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Program Inputs**

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ABSTRACT

Head Start Funding Expansions and Program Inputs*

Our paper provides some of the first evidence on the effect of the Head Start funding expansions on program inputs. We take advantage of the county-year variation in funding increases that were implemented due to a number of legislated policy changes in the late 1980s and throughout the 1990s. By focusing on the period between 1988 and 2007, we show that the funding increases were directed at increasing program enrollment and full-time enrollment. We also show that the funding expansions were used to make a number of quality-related investments, including increasing the number of teachers and staff, and upgrading the skill-level of teachers.

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I Introduction

Since its inception in 1965, Head Start has become one of the most important early childhood education programs in the U.S. Designed as a two-generation program, Head Start provides education and health services to economically disadvantaged children as well as a variety of social services to parents. Today, Head Start receives approximately \$10 billion in federal funding to serve nearly 900,000 children (Office of Head Start, 2019). Given its size and importance, the program has been studied extensively using a number of data sources and methodologies, with the results showing positive effects on child development in the short-run and schooling and labor market outcomes in the long-run.¹

Although the evidence on *program impacts* is well-established, relatively little is known about the *mechanisms* through which Head Start influences child outcomes. Two interrelated questions are central to an understanding of mechanisms: which inputs (e.g., teacher training and education, compensation, and classroom group sizes/ratios) are the most effective at driving overall program impacts, and to what extent do program administrators allocate funding to those inputs? Such questions have become increasingly important, given that the explicit goal of several recent Head Start funding expansions has been to simultaneously increase child enrollments and improve program quality. One concern with these requirements is that administrators—who nevertheless remain resource constrained—may be forced to serve more children by forgoing some quality-related investments, or vice versa. Such trade-offs might also take the form of input substitution, in which administrators disinvest in some dimensions of program quality to allocate additional resources to improve other dimensions. Together, these issues relate to whether Head Start funding is directed at the most developmentally productive program inputs.

In this paper, we provide evidence on how program administrators allocate financial

¹The best available evidence from the literature comes from the following papers: [Bitler, Hoynes and Domina \(2014\)](#); [Kline and Walters \(2016\)](#); [Ludwig and Miller \(2007\)](#); [Puma et al. \(2005\)](#) for the short-medium run impacts, and [Bailey, Timpe and Sun \(2020\)](#); [Currie and Thomas \(1995, 1999\)](#); [Deming \(2009\)](#); [Thompson \(2017\)](#) for the long-run impacts.

resources to two key characteristics: enrollments and quality inputs (e.g., teacher training and education, staff compensation, and classroom group sizes/ratios). Specifically, our empirical analysis studies the impact of a series of legislated funding increases throughout the 1980s and 1990s, during which federal funding grew from \$2 billion to \$7 billion dollars.² This federal funding increase occurred at different times and in different locations, and we exploit this variation to provide the first evidence on how funding is allocated by administrators across various program inputs. In doing so, our analysis aims to shed light on the mechanisms through which Head Start may improve child outcomes.

Our analysis dataset merges information on Head Start funding records from the Consolidated Federal Funds Reports (CFFR) with grantee-level characteristics from the Office of Head Start’s Program Information Reports (PIR) during the period 1988 to 2007. Our outcome variables relate to Head Start enrollments (e.g., overall and full-time) and quality-related inputs (e.g., number of staff, staff education levels, compensation, and student-teacher ratios). Given that all variables are measured in county-year cells, our dataset consists of a panel of counties over a 20-year period, thereby allowing us to take advantage of within-county over-time variation in per child Head Start funding, controlling for unobserved permanent differences across counties as well as time-varying national shocks that may be correlated with program funding.

Our key findings can be summarized as follows. First, we confirm that Head Start funding increased substantially during the study period. In particular, our descriptive analysis shows that per child Head Start spending tripled between 1988 and 2007, with most of the growth occurring during the 1990s. We also find that the federal funding expansion was disproportionately distributed across counties. We show that counties experiencing economic hardship, those with a larger share of the black population, and those with higher government assistance per capita receive more Head Start funding. Second, results from our regression models suggest that the funding expansions were moderately successful in achieving their

²All the monetary values are expressed in constant 2008 dollars throughout the paper.

intended goals. On the one hand, the additional funding substantially increased overall program enrollment and full-time enrollment. Our preferred estimate implies that a \$1,000 increase in Head Start funding per child increased enrollment by 25 percent and full-time enrollment by 14 percent. These overall enrollment effects were driven by the substantial response by Hispanic children, whose enrollment rate increased by 66 percent. In addition, the funding was used by program administrators to make a variety of quality investments, such as increasing the number of teachers and staff, and upgrading the skill-level of teachers. However, our results also point to the potential limits of such funding increases, given that critical inputs like student-teacher ratios and teacher compensation were not affected.

This paper contributes to the literature on Head Start in multiple ways. First, many studies within the literature exploit variation in program funding to identify the impact of Head Start on children’s outcomes (Currie and Neidell, 2007; Ludwig and Miller, 2007; Thompson, 2017; Barr and Gibbs, 2019; Bailey, Timpe and Sun, 2020; Kose, 2021). Although these studies suggest there is a strong link between program funding and child development, little attention has focused on the mechanisms through which this funding improves child well-being. This paper attempts to fill this gap by focusing explicitly on how funding increases are used by administrators to alter the supply and characteristics of Head Start programs. We do so by analyzing these input decisions during a period of unprecedented funding growth. Thus, our results may be able to shed light on how these funding-induced program changes ultimately influence children outcomes.

Second, our results offer clues about whether Head Start administrators allocate funding to the most developmentally productive program inputs. The funding-induced increase in Hispanic enrollment is a positive development, in light of the evidence that Head Start has larger positive effects on such children (e.g., Currie and Thomas, 1999; Kose, 2021). In addition, the funding used to increase full-time enrollment seems important, given the results in Walters (2015) that the positive impact of Head Start participation operates in large part

through the full-time-enrollment channel. Third, our finding that the 1990s funding expansion increased the number of Head Start teachers with higher levels of field-specific education is inconclusive from a developmental perspective. The evidence suggests that teacher credentials have mixed effects on classroom quality (Early et al., 2006, 2007) and null effects on child development (Early et al., 2006, 2007; Mashburn et al., 2008). Finally, although statistically imprecise, it is encouraging that teacher-pupil ratios actually increased somewhat and that staff turnover rates did not change in light of the increase in teacher education levels. That the ratios did not decline, nor did turnover rates increase, are encouraging from a developmental perspective (e.g., Chetty et al., 2011; Ronfeldt, Loeb and Wyckoff, 2013).

The remainder of the paper proceeds as follows. Section II provides a brief history and description of the Head Start program, and discusses the relevant literature. In Section III, we describe the data used for this analysis, followed by a formal presentation of the empirical model in Section IV. Section V reports the main results, and we end with a discussion of policy implications in Section VI.

II Background and Related Literature

A History and Description

The Head Start program began in 1965 as part of President Johnson’s War on Poverty initiative to provide education, health and other social services to low-income children and their families. Since its inception, the program experienced a series of policy changes to expand its reach, services and quality. We summarize these policy changes in Figure 1 while focusing on the period 1988 to 2007, which coincides with the timing of our data availability.

Throughout the 1980s and 1990s, a number of legislative revisions were made to Head

Start which both increased funding for the program while raising the quality requirements for individual grantees. Beginning in 1986, when Head Start was reauthorized, discussions during the process led Congress to set aside funds for salary improvements for teachers starting in 1988. In addition, during the George H. W. Bush administration between 1989 and 1993, the Head Start program received significant attention, culminating in a series of funding expansions to increase enrollment and quality. These initial program changes culminated in the passage of the Head Start Expansion and Quality Improvement Act of 1990, which increased funding for quality improvement and teacher training. More specifically, the Act set minimum requirements for teachers for the first time by mandating that every classroom have at least one teacher with a Child Development Associate (CDA) credential or an Early Childhood Education (ECE) degree.

