 1966 cohort is higher but still below the national rate (8 percent in PSID). The PSID and national

1965 and 1977; (2) living in the United States at age 3, 4, or 5; and (3) living in the United States in 1995. Thus, in order to be relevant for our sample, someone born outside the United States in 1965 would have had to immigrate to the United States by 1970, while someone born abroad in 1977 would have had to immigrate before 1982. Since immigration was at a much lower level in the 1960's, 1970's, and much of the 1980's than it has been in the 1990's, missing immigrants would pose a greater problem if we were looking at shorter-term effects of Head Start with more recent cohorts of Head Start children. Specifically, between 1969 and 1975, there were approximately 380,000 legal immigrants into the United States each year whereas by 1990 the number of legal immigrants had reached 1,000,000 per year. The majority of the people that are missed because they are eligible immigrants are Hispanic and so we have excluded Hispanics from this study. (See Currie and Thomas, 1999, for a discussion of how the shorter-term effects of Head Start on Hispanics differ from the effects on whites and African-Americans.)

The data have been weighted so that our sample is representative of the 1995 white and African-American populations. Specifically, we have constructed weights so that the joint distribution of race, sex, and year of birth in our sample matches the joint distribution in the 1995 Current Population Survey. We prefer these weights to the PSID longitudinal weights because some new entrants into the PSID sample are assigned a zero PSID longitudinal weight; many of the adults in our sample are new entrants to PSID and so would contribute no information.

⁵ This estimate is based on data reported by the Administration for Children and Families on enrollments in each year of the program and the number of births, reported by the National Center for Health Statistics (Administration for Children and Families, 1999; National Center for Health Statistics, 2000).

⁴ Our sample includes all white and African-American household members in the 1995 wave of PSID who were born between 1965 and 1977. The SEO ("poverty") sample is not included. Immigrants are underrepresented in the PSID. From the perspective of this study, the missing immigrants are people who had parents who were not living in the United States in 1968 but who were: (1) born between

TABLE 1—SAMPLE SUMMARY STATISTICS: MEANS (AND STANDARD ERRORS)

Measure	All sample (1)	Head Start (2)	Not in Head Start (3)	Sibling sample (4)
Program participation^a				
Head Start	10.57 (0.53)	100.00	0.00	10.89 (0.73)
Other preschool	28.34 (0.77)	13.33 (1.51)	30.11 (0.85)	27.71 (1.05)
Outcomes				
Percentage completed high school	76.60 (0.74)	64.65 (2.16)	78.03 (0.79)	77.21 (1.01)
Percentage attended some college	37.14 (0.85)	25.08 (1.96)	38.59 (0.93)	38.80 (1.17)
Earnings (average when age 23–25) (\$1,000's, 1999 prices)	17.29 (0.69)	12.10 (0.67)	17.81 (0.76)	17.31 (1.00)
Percent booked/charged with crime	9.69 (0.51)	11.04 (1.39)	9.53 (0.54)	10.04 (0.70)
Demographic characteristics				
Percentage African-American	25.17 (0.74)	75.32 (1.92)	19.24 (0.73)	22.85 (0.98)
Percentage female	51.49 (0.85)	56.41 (2.20)	50.91 (0.93)	50.75 (1.17)
Age (years) in 1995	23.66 (0.06)	23.35 (0.15)	23.70 (0.06)	23.65 (0.08)
Percentage eldest child in family	53.11 (0.56)	50.89 (1.41)	53.37 (0.61)	50.57 (0.76)
Percentage low-birth-weight baby	6.99 (0.37)	10.40 (1.24)	6.59 (0.38)	6.69 (0.56)
Background				
Mother's years of education	12.14 (0.04)	11.33 (0.09)	12.24 (0.04)	12.30 (0.05)
Percentage whose mother completed high school	70.37 (0.78)	55.52 (2.21)	72.12 (0.83)	78.15 (0.97)
Father's years of education	11.60 (0.06)	10.19 (0.14)	11.76 (0.06)	12.23 (0.07)
Percentage whose father completed high school	56.12 (0.85)	26.38 (1.96)	59.64 (0.91)	63.30 (1.13)
Family income (when respondent age 3–6) (\$1,000's, 1999 prices)	46.23 (0.46)	26.62 (0.58)	48.54 (0.50)	47.33 (0.67)
Percentage whose mother single (when respondent age 4)	16.42 (0.61)	40.35 (2.16)	13.59 (0.61)	13.06 (0.79)
Household size (when respondent age 4)	4.59 (0.03)	4.97 (0.09)	4.55 (0.03)	4.84 (0.04)
Sample size	3,255	489	2,766	1,742

Note: See footnote 4 regarding sample weights.

