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INEQUALITIES AT THE STARTING GATE

Cognitive and Noncognitive Skills Gaps between 2010–2011 Kindergarten Classmates

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Introduction and executive summary

Inequalities in education outcomes such as test scores or degree attainment have been at the center of education policy debates for decades. Indeed, the first seminal national report on the state of U.S. education—the 1966 Coleman Report—examined some of these inequalities 50 years ago. Since then, researchers have examined performance gaps by income level and race or ethnicity in depth, as well as inequalities in educational attainment (degrees earned, etc.), employment opportunities, earnings, and even health status and overall well-being—all of which can be seen, partly, as long-lasting consequences of earlier education gaps (Altonji and Blank 1999; Cutler and Lleras-Muney 2010; Duncan and Murnane 2011a; Jencks and Phillips 1998; Magnuson and Waldfogel 2008; Morsy and Rothstein 2015; Rothstein 2004; Schultz 1980).

This study seeks to broaden the debate by examining the education gaps that exist even before children enter formal schooling in kindergarten, and showing that the gaps extend to noncognitive skills, which are also critical for adulthood outcomes (Heckman 2008; Heckman & Kautz 2012). Regarding the analysis of early education gaps, this paper is modeled on Lee and Burkam's 2002 monograph *Inequality at the Starting Gate: Social Background Differences in Achievement as Children Begin School*, which found that cognitive gaps between children of different socioeconomic backgrounds and races and ethnicities were both sizeable and statistically significant at school entry in kindergarten.[1] This is important for policymakers because, if unaddressed, there is the potential that gaps persist over time and compound. Such early-in-life inequalities point to the need for substantial interventions to reduce them, including early educational interventions, to ensure that children arrive in kindergarten ready to learn and for compensatory policies to support these children throughout the school years (from kindergarten through 12th grade). Moreover, the social and economic disadvantages that generate these gaps should be addressed directly and eliminated through social and economic policies, not just education policies (Morsy and Rothstein 2015; Putman 2015; Rothstein 2004).

Newly available data on kindergartners in the 2010–2011 school year allow us to examine the presence of education gaps for a recent cohort of children at their educational "starting gate," their kindergarten year. Given the different conditions in which, relative to earlier cohorts, today's young children have spent their early years, we might expect that gaps among groups in the recent cohort would be different. Presumably, today's kindergartners would have benefited from a decade in which parents, practitioners, policymakers, and researchers actively sought new ways to boost young children's educational experiences (Kagan and Kauerz 2012; Pianta, Cox, and Snow 2007). On the one hand, the newest generation of students potentially started school in a much better shape than the earlier cohort, as they were exposed, on average, to several welfare and education interventions designed to improve their school readiness and skills (such as expanded prekindergarten school, among others). On the other hand, students in 1998 entered school in years of prosperity, while the economy and context for this more recent group of children and their families has been characterized by economic stagnation and high rates of unemployment (Mishel et al. 2012). In addition to these differences, there have been demographic shifts as the proportions of low-income, immigrant, and minority individuals increased.[2]

Whether and how these dynamics have changed education inequalities is the focus of this study. Using recent data from a younger cohort of kindergarten students—the National Center for Education Statistics' Early Childhood Longitudinal Study, Kindergarten class of 2010–2011 (hereafter, ECLS-K 2010–2011 NCES), this paper delineates an updated picture of education inequalities among our youngest children in school. We produce a comprehensive analysis of gaps

in both cognitive and noncognitive skills among this cohort of children.[3] We conclude with a discussion of the research and policy implications of these findings.

Following are the major findings of this report:

- Inequalities based on socioeconomic status (SES) are very significant. Cognitive and noncognitive skills are least developed among those with the lowest socioeconomic status and sharply increase as one ascends the socioeconomic ladder, as these examples show:
    - The relative advantage of a child in the top fifth of the SES distribution (referred to in this report as "high SES") relative to a child in the bottom fifth ("low SES") is of 0.8 standard deviations in reading and math, and 0.4 standard deviations in persistence in completing tasks.
    - Middle-socioeconomic-status children have a relative disadvantage with respect to children in the top SES fifth of about 0.4 standard deviations in the cognitive skills, and almost 0.25 standard deviations in persistence in completing tasks.
- There are statistically significant education inequalities by race and ethnicity before accounting for the circumstances in which children live (i.e., their social class). After these factors are taken into consideration, race-based gaps shrink (and even vanish, in some cases). Importantly, this supports other evidence that education gaps are driven by socioeconomic differences (i.e., racial gaps reflect that racial minorities have lower socioeconomic status).
    - For cognitive skills such as reading, when controlling for socioeconomic differences, the only group that shows a highly significant inequality compared with whites is the Hispanic ELL (English Language Learner) group. Black children's disadvantage relative to whites is marginally significant, and small. Hispanic non-ELL children are statistically equivalent to white children, while Asian children are ahead of white children by 0.4 standard deviations. In math and some of the executive function skills, these gaps are larger.
    - Children's reported levels of noncognitive skills differ significantly depending on the race and ethnicity of the parent and whether parents or teachers are doing the assessments. For example, Hispanic ELL or Asian parents' assessments of their children's approaches to learning are lower than white parents' (about 0.2 standard deviations below), but teachers' assessments of these two groups' approaches to learning do not confer any relative advantage to white children (gaps are about 0.1 standard deviations, but statistically insignificant). The opposite can be seen among black parents' and teachers' assessments of black children: black parents' assessments of their children's approaches to learning are equal to white parents' assessments, but teachers confer on black children an average disadvantage of 0.2 standard deviations relative to whites in this skill.
    - It is important to note that unadjusted skills gaps (not controlling for socioeconomic status, family characteristics, and other variables) by race relative to white children are highly statistically significant, especially for black and Hispanic ELL children. Those gaps, and not the adjusted gaps, indicate the degree of disadvantage with which black and Hispanic ELL children start school in reality. However, the adjusted results show that it is the factors that are highly correlated *with* race that drive the racial gaps (Ladd 2012; Rothstein 2004). If instead of race we could control for all that race mediates for, on average, adjusted gaps by

race would shrink and/or become statistically insignificant. This implies that if we actually lived in a race-neutral economy these unadjusted racial gaps would be absent.

- Analysis of education gaps by gender at the starting gate lead to two conclusions: that any preexisting cognitive gap between girls and boys when they enter school is very small (with a slight relative advantage of girls in reading and a slight relative advantage of boys in math—0.07 standard deviations in each case); and that girls' noncognitive skills are noticeably superior to boys, as rated by teachers and parents alike (but with teachers' assessments manifesting more pronounced differences between boys and girls).
- Our analytic approach confirms that the following must be considered when designing policies and programs:
  - **We need to be more discerning when looking at children's needs by subgroup**. To effectively identify the performance and needs of groups of children that are highly heterogeneous in themselves analyses must first group them by common underlying characteristics and put them into more homogenous subgroups. Such targeted analysis is especially essential in light of minorities' increasing share of the U.S. population, their heterogeneity, and the concentration of disadvantages many face. For example, among Hispanics, focusing on subgroups of ELL or non-ELL children can help us better understand their performance relative to other groups and their different needs.
  - **We need to look holistically at what matters for children's development**, in terms of the outcomes (cognitive skills and noncognitive skills) and agents involved in the process (children, teachers, and parents). Having this broader understanding will shed light on the real opportunities that children have been given—and the needs that they have—as they cross the school's starting gate.
- Our findings have important implications for policy:
  - **The existence of significant education inequalities at the starting gate poses a strong challenge to education policy**. Programs and policies must account for the fact that schools and teachers serve students who do not start school on equal terms. Many students haven't participated in preschool education and care, nor have they engaged in equal amounts of developmental and play time with adults. Not only are children unequally prepared to learn when they enter school, but, as research shows, their chances of attending unequally resourced schools are high, as they are much more likely to share school with children who face the same circumstances (Adamson and Darling-Hammond 2012; Baker and Corcoran 2012; García and Weiss 2014; Rothstein 2014). In short education policies must grapple with the relative disadvantages that many children face—disadvantages that are concentrated and compounded, and accumulate over time.
  - **Whether a child is faring better or worse than her peers is largely determined by her socioeconomic status**. The high poverty levels among the 2010–2011 kindergarten class (a quarter of children live in poverty) and significant income disparities by race and ethnicity (close to two thirds of black and Hispanic ELL children live in poverty) call for critical policy attention to the effect of these inequalities on outcomes—on the real opportunities given to children. (In this data set, poverty is defined as having a household income at or below 200 percent of the federal poverty line.)
  - **Education policy alone is unlikely to suffice**. Because severe education inequalities develop before children reach school, addressing these inequalities cannot be left to education policy alone. Interventions

need to include wider economic and social policies to tackle the socioeconomic disadvantages that constrict opportunities before children even reach the school starting gate. These broader policies would include strategies to make poor children less poor (including employment, criminal justice, immigration, health, and housing policies); early educational interventions and programs to boost parents' capacity to provide educational opportunities at home; and compensatory policies integrated throughout school (from kindergarten through 12th grade) to offset children's disadvantages at school entry.

This study first reviews the existing literature analyzing education inequalities. The technical details of the analysis are explained in the "Dataset and methodology" section and appendix A. In the fourth section, we describe the characteristics of the 2010–2011 kindergarten class, in terms of race, socioeconomic status, and the other determinants of gaps that are examined in the study. In the results section, we discuss current socioeconomic-based and race-based inequalities in cognitive and noncognitive skills of students at the beginning of their school life. The report concludes with a review of results and a discussion of the implications of the findings for both future research and policy.

Literature review

Research on achievement gaps can be grouped under three main topics: existence and persistence of gaps, mechanisms driving the gaps, and consequences of the gaps for subsequent learning and development.[4] Major contributions in these three different areas are described below. This section also includes an explanation of the contribution of this paper to the broader literature and provides a justification of why a more comprehensive understanding of the gaps (one that includes assessment of cognitive and noncognitive gaps) could help advance more successful strategies to close them.

Existence and persistence of gaps

In the United States, the study of education inequalities has been largely associated with the study of education outcomes of whites relative to outcomes of minority groups, especially African Americans. The precedent for this research was the *Equality of Educational Opportunity* study requested by the Civil Rights Act of 1964 and conducted by James Coleman and colleagues (see Coleman et al. 1966), which assessed the differences between the resources or inputs available to minority students attending public schools and those available to white children and discussed the consequences of those differences in terms of outcomes.[5] In response to extensive research demonstrating that the race-education performance link is not a direct association but rather an indirect relationship strongly mediated by income and other factors related to income, recent studies have focused more on income-based gaps, and less on those based on race or ethnicity (Duncan and Murnane 2014; Duncan and Magnuson 2011). Research on gaps in noncognitive skills between ethnic or economic groups is still scarce (Grissmer and Eiseman 2008; Nores and García 2014; Rothstein 2004).

Whether race- or income-based, multiple studies have documented substantial and persistent differences in performance among population subgroups. These works tend to agree that gaps originate early in life, persist over time, and are measurable throughout a person's lifetime.[6] On average, a black student's academic score is about 75 percent the score of a white student, and the difference is visible among children as young as three or four years old (Jencks and Phillips 1998). Indeed, one of the main findings in Lee and Burkam's 2002 report is that children from different racial and ethnic groups begin school on very unequal terms. For children starting kindergarten in 1998, math achievement was 21 percent lower for blacks than for whites, and 19 percent lower for Hispanics than for whites. These sizable race-based

gaps are described in-depth in recent volumes edited by Magnuson and Waldfogel (2008) and Duncan and Murnane (2011a).

Along with a review of tentative explanations for the evolution of the gaps, Rothstein (2013) describes changes in the black-white gap since the 1970s. His study highlights a reduction of the gap among these groups, driven by increases in educational achievement among black students that are greater than increases of their white peers in the 1970s and in the early 2000s. In part, the relative convergence was explained by a relative improvement of black parents' educational attainment and subsequent occupational status and income levels, and by reductions in family size (fewer children per family) over those decades (Grissmer et al. 1994; Rothstein 2013). Barton and Coley (2010) agree with the assessment, and highlight that the convergence stalled at the end of the 1980s. They review the impact of school-level policies (such as reductions in class size) or other public policy stimuli (such incentivizing neighborhood desegregation, etc.), which also partially contributed to the narrowing of the gap during the decades when this positive phenomenon occurred.[7]

At the same time, as noted above, education gaps by income (or, more broadly, socioeconomic status, which includes income and other indicators of education attainment, occupation status, or wealth or possessions) are increasingly noticeable. In Lee and Burkam's study, cognitive achievement of children in the highest socioeconomic group is 60 percent higher than that of children in the lowest socioeconomic group, as measured by test scores (and cognitive skills are much less closely related to race/ethnicity after accounting for socioeconomic status). In terms of the evolution of the income gaps, a review of research on trends in education gaps by income gradient offers two complementary views. The intergenerational mobility approach (Reardon 2011) suggests that the academic achievement gap between children at the 90th and at the 10th percentiles of the income distribution increased in recent decades; Reardon estimated that the gap was between 30 and 40 percent larger among children born in 2001 than among children born in 1975.