In 1992, Head Start funding increased once again to extend services to an additional 180,000 children and families. In addition, Congress passed the Head Start Improvement Act of 1992 to provide health services for younger siblings and child development and literacy training for parents. The Head Start program continued to grow and transform throughout the Clinton era. The Head Start Amendments Act of 1994 emphasized the importance of staff qualifications and professional development and increased salary compensation for Head Start staff.³ Furthermore, performance standards were revised and monitoring was improved. In 1998, Congress reauthorized Head Start through the Community Opportunities, Accountability, and Training and Educational Services (COATES) Act, which once again increased the minimum standard for teachers' education levels by requiring at least one teacher in each classroom and 50% of teachers nationwide to have an associate's degree in Early Childhood Education (ECE) or a related field by 2003. This legislation also mandated increases in annual funding, some of which was directed toward improving staff salaries and benefits.

³Early Head Start was created in 1994 to provide services for pregnant women, infants and toddlers. Our paper's focus is on the Head Start program, therefore, we leave out the discussion of Early Head Start from the main text.

During the George W. Bush administration, Head Start funding growth stalled, with a shift in emphasis on children’s school readiness. In 2002, a national training program for teachers was implemented to learn early literature teaching techniques, and in the following year the Head Start National Reporting System (NRS) was introduced to assess children’s academic progress and skill-attainment in language, literacy, and mathematics. The NRS was replaced in 2007 through the Improving Head Start for School Readiness Act, which created five-year term limits for grantees and introduced additional domain indicators for children’s early learning goals. Importantly, the 2007 legislation increased once again Head Start teachers’ education requirements, mandating that 50% of teacher nationwide have a bachelor’s degree in ECE or a related field by 2013.

As a result of these policy reforms, Head Start funding grew from \$2 billion in 1988 to nearly \$7 billion in 2007 (in constant 2008 dollars), and program enrollments increased from 400,000 children to 900,000 children.

B Relevant Head Start Literature

Head Start has served low-income children and families for more than 50 years and has been evaluated extensively. The extant literature focuses on the effect of Head Start on children’s human capital and health outcomes, and is shown that Head Start improves children’s long term outcomes.⁴ Relevant for our work, a few papers have examined Head Start’s funding availability and program extensions on children’s outcomes in the first 15 year’s of program’s introduction (Ludwig and Miller, 2007; Thompson, 2017; Barr and Gibbs, 2019; Bailey, Timpe and Sun, 2020). Recent papers by Kose (2021) and Wikle and Wilson (2020) analyze the effect of Head Start funding expansions in the 1990s on children’s outcomes and maternal labor supply decisions, respectively. We contribute to this literature by examining the effect of Head Start program funding expansions in the 1990s on program characteristics.

⁴Currie (2001), Duncan and Magnuson (2013), Gibbs, Ludwig and Miller (2013), and Ludwig and Phillips (2008) provide extensive literature review.

Our paper provides additional insights by showing funding expansions led to an increase in program enrollment, full-time enrollment, the number of teachers and staff. Our paper is the first to link the funding changes on the supply side.

An important study by [Currie and Neidell \(2007\)](#) investigates whether higher Head Start funding is associated with better cognitive and behavioral outcomes for children. They find that indeed children who were exposed to higher Head Start funding levels had better test scores. Taking advantage of detailed administrative budget data, the authors also show that higher education and health expenditures in Head Start programs were associated with better behavioral outcomes for children. In a recent paper, [Kose \(2021\)](#) finds that increases in Head Start funding lead to improved test score outcomes for children, particularly among Hispanic children. These findings suggest that there is a strong link between program funding and children outcomes. Overall, these findings are consistent with those in [Jackson \(2020\)](#) and [Jackson, Johnson and Persico \(2016\)](#), which show that K-12 public school spending has sizable short- and long-run effects on student outcomes.

III Data

A Data Construction

We use several data sources on Head Start funding, program characteristics, and county-level socioeconomic characteristics to analyze the impact of Head Start funding expansions on program inputs between 1988 and 2007. Our final dataset is at the county-year level.⁵

We compile Head Start funding data from the Consolidated Federal Funds Reports (CFFR), which contains information on federal program appropriations annually with a grant identification code and the location for each grant (state and county).^{6,7} We collapse

⁵We exclude Alaska, Hawaii, and other U.S. territories from our analysis. All the monetary values are expressed in constant 2008 dollars.

⁶Head Start grants are retained using the identification code “93.600”.

⁷Source: Consolidated Federal Funds Report, Fiscal Years 1982-2007: County Areas [CFFR-dataset].

the CFFR data at the county and year level to determine the funding allocation to each county. We then validate the CFFR data with published annual Head Start funding records that are reported by the Office of Head Start.⁸ Figure A.1 compares Head Start funding levels between 1983 and 2007 using published federal appropriations and aggregated annual funding using CFFR. This figure shows that patterns of funding levels and changes over the years align well across the two data sources, except for the years 2000 and 2006. For those years, the CFFR shows funding levels dropping significantly. To account for this, we assign the average value of funding between the two data points for each county in those years.⁹

For Head Start program characteristics, we use detailed annual grantee-level data from the Office of Head Start’s Program Information Reports (PIR).¹⁰ The PIR data have been collected since 1988 from Head Start grantees and delegate agencies, providing comprehensive information on program and staff characteristics as well as the services received by children and families. Importantly for our purposes, these data include Head Start enrollment counts by race and ethnicity, full-time enrollment counts, the number and characteristics of teachers and staff, and staff compensation.

We construct county-level population counts for children ages three and four using data from the Surveillance, Epidemiology, and End Results Program (SEER). Using the population of age-eligible children, we create “per child” measures of the funding and program variables.¹¹ Importantly, SEER reports county-year level population in total and by race, which we use as control variables, including the total population, percent black, and percent white population.

Washington D. C.: Bureau of the Census and U. S. Department of Commerce. Retrieved from National Archives Catalog <https://catalog.archives.gov/id/626196>.

⁸The Office of Head Start reports funding levels annually and across states in the Head Start Fact Sheets <https://eclkc.ohs.acf.hhs.gov/about-us/article/head-start-program-facts>.

⁹We show that our results are not sensitive to dropping those years from our analysis (see Table A.1).

¹⁰Source: PIR data retrieved from <http://eclkc.ohs.acf.hhs.gov/PIR>

¹¹We also use county-year level child counts as weights in some of our regression analyses.

As additional county-level control variables, we include the unemployment rate from the Bureau of Labor Statistics (BLS) and transfer payments per capita from the Bureau of Economic Analysis' Regional Economic Accounts (REIS). The REIS data contain per capita income and per capita funding for social security, supplemental security income, supplemental nutrition assistance, and unemployment insurance.

Finally, we compile data from the Small Area Income and Poverty Estimates (SAIPE) that report counts of children ages 0-17 and 5-17 living in poverty for the years 1989, 1993, 1995, 1998, 1999, and between 2000 and 2008. Interpolating data for the missing years, we generate population count for children ages 0-4 living in poverty by subtracting children ages 5-17 from children 0-17 for each county and year. We then create the county-year level poverty rate for children ages 0-4 and use it as a control for material well-being.¹²

B Summary Statistics

This analysis focuses on the period between 1988, when the PIR data first became available, and 2007, just before the Great Recession hit the U.S. economy. Figure 2 presents the time series in total and per-child Head Start funding during this period. While total funding increase from \$2 billion to \$7 billion, Head Start funding per child tripled from \$1,000 to \$3,000. To demonstrate the county-level variation in funding levels over time, we chose the following five states: Alabama, Minnesota, New York, Pennsylvania, and Washington. Figure 3 shows that there is substantial variation in funding levels across counties and within a county over time.

We further illustrate the geographic variation in the levels and growth of funding per child across years in Appendix Figures A.2 and A.3 for the U.S. at large. These maps reveal that the increase in funding levels occurred throughout the U.S., which implies that funding growth is not concentrated within certain regions or that funding was targeted to programs

¹²Poverty rate for children is calculated using the population of children 0-4 living in poverty divided by the overall population in each county and year.

in specific states or counties. Our empirical strategy takes advantage of the variation in funding per child across counties and over-time to examine its potential impact on program enrollment and inputs.

Table 1 reports the summary statistics for Head Start funding per child and the outcome variables, and shows the years each variable is available in the data set.¹³ The average funding per child is around \$2,148 during the period 1988 to 2007. While about 27 percent of children ages three and four were enrolled in Head Start, on average, six percent were enrolled full-time. Of the Head Start participants, about 15 percent were white, seven percent were black, and three percent were Hispanic. In Figure 4, we present descriptive evidence on the relationship between Head Start funding per child and Head Start enrollment by plotting the average Head Start funding against the overall enrollment, enrollment by race and ethnicity and by full-time status over time. These figures show a strong positive correlation between enrollment and funding, which suggests that the growth in program funding during this period was partially used to enroll more children in the Head Start program.