^a Percentage of respondents reporting participation in program.

rates are very close in the 1967 birth cohort (11 percent) and for all other birth cohorts, the PSID mimics the national numbers. (Reported participation in the PSID declines to 9 percent in the early 1970's and then rises to 12 percent by the 1977 birth cohort, the last cohort in our sample.)

Recall that for the oldest birth cohorts, Head Start was primarily a summer program. It is not surprising that the reported rate of participation

in Head Start among these birth cohorts in the PSID is much lower than the national rate. First, there is abundant evidence in the survey research literature that the more salient a life event, the more likely it is to be recalled;⁶ participation in a summer Head Start program is

⁶ See Seymour Sudman et al. (1996).

not likely to be as salient to a respondent as full-year participation in one's first school-oriented program. Second, many of the children who participated in Head Start during the summer are likely to have attended some other preschool during the rest of the year and PSID respondents are more likely to have reported their preschool experience during the school year rather than in the summer. By the early 1970's, Head Start had become a full-year program. Respondents born in the late 1960's would have participated in this full-year program rather than the summer one. Since the summer program is substantially different from the full-year program, we exclude the oldest birth cohorts from the analyses presented below.⁷ Among those born between 1966 and 1977, the national enrollment rate is 11.1 percent according to the Head Start Bureau; of PSID respondents, 10.7 percent (standard error = 0.6 percent) report having attended Head Start.

The racial composition of Head Start children is not reported for every year by the Head Start Bureau. Taking 1980 as an example, 42 percent of Head Start participants were African-American. Since about 14 percent of the nation's children were African-American, this implies that about 33 percent of those children participated in Head Start and that the enrollment rate was around 7 percent among white children. The implied enrollment rates in the PSID are very close: for the 1975 birth cohort, 36 percent of African-Americans and 5 percent of whites report participation in Head Start.

Seminal work by Hermann Ebbinghaus (1894) and many subsequent studies in the survey research literature have shown that recall error tends to increase as a respondent is asked to

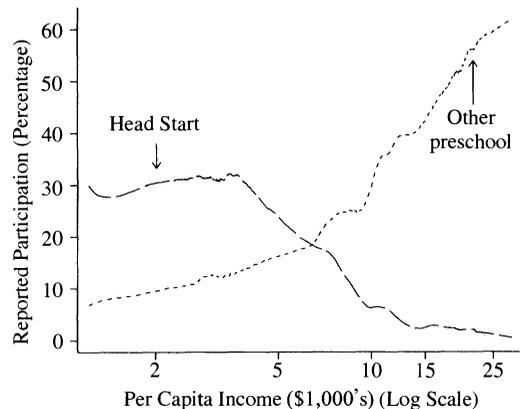


FIGURE 1. REPORTED PARTICIPATION RATES IN HEAD START AND OTHER PRESCHOOLS

stretch further back in time. If recall error seriously contaminates responses in the PSID, then we would expect the gap between the national enrollment rates and those reported in the PSID to be greater among the earlier birth cohorts. However, once we exclude the 1964–1965 birth cohort who participated in a summer program, enrollment rates implied by the PSID mimic the temporal pattern of the national rates. We also find no pattern of differences by birth year of the respondent in a regression of enrollment rates on year of birth.