Another perspective consists of studying intragenerational education inequalities, or how the gaps evolve over time for the same cohort of students. A recent study on performance gaps (see Nores and García 2014) examines student performance from kindergarten to 8th grade. The study divides Hispanic students into different subgroups depending on their knowledge of English and their immigration status, and finds that cognitive inequalities between white and some Hispanics subgroups—especially non–English language speaking Hispanic children—in reading and math achievement at the beginning of kindergarten significantly shrank over the school years (the opposite was true for Hispanic-immigrant children). With respect to noncognitive performance, the gaps are smaller overall and diminish over time, which suggests a small relative advantage of Hispanics versus whites in skills such as approaches to learning, internalizing and externalizing behavioral problems, and self-control (all reported by teachers). Besides the methodological contribution, this paper illustrates the importance of understanding the heterogeneity within certain groups (such as Hispanic children by their knowledge of English, for instance), in order to better disentangle which groups are relatively lagging behind and consequently, to better identify policies to address obstacles and needs (Waldfogel 2001).[8]

Causes or mechanisms driving gaps

In light of these sizeable achievement gaps, researchers and policymakers have concentrated their efforts on identifying the mechanisms that generate gaps at such early stages. As already mentioned, one of the factors most strongly correlated with achievement disparities among different groups of students is a child's social class or socioeconomic status. As the empirical research shows, socioeconomic status affects achievement gaps in two (compounded) ways. First is the well-documented direct association between education outcomes and individual economic (dis)advantage, whereby low-SES

status is associated with lower academic performance.[9] Second is the indirect link between SES and outcomes through the statistically significant associations between economic (dis)advantage and multiple factors *also* related to education results (Ladd 2012; Rothstein 2004; Coley and Baker 2013). These factors include the environment in which a child grows up (neighborhood factors and family characteristics), a child's participation in early childhood programs, the quality of those programs, and even the type and quantity of instructional and motivational activities that parents engage in with their children and that affect child development and school readiness. All of these associations are significant, and all help better explain the link between education inequalities and economic inequalities.

Indeed, a child's early environment is one of the fundamental drivers of race- and SES-associated education gaps. Importantly, this attention to conditions in which children live has, for the most part, disproved the misleading theory that innate or genetic factors partly explain the gaps (or account for any unexplained part of them).[10] Two important contributions in this area are Shonkoff and Phillips (2000) and related research, and Wilson (1978), and related research.[11]

Shonkoff and Phillips' book *From Neurons to Neighborhoods* made widely accessible the explanations of how the environment influences human development, and how neurobiology research could contribute to documenting these relationships.[12] The authors emphasize that "every aspect of early human development … is affected by the environments and experiences that are encountered in a cumulative fashion, beginning in the prenatal period and extending throughout the early childhood years" (Shonkoff and Phillips 2000, 6).

The book illustrates, in particular, how disparities in infants' and toddlers' experiences in out-of-the-home settings translate into large gaps in school readiness. For instance, less affluent parents have less access to information about the importance of children's interactions with adults, less economic capacity to buy stimulating toys, and less time to go to museums (Phillips 2011). Moreover, these early disparities compound differences in children's health and well-being at birth. As Janet Currie and her colleagues have documented, low-income mothers' lack of access to health care during pregnancy, as well as other influences of their environment, increase their babies' health risks (Currie and Goodman 2010; Currie and Almond 2011). In fact, Currie's findings indicate that these health disparities at birth already predict some of the subsequent large education gaps (Currie 2011; 2009).

The second contribution to the acceptance of the early environment as a fundamental driver of race- and SES-based education gaps is a set of studies, beginning with those by William Julius Wilson, whose scope also goes beyond the limits of school walls. These studies note that children of certain minorities are more likely to live in concentrated poverty (Wilson 1978, 1987; Jargowsky 2013; Orfield 2013; 1978; Rothstein 2004), and to do so over prolonged periods of time (Sharkey 2013). Deprived neighborhoods mean deficient learning environments, since growing up in a poor or violent neighborhood limits a child's access to role models, exposes him or her to pollutants in the air and soil, leads to consistently high levels of stress, is associated with lower-quality schooling opportunities, and limits his or her economic opportunities (Sharkey 2013). As well, as recently shown, accumulation of problems in neighborhoods translates into stronger prevalence of disadvantage around minority children in those neighborhoods' schools (such as the proportion of children eligible for free or reduced lunch, the proportion of children not living with their two parents, etc.) (García and Weiss 2014). As a result of all these circumstances, students in highly segregated schools, who are less prepared on average in the fall, make lower relative gains by spring than students in nonsegregated schools (García and Weiss 2014).

Disparities in access to preschool education are widely seen as another major driver of education gaps. Preschool has been identified as one of the most important contributors to school readiness and education success (Magnuson et al. 2004; Cabell et al. 2011; Barnett and Belfield 2006; Barnett 2011; Diamond et al. 2013; Duncan and Magnuson 2013; Heckman 2004; 2000). Studies find that early childhood education increases a child's exposure to learning and provides opportunities to develop his or her social interaction skills with peers and adults. Because all students benefit from early childhood education, but wealthier children are more likely to attain it, lack of universal access can be expected to widen gaps. Indeed, if participation in preschool, the ability to benefit from it, and/or the quality of preschool programs differed by ethnic group (or, more likely, by socioeconomic status), the effects could just be exacerbating other existing differences (Barnett and Yarosz 2007; Pianta et al. 2009; Bridges et al. 2004; Bartik 2011; Kagan 2009).

Parents' efforts to promote their children's development constitute another important contribution to student development and school readiness (Hart and Risley 1995; Belfield and García 2013; Phillips 2011; Brooks-Gunn and Markman 2005). Simple adult-to-child interactions during playtime during the first three years of life improve the child's vocabulary and have been found to drive other educational outcomes (Hart and Risley 1995). Reading to children and other parenting practices likewise contribute to children's learning and development (Barbarin et al. 2010). And parenting styles supportive of children's autonomy have been positively associated with executive function skills, such as working memory and impulse control, at later ages (Bernier, Carlson, and Whipple 2010). As is true of unequal access to high-quality preschool education, low-income parents have less ability to afford leisure and educational time with their children relative to their more economically advantaged counterparts, further increasing gaps by income and racial status (Van Voorhis et al. 2013; Waldfogel 2006; Rothstein 2004; Phillips 2011; Brooks-Gunn and Markman 2005). Disparities in monetary investment in children's education also contribute to gaps; spending on education-enhancing activities by parents in the top income fifth has nearly tripled since the 1970s (from $3,500 in 1972 to $8,900 in 2006), while spending by parents in the bottom income fifth has remained low and more stable ($800 in 1972 and $1,300 in 2006) (Duncan and Murnane 2011b). [13]

A natural next question, then, is whether these early disparities are compensated for, or compounded by, the U.S. formal education system. There is some descriptive information that suggests that low-SES children begin kindergarten in lower-quality elementary schools than more advantaged children—whether measured by level of student achievement, school resources, teacher qualifications, positive attitudes toward learning, neighborhood characteristics, or school type (i.e., private or public school) (Adamson and Darling-Hammond 2012). Low-SES students are more likely to fall behind their more advantaged peers during the summer breaks (Peterson 2013). Minority and/or low-SES children are also normally in schools in which the proportion of poor children is high (García and Weiss 2014). Whether this is a cause or a consequence of historical segregation, housing segregation, economic segregation, or any other reason is not clear, but this factor could be highly likely to alter the schooling and economic opportunities of a child (Lee and Burkam 2002; Orfield 2013; Rothstein 2014).

Consequences of the gaps for later learning and development

As described above, research emphasizes that early skills gaps, both cognitive and noncognitive, translate into differences in students' subsequent learning and development (Duncan et al. 2007; Duncan and Magnuson 2011). And early investments in education strongly predict adolescent and adult development (Heckman 2008; Heckman and Kautz 2012; Cunha and Heckman 2007). Children with stronger skills at school entry are on a more favorable pathway

toward academic success than are students with weaker initial skills. For instance, students with higher levels of behavioral skills learn more in school than peers whose attitudinal skills are lower (Jennings and DiPrete 2010).[14] In general, as Heckman asserted, "skills beget skills," meaning that creating basic, foundational knowledge makes it easier to acquire skills in the future (Heckman 2008).

Conversely, children who fail to acquire this early foundational knowledge may experience some permanent loss of opportunities to achieve to their full potential. Indeed, scholars have documented a correlation between lack of kindergarten readiness and not reading well at third grade, which is a key point at which failing to read well greatly reduces a child's odds of completing high school (Fiester 2010; Hernandez 2011).[15]

Why do we study noncognitive skills at the starting gate?

Noncognitive skills, which include skills such as persistence, respect for others, academic confidence, teamwork, interpersonal relationships, and creativity, are central to this analysis for a number of reasons.[16] These skills directly affect the productivity of a person (as a student, worker, and citizen) and also alter the productivity relationships between factors and educational outcomes (for instance, the effect of some teaching styles on learning can differ among children depending on their socioemotional skills). First, noncognitive skills help nurture children's learning. As noted above, children whose behavioral skills are high learn more than children with weak behavioral skills (Jennings and DiPrete 2010); and noncognitive skills help explain achievement gaps between black and white students at young ages (Grissmer and Eiseman 2008). Although the empirical evidence on how these traits predict later cognitive and noncognitive performance is still relatively scarce, research shows a positive and reciprocal relationship between noncognitive and cognitive abilities (García 2013), and of "self-productivity" and "dynamic complementarities" between investments in the two types of skills (Cunha and Heckman 2007).[17] These relationships suggest that boosting cognitive productivity may not be possible without paying attention to noncognitive skills, and that increased attention to noncognitive skills in education policy can thus increase children's opportunities and pathways to develop (García 2014). More broadly, as are cognitive skills, noncognitive skills are a component of a person's development and life potential. Consequently, knowing whether there are gaps in these skills at earlier stages would reveal important mechanisms behind inequalities among children of different characteristics.

Moreover, the examination of noncognitive skills available in the ECLS-K: 2010–2011 study provides an additional, and potentially useful, insight—that the ratings of these skills come from parents' and teachers' subjective assessments, and, as such, reflect those adults' individual characteristics and own social and cultural norms as well as the children's observed abilities and behaviors. Deeper understanding of why parents and teachers rate children differently (through studying the influence of biases and stereotypes), and whether these influences affect children's development, could help us to better understand and address educational inequalities at the starting gate and throughout the school years.

Dataset and methodology

The analysis developed in this study is based on data from the Early Childhood Longitudinal Study, Kindergarten Class of 2010–2011 (ECLS-K: 2010–2011), sponsored by the National Center for Education Statistics (Institute of Education Sciences, U.S. Department of Education). This study will follow a nationally representative sample of children starting in their kindergarten year, through their elementary school years.[18] It provides information on multiple dimensions of children's development, early learning, and progress in school, as well as information on children's families

and on teachers' and parents' perceptions of children's skills and behaviors. The tracking of students over time is one of the study's most valuable features, as is the availability of two ECLS-K studies (ECLS-K: 1998–99 and ECLS-K: 2010–2011), which will allow for cross-comparisons "of two nationally representative kindergarten classes experiencing different policy, educational, and demographic environments" (Tourangeau et al. 2013).[19]

Both the outcome variables and the individual level characteristics (control variables) that are used in the analysis are described below.

Variables—Outcomes

For the current analysis, we focus on measurements of the child's cognitive and noncognitive skills at the beginning of the school year (assessments were conducted from August through mid-December 2010).

The definitions that follow summarize and paraphrase the information reported by Tourangeau et al. (2013), which can be consulted for more details. See also Appendix B for a more detailed explanation of the variables used in this analysis.

Cognitive skills and executive function

These cognitive skills and executive function skills[20] are assessed with instruments that measure the child's:

- Reading skills: print familiarity, letter recognition, beginning and ending sounds, rhyming words, word recognition, vocabulary knowledge, and reading comprehension.
- Math skills: conceptual knowledge, procedural knowledge, and problem solving; number sense, properties, and operations; measurement; geometry and spatial sense; data analysis, statistics, and probability; and patterns, algebra, and functions.
- Cognitive flexibility: ability to sort a series of picture cards according to different rules, and response time at this task.
- Working memory: ability to repeat increasingly long strings of orally presented numbers in reverse order.