In the rest of Table 1, we report summary statistics for the average number of teachers, staff, and teacher salary in addition to the inputs that the education literature suggests may be important for children’s academic achievement, such as teacher-pupil ratios, staff-pupil ratios and the percent of full-time participants. We also show the time series for some of these variables in Appendix Figure A.4. Overall, this descriptive analysis strongly suggests that increases in funding coincide with improvements in program characteristics, a relationship we test more rigorously in the regression analysis.

C Empirical Determinants of Funding Expansions

Historically, Head Start funding increases have been driven by policy changes implemented by the federal government. The Community Services Act of 1974 suggested that the addi-

¹³We show unweighted means and standard deviations for variables that are constructed using the population of children in the denominator and weighted means and standard deviation for the rest of the variables.

tional funding at the state level should be distributed based on the number of unemployed, public assistance recipients, and children living below the poverty line. However, guidelines on how the federal funding got distributed to local agencies are not clearly stated.

Table 2 presents correlations between Head Start funding per child and the time-varying county characteristics.¹⁴ Columns 1 through 10 show that counties experiencing economic hardship, with a higher percentage of the black population, and with higher transfers per capita secure more Head Start funding. Columns 11 and 12 suggest that more populated counties experience less funding per child; this could just be a mechanical relationship. In the last two columns, we show results from models that include all of the variables in the estimation without (Column 13) and with state fixed effects (Column 14). While the socioeconomic characteristics of counties explain only a small part of the overall variation in funding expansions (R^2 varies between 0.16 and 0.26), they are collectively important explanatory variables. Thus, we use them as controls in our main estimation.

In addition, Figure 5 shows a positive relationship between the funding levels in 1988 and 2007, which suggests that places with more funding in the past also experienced higher funding levels in the future.

IV Empirical Strategy

Given that Head Start funding is not randomly distributed across time and geography, it is hard to identify the causal effect of an increase in funding on program characteristics. However, we take advantage of the panel structure of the data and use fixed effects to minimize omitted variable bias, while controlling for a rich set of observable time-varying county characteristics. The application of county fixed effects allows us to control for observed and unobserved time-invariant differences across counties that may be correlated with both Head

¹⁴These regressions use Head Start funding per child as the outcome variable and are weighted by county-level population of children at ages three and four.

Start program funding and changes in program characteristics, while time fixed effects allow us to control for unobserved national shocks, such as other federal child-related policy reforms, that may influence the Head Start program.

We use county-year panel-fixed-effects estimation formulated using the following equation:

$$Y_{ct} = \alpha + \beta \text{HeadStartfunding}_{ct} + \theta_c + \gamma_{s(c)t} + \mathbf{X}'_{ct}\boldsymbol{\rho} + \varepsilon_{ct} \quad (1)$$

where Y_{ct} is an outcome variable in county c and year t ($= 1988, \dots, 2007$). $\text{HeadStartfunding}_{ct}$ is Head Start funding per child (scaled by \$1,000) in county c and year t . θ_c denotes county fixed effects to absorb time-invariant differences across counties. $\delta_{s(c)t}$ is a set of state-by-year fixed effects to capture time-varying changes that are differential across states such as state-provided preschool. \mathbf{X}_{ct} includes county-year level characteristics including child poverty rate, per capita income, and per capita measures of government transfers such as supplemental security income, supplemental nutrition assistant, unemployment insurance, and social security. Standard errors are clustered at the county level. β is the coefficient of interest that measures the conditional change in the outcome in response to a \$1,000 increase in Head Start funding per child.

The key assumption for the unbiasedness of β is no time-varying unobservables within counties that are correlated with Head Start funding and program characteristics. As this is unlikely to be a tenable assumption, we take a number of steps to mitigate the consequences of any omitted time-varying confounders. First, we control for a rich set of observable county characteristics, as described above. Second, we incorporate a set of state-by-year fixed effects (in addition to the county fixed effects) to account for time-varying state unobservables that may be correlated with Head Start funding at the local level. Finally, we show results including county-specific linear time trends in the model to capture any within-county unobservables that may be trending linearly over time. As will be shown, the coefficient β is extremely robust to the inclusion of these additional controls.

V Results

A Enrollment Results

Tables 3 and 4 provide the paper’s main results of the impact of Head Start funding on program enrollment. The models in Table 3 use the total Head Start enrollment (in county and year cells) per child ages three and four as the outcome variable, with each column varying the controls included in the model. Specifically, Column 1 includes county and year fixed effects, Column 2 adds the time-varying county-level controls, and Column 3 adds state-by-year fixed effects. We regard the estimates in Column 3 as the preferred results. We then subject this model to two robustness tests, first in Column 4 by interacting 1988 values of the county controls with a linear time trend, and then in Column 5 by including county-specific linear trends. Using our preferred estimation, Table 4 examines as the outcomes race- and ethnicity-specific enrollment rates (columns 2 through 4), as well as the full-time enrollment rate (Column 5).

The point estimates in Table 3, which are remarkably stable across the various specifications, reveal a strong positive relationship between Head Start funding and total program enrollment. Specifically, the estimate in Column 3 implies that a \$1,000 increase in Head Start funding per child increases enrollment in Head Start by nearly seven percentage points. Given that the mean enrollment rate is about 27%, the coefficient implies an increase in program enrollment of 25%.

Table 4 examines heterogeneity in enrollment responses across white, black, and Hispanic children. Although Head Start enrollments rise substantially across all three demographic groups, it appears that Hispanic children experience the most robust increases in enrollment. Indeed, the coefficient in Column 4 implies that a \$1,000 increase in Head Start funding leads to a 64% increase in Hispanic enrollment (from the mean), while the estimates in columns 2 and 3 indicate enrollment responses of 23% and 21% for white and black children

respectively. Finally, Column 5 of Table 4 studies full-time enrollment. Interestingly, only six percent Head Start enrollments are full-time, on average. Our results show that increased funding is a reasonably powerful tool for increasing full-time Head Start participation, with the coefficient implying a 15% increase in full-time enrollment (from the mean) for each \$1,000 increase in funding.

B Program Characteristics

Table 5 presents estimates of the impact of Head Start funding expansions on the number of teachers and staff (columns 1 and 2), teachers' education qualifications (columns 3 through 6) and salary (Column 7).¹⁵ The results in columns 1 and 2 show that a \$1,000 increase in Head Start funding per child increases the number of teachers per child by approximately 0.4 percentage points and the number of staff per child by 2 percentage points. These estimates are statistically significant and correspond to a nearly 30% increase relative to the mean. In the rest of the table, the results show a positive but statistically imprecise association between funding expansions and teacher degree attainment and salary.

Table 6 examines the relationship between funding expansions and some additional inputs that are considered as part of the education production function. In the first two columns, the results show statistically imprecise positive associations between Head Start funding and teacher-pupil ratios and teacher-plus-aide-pupil ratios. This is partly due to the fact that both enrollment and the number of teachers increased at a similar rate in response to Head Start expansions. In the next two columns, the results show that additional Head Start funding per child is associated with improvements for the staff-pupil ratios ($p < 0.05$) and the share of full-time enrollment ($p < 0.05$) in the Head Start programs.

Panel A of Table 7 shows the effect of funding per child on teacher composition by degree attainment, that is, the share of teachers with a Child Development Associate (CDA)

¹⁵In the PIR data, teachers' education qualifications and salary are reported only in a subset of years which are listed in Table 1.

credential, an ECE degree (at the bachelor's or associate's level), an associate's degree (in any field), and a bachelor's degree (in any field). Of these outcomes, the share of teachers with AA degree is marginally improved in response to funding expansions ($p < 0.10$). In Panel B, we show that there is no statistically significant relationship between funding expansions and staff composition using the share of staff members replaced during the school year, the share of staff who are teachers, aides and home visitors as outcomes.