Our third assessment of the quality of the recall data on Head Start participation exploits the fact that because the PSID is a long-term panel, we know family income when the person was a child. We have calculated average per capita family income (in 1999 prices) at the time the person was age 3, 4, 5, and 6, and as shown in Table 1, Head Start children tend to be drawn from lower-income families. Figure 1 presents the fraction of respondents who report attending Head Start and other preschools by per capita family income. Of respondents whose families were in the bottom quartile of the income distribution, about 30 percent report attending Head Start. The fraction declines with income and is close to zero for all respondents whose families were above median income.⁸

⁷ The 1964 and 1965 birth cohorts have been excluded. Some of the 1966 cohort will have participated in the full-year program and some in the summer program. Assuming that full-year participation is more salient, it is likely that those respondents in this birth cohort who report participation in Head Start were full-year participants. (One in ten participants report participation in another preschool which is slightly lower than the rate for later birth cohorts.) We have experimented with dropping the 1966 birth cohort from our analytical sample. The regression results discussed below are little impacted by this restriction and none of the significant or important results is affected.

⁸ Given that Head Start has long enjoyed widespread public support, it is possible that some people who attended other types of preschools erroneously label them "Head

The fraction of respondents who attended other preschools rises monotonically with income. The shapes of the relationships between income and participation in Head Start and other preschool programs are remarkably similar to those reported in Currie and Thomas (1995), which are based on prospective reports in the NLSY-CM. Respondents who report participation in Head Start as children were clearly disadvantaged when young, relative to other respondents. They are also more likely to have been living with a single mother at that time, their mothers are less educated, and they are more likely to have been low weight at birth (see Table 1).⁹

In sum, among the 1966–1977 birth cohorts in the PSID, retrospectively reported rates of participation in Head Start match the national enrollment rates very closely; Head Start participants were clearly disadvantaged around the time of preschool; and the link between participation and family income mimics the associations observed in other data sources. On balance, the PSID data on Head Start participation seem to be of high quality. While there is likely to be some classification error by respondents, we find no evidence of systematic reporting bias. Random classification error will tend to obscure positive benefits of Head Start in which case our estimates are likely to provide a lower bound.

Start.” If reported Head Start children had family incomes greater than 150 percent of the poverty line in every preschool year, and never received any form of welfare then we reclassified them as “other preschool.” About 5 percent of the reported Head Start participants in each year fell into this category.

⁹ There are however, some differences in characteristics of families of Head Start children by race. Mothers of white Head Start children tend to be less educated than those of African-American Head Start children, although when they were eligible for the program, white Head Start children were less likely to be living with a single mother than African-Americans. White Head Start children in the PSID are almost twice as likely to have been low birth weight than African-American Head Start children (14 percent and 8 percent, respectively) although in the general population, African-American children are substantially more likely to suffer from low birth weight than whites. These differences suggest that the mechanisms underlying participation in Head Start are different for African-Americans and whites, and suggest that it may be fruitful to examine the two groups separately.

III. Empirical Methods

The aim of this study is to ask whether participation in Head Start results in greater economic or social success later in life. We focus on four adult outcomes: completion of high school, attendance at some college, ln(earnings) if the household member worked, and whether the household member ever reported being booked or charged with a crime.

A natural starting point would be to estimate a model in which each outcome of an individual respondent, Y_i , is assumed to depend on participation in Head Start, HDST, some other preschool, OPRE, and a set of individual-specific controls, \mathbf{X} :

$$(1) \quad Y_i = \alpha_0 + \alpha_1 \text{HDST}_i + \alpha_2 \text{OPRE}_i + \alpha_3 \mathbf{X}_i + \varepsilon_i$$

where HDST and OPRE are indicator variables and ε captures unobserved heterogeneity. The vector \mathbf{X} includes observable exogenous variables that are likely to be correlated with outcomes such as the respondent’s year of birth, and indicators equal to one if the respondent is female or African-American. It is important to include a control for whether the respondent attended a preschool other than Head Start for two reasons. First, we do not want to erroneously attribute the effects of other preschools to Head Start. Second, it is useful to compare the effects of Head Start to those of other preschools, as is discussed further below.

As noted above, the key problem with interpretation of (1) is that participation in Head Start (or other preschools) is not randomly assigned and covariates may be correlated with unobservables, ε . In that case, estimates of the effect of Head Start will be biased. Head Start is targeted toward disadvantaged children and children who are perceived to be “at risk” because of learning disabilities, or a negative home environment are often referred to Head Start by social agencies. Failure to control for these intervening characteristics will result in their being included in ε_i .