Principal noncognitive skills

We use the term "principal" to identify a set of noncognitive skills that are measured by both the ECLS-K 1998–1999 and 2010–2011 surveys, and that have been relatively extensively used in research. We distinguish these "principal noncognitive skills" from "other noncognitive skills" described later, which, while not available in the public data from the kindergarten class of 1998–1999, are nevertheless important noncognitive skills to measure.

Teachers are asked to assess the child's:

- Self-control: ability to control behavior by respecting the property rights of others, controlling temper, accepting peer ideas for group activities, and responding appropriately to pressure from peers.
- Approaches to learning: organizational skills (keeps belongings organized); curiosity (is eager to learn new things); independence (works independently); adaptability (easily adapts to changes in routine); persistence in completing tasks; focus (ability to pay attention); and ability to follow classroom rules.

- Internalizing problems: degree of internalizing behavioral problems as measured by the frequency with which the child shows anxiety, loneliness, low self-esteem, and sadness.
- Externalizing problems: degree of externalizing behavioral problems as measured by the frequency with which a child argues, fights, gets angry, acts impulsively, and disturbs ongoing activities.

Parents are asked to assess the child's:

- Self-control: ability to control behavior by refraining from fighting, arguing, throwing tantrums, and getting angry.
- Approaches to learning: persistence (keeps working at something until finished); curiosity (shows interest in a variety of things); focus (concentrates on a task and ignores distractions); helpfulness (helps with chores); intellectual curiosity (is eager to learn new things); and creativity (in work and play).
- Social interaction (with peers and adults): ease in joining in play, ability to make and keep friends, and capacity to positively interact with peers (e.g., by comforting or helping).

Other noncognitive skills

The ECLS-K 2010–2011 includes a range of interesting measures not available in the ECLS-K 1998–1999 public data and our analysis encompasses many of these measures. Other skills reported by teachers and covered in our study include the child's interpersonal relationships (based on items describing the child's skill in forming and maintaining friendships; getting along with people who are different; comforting or helping other children; expressing feelings, ideas, and opinions in positive ways; and showing sensitivity to the feelings of others); closeness to the teacher (based on items that measure the affection, warmth, and open communication that the teacher experiences with the student); eagerness to learn, persistence in completing tasks, and attention (whether the child "pays attention well").

Other skills reported by parents and covered in our study include the child's persistence (ability to work until finished); eagerness to learn new things; and level of creativity in work or play.

For the purpose of the analysis, all variables are standardized to have a mean of zero and standard deviation of one. [21]

Variables—Child and family characteristics (education inputs)

Variables describing the children and their families are used as controls in our estimates. These variables include:

- *Race/ethnicity*: The groups of interest in the paper are white, black, Hispanic, Asian, or other. Hispanic children are divided into two groups, depending on whether the language spoken at home is English or not. This decomposition is first described and utilized by Nores and Barnett (2014) and Nores and García (2014).[22]
- *Socioeconomic status (SES):* SES is based on five different components, including parents' (or guardians') educational attainment, occupational prestige score, and household income (see more details in Tourangeau et al. 2013, 7-56 to 7-60). We divide the variable into quintiles or fifths, where "low SES" indicates the first or bottom quintile; "middle-low SES" indicates the second quintile; "middle SES" is the third socioeconomic quintile; "high-middle SES" indicates the fourth SES quintile; and "high SES" represents the top quintile.

- *Other individual and family characteristics:* These other characteristics include the child's gender, age, disability status, immigrant status, ELL status (whether the child is an English Language Learner versus whether she speaks English), number of siblings, and whether the child lives with both parents.
- *Prekindergarten care and parenting experiences:* This variable indicates whether the child was cared for in a center-based setting during the year prior to the kindergarten year[23] and engaged in enrichment activities with parents (as measured by a composite that captures early literacy practices, leisure activities, other rules, and routines[24]).

Following the traditional framework to estimate gaps, we use the economic approach in which education outcomes—cognitive and noncognitive skills—are explained as a function of education inputs, including an indicator for each of the population groups of interest, whether by race/ethnicity (white, black, Hispanic ELL, Hispanic non-ELL, Asian, or other) or socioeconomic status (low SES, middle-low SES, middle SES, high-middle SES; and high SES) (García 2013; Nores and García 2014; Todd and Wolpin 2003).

In order to estimate education gaps for the 2010–2011 kindergarten cohort, we follow a parsimonious strategy with three models for each of the two sets of estimated gaps: by race and by SES.[25] The baseline model shows unadjusted skills gaps by race/ethnicity and language, or by SES, reflecting absolute performance gaps, and model 2 incorporates only controls for SES, or race/ethnicity. The final model provides adjusted race/ethnicity-based and SES-based gaps for both cognitive and noncognitive skills after controlling for other individual and family characteristics, and early educational practices such as pre-K experience and parental activities with children.

In order to control for across-school differences and to account for potential selection of students into schools, we use a schools-fixed-effects model, in which the estimated gaps are within-school gaps.[26] This approach controls for biases that may arise due to selection processes; for instance, certain types of students are more likely to attend certain schools, which in turn is also associated with their outcomes. In the absence of longitudinal information for a child (or in absence of individual fixed effects), this strategy has been utilized to account for such selection both for cognitive and noncognitive outcomes (Neidell and Waldfogel 2010; Nores and García 2014).[27]

The specifications are shown in **Appendix A**. Coefficients of interest for race- and ethnicity-based gaps are represented by β_1 to β_4, and represent the unadjusted (Model 1R) to fully adjusted (Model 3R) skills gaps by race/ethnicity (R) and language (L). For the socioeconomic-based gaps, the coefficients of interest are δ_1 to δ_4, obtained under Models 1S (unadjusted socioeconomic gaps) to Model 3S (fully adjusted socioeconomic gaps).

Analytic sample

While the ECLS-K: 2010–2011 is designed to provide a nationally representative sample of the 2010–2011 U.S. kindergarten population, the study has experienced the problem of lack of responses (i.e., missing data) on some variables of interest. As such, the analytic samples do not fully represent the intended population of interest.[28]

In order to select the analytic samples used in the study, we proceed as follows. The descriptive analyses in the next section are based on the maximum number of per-child responses for each variable, and provide an updated description of the student population at kindergarten entry as of 2010. Analytic samples supporting the results shown in the "Gaps at the starting gate" section vary as a function of the complete response in the predictors (the control variables, e.g., race,

ethnicity, SES, etc.) minus the missing responses of each skill. A more detailed discussion of how missing data affects the different outcomes and the predictors is included in **Appendix B**.

Child-level weights are used in all results in the following sections (see more details in Appendix B).

A description of the kindergarten class of 2010–2011

Our analysis starts with a description of the characteristics of the members of the 2010–2011 kindergarten class, with a focus on several demographic dimensions that are relevant to assessing educational performance. In particular, we describe the characteristics of the slightly over four million children in the 2010–2011 class by their race/ethnicity and socioeconomic status. We also examine parents' characteristics, including their investment in their children's prekindergarten care/schooling, and activities aimed at promoting their children's development.

Who is entering kindergarten?

Table C1 in **Appendix C** shows the characteristics of the kindergarten class of 2010–2011. The first set of variables indicates that white students represent just over half of the group, while black students are about 14 percent (13.7 percent). One of every four kindergarteners is Hispanic (and, among the respondents for the immigration question, almost one of every five students is a Hispanic English language learner (ELL). Four percent (4.4 percent) of the children are Asian, and the remaining 5.5 percent are classified in the "other races/ethnicities" group.

With respect to children's families, we highlight the fact that almost one-third of kindergarten entrants live in a family that does not include two parents (31.8 percent). The vast majority of the children speak English at home (84.7 percent), and three-fourths (74 percent) are native born with native parents. Of particular importance for our analysis of achievement gaps, as reported in Table C1 (second panel), one of every four children (25.5 percent) lives in poverty.[29]

What did parents do to boost their children's development before entering kindergarten?

As discussed above, research makes clear the importance of providing all children with a high quality preschool education (Gormley, Phillips, and Gayer 2008; Barnett 2013; 2010). While providing such support has not yet become the norm, economic and employment realities dictate that most young children receive some type of paid care outside the home. Indeed, more than half of the students in the cohort have received some center-based pre-K care (55.1 percent), and nearly four-fifths of parents made some nonparental care arrangements during the year prior to kindergarten (79.3 percent).

In addition to early education arrangements, parents undertake a multitude of activities with their children, from reading to children to ensuring playing time, which also contribute to children's development. ECLS-K includes an extensive set of questions about the frequency with which parents engage in different activities. According to the descriptive findings (available upon request), the majority of children are read to and/or told stories on a daily basis (52.0 and 39.4 percent respectively). In addition, parents sing songs with their children (45.3 percent) and practice reading (61.3 percent) and writing (50.7 percent) with their children, and children read picture books or read outside of school daily (36.9 percent). The majority of parents also play games (41.6 percent) and sports (37.4 percent) with their children with a high frequency (three to six times a week) and 36.9 percent have children help with chores. Parents report that

they engage their children less frequently (once or twice per week) in talking about nature (49.2 percent), building things (42.5 percent), or doing art projects (36.7 percent).

Given the high correlation among the activities, for the empirical analysis, we construct an index that captures the joint variance of all these activities (see Appendix B). The index reflects the frequency with which parents engage in a range of educational and leisure activities with their children.

Characteristics of the kindergartners by ethnic and socioeconomic backgrounds

Understanding the education gaps we are studying requires, first, analyzing some of these inequalities with respect to inputs. **Table C2** shows the descriptive statistics of such inputs by racial/ethnic group and by socioeconomic status.

Over half (52 percent) of white children are in the two highest socioeconomic quintiles (high-middle or high), while only 8.9 percent fall into the lowest SES quintile. A similar pattern is true among Asian kindergartners: 59.9 percent are in the highest two quintiles, and 11.8 percent are in the lowest. For black and especially for Hispanic children, however, the situation is reversed. Over half (56.8 percent) of black children and over two-thirds (66.6 percent) of Hispanic children are in the two lowest quintiles, and fewer than one in 10 of either group are in the highest SES quintile (8.3 percent of black children and 6.8 percent of Hispanic children). Another angle through which to see these numbers is the proportion of children who live in poverty by race/ethnicity: 13.1 percent of white children, 17.3 percent of Asian children, and nearly half of black children (45.5 percent) and Hispanic children (46.3 percent). Among Hispanics, 30.5 percent of non-ELL, and 62.5 percent of ELL children live in poverty. Among all racial/ethnic groups, the Hispanic ELL group has the largest share living in poverty.

Other disparities are also clear along racial/ethnic lines. Almost two-thirds of black children (64.5 percent) do not live with two parents, compared with 9.6 percent of Asian children. Both Asian and Hispanic children are more likely to speak a language other than English at home (54.5 percent and 47.5 percent respectively), versus white and black children (1.8 percent and 4.0 percent respectively). And Asian children are the most likely to have received center-based pre-K care (61.7 percent), while Hispanic children—especially ELL-Hispanic—are among the least likely to have participated in center-based care (46.5 and 41.3 percent respectively).

Regarding the disparities by socioeconomic status (shown in the bottom half of the table), all statistics consistently confirm the correlation between socioeconomic status and obstacles to educational development (selected control variables are shown in table). Low-SES students are more likely than their higher SES peers to not speak English, to not live with two parents, to be immigrants, to not have participated in center-based pre-K care activities in the previous year, and to have a lower index of early literacy practices at home. Among children in the low SES group, half (50.4 percent) are Hispanic, 23.1 percent are white, 19.6 percent are black, and 2.5 percent are Asian.

Gaps at the starting gate: Results from the econometric approach

This section includes the results of the analysis estimating education (or more specifically, cognitive and noncognitive skills) gaps at the school starting gate. Results are presented for different socioeconomic groups (see specific results in Appendix D, figures D1 to D6 and tables D1 to D6; Appendix F, tables F1 to F6; and Table 1) and for different racial/ethnic groups (see specific results in Appendix E, figures E1 to E6 and tables E1 to E6; Appendix F, tables F1 to F6;

and Table 2). The section ends by highlighting some other relationships between outcomes and inputs of interest (see results in Appendix F, tables F1 to F6; and Table 3).