Taken together, these results in Sections A and B provide empirical evidence that Head Start funding expansions were spent toward increasing program enrollment and full-time enrollment as targeted. However, the results do not show strong evidence that the quality of the program is improved in all measured inputs, i.e. teacher pupil ratio. Although not conclusive due to data limitations, we do not find strong evidence that teachers' education and teachers' salary (some of outcomes that policy changes targeted) improved in response to funding increases.¹⁶

Full-time enrollment is an important input that funding expansions increased. Using data from the HSIS, Walters (2015) shows that centers that offer full-time services and home visiting are more effective in improving cognitive effects of children. On the other hand, Walter's paper show that teacher education and class size are not associated with cognitive improvements for Head Start participants.

VI Conclusion and Policy Implications

There is a large body of evidence that compensatory education programs targeting preschool-age children can improve short-run academic performance as well as long-run labor market outcomes. For example, Head Start, a two-generation program in operation since the mid-1960s, has been studied extensively using a variety of methodological approaches, and results

¹⁶Detailed information on teachers' education is only reported between 1999 and 2007. Teacher salary information is only available between 1992 and 2000 in the PIR data.

from these studies are fairly consistent: participation in Head Start increases the odds of long-term success in school and in the labor market among disadvantaged children.

Although the evidence on *program impacts* is well-established, relatively little is known about the *mechanisms* through which Head Start influences child outcomes. In this paper, we provide some of the first evidence on how Head Start administrators allocate funding across the various program inputs, a key intermediate question that may shed light on the mechanisms at work to improve child outcomes. Indeed, a recent paper from [Kose \(2021\)](#) informs the importance of this question, showing that increases in Head Start funding in and of itself leads to improved student performance, particularly among Hispanic students. This finding is consistent with those in [Jackson \(2020\)](#) and [Jackson, Johnson and Persico \(2016\)](#), which show that K-12 public school spending has sizable short- and long-run effects on student outcomes.

Our empirical analysis exploits a number of legislated funding increases during the 1980s and 1990s. In particular, the Bush and Clinton administrations increased program funding to serve more children and improve quality by raising teacher education requirements and compensation and expanding social services. Indeed, our descriptive analysis shows that per child Head Start spending tripled between 1988 and 2007, which coincided with increases in enrollments (including full-time enrollments) and improvements in teacher education level and salaries and classroom ratios.

Nevertheless, our regression results suggest that these Head Start funding expansions were moderately successful in achieving its objectives. On the one hand, the additional funding was used to enroll more disadvantaged children, particularly Hispanic children, and to increase the number of children attending full-time. In addition, the funding was used to increase the number of teachers and staff and upskill the workforce, with more teachers estimated to have an associate's degree and/or a field-specific degree in ECE. However, our results also underscore the potential limits of these funding expansions. Although an explicit

goal of such reforms was to improve teacher compensation, we find suggestive evidence that this may have occurred. Furthermore, we show that the funding did not appear to improve some potentially important quality inputs such as teacher-pupil ratios. However, it should be noted that the concomitant increase in enrollments and teachers over this period likely explains why teacher-pupil ratios did not change.

The analyses in this paper exploit several pieces of legislation that significantly increased Head Start funding. However, more recent legislation introduced strict standards and accountability measures into the program with comparatively little funding increases. For example, the 1998 Community Opportunities, Accountability, and Training and Education Services Act mandated that 50 percent of all Head Start teachers nationally must have an associate's degree in ECE (or related field) by 2003. In addition, the 2007 Improving Head Start for School Readiness Act required 50 percent of teachers to have a bachelor's degree by 2013 (Office of Head Start, 2021). As of the 2014-2015 school year, these education requirements were met, with 72 percent of Head Start teachers having at least a bachelor's degree (NIEER 2016).

Our results suggest that Head Start administrators may make trade-offs between serving more children and engaging in some quality-related investments (e.g., increasing teacher salaries and auxiliary services), even during a period of rapid funding growth. Therefore, it is possible that, to comply with the 1998 and 2007 teacher education mandates in the face of limited financial resources, Head Start administrators may have reduced the number of children served or engaged in input substitution (i.e., reducing or withholding other quality investments). Although additional research is needed to examine how Head Start programs adjusted to these recent reforms, this paper reveals that even a modest amount of quality improvement requires significant financial resources. Finally, more consistent and quality data collection would allow researchers to credibly analyze the costs and benefits of the reforms to inform policy discussions.

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VII Tables

Table 1: Summary Statistics

	Years data available	Unweighted		N of obs.	Weighted	
		Mean	SD		Mean	SD
<i>Head Start Funding per Child</i>						
Head Start Funding Per Child (in 2008\$)	1988-2007	2148.47	3871.01	21656		
<i>Head Start Enrollment per Child</i>						
Total	1988-2007	0.27	0.49	21656		
Whites	1988 and 1992-2007	0.15	0.33	20835		
Blacks	1988 and 1992-2007	0.07	0.19	20835		
Hispanics	1988 and 1992-2007	0.03	0.14	20835		
Full-Time	1988-2007	0.06	0.17	21656		
<i>Teacher and Staff per Child</i>						
# Teachers	1988-2007	0.01	0.02	21656		
# Total Staff	1988-2007	0.06	0.10	21656		
Teacher Salary (in 2008\$)	1992-2000	18.53	30.40	9748		
<i>Constructed Variables</i>						
Teacher Pupil Ratio	1988-2007			21649	0.04	0.02
Teacher+Aide Pupil Ratio	1988-2007			21649	0.09	0.03
Staff Pupil Ratio	1988-2007			21649	0.18	0.06
% Full Time Enrollment	1988-2007			21649	26.93	32.61
<i>Teacher and Staff Composition in Education</i>						
% Teachers with ECE degree	1988-1996			9345	82.83	18.34
% Teachers with AA degree	1999-2007			9881	26.52	19.41
% Teachers with BA degree	1999-2007			9881	28.32	20.47
% Staff Replaced	1988-2007			21654	9.62	7.24
% Staff Teachers	1988-2007			21654	25.84	7.16
% Staff Aides	1988-2007			21654	25.63	7.58

Notes: Head Start funding data are from the Consolidated Federal Funds Reports (CFFR), combined with the population counts for three- and four-year-olds from the SEER. Head Start enrollment and program characteristics are from the Program Information Reports (PIR). The data are at the county-year level and include years between 1988 and 2007. All the monetary values are expressed in constant 2008 dollars. For more details about the data description, see Section IIIA.

Table 2: Determinants of Head Start Funding Per Child

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Poverty Rate	3.471*** (0.309)												9.370*** (1.043)	8.678*** (0.902)
Poverty Rate among children 0-4		1.535*** (0.142)											-4.887*** (0.357)	-4.519*** (0.323)
Per capita personal income (000s)			-0.020*** (0.001)										-0.019*** (0.002)	-0.013*** (0.001)
Unemployment rate				0.050*** (0.004)									-0.070*** (0.006)	-0.056*** (0.006)
Percent Black					0.801*** (0.089)								-1.697*** (0.294)	-2.984*** (0.361)
Percent White						-0.821*** (0.083)							-1.631*** (0.302)	-1.907*** (0.351)
Social Security benefits per capita							0.303*** (0.019)						0.411*** (0.022)	0.564*** (0.021)
Unemployment insurance compensation per capita								0.038 (0.096)					0.020 (0.122)	1.050*** (0.135)
SNAP benefits per capita									4.080*** (0.200)				2.497*** (0.389)	-0.138 (0.360)
Supplemental Security Income benefits per capita										2.975*** (0.158)			2.916*** (0.180)	5.481*** (0.224)
Population of Children 3-4 (000s)											-0.001*** (0.000)		-0.004*** (0.001)	-0.003*** (0.001)
Total Population (000s)												-0.000*** (0.000)	0.000 (0.000)	0.000 (0.000)
Obs	21656	21656	21656	21656	21656	21656	21656	21656	21656	21656	21656	21656	21656	21656
R-Squared	0.041	0.028	0.028	0.010	0.008	0.010	0.015	0.000	0.054	0.053	0.006	0.004	0.154	0.253
F-test	126.430	116.998	377.204	133.572	81.001	97.576	266.956	0.155	416.344	353.584	38.764	24.328	178.775	275.746
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.694	0.000	0.000	0.000	0.000	0.000	0.000
State FE														Y

Notes: The dependent variable is average federal Head Start funding per child. Head Start funding data are from the Consolidated Federal Funds Reports (CFFR), combined with the population counts for three- and four-year-olds from the SEER. The data on economic indicators are from various sources listed in Section IIIA. The data are at the county-year level and include years between 1988 and 2007. All the monetary values are expressed in constant 2008 dollars. Estimates are weighted by the population of three- and four-year-olds. Standard errors are adjusted for heterokedasticity. * p<0.10, ** p<0.05, *** p<0.01.