To the extent that these characteristics are correlated with HDST, estimates of α_1 , the long-run “effect” of Head Start, will be biased. Because disadvantaged children are more likely to participate in Head Start, α_1 will probably be

biased downward. Children who attend other preschools are likely to come from more advantaged backgrounds and so α_2 is likely to be biased upward. One approach to addressing this concern is to include measures of the relevant intervening characteristics in the vector \mathbf{X} .

The PSID is a good data source for taking this approach since extensive information on the child's family background has been collected on an annual basis since 1968. Hence, we augment the vector \mathbf{X} by including: maternal and paternal education of the respondent; a spline in family income when the child was of preschool age; family size measured at age 4; whether the respondent lived with both parents at age 4; an indicator for whether the respondent was the oldest child, and birth weight.¹⁰ We have also experimented with adding controls for whether the mother worked or was on welfare when the child was age 4. (The addition of these variables had little impact on the results reported below.)

Despite the richness of the PSID, there may well be other unmeasured characteristics that distinguish Head Start children from their peers and which cannot be controlled in the regression model. If, conditional on the controls, these other characteristics are correlated with observable differences between Head Start children and other children then the estimated effects of Head Start will be biased. For example, if parents who send their children to Head Start (or other preschools) place a higher value on building human capital at an early age than other parents, and if that human-capital accumulation is associated with better outcomes later in life, then this unobserved difference will result in an upward bias in the Head Start "effect," α_1 . In this case, it will be the (unobserved) parental emphasis on education that leads to better outcomes in adulthood rather than Head Start (or other preschool) attendance per se.

¹⁰ Missing values were handled by first determining whether a value could be assigned using information from other waves of the PSID. For example, in some cases, father's education could be assigned to one sibling by looking at reported values for the other sibling. Using the average of household income available at age 3, 4, 5, and 6 resulted in few instances of missing data for this variable (less than 1 percent of the sample). This average income measure is what we loosely refer to as income at preschool age. When data remained missing, we assigned the mean value from the sample and included a dummy variable in the regression which indicated that a value had been assigned.

To the extent that parental taste for human capital accumulation does not differ between siblings, then it can be absorbed in a family-specific fixed effect, μ_f :

$$(2) \quad Y_{if} = \beta_0 + \beta_1 \text{HDST}_{if} + \beta_2 \text{OPRE}_{if} \\ + \beta_3 \mathbf{X}_{if} + \mu_f + \xi_i.$$

This design controls for any unobserved family characteristics that have the same linear and additive effect on the adult outcomes of all siblings. As a practical matter, μ_f is specified as a mother-specific fixed effect in the empirical models below.

The fixed-effects method is not without its own limitations. First, the effective sample includes only those respondents with at least one sibling in the sample (which is slightly over half of the total sample). In these models, the effect of Head Start, β_1 , is identified by comparing the outcomes of adults who participated in Head Start as children with the outcomes of the siblings who did not (255 adult household members from 100 families).¹¹

Second, the effects of random measurement errors may be exacerbated in a fixed-effects framework. That is, by focusing on differences between siblings within a family, we may difference out much of the true signal in the data, and result in an underestimate of the positive effects of Head Start. On the other hand, fixed effects can mitigate the effects of some forms of nonrandom measurement error. Suppose for example, that all siblings in a family erroneously report that they did not attend Head Start but some other form of preschool. This will have no impact on the estimated effect of Head Start in the fixed-effects framework.

The third problem arises when μ_f is not fixed within a family. This would arise if parents treat siblings differently. Say, for example, parents invest more in the human capital of one sibling; if they also send that child to Head Start, β_1 will

¹¹ While small, this sample is larger than many of the experimental samples discussed in Barnett's (1995) summary of the literature. Our small sample should not affect the magnitude of effects but will affect the precision with which they are estimated. It is worth noting as well that given the low Head Start participation rates among whites, there are more African-American than white families with differences in the Head Start participation of siblings.