The sizes of the real education gaps between groups of U.S. kindergartners are revealed by the unadjusted gaps estimates. As the findings illustrate, skills gaps by SES in both cognitive and noncognitive dimensions are sizeable by the time children enter kindergarten. In other words, if we compare the achievement of each of the SES groups relative to the lowest SES children (the reference group in the analyses), we see that gaps exist between all groups, as average scores increase for each step up the SES distribution. Low-income children come to the starting gate well behind their more affluent peers, those in the four SES groups above them. And if we compare their position with each of the four SES groups, that gap widens steeply for each step up the SES distribution.While the skills gaps by socioeconomic status shrink slightly when adjusted for controls such as race, other individual and family characteristics, and pre-K care arrangements and parenting activities, substantial inequalities remain, and this is true for all the skills analyzed. Conversely, the unadjusted gaps by race/ethnicity are, in many cases, statistically significant, but they shrink—and even disappear for some groups—after the inclusion of the different covariates that identify the children's socioeconomic background (i.e., they are very sensitive to the inclusion of SES covariates). Although skills gaps for black children and a subgroup of Hispanic children (the ELL Hispanic group) also diminish when adjusted for the covariates, the analysis by race/ethnicity for these two groups points out their relative disadvantage, compared with white children.

Gaps based on socioeconomic status

When children in the bottom socioeconomic quintile (low SES) are compared with children in the other four quintiles (low-middle, middle, high-middle and high SES), we find no educational outcome for which a sizeable gap does not exist under the unadjusted to fully adjusted models. All gaps and gradients are sizeable, and virtually all are statistically significant (with just a few exceptions for average performance between students in the low-middle and middle SES groups compared with the poorest children). While strong and persistent, though, all of the gaps narrow slightly with the addition of controls, which implies that gaps can be narrowed to some extent by using compensatory policies in favor of children (such as preschool and parental engagement activities) and by providing support associated with the family circumstances that most contribute to the reduction of the unadjusted gaps (economic support, knowledge of English, immigration status, etc.).

Socioeconomic-based gaps in cognitive skills

Overall, our results—showing significant socioeconomic-based gaps in cognitive skills—confirm what multiple other research analyses (e.g., Reardon 2011) have found: that students' levels of readiness and development are closely associated with their parents' socioeconomic status. Unadjusted differences in cognitive domains indicate that each move up a socioeconomic quintile in the SES distribution is associated with approximately a quarter of a standard deviation (sd) improvement in performance in both math and reading, with students in the top quintile (the high SES group) scoring nearly a full standard deviation above students in the bottom quintile (the low SES group).[30] While the gaps shrink when controls are included, all of the adjusted differences remain statistically and educationally significant. Fully adjusted gradients show that moving each subsequent quintile up in the SES distribution improves performance by about 0.2 standard deviations (with a minimum of 0.15 sd and a maximum of 0.23 sd), in both math and reading, and the gaps between the lowest and highest SES groups still surpass three-fourths of a standard deviation in the two cognitive skills.[31]

One interesting finding is that, when all controls are included, the coefficients associated with math and reading performance of the two lowest SES quintiles narrow more, proportionately, than do the coefficients associated with the two highest SES quintiles. In other words, adding controls such as family composition and early education practices has a bigger influence on gaps at the low-SES versus the high-SES end of the distribution. This may indicate that education supports that children receive outside their homes and/or parenting enrichment activities are particularly beneficial for low- to middle-income children, since higher-income parents likely provide such supports from their own resources. This suggests that increasing low-income children's access to educational activities that can complement the attention and stimulation received within their homes could substantially reduce their relative disadvantage in reading and math skills.

While SES-based gaps for a set of executive function indicators—cognitive flexibility and working memory—are also substantial, a closer look offers some interesting findings that contrast with the trends for math and reading. Controlling for race/ethnicity (Model 2S) significantly decreases the gaps, whereas the decrease was smaller in math and reading. There is also a small additional shrinking effect from adding child and family characteristics, pre-K schooling, and the various parenting educational activities (Model 3S), but this additional decrease is much smaller than it was for reading and math. The adjusted advantages for children across the socioeconomic distribution compared with children in the low-SES quintile in the cognitive flexibility skill are between 0.10 and 0.25 standard deviations. A similar gradient, but steeper, is also observed for the working memory skill (adjusted gaps relative to children in the low SES quintile are between 0.10 and 0.51 standard deviations).

Socioeconomic-based gaps in noncognitive skills

Estimates of SES-based gaps in noncognitive skills, as reported by parents and teachers, reveal two important trends. First, both parent- and teacher-based assessments reveal gaps or socioeconomic gradients. Related to this main finding, as we will see, the steepness of the gradients is not uniform, and depends both on the skills and on whether parents or teachers are providing the assessments. In terms of sensitivity to the controls, gaps do not always shrink when race/ethnicity controls are added (comparing unadjusted with adjusted-by-race gaps). Second, the size of the gaps in comparable constructs (e.g., persistence in completing tasks) differs depending on whether parents or teachers are doing the rating. In other words, parents sometimes rate their child as having better behaviors than the child's teacher rates the child, and vice versa.

According to the estimates, children's noncognitive skills as rated by teachers clearly differ by socioeconomic status, for all the skills studied. The steepest gradients are found in teachers' assessments of children's approaches to learning, eagerness to learn, persistence, and attention. In the approaches to learning category, fully adjusted scores for children rise from 0.13 standard deviations for children in the low-middle SES quintile to 0.51 standard deviations for children in the high SES quintile (compared with children in the poorest quintile). In the eagerness to learn category, the range from low-middle to high quintiles is from 0.09 to 0.41 standard deviations. In the persistence category, the range from low-middle to high quintiles is from 0.12 to 0.42 standard deviations. In the attention category, the range from low-middle to high quintiles is from 0.10 to 0.44 standard deviations.

Compared with the steep ladders just described, gradients are not as uniformly steep for internalizing behavioral problems, externalizing behavioral problems, and closeness to teachers, especially when comparing children in the two lowest SES quintiles. In each of these categories, under the fully adjusted model, there is no statistically significant difference

between teacher's ratings of the poorest children versus those of children in the low-middle SES. However, the gaps become significant when comparing the poorest children with children in the top two SES quintiles (these gaps range from 0.15 to 0.23 standard deviations). The gaps are also marginally statistically significant for middle-SES children relative to low-SES children in the internalizing behavioral problems and teacher closeness skills.

Finally, although SES-based gaps in noncognitive skills as rated by teachers are narrowed by the controls included in the fully adjusted model, intermediate adjustments show some trends that are in clear contrast with cognitive skills gaps. For example, controlling for race alone (model 2 in the tables) increases, rather than reduces, the perceived disadvantage of low-SES children relative to all the other children. The only exceptions are estimated gaps in closeness to the teacher, in which race controls decrease the gap, and interpersonal relationships, where the gap essentially remains the same). Moreover, when controlling for race/ethnicity and certain other family and child characteristics (not shown in tables), the gradients become fixed; they are not responsive to either prekindergarten attendance or parental enrichment activities. This is in contrast to parents' reports of noncognitive skills.

Unfortunately, we found no research evidence explaining the key trends in teacher-reported gaps discussed above: why teachers rate noncognitive skills higher for higher-SES children and why gaps increase rather than decrease after adjusting by race. Clearly, it is important that further research explores why this occurs and the potential implications of these gaps for educational performance as children progress in school.

Turning to children's noncognitive skills as rated by parents, we also see clear differences by socioeconomic status. The gradients or slopes are markedly steep for most measures of noncognitive skills. This is particularly true for approaches to learning, self-control, and persistence in completing tasks. In these three areas, the fully adjusted gaps relative to the poorest children are between 0.07 and 0.15 standard deviations for students in the low-middle SES group and 0.20 to 0.30 standard deviations for students in the high SES group, relative to the poorest children. However, a slight exception to the general finding of sizable socioeconomic gaps is found in the gradient for the social interactions index. Under the fully adjusted model, it is statistically significant but shows almost no slope, suggesting that, according to parents, only the most disadvantaged students have a meaningful gap relative to other students (on average, they score between 0.16 sd and 0.19 sd below the SES groups further up in the distribution; this gap would be considered a sizable gap in any event). Similarly, a small gap appears in parents' perception of their children's creativity, where the slope is relatively flat and the gaps are relatively small. Under the fully adjusted model, the gaps—while statistically significant for children in the low-middle, middle-high and high SES quintiles (and not in the middle SES quintile) compared with the poorest quintile—each rounds to 0.1 standard deviations (except the gap at the middle) .

In comparing unadjusted and adjusted gaps (in the figure models and also in nonreported, more parsimonious, estimations), we note that for all the noncognitive skills reviewed, SES gaps as reported by parents shrink when controls are added. The unadjusted gaps show steeper SES gradients than the adjusted gaps. In particular, adding an adjustment for the index of parental enrichment activities (as we did in a nonreported estimation) systematically reduces the gaps. This finding (from the underlying data but not portrayed specifically in the figures) shows that early stimulation by parents delivers benefits across all SES groups. As such, improving parents' understanding of which activities can be beneficial for their children would boost those children's skills, and may also make parental perceptions of children's skills more accurate.

Although the results discussed above show clear differences by socioeconomic status, it is unclear whether parental SES directly influences children's noncognitive abilities, or whether SES influences the parents' *perceptions* of their children's noncognitive skills. In other words, we may be seeing real differences in the low-SES children's social, behavioral, and interpersonal skills, or something that reflects a negative self-perceived bias on the part of parents, perhaps due to a level of isolation that affects low-SES parents' ability to objectively evaluate their children's abilities. Although the research on this issue is thin and inconclusive, in extreme cases, severe isolation could lead to self-esteem issues and/or lowered expectations, both of which could lead low-SES parents to perceive their children in a more negative light.

Finally, the differences between parents' and teachers' perceptions of children in seemingly comparable skills merit a separate comment. Both assessed the children's approaches to learning, self-control, eagerness to learn, social skills ("social interactions" by parents and "interpersonal relationships" by teachers), and persistence in completing tasks (technically, "works until finishes" by parents and "persists in completing tasks" by teachers). The comparison in their assessments will be more concerning in the discussion of gaps by race/ethnicity, but even in this discussion of SES gaps, in general, teachers' perceived gaps are significantly greater than parents' reported gaps. For example, teachers' ratings of high-SES children on these paired skills are close to twice as high as the ratings of high-SES children by their parents (the exception being self-control). The differences could be partly attributed to the fact that adults answered slightly different questions about children's behavioral skills. But the differences could also reflect real differences in how children behave at home and in school, or some type of bias on the part of the adults (respondents' assessments inherently build on their perceptions and individual characteristics, see Salzinger et al. 1984), or both. Teachers could be influenced by what they know about the children's parents, or even by the children's academic performance. Parents could be influenced by their perceptions of the skills levels of their children's peers, etc. As before, we found no research evidence that could explain these biases.[32] Because adults' perceptions create expectations or perceptions that can influence the way children see themselves, which may affect their performance, it is also important to conduct further research exploring these differences in more depth.

Gaps by race/ethnicity

Unlike persistent socioeconomic-based skills gaps, gaps by race/ethnicity shrink substantially, and sometimes disappear, when controls for children's socioeconomic background are included. While gaps exist for all ethnic or racial groups when no adjustments are made, the fact that they shrink substantially with the inclusion of other indicators means that education gaps are not actually driven by race, but rather reflect the fact that some racial/ethnic groups are more likely to be economically disadvantaged and have experienced deficits related to economic disadvantage (as shown in **Appendix C**, **Table C2**). As such, the fully adjusted models reveal no large or statistically significant differences between students who are white, Hispanic English speakers, Asian, and "other" races (with a few exceptions explained below). Race/ethnicity-based gaps remain partly unexplained for black and Hispanic-ELL children, although in different senses, as discussed below.

Another important finding is that, generally, once SES is accounted for, the remaining predictors (preschool experience and parenting) contribute relatively little to explaining the education gaps at the starting gate. These results could support the idea that gaps by race/ethnicity are actually the result of higher rates of poverty and associated disadvantages among minority children than among their white counterparts.[33] This is an important finding; it confirms that the challenges minority children face at the starting gate are a result of their socioeconomic disadvantage, not their race, as

TABLE 1

Summary of socioeconomic-based education gaps; fully adjusted differences (Model 3, M3S)

Variables (measured in standard deviations)	Low-middle SES	Middle SES	High-middle SES	High SES	N	Adj.R2
Cognitive skills and executive function						
Reading	0.167***	0.345***	0.555***	0.784***	10,240	0.339
Math	0.153***	0.372***	0.539***	0.761***	10,220	0.362
Cognitive flexibility	0.098**	0.192***	0.182***	0.254***	10,220	0.097
Working memory	0.101***	0.259***	0.416***	0.513***	9,570	0.255
Principal noncognitive skills (as reported by teachers)						
Self-control	0.073	0.162***	0.286***	0.311***	8,910	0.176
Approaches to learning	0.132***	0.230***	0.432***	0.507***	9,690	0.202
Internalizing problems	-0.043	-0.110**	-0.151***	-0.163***	9,360	0.103
Externalizing problems	0.016	-0.066	-0.150***	-0.191***	9,440	0.147
Principal noncognitive skills (as reported by parents)						
Self-control	0.068	0.175***	0.192***	0.258***	10,240	0.068
Approaches to learning	0.151***	0.175***	0.259***	0.302***	10,260	0.186
Social interactions	0.163***	0.184***	0.177***	0.186***	10,260	0.112
Other noncognitive skills (as reported by teachers)						
Interpersonal relationships	0.088**	0.176***	0.319***	0.348***	9,020	0.181
Closeness to teacher	0.046	0.120***	0.192***	0.229***	9,640	0.170
Eagerness to learn	0.092**	0.189***	0.355***	0.407***	9,730	0.146
Attention	0.104***	0.185***	0.360***	0.438***	9,730	0.163
Persistence in completing tasks	0.116***	0.177***	0.346***	0.422***	9,710	0.174
Other noncognitive skills (as reported by parents)						
Persistence in completing tasks	0.076*	0.099**	0.169***	0.203***	10,260	0.077
Eagerness to learn	0.166***	0.189***	0.174***	0.232***	10,260	0.099
Creativity in work or play	0.081**	0.062	0.109**	0.136***	10,250	0.132

TABLE 1 (CONTINUED)

Note: Columns 1 to 4 are extracted from Model M3S (see Appendices D and F).