Table 3: Head Start Funding Per Child and Enrollment Per Child, Sensitivity

	(1)	(2)	(3)	(4)	(5)
Head Start Funding/1000	0.067*** (0.016)	0.067*** (0.016)	0.069*** (0.016)	0.069*** (0.016)	0.068*** (0.017)
% Effect (Coef/Mean)	24.71	24.63	25.22	25.33	25.12
Mean Y	0.272	0.272	0.272	0.272	0.272
Mean Funding in 1988	930	930	930	930	930
Mean Funding 1988-2007	2148	2148	2148	2149	2148
County, Year FE	Y	Y	Y	Y	Y
County-Year Controls		Y	Y		Y
State*Year FE			Y	Y	Y
1988 County Conts*Trend				Y	
County Specific Linear Trend					Y
Obs	21656	21656	21656	21643	21656

Notes: This table reports the estimated coefficients for Head Start enrollment per child when the independent variable is real federal Head Start spending per child (2008\$). Head Start spending per child is scaled by \$1000. Head Start spending data are from the Consolidated Federal Funds Reports (CFFR), coupled with the population counts for three- and four-year-olds from the SEER. Head Start enrollment data are from the Program Information Reports (PIR). For more details about the data description, see Section IIIA. The data are at the county-year level and include years between 1988 and 2007. All regressions include county and year fixed effects. Standard errors are clustered at the county level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Head Start Funding Per Child and Enrollment Per Child, by Race/Ethnicity and Full-time

	Total	Whites	Blacks	Hispanics	Full-Time
	(1)	(2)	(3)	(4)	(5)
Head Start Funding/1000	0.069*** (0.016)	0.036*** (0.012)	0.014*** (0.005)	0.022*** (0.006)	0.009** (0.003)
% Effect (Coef/Mean)	25.22	23.71	21.34	65.60	14.32
Mean Y	0.272	0.150	0.067	0.033	0.060
Mean Funding 1988-2007	2148	2193	2193	2193	2148
Obs	21656	20831	20831	20831	21656

Notes: This table reports the estimated coefficients for Head Start enrollment per child by race and ethnicity and full-time status when the independent variable is real federal Head Start spending per child (2008\$). Head Start spending per child is scaled by \$1000. Head Start spending data are from the Consolidated Federal Funds Reports (CFFR), coupled with the population counts for three- and four-year-olds from the SEER. Head Start enrollment data are from the Program Information Reports (PIR). For more details about the data description, see Section IIIA. The data are at the county-year level and include years between 1988 and 2007. All regressions include county and state-by-year fixed effects, and time varying county controls. Standard errors are clustered at the county level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Head Start Funding Per Child and Program Characteristics

	Program Characteristics Per Child		Teacher Characteristics Per Child				Teacher Salary(Real)
	# Teachers	# Tot Staff	# ECE Deg	# Associate Deg	# BA Deg	# Advanced Deg	
Head Start Funding/1000	0.0037*** (0.0008)	0.0176*** (0.0032)	0.0040*** (0.0007)	0.0014* (0.0008)	0.0003 (0.0003)	0.0001 (0.0001)	0.4546 (0.4002)
% Effect (Coef/Mean)	29.28	31.71	51.03	33.65	6.91	17.26	2.45
Mean Y	0.013	0.056	0.008	0.004	0.004	0.000	18.518
Mean Funding 1988-2007	2148	2148	1411	2861	2861	2861	1951
Obs	21656	21656	9496	9950	9950	9950	9732

Notes: This table reports the estimated coefficients for Head Start program and teacher characteristics when the independent variable is real federal Head Start spending per child (2008\$). Head Start spending per child is scaled by \$1000. Head Start spending data are from the Consolidated Federal Funds Reports (CFFR), coupled with the population counts for three- and four-year-olds from the SEER. Head Start program and teacher characteristics data are from the Program Information Reports (PIR). For more details about the data description, see Section IIIA. The data are at the county-year level and include years between 1988 and 2007. All regressions include county and state-by-year fixed effects, and time varying county controls. Standard errors are clustered at the county level. * p<0.10, ** p<0.05, *** p<0.01.

Table 6: Head Start Funding Per Child and Constructed Program Characteristics

	Constructed Variables			
	Teacher Pupil Ratio	Teacher+Aide Pupil Ratio	Staff Pupil Ratio	% Full Time Enrollment
Head Start Funding/1000	0.0008 (0.0005)	0.0012 (0.0008)	0.0038** (0.0017)	1.3200** (0.5925)
% Effect (Coef/Mean)	1.72	1.38	2.15	4.90
Mean Y	0.045	0.089	0.179	26.930
Mean Funding 1988-2007	2149	2149	2149	2149
Obs	21648	21648	21648	21648

Notes: This table reports the estimated coefficients for Head Start program inputs when the independent variable is real federal Head Start spending per child (2008\$). Head Start spending per child is scaled by \$1000. Head Start spending data are from the Consolidated Federal Funds Reports (CFFR), coupled with the population counts for three- and four-year-olds from the SEER. Head Start program input data are from the Program Information Reports (PIR). For more details about the data description, see Section IIIA. The data are at the county-year level and include years between 1988 and 2007. All regressions include county and state-by-year fixed effects, and time varying county controls. Regressions are weighted using county population of three- and four-year-olds. Standard errors are clustered at the county level. * p<0.10, ** p<0.05, *** p<0.01.

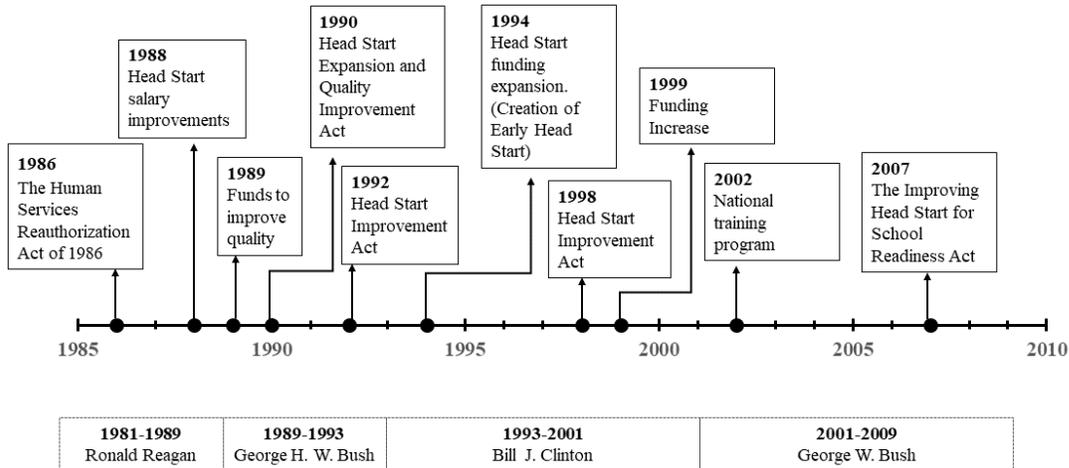
Table 7: Head Start Funding Per Child and Staff Composition

	(1)	(2)	(3)	(4)
	% Teachers with CDA degree	% Teachers with ECE degree	% Teachers with AA degree	% Teachers with BA degree
<i>A: Teacher Composition in Education</i>				
Head Start Funding/1000	-0.439 (0.592)	0.129 (0.805)	0.692* (0.355)	-0.377 (0.390)
% Effect (Coef/Mean)	-0.97	0.16	2.61	-1.33
Mean Y	45.010	82.832	26.517	28.326
Mean Funding 1988-2007	1542	1411	2870	2870
Obs	11519	9338	9870	9870
	% Staff Replaced	% Staff Teachers	% Staff Aides	% Staff Home Visitors
<i>B: Staff Composition</i>				
Head Start Funding/1000	0.153 (0.105)	-0.087 (0.128)	-0.084 (0.182)	-0.111 (0.128)
% Effect (Coef/Mean)	1.60	-0.34	-0.33	-3.72
Mean Y	9.615	25.835	25.632	2.994
Mean Funding 1988-2007	2149	2149	2149	2149
Obs	21653	21653	21653	21653