TABLE 2—RELATIONSHIP BETWEEN PARTICIPATION IN HEAD START AND OUTCOMES AS AN ADULT

Outcome	All respondents (1)	Sibling sample (2)	Control observables (3)	Mother fixed effects (4)	Mother fixed effects		If mother \leq high school	
					African-American (5)	White (6)	African-American (7)	White (8)
A) Completed high school								
Head Start	-0.089 (0.026)	-0.075 (0.035)	0.006 (0.034)	0.037 (0.053)	-0.025 (0.065)	0.203 (0.098)	0.000 (0.071)	0.283 (0.119)
Other preschool	0.085 (0.016)	0.073 (0.022)	0.003 (0.021)	-0.032 (0.038)	-0.056 (0.064)	-0.014 (0.048)	-0.080 (0.077)	-0.019 (0.067)
Difference ^a	-0.174 (0.028)	-0.148 (0.037)	0.003 (0.039)	0.069 (0.062)	0.031 (0.085)	0.217 (0.105)	0.081 (0.097)	0.302 (0.126)
B) Attended some college								
Head Start	-0.038 (0.023)	-0.016 (0.033)	0.075 (0.033)	0.092 (0.056)	0.023 (0.066)	0.281 (0.108)	0.031 (0.067)	0.276 (0.120)
Other preschool	0.142 (0.019)	0.149 (0.027)	0.023 (0.026)	0.050 (0.040)	-0.007 (0.064)	0.095 (0.052)	0.022 (0.072)	0.103 (0.068)
Difference ^a	-0.180 (0.028)	-0.165 (0.040)	0.052 (0.041)	0.042 (0.065)	0.030 (0.085)	0.186 (0.115)	0.009 (0.092)	0.173 (0.127)
C) ln(Earnings at age 23–25)								
Head Start	-0.034 (0.090)	0.053 (0.116)	0.170 (0.117)	0.194 (0.257)	0.073 (0.321)	0.566 (0.459)	0.051 (0.357)	1.004 (0.516)
Other preschool	0.173 (0.063)	0.174 (0.086)	0.002 (0.082)	0.079 (0.171)	-0.087 (0.287)	0.146 (0.219)	0.124 (0.341)	0.136 (0.306)
Difference ^a	-0.207 (0.104)	-0.122 (0.138)	0.167 (0.144)	0.115 (0.302)	0.160 (0.420)	0.420 (0.504)	-0.073 (0.482)	0.868 (0.548)
D) Booked or charged with crime								
Head Start	0.023 (0.018)	0.041 (0.026)	0.012 (0.026)	-0.053 (0.039)	-0.116 (0.045)	0.122 (0.077)	-0.126 (0.050)	0.058 (0.095)
Other preschool	-0.017 (0.011)	-0.022 (0.016)	-0.001 (0.017)	0.032 (0.028)	0.000 (0.045)	0.063 (0.036)	-0.023 (0.056)	0.147 (0.054)
Difference ^a	0.040 (0.020)	0.063 (0.028)	0.013 (0.030)	-0.085 (0.045)	-0.117 (0.059)	0.059 (0.082)	-0.103 (0.070)	-0.089 (0.100)
Mother fixed effects	no	no	no	yes	yes	yes	yes	yes
Sample sizes:								
Panels A, B, and D	3,255	1,742	1,742	1,742	706	1,036	554	677
Panel C	1,383	728	728	728	272	456	216	320

Notes: Standard errors (in parentheses) permit family clustering and heteroscedasticity in OLS models. Columns (1) and (2) control for year of birth, gender, and race. Column (3) adds controls for maternal and paternal education, whether the mother was the head of household when the respondent was age 4, a spline in the log of family income at age 3–6 (with knots at each quartile), family size at age 4, birth order, whether respondent is oldest child, and whether respondent was low-birth-weight baby. All covariates that vary between siblings are included in columns (4)–(8) along with a mother fixed effect.

^a (Head Start) – (other preschool).

be biased upward. It is more likely, however, that parents who want to invest in the human capital of a child send that child to another preschool since Head Start is targeted at disadvantaged children. So it is, in fact, β_2 that is more likely to be biased upward. In this case, the difference $B_1 - \beta_2$ could be considered a lower-bound estimate of the effect of Head Start where the estimate takes into account systematic differences in the treatment of siblings

which result in one of them attending Head Start or another preschool while the other does not. Hence, we report this difference in Table 2.