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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poverty both directly impedes minority children's development and mediates for many factors that further the disparities in readiness to learn.

White-black gaps

Education gaps for black children relative to their white peers are not only large but also remain statistically significant (though smaller) after adjusting for SES, other individual and family characteristics, and early childhood experiences. Gaps are statistically significant for almost all cognitive outcomes. On math skills and executive functions, black children score between 0.24 and 0.29 standard deviations below whites; for reading, the gap is marginally statistically significant and small, 0.07 standard deviations. Fully adjusted skills gaps between black and white children are also statistically significant for all but one of the noncognitive skills reported by teachers, with differences between 0.14 and 0.25 standard deviations (the exception is internalizing behavioral problems). However, there are no statistical differences between how black parents and white parents perceive their children's approaches to learning, social interactions, persistence in completing tasks, and eagerness to learn new things). Black parents do rate their children as less creative, on average, than white parents (-0.11 standard deviations) but report that their children show higher self-control than white parents (+0.17 standard deviations), a gap that actually increases after including controls.[34]

White-Asian gaps

Asian children start school with significant relative advantages compared with white (and other) students in both the cognitive skills (reading and math) and the noncognitive skill of persistence as reported by their teachers. But they also begin with a significant disadvantage compared with white children in closeness to teachers. Teachers perceive no differences between Asian and white children in self-control, approaches to learning, behavioral problems, interpersonal relationships, eagerness to learn, and attention (under the fully adjusted model). Interestingly, however, parents of Asian children perceive them as relatively behind, compared with white parents' perceptions of their children, in all the reported noncognitive skills except for self-control, persistence, and eagerness to learn new things (differences on these three measures are not statistically significant under the fully adjusted model).[35] In light of these results, there appears to be a negative bias expressed by parents of Asian children, whose reference or measurement bar is, if anything, higher than and different from teachers' in comparable outcomes such as approaches to learning or persistence.

Another interesting finding is that, as is true of black-white skills gaps, the skills gaps between Asian and white students tend to shrink after controlling for SES and other individual and family factors and for children's early education experiences, although the relative decrease is much lower than it is for black children. There are two noticeable exceptions: reading and math. Indeed, the fully adjusted gaps between Asian and white children on reading and math are *larger* than the unadjusted gaps (under the fully adjusted model the gap is about one-third of a standard deviation or higher).[36]

White-Hispanic gaps

The observed patterns suggest a significant disadvantage for Hispanic children versus white children across all the cognitive variables, with the degree depending on their use of English at home.[37] While both Hispanic subgroups—ELL and English speakers—perform worse than white children, absolute gaps for ELL children are much larger than for English speakers. Indeed, unadjusted ELL Hispanic-white gaps are the largest estimated gaps among any nonwhite-white pairing across all cognitive skills and parents' reported noncognitive skills (the unadjusted differences are between about 0.2 and 0.3 sd for English speakers in reading and math, but near 0.7 sd for ELL).

After all controls (SES, family characteristics, etc.) are added, these cognitive gaps relative to white children shrink by about half for English speakers, to 0.08 sd in reading and 0.16 sd in math. And, though they shrink even more for ELL students, because they are so large to begin with, they remain sizeable—0.20 sd in reading and 0.26 sd in math. Both Hispanic subgroups also lag behind their white peers in working memory (their performance is 0.2 sd and 0.4 sd behind their white peers for English speakers and ELL, respectively). Interestingly, the gap between cognitive flexibility of Hispanic ELL children and white children loses its significance after all controls are included (falling from -0.38 sd under the unadjusted model to a statistically insignificant -0.08 sd) but remains significant among English speakers (falling from -0.11 sd to -0.08 sd).

Turning to noncognitive skills, after controls are introduced, any differences between English-speaking Hispanics and white children disappear, with three exceptions: compared with white children, they have a relative advantage in creativity and eagerness to learn as perceived by parents and a relative disadvantage in persistence in completing tasks as reported by teachers.[38]

In contrast, parents of Hispanic ELL children perceive their children to be substantially disadvantaged compared with whites in social interactions, approaches to learning, and persistence, after all controls are introduced.[39] For this group, too, moderate initial gaps in self-control and creativity as reported by parents vanish after the incorporation of controls.[40] Similarly, once controls are introduced to teachers' assessments, gaps between white students and non-English-speaking Hispanics become insignificant, for all of the considered outcomes. So teacher-parent gaps operate similarly for Hispanic ELL and Asian children, although they apply to different behavioral skills, and somewhat opposite to how they operate for black children, suggesting an interesting avenue for further analysis (see footnote 32).

Other relationships of interest

The tables in **Appendix F** reveal some relationships of interest between educational outcomes and the inputs (other individual and family characteristics and prekindergarten care and parenting experiences) that are utilized as controls under the fully adjusted model. We examine whether the child is a boy or a girl, whether the child lives with one parent or with two parents, whether the child participated in some center-based pre-K schooling the year before kindergarten, and the level of enrichment activities with parents (as captured by an index). The coefficients are summarized in **Table 3** (models 3RL/3S, which include all the control variables).

Children living in single-parent homes begin school at a relative disadvantage compared with children who live with two parents, with gaps in reading (-0.14 sd), math (-0.12 sd), and teacher-reported noncognitive skills (gaps between 0.07 and 0.26 sd). They also lag behind children living with two parents in three of the parent-reported noncognitive variables (self-control, creativity, and persistence in completing tasks, -0.09, -0.06 and -0.10 standard deviations,

TABLE 2

Summary of race/ethnicity-based education gaps, fully adjusted differences (Model 3, M3R)

Variables (measured in standard deviations)	Black	Hispanic ELL	Hispanic English	Asian	Other	N	Adj.R2
Cognitive skills and executive function							
Reading	-0.069*	-0.200***	-0.083**	0.373***	0.060	10,240	0.339
Math	-0.236***	-0.256***	-0.155***	0.267***	0.006	10,220	0.362
Cognitive flexibility	-0.240***	-0.077	-0.079**	-0.038	-0.090**	10,220	0.097
Working memory	-0.291***	-0.361***	-0.167***	-0.015	0.047	9,570	0.255
Principal noncognitive skills (as reported by teachers)							
Self-control	-0.194***	0.075	0.005	-0.010	-0.052	8,910	0.176
Approaches to learning	-0.185***	0.051	-0.038	0.079	-0.049	9,690	0.202
Internalizing problems	-0.043	-0.052	0.007	-0.090	-0.003	9,360	0.103
Externalizing problems	0.160***	-0.040	-0.043	-0.031	0.051	9,440	0.147
Principal noncognitive skills (as reported by parents)							
Self-control	0.174***	-0.066	-0.029	-0.022	0.062	10,240	0.068
Approaches to learning	0.009	-0.172**	0.057	-0.154***	0.025	10,260	0.186
Social interactions	0.002	-0.212**	-0.007	-0.255***	-0.027	10,260	0.112
Other noncognitive skills (as reported by teachers)							
Interpersonal relationships	-0.200***	0.061	-0.020	-0.047	-0.050	9,020	0.181
Closeness to teacher	-0.246***	0.015	-0.003	-0.193***	-0.164***	9,640	0.170
Eagerness to learn	-0.188***	0.061	-0.069	0.031	-0.019	9,730	0.146
Attention	-0.136***	0.061	-0.055	0.040	-0.063	9,730	0.163
Persistence in completing tasks	-0.144***	0.027	-0.071*	0.132**	-0.008	9,710	0.174
Other noncognitive skills (as reported by parents)							
Persistence in completing tasks	0.071	-0.178*	0.007	-0.105	0.022	10,260	0.077
Eagerness to learn	0.026	-0.080	0.072*	-0.056	-0.022	10,260	0.099

TABLE 2 (CONTINUED)

Variables (measured in standard deviations)	Black	Hispanic ELL	Hispanic English	Asian	Other	N	Adj.R2
Creativity in work or play	-0.112**	-0.082	0.091**	-0.151**	0.043	10,250	0.132

Note: ELL stands for English-language learner. English refers to English-language speaker. Columns 1 to 4 are extracted from Model M3R (see Appendices E and F).

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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respectively). However, children's executive function skills do not seem to be affected by the adult composition of their homes, nor are children in single-parent homes, according to parents, lagging on the noncognitive skills of approaches to learning, social interactions, or eagerness to learn new things.

Center-based preschool care has a positive and statistically significant correlation (after controlling for SES and the remaining predictors) with children's math skills (of 0.07 sd), and reading skills (0.11 sd), but no association with executive functioning. It also improves children's social interaction skills (0.06 sd), and reduces their internalizing behavior problems (-0.05 sd). However, it also reduces self-control, and increases children's externalizing behavioral problems, as reported by teachers. We find no independent effect of prekindergarten schooling, on top of other SES-mediated factors, on approaches to learning, self-control reported by parents, creativity, or persistence. As discussed earlier, more detailed information on the characteristics of the nonparental care arrangements (type, quality, and quantity) would help researchers further disentangle the importance of this variable. This additional information would provide a much clearer picture of the effects of early childhood education on the different educational outcomes.

The different parenting activities that are summarized in the index called "enrichment activities with parents" are positively associated with all outcomes other than the index of internalizing behavioral problems, as reported by the teacher. The association with cognitive skills is strong, especially for reading performance (0.14 sd) and for math (0.09 sd).

The correlation between parents' assessments and parenting activities is noteworthy, and it could be interpreted as a bidirectional association. The coefficients are 0.55 sd for approaches to learning, 0.43 for creativity, 0.24 for self-control, 0.28 for social interactions, and 0.32 for persistence in completing tasks. On the one hand, parents who are more inclined to participate in their children's early play and educational time are probably more likely to perceive or judge that this had an impact on these school preparation and social skills. On the other hand, the activities might affect their children's skills.

The association between the enrichment index and teachers' assessments of children's noncognitive skills is positive but weaker than the associations between parental engagement and parent assessments. The standardized coefficients for the former show an association that is about 0.1 sd or lower in all cases (and is statistically insignificant for internalizing behavioral problems).

Finally, we find little evidence of the alleged gender gap in mathematics at the beginning of kindergarten. Girls have a small relative advantage with respect to boys in reading (0.07 sd), and a relative disadvantage in math (0.08 sd). Girls outperform boys in cognitive flexibility, but there is no statistical difference in working memory performance. This

finding—that any preexisting cognitive gap between girls and boys when they enter school is very small—is important because it shows that subsequent differences in boys' and girls' academic trajectories are likely not due to differences in readiness when they start school. Rather, as researchers have suggested, different contextual factors, role models, and gender roles, etc., may drive the observed increase in gender-based gaps (Entwisle, Alexander, and Olson 1994).

We do however find gender gaps in noncognitive areas: both parents and teachers perceive girls as having better noncognitive skills. Moreover, teachers have a much more positive opinion of girls than do parents when assessing other skills (the teacher-reported gender gaps are two to three times bigger than the parent-reported gender gaps in children's self-control, persistence, and approaches to learning). Girls also outperform boys in creativity as reported by parents (0.19 sd), closeness to teachers (0.32 sd), and behavioral control (with negative scores—0.05 and 0.39—on the frequency of internalizing and, specially, externalizing behavioral problems).

Recommendations

This analysis affirms decades of research that connects parents' economic resources and opportunities (or lack thereof) to their children's degree of school readiness, with gaps in readiness growing as we compare families that are further and further apart on the socioeconomic spectrum. Moreover, the fact that unequal starts are found in both traditional cognitive skills such as math and reading and in noncognitive skills such as creativity or approaches to learning means that socioeconomic inequality affects all aspects of children's early development.