Notes: This table reports the estimated coefficients for Head Start staff composition when the independent variable is real federal Head Start spending per child (2008\$). Head Start spending per child is scaled by \$1000. Head Start spending data are from the Consolidated Federal Funds Reports (CFFR), coupled with the population counts for three- and four-year-olds from the SEER. Head Start staff composition data are from the Program Information Reports (PIR). For more details about the data description, see Section IIIA. The data are at the county-year level and include years between 1988 and 2007. All regressions include county and state-by-year fixed effects, and time varying county controls. Regressions are weighted using county population of three- and four-year-olds. Standard errors are clustered at the county level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

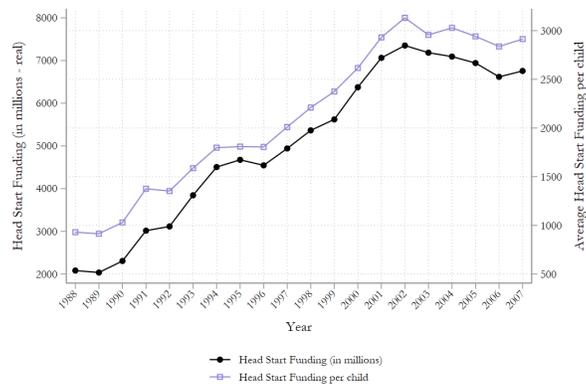
VIII Figures

Figure 1: Timeline of Head Start Policy Changes



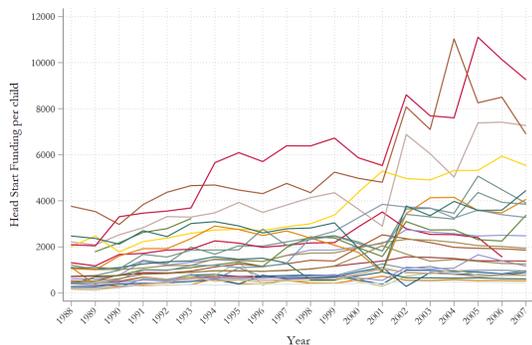
Source: This chart is made using the detailed information provided by the U.S. Department of Health and Human Services' website: <https://eclkc.ohs.acf.hhs.gov/about-us/article/head-start-timeline>.

Figure 2: Head Start Funding in Millions and Head Start per Child in 2008 dollars, 1988-2007

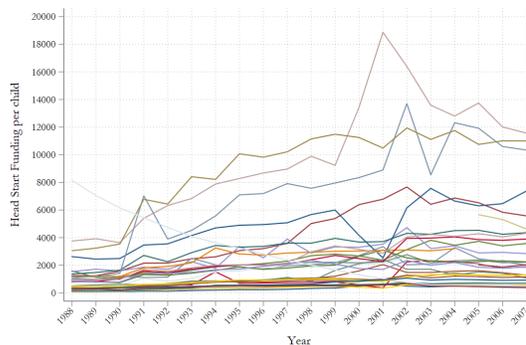


Notes: The dark black line plots the total Head Start funding (in millions) and the light purple line with hollow squares plots the average Head Start funding per child between 1988 and 2007. Head Start spending (in 2008\$) data are from the Consolidated Federal Funds Reports (CFFR), coupled with the population counts for three- and four-year-olds from the SEER. For more details about data construction, see Section IIIA.

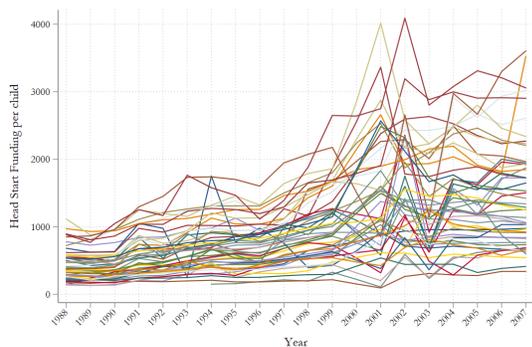
Figure 3: Head Start Funding per Child Variation within States across Counties over Time