Another reason μ_f may not be fixed within a family is that siblings experience different environments while growing up. For example, one child may participate in Head Start because family resources are low when the child is age 4 or 5 but siblings may attend other preschools (or no preschool) because resources are less

constrained when the siblings are age 4 or 5. For this reason, we include a control for family income averaged over the period that the respondent was age 3, 4, 5, and 6 in all our regression models.

A special case in which the family effect is not fixed arises when benefits associated with Head Start spill over from one sibling to the other. The Head Start program emphasizes parent participation and teaches parenting skills which might affect all children. Moreover, it is possible that what one child learns may “spill over” to siblings. In general, in the fixed-effects framework, spillovers will tend to result in downward-biased estimates of the effect of Head Start because they reduce the differences in outcomes between siblings who did and did not attend the program. We will explore evidence that spillovers are important below.

IV. Results

Table 2 presents our empirical results. For each of the four adult outcomes, we present a set of estimates following the empirical strategy outlined above. In each panel, we report the correlation of the outcome with participation in Head Start and with participation in other preschools as well as the difference between these correlations. Standard errors below the estimates take into account correlations within families (and are robust to arbitrary forms of heteroscedasticity). For simplicity of interpretation of the coefficients, we present results based on ordinary least squares (OLS); logit (and Chamberlain fixed-effects logit) estimates provide substantively the same results.

We begin with the probability that a child completed high school. About three-quarters of the sample completed high school. The first column is based on OLS estimates of model (1). In addition to HDST and OPRE, the model includes year of birth, gender of the respondent, and whether the respondent is African-American. These OLS estimates indicate that relative to those who attended no preschool, respondents who reported attending Head Start were about 9 percent less likely to complete high school, while those who attended other preschools were about 9 percent more likely to

complete high school.¹² In the second column, the sample is restricted to respondents with at least one sibling: the estimates are essentially the same as with the full sample. The results demonstrate once again that adults who attended Head Start are significantly less likely than other children to have completed high school, which is not surprising given their disadvantaged backgrounds.

Column (3) shows that, when we control for observable characteristics, high-school graduation rates are independent of reported preschool experience.¹³ Estimates that include maternal fixed effects are reported in column (4). As discussed above, these estimates show the effects of controlling for both observed and unobserved characteristics of mothers that are fixed over time and have a linear and additive influence on high-school graduation. These estimates are consistent with those shown in column (3) in that they suggest that the negative effects of Head Start shown in column (1) are an artifact of the disadvantages of Head Start children. Columns (5) and (6) of Table 2 show estimates stratified by race. The estimates suggest that whites who attended Head Start are 20 percentage points more likely to complete high school than siblings who did not attend. However, there is no statistically significant effect for African-Americans.

In the final two columns of the table, the sample is restricted to respondents whose mother had no more than a high-school education. We examine this subsample for two reasons. First, the probability that a respondent

¹² A small fraction (8 percent) of respondents report attending both Head Start and also other preschools. For these respondents, both indicator variables are turned on. The Head Start effect is, therefore, the marginal effect of attending Head Start over and above the effect of participating in other preschools. We have experimented with including an additional indicator that isolate this group who attended both. The estimates suggest that the effects of other preschools are dominant: in all models that include family controls, there are no significant differences between other preschoolers and those who attended both Head Start and other preschools.

¹³ In addition to those in columns (1) and (2), the controls are maternal education, paternal education, whether the mother was the head of the household, family income at age 4–6 (a spline in log income with knots at each quartile), family size at age 4, birth order, whether the respondent is the oldest child in the family, and whether the respondent was a low-birth-weight baby.

attended Head Start rises as socioeconomic status declines and so the percentage of reported Head Starters who are false positives is likely to be lower in this group. Second, since Head Start is targeted toward the most disadvantaged, it is of interest to know whether any long-term benefits associated with the program accrue to those from the poorest backgrounds. (We have also stratified on family income at age 3–6; the results are substantively the same but estimated with less precision in a few cases; these results are not shown.) We find that the long-term benefits of Head Start are even greater for whites in this group: those who attended Head Start are nearly 30 percent more likely to have completed high school than their siblings.