These significant education gaps by socioeconomic status raise important questions about the potential for efforts to improve the U.S. education system. Not only are our schools and teachers serving students who are unequally prepared to learn, but, as research shows, those who enter behind tend to enter under-resourced and racially and economically segregated schools (Adamson and Darling-Hammond 2012; Baker and Corcoran 2012, García and Weiss 2014; Rothstein 2014). This compounds early disadvantages, expands them over time, and threatens the promises of equal opportunity and social mobility based on educational attainment.

These education gaps serve, as well, to raise the question of whether our public policies sufficiently address the needs of young children (and their families) in their formative years. The gaps highlight the urgent need to not only rethink how we design and implement education policies, but also, more broadly, pursue a range of social and economic policies proven to avert and narrow early gaps and improve vulnerable children's odds of success.

Policy implications: Early childhood and education policy

While controlling for parenting practices and investments in early care and education does not substantially alter education gaps once we've already factored in socioeconomic status and race, there are strong reasons to prioritize investments in quality early care and education. First, such experiences had the biggest impact on gaps at the low end of the SES spectrum, supporting existing research that shows that preschool and similar activities particularly benefit children at the bottom of the socioeconomic distribution (who start school further behind in cognitive and noncognitive domains). Second, these children are less likely to have access to such supports: only 44 percent of the children in the lowest SES quintile in the 2010 kindergarten class attended preschool, compared with 70 percent of children in the highest quintile (see Table C2). This disparity in access occurred despite efforts to increase targeted and universal pre-K across states (U.S. Department of Education 2015). Moreover, the poorest kids (low and low-middle SES quintiles) who do have

TABLE 3

Summary of association between educational outcomes and selected child and family characteristics, fully adjusted differences (Model M3S/M3R)

Variables (measured in standard deviations)	Girl	Not living with two parents	Center-based pre-K	Enrichment activities with parents	N	Adj.R2
Cognitive skills and executive function						
Reading	0.069***	-0.141***	0.108***	0.144***	10,240	0.339
Math	-0.075***	-0.117***	0.069***	0.094***	10,220	0.362
Cognitive flexibility	0.055***	0.006	0.012	0.044**	10,220	0.097
Working memory	0.023	-0.042	0.032	0.073***	9,570	0.255
Noncognitive skills (as reported by teachers)						
Self-control	0.325***	-0.221***	-0.062***	0.084***	8,910	0.176
Approaches to learning	0.414***	-0.233***	-0.006	0.104***	9,690	0.202
Internalizing problems	-0.045**	0.144***	-0.047*	-0.020	9,360	0.103
Externalizing problems	-0.386***	0.255***	0.098***	-0.075***	9,440	0.147
Noncognitive skills (as reported by parents)						
Self-control	0.092***	-0.087***	-0.029	0.241***	10,240	0.068
Approaches to learning	0.176***	-0.036	0.028	0.548***	10,260	0.186
Social interactions	0.123***	0.030	0.060***	0.280***	10,260	0.112
Other noncognitive skills (as reported by teachers)						
Interpersonal relationships	0.345***	-0.221***	-0.032	0.065***	9,020	0.181
Closeness to teacher	0.318***	-0.074**	0.019	0.086***	9,640	0.170
Eagerness to learn	0.210***	-0.162***	0.005	0.115***	9,730	0.146
Attention	0.385***	-0.209***	-0.012	0.099***	9,730	0.163
Persistence in completing tasks	0.270***	-0.172***	-0.002	0.069***	9,710	0.174
Other noncognitive skills (as reported by parents)						

TABLE 3 (CONTINUED)

Variables (measured in standard deviations)	Girl	Not living with two parents	Center-based pre-K	Enrichment activities with parents	N	Adj.R2
Persistence in completing tasks	0.133***	-0.099***	0.021	0.318***	10,260	0.077
Eagerness to learn new things	0.122***	-0.028	0.057**	0.354***	10,260	0.099
Creativity in work or play	0.187***	-0.057**	0.016	0.427***	10,250	0.132

Note: Columns 1 to 4 are extracted from models M3S/M3R (see Appendix F).

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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access to paid care outside the home are more likely than their more affluent peers to be in non-center-based care, which is often unlicensed, poorly regulated, and of low quality (Weiss and Brandon 2010; Waldfogel 2009). Investments in quality early care and education are only one component of the set of policy strategies needed to close socioeconomic status–related gaps, but they are an important piece, and one for which research provides helpful guidance.

A number of initiatives at the federal, state, and district levels show promise in advancing the early childhood policy agenda. For example, in the recent reauthorization of the Child Care and Development Block Grant Act, Congress took important steps toward improving the safety and quality of child care for children whose parents need federal subsidies. New York City increased the number of 4-year-olds served in all day pre-K from 13,000 in 2013 to over 70,000 in fall 2015 (Potter 2015). And Boston currently serves a majority of children in high-quality settings and recently announced plans to scale up to serve every four-year-old in a full-day program (Office of Mayor Martin J. Walsh 2014.) Scaling up these and similar programs and expanding them to create a nationwide system of early supports will be critical to a push to substantially narrow education gaps. These policies enhance children's readiness for school while also improving their parents' job prospects and productivity, and have a high public return on investment (Barnett 1985; Bartik 2014; Heckman 2006; Heckman et al. 2010; Nores et al. 2005; Rolnick and Grunewald 2003).

Given the close association between inequalities at the starting gate and parents' practices and characteristics, improving parents' capacity to provide educational opportunities at home represents another policy opportunity (Magnuson and Duncan 2004). For example, home visits by nurses who help parents understand and enhance their children's healthy development provide a significant societal return in the form of improved child well-being and school readiness (Currie 2011; Olds et al. 1998; The White House 2014). While Congress has reauthorized federal funding for the Maternal Infant and Early Child Home Visiting program, which supports state home-visiting programs, insufficient funding levels still leave many at-risk mothers without access.

The benefits of investments in early care and education extend beyond improving children's school readiness to developing the human capital early in a child's life that is predictive of future outcomes (Currie and Almond 2011). Interventions such as nurse home visits improve child well-being more broadly (Currie 2011; The White House 2014). And increasing access to high quality early childhood education would also boost job options for low- and middle-wage

workers (U.S. Department of Education and U.S. Department of Health and Human Services 2014; The White House 2014).

Policy implications: Economic and social policies

Socioeconomic status is by far the largest predictor of early education gaps, and one-fourth of the children entering kindergarten in our study live in poverty, with that share rising to nearly half (46 percent) among black children and almost two-thirds (63 percent) among Hispanic ELL children. While investing in early care and education can help narrow these gaps by mitigating the effects of poverty, this is insufficient to overcome the huge challenges to life success that absolute poverty poses. As Putnam (2015) warns, saving the American Dream requires ensuring not just opportunity but mobility (both of which are compromised when a child's life odds are as clearly shaped by her parents' jobs or wealth as they are). We cannot ensure real opportunities for all our children unless we tackle the severe inequities underlying our findings.

The most straightforward way to decrease poverty among children and thus increase the resources available to them is to boost their parents' incomes. Wage stagnation among low-paid workers has been the greatest barrier to reducing poverty in recent decades (Cooper 2014).[41] Policies aimed at increasing overall wages and employment, especially at the lower rungs of the employment and wage ladders, include raising the federal minimum wage (many states and cities have already raised their minimum wages above the federal minimum).[42] For example, increasing the minimum wage to $10.10— less than the proposed increase currently on the table—would reduce the number of non-elderly individuals living in poverty by an estimated 4.6 million and increase family incomes by 12 percent for those families in the lowest income decile (Dube 2013). Raising the minimum wage would also help ensure that parents working full-time do not have to rely on public assistance to provide their children with the basic necessities (Cooper 2014; Economic Policy Institute 2015).

We could also make those wages go further by increasing the earned income tax credit (EITC) and child tax credit, which together account for only about 2 percent of total federal outlays.[43] Research demonstrates that such strategies are effective: for children living in the lowest-income households, increasing their parents' incomes to above the federal poverty line during their first formative years had lasting educational and other benefits (Duncan, Magnuson, and Votruba-Drzal 2014).

Raising incomes for middle– and low–social class families is key to ensuring that children do not grow up in poverty, and that today's children become less poor. (Of course, federal budgetary and monetary policies that boost employment are also part of the solution.) At the same time, we must protect families that fall on hard times, so that parents can still provide what their children need. As extensive studies have shown, federal "social safety net" policies such as unemployment insurance, food stamps, and cash assistance are a critical supplement for parents who are out of work or earning chronically low wages. These programs help ensure that children do not suffer the effects of poverty (Trisi 2014; Steinberg 2014).

Closing education gaps also calls for policies that address other structural factors that influence a child's odds of growing up poor. For example, children who are poor are disproportionately growing up in single-parent households—and black kindergartners are three times as likely to live in such households as are white kindergartners. While the factors that contribute to living with fewer than two parents are many, research has shown that boosting low-income workers' wages

will bring many men who are currently not eligible or able to marry into the eligible pool (Carbone and Cahn 2014). And since a high proportion of young, poor, black men are excluded from that pool because they are in prison or the correctional system, policies that ultimately could help close education gaps could also include reforming correctional systems (Gudrais 2013; The Sentencing Project 2013).[44]

Immigration reform discussions are also relevant to school improvement efforts. Virtually half of the low-SES children in the study are from an immigrant background (49.8 percent), compared with 26 percent of all kindergartners who are immigrants. Hispanic children growing up in immigrant households may face additional barriers to success. Lack of legal status severely limits the work options and incomes of their parents, and the stability of many of their families. Given the impact of these factors on children's well-being, immigration policies that limit the access that these children and their families have to basic supports merit close scrutiny.

Finally, we must address societal and structural biases that compound the effects of poverty on children of color. Poverty-related disadvantages work at multiple levels: at the individual level (as documented in the study), at the neighborhood and school levels (García and Weiss 2014; Wilson 1987), and at the state level (Carnoy et al. 2015). One of the major socioeconomic inequities that must be addressed is school funding disparities at the school, district, and state levels.

Moreover, because poor black and Hispanic ELL children tend to live in isolated neighborhoods of concentrated poverty, and many black children live in those conditions over multiple generations, reducing segregation and multigenerational poverty is an additional policy imperative (Sharkey 2013; Rothstein 2013 and 2014).

In terms of research, scholars should further analyze the factors underlying race-based disparities in teachers' versus parents' perceptions of their children—which are particularly stark with respect to black children—and explore their repercussions. Research could seek to understand whether these influence students' performance and parental engagement and, also, any potential connection between race-based perceptions of students' abilities and race-based disparities in school-discipline practices at both the preschool and high school levels (recent research has found that minorities experience harsher discipline, see U.S. Department of Education 2014).

Conclusion

Whether assessed from the perspective of socioeconomic status or race and ethnicity, our analysis confirms substantial education gaps between subgroups of a recent cohort of U.S. kindergartners as they begin their academic lives. The analyses make palpable the harsh differences in cognitive and noncognitive skills in the 2010 kindergarten class, with gaps in cognitive skills larger than gaps in noncognitive skills.

Gaps based on socioeconomic status are very significant and prevalent, while those based on race/ethnicity are largely sensitive to the inclusion of socioeconomic status (and other controls). These findings indicate that inequalities at the starting gate are largely the result of accumulated social and economic disadvantages; that socioeconomic status, or social class, is the single largest predictor of early education gaps; and that gaps based on race are primarily a result of the many factors for which race mediates and that minority groups disproportionately experience (Ladd 2012; Rothstein 2004).

Inequalities at the starting gate sometimes narrow as children grow. But whether they remain or shrink, they represent bleak life prospects that portend serious problems for our society as a whole if we do not treat them as the moral and economic crisis they represent. In failing to address these education gaps, we lose enormous potential human capital among groups that have historically contributed to the uniquely diverse, dynamic, and entrepreneurial nature of the country. And we are shortchanging too many of our youth. The findings of this study are a contribution to voices urging that the real and equal opportunities always envisioned when a child crosses the school's starting gate are provided to all children.

About the author

Emma García joined the Economic Policy Institute as an economist in 2013. She specializes in the economics of education and education policy. Her areas of research include analysis of the production of education, returns to education, program evaluation, international comparative education, human development, and cost-effectiveness and cost-benefit analysis in education. Prior to joining EPI, García conducted research for the Center for Benefit-Cost Studies of Education and other research centers at Teachers College, Columbia University, and did consulting work for MDRC, the Inter-American Development Bank, and the National Institute for Early Education Research. García has a Ph.D. in Economics and Education from Teachers College, Columbia University.