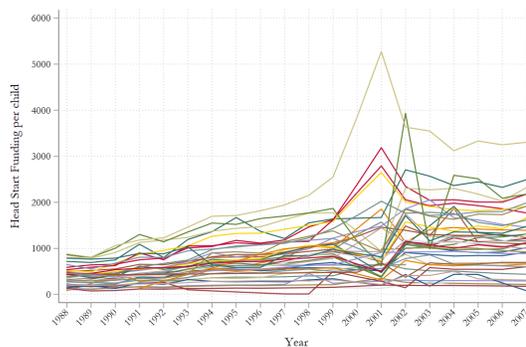
(a) Alabama



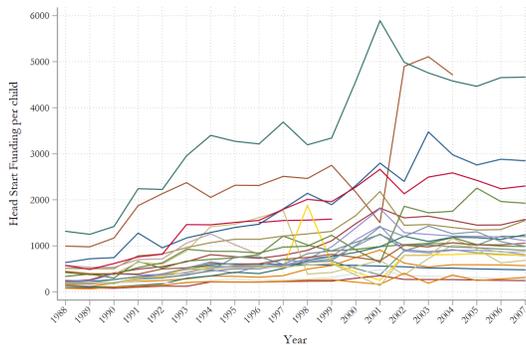
(b) Minnesota



(c) New York



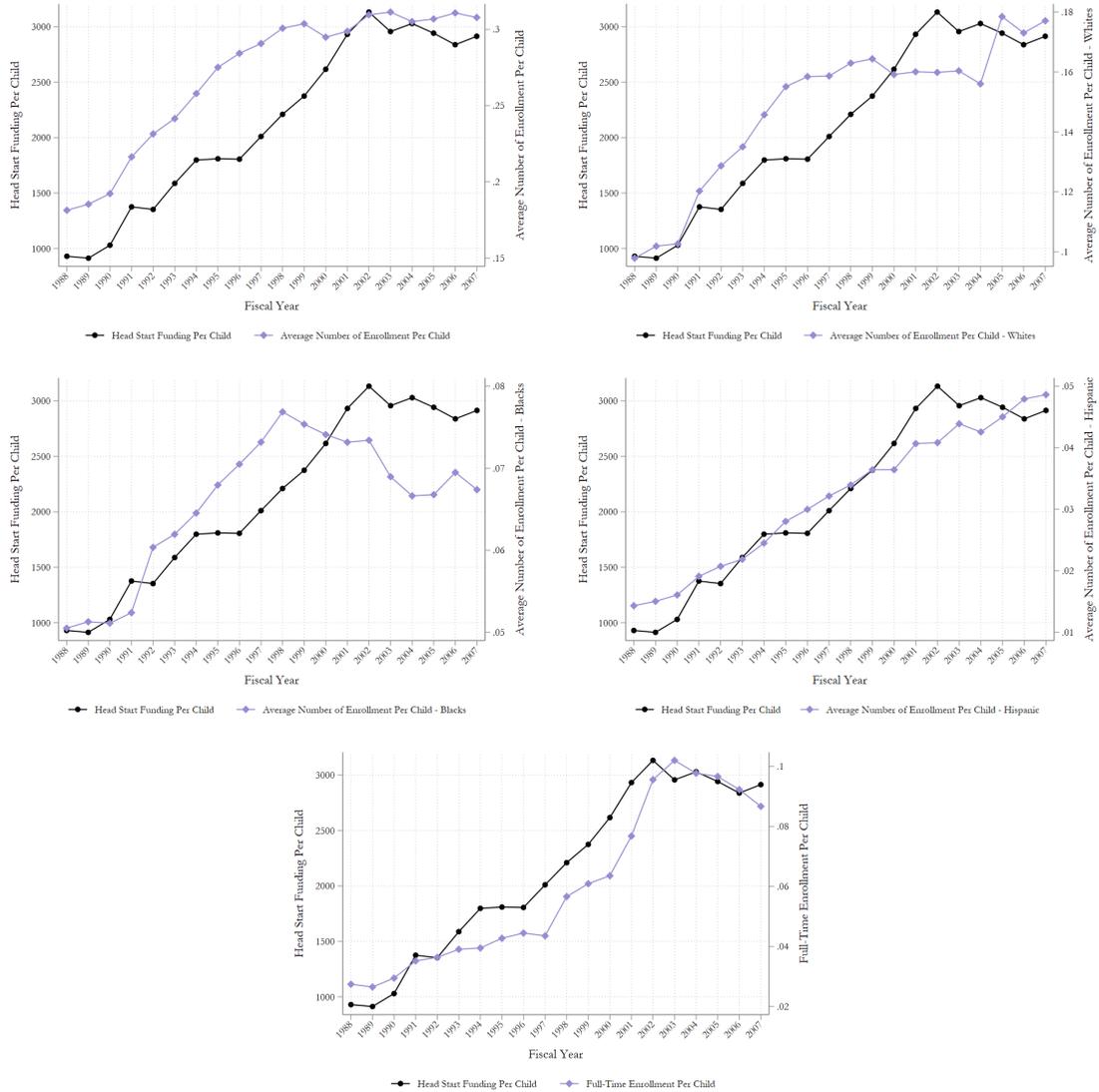
(d) Pennsylvania



(e) Washington

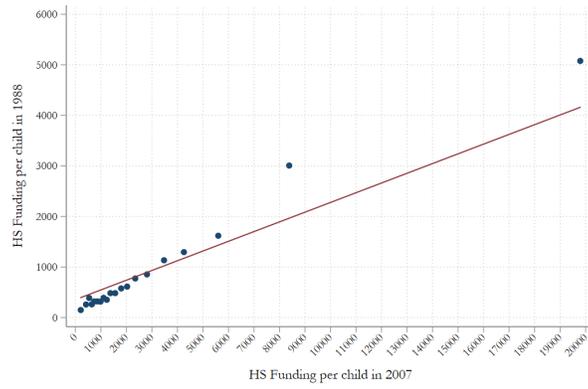
Notes: This figure plots the average Head Start funding per child across counties and over time for five states. Head Start spending (in 2008\$) data are from the Consolidated Federal Funds Reports (CFRR), coupled with the population counts for three- and four-year-olds from the SEER. For more details about data construction, see Section IIIA. The data are at the county-year level and include years between 1988 and 2007.

Figure 4: Head Start Funding Per Child and Head Start Enrollment



Notes: Head Start spending (in 2008\$) data are from the Consolidated Federal Funds Reports (CFFR), coupled with the population counts for three- and four-year-olds from the SEER. Head Start enrollment data are from the Program Information Reports (PIR). For more details about data construction, see Section IIIA. All the measures are averages calculated using means. The data include years between 1988 and 2007.

Figure 5: Binscatter Head Start per Child in 1988 and 2007



Notes: Head Start spending (in 2008\$) data are from the Consolidated Federal Funds Reports (CFFR), coupled with the population counts for three- and four-year-olds from the SEER. For more details about data construction, see Section IIIA.

A APPENDIX

B Empirical Appendix

A Tables

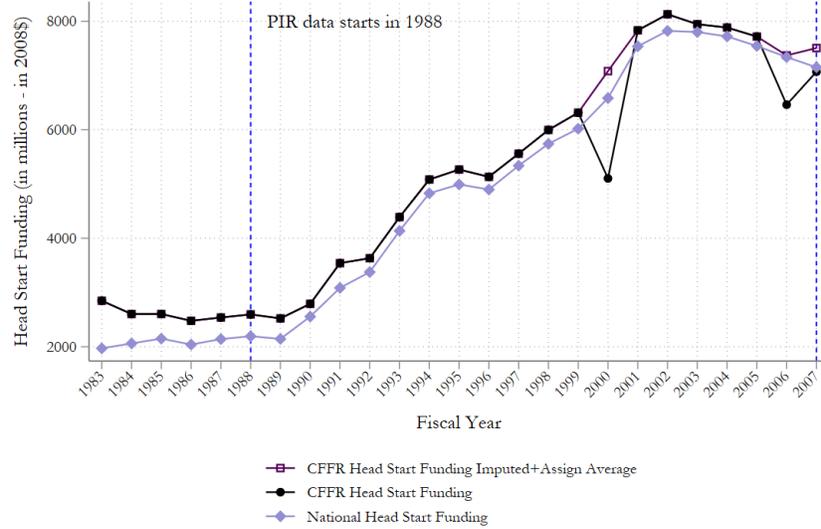
Table A.1: Head Start Funding Per Child and Enrollment Per Child,
Dropping years 2000 and 2006

	Total	Whites	Blacks	Hispanics	Full-Time
	(1)	(2)	(3)	(4)	(5)
Head Start Funding/1000	0.069*** (0.016)	0.037*** (0.012)	0.014*** (0.005)	0.022*** (0.006)	0.009** (0.004)
% Effect (Coef/Mean)	25.92	24.75	21.70	67.93	15.04
Mean Y	0.268	0.148	0.066	0.032	0.058
Mean Funding 1988-2007	2083	2129	2129	2129	2083
Obs	19446	18621	18621	18621	19446

Notes: This table reports the estimated coefficients for Head Start enrollment per child by race and ethnicity and full-time status when the independent variable is real federal Head Start spending per child (2008\$). Head Start spending per child is scaled by \$1000. Head Start spending data are from the Consolidated Federal Funds Reports (CFFR), coupled with the population counts for three- and four-year-olds from the SEER. Head Start enrollment data are from the Program Information Reports (PIR). For more details about the data description, see Section IIIA. The data are at the county-year level and include years between 1988 and 2007 but drop 2000 and 2006. All regressions include county and state-by-year fixed effects, and time varying county controls. Standard errors are clustered at the county level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

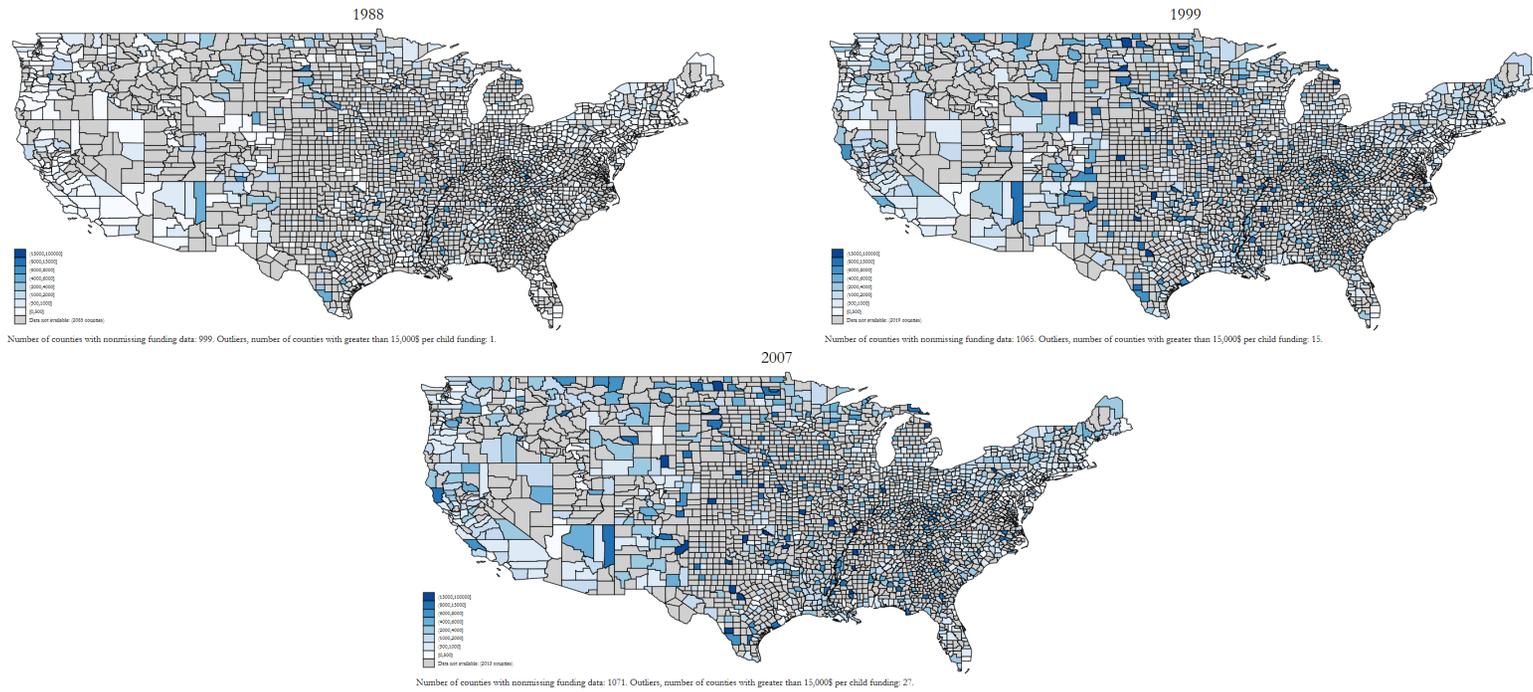
B Figures

Figure A.1: Head Start Funding in Millions, 1983-2007:
CFFR and National Reported Funding (in 2008\$)