Panel B of Table 2 focuses on the next step in education: attendance at college. In the absence of controls for family background, those who attended Head Start are less likely to go to college relative to those who went to other preschools and, to a lesser extent, relative to those who attended no preschool. However, column (3) shows that after controlling observable differences in family background, those who attended Head Start are more likely to attend college. Column (4) shows that this is also true when unobserved fixed differences between families are controlled using mother fixed effects (although significance is marginal presumably because of the sample size). Columns (5) and (6) suggest that this effect is driven by white children who attended Head Start. These children are 28 percent more likely to attend college than siblings who attended no preschool and nearly 20 percent more likely than those who attended other preschools.¹⁴

Higher educational achievement is associated with many indicators of social and economic success in adulthood. In Panel C, we focus on one dimension of that success: annual earnings conditional on working.¹⁵ To smooth out year-to-year fluctuations (and fill in some missing

values), we examine the logarithm of average earnings in each year the respondent reported working between the ages of 23 and 25. There is little evidence that Head Start is associated with higher earnings at this age except in the case of white children of high-school dropouts [see column (8)]. In this group, children who attended Head Start earn significantly more than their siblings who did not attend preschool and also more than those who attended other preschools (although this latter difference is not significant). It is reasonable to suppose that earnings benefits associated with Head Start may emerge more clearly as these people move through their working lives given the findings for schooling attainment above and the well-documented association between schooling and earnings. (We have also examined whether Head Start is associated with elevated rates of labor-force participation among young adults but we find no statistically significant effects.)

The final panel examines the incidence of reported brushes with the law. Each respondent is asked whether he or she has ever been booked for or charged with a crime. Slightly less than 15 percent of the sample respondents report some brush with the law. Column (1) suggests that people who attended Head Start are significantly more likely than those who attended other preschools to have been booked or charged, although the point estimates for HDST and OPRE are not individually statistically significant. However, column (3) indicates that this gap disappears when observable characteristics are controlled, and column (4) shows that when both observed and unobserved characteristics are controlled the gap turns negative. That is, people who attended Head Start are significantly less likely to report being booked for or charged with a crime than siblings who attended another preschool.

In contrast to the results for educational attainment, this estimate appears to be driven by African-Americans. Columns (5) and (6) show that African-American children who attended Head Start are 12 percentage points less likely to report being booked or charged than siblings who did not. The effect is slightly larger among African-Americans whose mothers have only a high-school education, as shown in column (7). Reynolds et al. (2001) report a similar gap between treatments and controls in juvenile and violent crime rates among poor black children who participated in the Chicago CPC study.

¹⁴ This racial difference is also evident in OLS models that control for observable but not unobservable differences. The point estimate on Head Start is 0.141 for whites with a standard error of 0.073, but the corresponding coefficient is not statistically significant for African-Americans.

¹⁵ Since not all young adults work, the sample available for these models is smaller. There are 1,383 observations in total and 728 for people with siblings in the sample. Of these, 272 are African-American and 456 are white.

There is little evidence that children who attend preschools other than Head Start perform better later in life than children who do not attend preschool. [Of the 20 estimates in columns (4)–(8), one is significant at the 5-percent level which is the number to be expected if the estimates were independent.] This results suggests that the positive outcomes associated with attending preschool in columns (1) and (2) largely reflect selection into these programs.

We have also explored the question of whether the effects of Head Start differ with other demographic characteristics of the respondent, such as gender and birth order. While we find no significant differences in the effect of Head Start on males relative to females, there is one instance in which large differences in the point estimates for males and females emerge. Relative to their siblings, males who attended Head Start are between 15 and 20 percentage points more likely to complete high school than female respondents. This is true for both whites and African-Americans. The gap disappears when we examine college attendance and there are no gender differences with respect to earnings or brushes with the law.¹⁶

Turning to birth order, we asked whether there were any significant differences between firstborn children and others. Again, we found no statistically significant differences in the effects of Head Start between firstborn children

and their siblings. However, once again, the point estimates are suggestive. Among African-Americans, higher birth-order children appear to benefit more from Head Start than their older siblings, particularly with regard to schooling outcomes.