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Appendix A

Race and socioeconomic gaps: specifications

The expressions below show the specifications used to estimate the race-based and socioeconomic status–based (SES-based) performance gaps. Model 1 shows the unadjusted differences for children belonging to different racial/ethnic groups or SES quintiles (for race-based gaps the reference group is white children; for SES-based gaps, the reference group is children in the lowest SES quintile, "low SES"). Model 2 shows the differences adjusted for SES (in the case of race-based gaps) and race/ethnicity (in the case of SES-based gaps). Model 3 shows the fully adjusted differences (also adjusted for child and family characteristics, prekindergarten care arrangements, and early literacy practices at home). (Note: in the equations below "*i*" denotes child "*i*" and "*s*" deontes school "*s.*")

Gaps by race (R)[45]

Model 1R: (baseline): unadjusted race/ethnicity gaps

$$A^{c,nc}_{i,s} = \beta_0 + \beta_1 Black_{i,s} + \beta_2 Hispanic_{i,s} + \beta_3 Asian_{i,s} + \beta_4 Other_{i,s} + \alpha_s + \varepsilon_{i,s}$$ (Equation AR.1)

Model 2R: race/ethnicity gaps adjusted for socioeconomic status

$$A^{c,nc}_{i,s} = \beta_0 + \beta_1 Black_{i,s} + \beta_2 Hispanic_{i,s} + \beta_3 Asian_{i,s} + \beta_4 Other_{i,s} + \delta_1 SES2_{i,s} + \delta_2 SES3_{i,s} + \delta_3 SES4_{i,s} + \delta_4 SES5_{i,s} + \alpha_s + \varepsilon_{i,s}$$ (Equation AR.2)

Model 3R: race/ethnicity gaps adjusted for child and family characteristics (SES and others, represented by F), prekindergarten care arrangements and early literacy practices at home.

$$A^{c,nc}_{i,s} = \beta_0 + \beta_1 Black_{i,s} + \beta_2 Hispanic_{i,s} + \beta_3 Asian_{i,s} + \beta_4 Other_{i,s} + \delta_1 SES2_{i,s} + \delta_2 SES3_{i,s} + \delta_3 SES4_{i,s} + \delta_4 SES5_{i,s} + \theta_1 Girl_{i,s} + \theta_2 F_i + \mu PreKcare_i + \pi Practices_i + \alpha_s + \varepsilon_{i,s}$$ (Equation AR.3)

Gaps by socioeconomic status (S)

Model 1S (baseline): unadjusted socioeconomic gaps

$$A^{c,nc}_{i,s} = \beta_0 + \delta_1 SES2_{i,s} + \delta_2 SES3_{i,s} + \delta_3 SES4_{i,s} + \delta_4 SES5_{i,s} + \alpha_s + \varepsilon_{i,s}$$ (Equation AS.1)

Model 2S: socioeconomic gaps adjusted for race/ethnicity

$$A^{c,nc}_{i,s} = \beta_0 + \delta_1 SES2_{i,s} + \delta_2 SES3_{i,s} + \delta_3 SES4_{i,s} + \delta_4 SES5_{i,s} + \beta_1 Black_{i,s} + \beta_2 Hispanic_{i,s} + \beta_3 Asian_{i,s} + \beta_4 Other_{i,s} + \alpha_s + \varepsilon_{i,s}$$ (Equation AS.2)

Model 3S: socioeconomic gaps adjusted for race, child and family characteristics (race/ethnicity and others, represented by F), prekindergarten care arrangements and early literacy practices at home.

$$A^{c,nc}_{i,s} = \beta_0 + \delta_1 SES2_{i,s} + \delta_2 SES3_{i,s} + \delta_3 SES4_{i,s} + \delta_4 SES5_{i,s} + \beta_1 Black_{i,s} + \beta_2 Hispanic_{i,s} + \beta_3 Asian_{i,s} + \beta_4 Other_{i,s} + \theta_1 Girl_{i,s} + \theta_2 F_i + \mu PreKcare_i + \pi Practices_i + \alpha_s + \varepsilon_{i,s}$$ (Equation AS.3)

Appendix B

Data issues: Definition of variables, missing data, use of sample weights, and distribution of dependent variables

The definitions that follow reproduce and summarize the information reported by Tourangeau et al. 2013. For the current analysis, we focus on measurements of the child's cognitive and noncognitive skills at the beginning of the school year. The child assessments were conducted from August through mid-December 2010. Both these outcome variables and the control variables (the individual child and family characteristics or "education inputs") that are used in the analysis are described below. (Note that page numbers in Tourangeau et al. follow a chapter-page number format whereby 2-4 refers to section 2 page 4.)

Outcome variables

Cognitive assessment and executive function

ECLS-K: 2010–2011 includes the following two basic educational skills (math and reading) and measures of "executive function" (cognitive flexibility and working memory), as outlined below:

- *Reading (language use and literacy).* The reading assessment includes questions on basic skills (such as print familiarity, letter recognition, beginning and ending sounds, rhyming words, and word recognition), vocabulary knowledge, and reading comprehension (Tourangeau et al. 2013, 2-4). The child was asked to identify information specifically stated in a text (for example, definitions, facts, or supporting details), to make complex inferences within and across texts, and to consider the text objectively and judge its appropriateness and quality (Tourangeau et al. 2013, 2-4).[46] Reading IRT (Item Response Theory)[47] scale scores measure the estimation of the number of correct items a child would have answered out of the total questions or items available in the reading domain.
- *Math*. This assessment measures skills in conceptual knowledge, procedural knowledge, and problem solving. The child was asked about number sense, properties, and operations; measurement; geometry and spatial sense; data analysis, statistics, and probability; and patterns, algebra, and functions (Tourangeau et al. 2013, 2-6).[48] Math IRT scale scores measure the estimation of the number of correct items a child would have answered out of the total questions or items available in the math domain.
- *Executive function*. This assessment captures information on cognitive processes associated with learning: cognitive flexibility (Zelazo 2006) and working memory. Cognitive flexibility was measured by asking children to sort a series of picture cards according to different rules. For example, children were asked to sort the cards first by color and then by shape. For children who correctly sorted four of the six cards by shape, a third sorting rule consisted of looking at the border of the card: If the card had a black border, the child was to sort by color; if the card did not have a black border, the child was to sort by shape (Tourangeau et al. 2013, 2-6). Working memory was measured asking children to repeat increasingly long strings of orally presented numbers in reverse order.[49]

Noncognitive assessment

ECLS-K: 2010–2011 provides a significant number of variables (indices) measuring children's socioemotional skills. As mentioned earlier, assessment of these skills was provided by teachers and parents, on different domains. Following our previous research, we select noncognitive skills that are relevant to the education process (in García 2014 we call these

skills "education-policy-relevant noncognitive skills," expanding on Rothstein, Jacobsen, and Wilder 2008 and several works by Pianta and colleagues).

Also, some of the skills selected to be analyzed in more detail are those that allow for a comparison with skills of the earlier kindergarten class studied by NCES (ECLS-K, Kindergarten Class of 1998–1999, see footnote 19). All variables are standardized, with a mean of 0 and a standard deviation equal to 1. Following are the skills examined in our analysis:

- *Approaches to learning, by teachers.* This assessment captures mean ratings of teachers' answers on how often (among four options on a frequency scale, from "never" to "very often") the student exhibits each of seven behaviors, including whether he keeps belongings organized, shows eagerness to learn new things, works independently, easily adapts to changes in routine, persists in completing tasks, pays attention well, and follows classroom rules. Higher scale scores indicate that the child exhibits positive learning behaviors with a high frequency (Tourangeau et al. 2013, 3-24). The aggregate index is included in this report in the tables and figures covering "principal" noncognitive skills as reported by teachers. Three components (eagerness to learn, persistence in completing tasks, attention) are included in the tables and figures covering "other noncognitive skills" as reported by teachers. The other components are available upon request but are not included in the tables and figures in this report.
- *Approaches to learning, by parents*. This assessment captures mean ratings of parents' answers about the frequency with which the child exhibits six behaviors, including whether she keeps working at something until finished, shows interest in a variety of things, concentrates on a task and ignores distractions, helps with chores, is eager to learn new things, and is creative in work and play. Higher scale scores indicate that the child exhibits positive learning behaviors with a high frequency (Tourangeau et al. 2013, 3-25). As before, this research will use both the aggregate index and some of its components. The aggregate index is included in the tables and figures covering principal noncognitive skills as reported by parents. Some components are included in the tables and figures covering other noncognitive skills as reported by parents: whether the child keeps working at something (which we have labeled as "persistence in completing tasks"), eagerness to learn, and creativity in work or play. The other components are available upon request but are not included in the tables and figures in this report.
- *Parent-reported social skills*. These assessments are based on parents' reports about how frequently (from "never" to "very often") their child exhibits certain behaviors or social skills. The items are based on the "Social Skills Rating System" (Gresham and Elliott 1990). Parents were asked about the child's social interaction (three items); sadness/loneliness (four items); tendency toward impulsiveness/being overactive (two items); and self-control (five items). In all cases, higher scores indicate higher frequency in showing the particular behavior (Tourangeau et al. 2013, 3-23). The results for the social interaction and self-control measures appear in the tables and figures covering principal noncognitive skills as reported by parents. The others are available upon request but are not included in the tables and figures in this report.
- *Teacher-reported social skills*. These assessments are based on teachers' reports of how frequently (from "never" to "very often") the student exhibits certain social skills and behaviors. The items are based on the "Social Skills Rating System" (Gresham and Elliott 1990). Teachers were asked about the child's self-control (four items); tendency to internalize problem behaviors (four items); tendency to externalize problem behaviors (five items); and interpersonal relationships (five items). In all cases, higher scores suggest that the child shows that behavior more often (Tourangeau et al. 2013, 3-21). Note that the values in the behavioral problems skills are negative. When discussing

these assessments, we report the size of the gaps and ignore the negative signs, as they represent fewer problems, i.e., better behaviors.

The results for the self-control, internalizing problem behaviors, and externalizing problem behaviors measures appear in the tables and figures covering principal noncognitive skills as reported by teachers. The interpersonal skills measure is included in the tables and figures covering "other noncognitive skills" as reported by teachers.

- *Student-teacher relationship scales.* These two scales are based on Pianta and Steinberg (1992) and derive from teachers' answers on a number of items. Teachers were asked whether certain statements about their relationship with the students apply, using a 5-point scale, ranging from "definitely does not apply" to "definitely applies." The closeness-to-teacher scale is based on seven items and measures the degree of affection, warmth, and open communication that the teacher experiences with the student. High scale scores on the closeness scale indicate that the teacher perceives that he or she has a close relationship with the child. This assessment appears in the tables and figures covering other noncognitive skills as reported by teachers. The conflict scale builds on eight items, including the teacher's perception of the negative and conflictual aspects of the teacher's relationship with the student. High scale scores on the conflict scale indicate that the teacher perceives his or her relationship with the child to be characterized by conflict (Tourangeau et al. 2013, 3-27). This assessment is available upon request but is not included in the tables and figures in this report.
- *Children's behavior*. Some assessments were performed and are available upon request but are not included in the tables and figures in this report. Among those are assessments of "attention focus" and "inhibitory control" (Putnam and Rothbart 2006). For the first measure, teachers assess whether it is true or untrue that students show six behaviors related to the ability to focus attention on cues in the environment that are relevant to the task in hand, with higher scale scores indicating a larger number of behaviors that demonstrate "attention focus." (Tourangeau et al. 3-26). Similarly, higher scale scores on the inhibitory control scale (also based on six items) indicate that the child exhibits a larger number of behaviors that demonstrate the ability to resist distractions and instead to do what is most appropriate or needed (Tourangeau et al. 2013, 3-26).

Control variables (child and family characteristics or "education inputs")

A set of variables describing the children are used as controls in our estimates. These variables include the following:

- *Race/ethnicity.* Our analysis includes dummy indicators of whether the race/ethnicity of the child is white, black, Hispanic, Asian, or other. Hispanic children are divided into two groups, those whose families speak English at home and those whose families do not. This decomposition is first described and utilized by Nores and Barnett (2014) and Nores and García (2014).
- *Socioeconomic status (SES).* Our analysis includes dummy indicators representing the child's family socioeconomic quintile (or "fifth"). The construct is based on five different components, including the educational attainment of parents or guardians, occupational prestige (determined by a score), and household income (see more details in Tourangeau et al. 2013, 7-56 to 7-60). We use the quintile indicators based on the continuous SES variable, and use the following labels in the tables and figures: "Low SES" indicates the first or bottom socioeconomic quintile, "Middle-low SES" indicates the second-lowest quintile, "Middle SES" is the third quintile, "High-middle SES" indicates the fourth quintile, and "High SES" represents the top quintile.