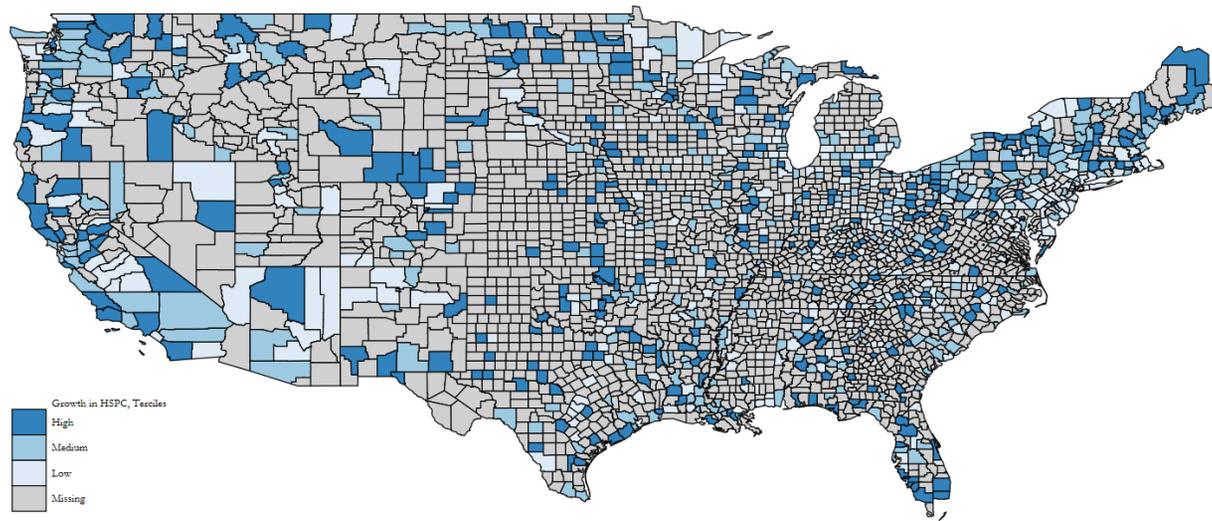
Notes: Each line represents the total real Head Start funding (in millions) (in 2008\$). The dark black line plots the total Head Start funding (in millions) using county-year level data are from the Consolidated Federal Funds Reports (CFFR) aggregated up to year level. The light purple connected line with diamonds plots the national Head Start funding reported in Head Start Fact Sheets. The dark purple line with hollow squares uses CFRR data while assigning the average funding for years in 2000, 2006 and 2007. For more details about data construction, see Section IIIA.

Figure A.2: Head Start Funding Per Child



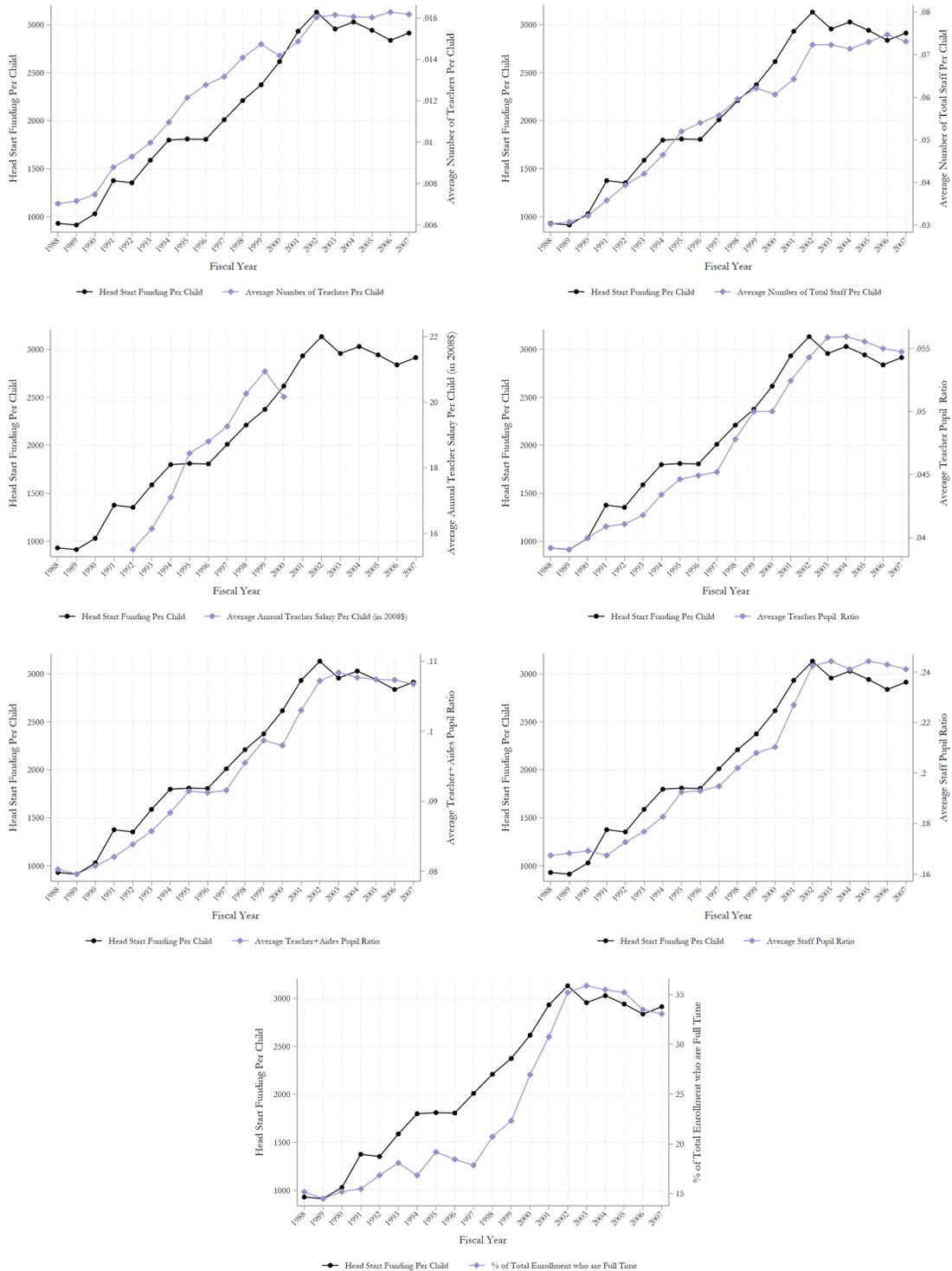
Notes: Head Start spending (in 2008\$) data are from the Consolidated Federal Funds Reports (CFFR), coupled with the population counts for three- and four-year-olds from the SEER. For more details about data construction, see Section IIIA.

Figure A.3: Growth in Head Start Funding Per Child between 1988 and 2007



Notes: Head Start spending (in 2008\$) data are from the Consolidated Federal Funds Reports (CFFR), coupled with the population counts for three- and four-year-olds from the SEER. Growth measure is calculated using 1988 as the base period, and the shades in the map on the right are determined based on the terciles of the growth distribution. For more details about data construction, see Section IIIA.

Figure A.4: Head Start Funding Per Child and Program Characteristics



Notes: Head Start spending (in 2008\$) data are from the Consolidated Federal Funds Reports (CFFR), coupled with the population counts for three- and four-year-olds from the SEER. Head Start program characteristics are from the Program Information Reports (PIR). For more details about data construction, see Section IIIA. All the measures are averages calculated using means. The data include years between 1988 and 2007.