As discussed above, larger effects for younger siblings could reflect the presence of spillovers of Head Start benefits from older to younger children. It is plausible to assume that spillovers flow in this direction rather than from younger to older siblings for two reasons. First, older siblings are more likely to teach (or be a role model) for younger siblings. Second, the Head Start program requires parent participation and some of the skills that parents learn are likely to benefit younger children more than older siblings. For example, if a parent of a five-year-old Head Starter and a one-year-old learns that it is important to read to children from infancy, the one-year-old is likely to benefit more than the five-year-old from this new knowledge regardless of whether the one-year-old goes on to attend Head Start.

In order to assess whether these sorts of spillovers are important, we have estimated models which allow the effects of Head Start (and other preschools) to differ if an older sibling participated in the program. For the two schooling outcomes, the spillover effects of Head Start tend to be positive but they are relatively small and not significant. There is no evidence of spillover effects on earnings. There do, however, appear to be spillover effects for being booked or charged: adults with an older sibling who attended Head Start are considerably less likely to have been booked or charged with a crime, and this effect reinforces the benefits associated with the index adult's participation in Head Start. For example, among African-Americans whose mothers only have a high-school education, the respondent is 11 percent less likely to have had a brush with the law if an older sibling attended Head Start (t statistic = 2.0) and 27 percent less likely if the respondent him or herself also attended Head Start (t statistic = 3.2).

In sum, there is evidence that Head Start attendance is associated with significant improvements in educational outcomes and possibly with higher earnings among whites, while among African-Americans, we find evidence that past Head Start attendance reduces reported

¹⁶ The relationship between Head Start and teenage or out-of-wedlock childbearing has received considerable attention in the literature. Whereas graduating from high school is generally regarded as a positive outcome, there is debate in the literature regarding the welfare interpretation that should be placed on a woman who has children during her teen years or outside of marriage. Moreover, the empirical strategy used in this study is not well suited to analyze the issue since the analytical sample is, by design, restricted to those women who have a female sibling. This results in a sample of 467 women of whom 10 percent attended Head Start and 16 percent had a child out of wedlock (or while a teenager). The effective sample size for these analyses is small. With these caveats in mind, we have investigated the relationship between Head Start and childbearing. Women who attended Head Start are about 10 percent more likely to have a child out of wedlock than other women. However, when selection is taken into account, the differences among siblings are reduced to 5 percent (and the standard error is 6 percent). Among white women, those who attended Head Start are 2 percent less likely to have a child out of wedlock relative to their siblings. None of the differences is significant. The differences in teenage childbearing are smaller in magnitude, and none is significant.

criminal activity. We also find some suggestive evidence that Head Start participation improved rates of high-school completion among African-American males (though these estimates were not statistically significant), and that there are spillover effects of Head Start attendance from older to younger siblings.

V. Conclusions

Very little is known about the longer-term effects of participation in Head Start, although previous research showing "fade-out" in effects on test scores raises legitimate questions about whether early gains translate into benefits later in life. This paper uses nonexperimental data on young adults in the PSID to ask whether participation in Head Start is associated with benefits in adulthood. We exploit the panel dimension of the PSID and control for observable differences between respondents when they were young children. We also exploit the family-based sampling frame of the PSID by including maternal fixed effects and comparing adult outcomes of siblings.

Participation in Head Start has positive effects on the probability of attending college. However, these positive effects are driven by whites. Whites also see large increases in the probability of graduating from high school, and possibly in earnings as young adults. We did not find statistically significant effects for African-Americans, though we did find some suggestive evidence that Head Start may increase the probability of graduating from high school among African-American males. We also find that African-Americans who participated in Head Start are significantly less likely to have been booked or charged with a crime than siblings who did not. Head Start did not appear to have any significant effect on reports of being booked or charged among whites. Finally, we find some evidence suggesting that there are positive spillovers from older children who attended Head Start to their younger siblings, particularly with regard to brushes with the law.

We have sought to carefully describe the limitations as well as the strengths of our study sample and methods. With those limitations in mind, we conclude that the results are supportive of the view that Head Start participants gain social and economic benefits that persist into adulthood. Moreover, as we have argued above,

our methods are likely to provide lower-bound estimates on the positive effects of Head Start. However, it would be foolhardy to leap to conclusions about the long-term efficacy of a large program like Head Start on the basis of a single study. Much remains to be discovered about the nature and distribution of longer-term benefits from early childhood interventions.

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