- *Child living in poverty.* Whether a household lives in poverty is obtained from a household-level poverty variable. This variable indicates whether the household income is below 200 percent of the U.S. Census Bureau poverty threshold. More details are provided in Tourangeau et al. (2013), see pages 7-53 and 7-54.
- *Gender.* There is a dummy indicator representing whether the child is a boy or a girl.
- *Age* is expressed in months.
- *Language spoken at home.* Our analysis includes a dummy indicator of whether the language spoken in the child's home is not English (we call a child in this setting an English language learner, or ELL), versus whether the language spoken at home is English or two languages are spoken at home.
- *Immigrant.* There is a dummy indicator of whether the child or either of the child's parents is an immigrant, versus whether the child is native (i.e., U.S.-born with U.S.-born parents).
- *Disability*. There is a dummy indicator of whether the child has been diagnosed with some disability.
- *Type of family*. This variable indicates whether the child lives with both parents, compared with living with one parent or in another family composition.
- *Number of siblings.* This continuous variable measures the number of siblings the child has.
- *Prekindergarten care in a center-based setting.* Our analysis includes a dummy indicator of whether the child was cared for in a center-based setting during the year prior to the kindergarten year, compared with other options. These alternatives include no nonparental care arrangements and care provided through other means (by a relative or a nonrelative, at home or outside the home, or a combination of options). Any finding associated with this variable may be interpreted as the association between attending prekindergarten (pre-K) programs, compared with other options, but interpreted with caution. These coefficients should not be interpreted as the impact of pre-K schooling because the variable's information is limited and the model uses it as a control-only variable.[50] For the extensive literature explaining the benefits of pre-K schooling, see Camilli et al. 2010.
- *Enrichment activities with parents.* We have created an index capturing the variance on a wide set of family early literacy practices, leisure activities, and rules and routines. This procedure overcomes potential problems of multicolinearity and therefore improves the properties of our specifications. (This index is labeled in the tables as "Enrichment activities," and has an alpha of 0.7605) In particular, parents are asked the frequency ("not at all," "once or twice a week," "three to six times a week," and "every day") with which they engage with the child in the following activities: reading books; telling stories; playing games or doing puzzles; building something or playing with construction toys; singing songs; doing arts and crafts; talking about nature or doing science projects; and practicing reading, writing, or working with numbers. Parents are also asked how often the child reads picture books outside of school, and reads to or pretends to read to himself or to others outside of school.

Table B.1 shows the number of missing observations for each variable and that number as a share of total observations in the study. If the absence of some observations is not completely random, our ability to estimate the gaps could be hindered. Missing data can also negatively affect the estimation efficiency, thereby increasing the uncertainty associated with the point estimates. In essence, if the characteristics of the observed students were different from the characteristics of students who dropped out of the study or failed to report the necessary information (in terms of observable or unobservable characteristics), external validity and efficiency of the empirical findings would be compromised.[51]

According to the table, for the educational outcomes, the shares of missing data range from roughly 14 percent for cognitive outcomes to 25 percent or more for some of the noncognitive variables. There is negligible missing information on gender and race, but significant missing information on the language spoken at home and immigration status (about 12 percent and 25 percent respectively). Both variables affect our division of races by language and by immigration status in the analysis. Information of the child's SES is missing for about 12 percent of the total observations. In total missing data represent 43 percent of the weighted sample.

Survey weights

The complex design of the Early Childhood Longitudinal Study leads to the presence of multiple survey weights in the database.

All statistical analyses (descriptive and regression) included in this study use the children weights at the beginning of kindergarten (W1C0). The estimates provided in our results would be representative of the U.S. kindergarten population in 2010–2011 under the assumption that missing data follows a MCAR (missing completely at random) process.

Distribution of outcomes

Exploration of the distribution of the outcome variables suggested some non-normality in the distribution of their values, in both cognitive and noncognitive skills.

For the purposes of the analyses presented in this study, we choose to present the estimates for the standardized continuous variables for two reasons. First, it increases comparability across outcomes in the study. Second, it ensures comparability of our results with others in other studies, which, to a great extent, use the same measurements for the dependent variables as the current study. An example of a study using the recent ECLS-K 2010–2011 data is Magnuson and Duncan (2014).

In addition to outcomes measured in standardized terms, we estimate the gaps using different transformations of the dependent variables. These include Ordinary Least Squares estimates using the skills that are directly reported in ECLS-K 2010–2011. For non-normally distributed cognitive skills, we perform logarithmic transformation and square root transformation (as recommended by the Stata ladder command). For non-normally distributed executive function skills, we estimate ordinal logistic regressions (cognitive flexibility), and transform the outcome using a logarithmic and an inversed outcome transformation. Similarly, for non-normally distributed noncognitive skills, we also estimate ordinal logistic regressions and/or transform the outcome using a logarithmic transformation.

The results are only analyzed for the fully adjusted model (M3S or M3RL). As expected, the transformations and the estimates using different methods lead to different statistical results and to interpretations that are not comparable across specifications. The results support the patterns obtained by the fixed-effects estimation approach using standardized outcomes presented in this study.

TABLE B1

Missing data (share of total cases)

Outcome variables		Predictors	
Variable	**Share**	**Variable**	**Share**
Reading	13.8%	**Girl**	0.4%
Math	14.2	**Black**	0.5
Cognitive flexibility	14.1	**Hispanic**	0.5
Working memory	20.5	**Hispanic ELL**	11.8
Self-control (teachers)	25.4	**Hispanic English**	11.8
Approaches to learning (teachers)	18.7	**Asian**	0.5
Internalizing problems	21.7	**Other**	0.5
Externalizing problems	20.8	**Age**	13.2
Self-control (parents)	27.3	**Has a disability**	28.3
Approaches to learning (parents)	27.3	**Family type: not living with two parents**	26.3
Social interactions (parents)	27.2	**Number of siblings**	26.3
Interpersonal relationships	24.6	**Language at home is not English (ELL)**	11.7
Closeness to teacher	12.2	**Language at home is English**	11.7
Eagerness to learn	18.4	**Native**	25.1
Attention	18.4	**Immigrant**	25.1
Persistence in completing tasks (teachers)	18.6	**SES (quintile 1 to 5)**	11.9
Persistence in completing tasks (parents)	27.2	**Center-based pre-K**	17.4
Eagerness to learn new things	27.3	**Enrichment activities with parents**	26.4
Creativity in work or play	27.3		

Note: The number of observations is rounded to the nearest multiple of 10. ELL stands for English-language learner. SES stands for socioeconomic status.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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TABLE C1

Student and family characteristics of the kindergarten class of 2010–2011

Student characteristics	Mean	Standard deviation (sd)
White	51.5%	
Black	13.7%	
Hispanic	24.9%	
Hispanic ELL	11.4%	
Hispanic English speaker	12.6%	
Asian	4.4%	
Other	5.5%	
Girl	48.5%	
Age (in months)	68.5	4.6
Has a disability	20.5%	
Family characteristics	**Mean**	**Standard deviations (sd)**
Family type: living with two parents	68.2%	
Family type: not living with two parents	31.8%	
Number of siblings	1.5	1.1
Language at home is English	84.7%	
Language at home is not English (ELL)	15.3%	
Native	74.0%	
Immigrant	26.0%	
Living in poverty	25.5%	
Low SES (quintile 1)	20.3%	
Low-middle SES (quintile 2)	20.5%	
Middle SES (quintile 3)	20.0%	
High-middle SES (quintile 4)	20.2%	
High SES (quintile 5)	18.9%	
Early educational practices	**Mean**	**Standard deviation (sd)**
Pre-K care	79.3%	
Pre-K care: center-based	55.1%	
Enrichment activities with parents	0.0	

Note: SES stands for socioeconomic status. ELL stands for English-language learner. Among Hispanic children, some do not report their language status (Hispanic children with language reported account for 24 percent of the Kindergarten Class of 2010–2011.)

TABLE C1 (CONTINUED)

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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TABLE C2

Student and family characteristics of the kindergarten class of 2010 –2011, by race/ethnicity and by socioeconomic (SES) quintile

By race/ethnicity	White	Black	Asian	Other	Hispanic	Hispanic ELL	Hispanic English
Low SES (quintile 1)	8.9%	30.3%	11.8%	15.9%	42.6%	64.2%	23.0%
Low-middle SES (quintile 2)	17.6%	26.5%	13.4%	23.1%	24.0%	21.4%	26.4%
Middle SES (quintile 3)	21.5%	20.4%	15.0%	24.6%	16.4%	9.1%	22.9%
High-middle SES (quintile 4)	26.4%	14.4%	21.1%	17.6%	10.3%	3.8%	16.1%
High SES (quintile 5)	25.6%	8.3%	38.8%	18.8%	6.8%	1.6%	11.6%
Living in poverty	13.1%	45.5%	17.3%	24.7%	46.3%	62.5%	30.5%
Has a disability	23.1%	17.7%	10.9%	22.5%	16.9%	12.7%	21.0%
Family type: not living with two parents	23.9%	64.5%	9.6%	42.4%	32.7%	25.6%	38.2%
Number of siblings	1.44	1.58	1.21	1.48	1.61	1.68	1.57
Immigrant	7.5%	12.3%	92.9%	22.9%	65.0%	95.8%	34.6%
Language at home is not English (ELL)	1.8%	4.0%	54.5%	2.2%	47.5%	100.0%	0.0%
Pre-K care	82.2%	80.7%	81.2%	81.3%	71.3%	63.1%	78.8%
Pre-K care: center-based	58.0%	55.5%	61.7%	57.6%	46.5%	41.3%	51.2%
Enrichment activities (index)	0.078	0.010	-0.084	0.082	-0.171	-0.341	-0.037

By socioeconomic quintile	Low SES (quintile 1)	Low-middle SES (quintile 2)	Middle SES (quintile 3)	High-middle SES (quintile 4)	High SES (quintile 5)
White	23.1%	45.5%	56.8%	69.0%	71.3%
Black	19.6%	17.0%	13.4%	9.4%	5.8%
Hispanic	50.4%	28.3%	19.7%	12.2%	8.6%
Hispanic English-language learner (ELL)	36.1%	11.9%	5.2%	2.1%	0.9%
Hispanic English speaker	14.3%	16.3%	14.4%	10.1%	7.7%
Asian	2.5%	2.8%	3.2%	4.4%	8.7%
Other	4.4%	6.4%	7.0%	4.9%	5.6%
Has a disability	20.2%	22.1%	21.1%	21.6%	17.5%
Family type: not living with two parents	54.9%	41.7%	34.1%	19.3%	9.6%

TABLE C2 (CONTINUED)

By socioeconomic quintile	Low SES (quintile 1)	Low-middle SES (quintile 2)	Middle SES (quintile 3)	High-middle SES (quintile 4)	High SES (quintile 5)
Number of siblings	1.67	1.46	1.47	1.41	1.45
Language at home is not English (ELL)	40.3%	15.6%	8.0%	5.0%	7.0%
Immigrant	49.8%	25.7%	18.9%	17.2%	21.6%
Pre-K care	66.6%	75.6%	81.6%	85.0%	88.3%
Pre-K care: center-based	44.3%	47.0%	53.1%	61.6%	69.9%
Enrichment activities (index)	-0.163	-0.015	0.028	0.065	0.109

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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TABLE D1

Reading and math achievement at the beginning of kindergarten, by SES quintile, under unadjusted to fully adjusted models

	Reading			Math		
	M1S	**M2S**	**M3S**	**M1S**	**M2S**	**M3S**
Low-middle SES	0.269***(0.032)	0.208***(0.033)	0.167***(0.032)	0.240***(0.032)	0.176***(0.032)	0.153***(0.032)
Middle SES	0.489***(0.034)	0.407***(0.035)	0.345***(0.034)	0.504***(0.035)	0.414***(0.036)	0.372***(0.035)
High-middle SES	0.739***(0.037)	0.648***(0.037)	0.555***(0.036)	0.710***(0.036)	0.604***(0.037)	0.539***(0.037)
High SES	0.996***(0.039)	0.892***(0.040)	0.784***(0.039)	0.957***(0.039)	0.841***(0.039)	0.761***(0.038)
Controlling for race	No	Yes	Yes	No	Yes	Yes
Controlling for other variables	No	No	Yes	No	No	Yes
Observations	10,240	10,240	10,240	10,220	10,220	10,220
Adj.R2	0.276	0.286	0.339	0.285	0.297	0.362

Note: Robust standard errors are in parentheses. For statistical significance, *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. The number of observations is rounded to the nearest multiple of 10. SES refers to socioeconomic status. See Appendix A, Figure D1, and Table F1.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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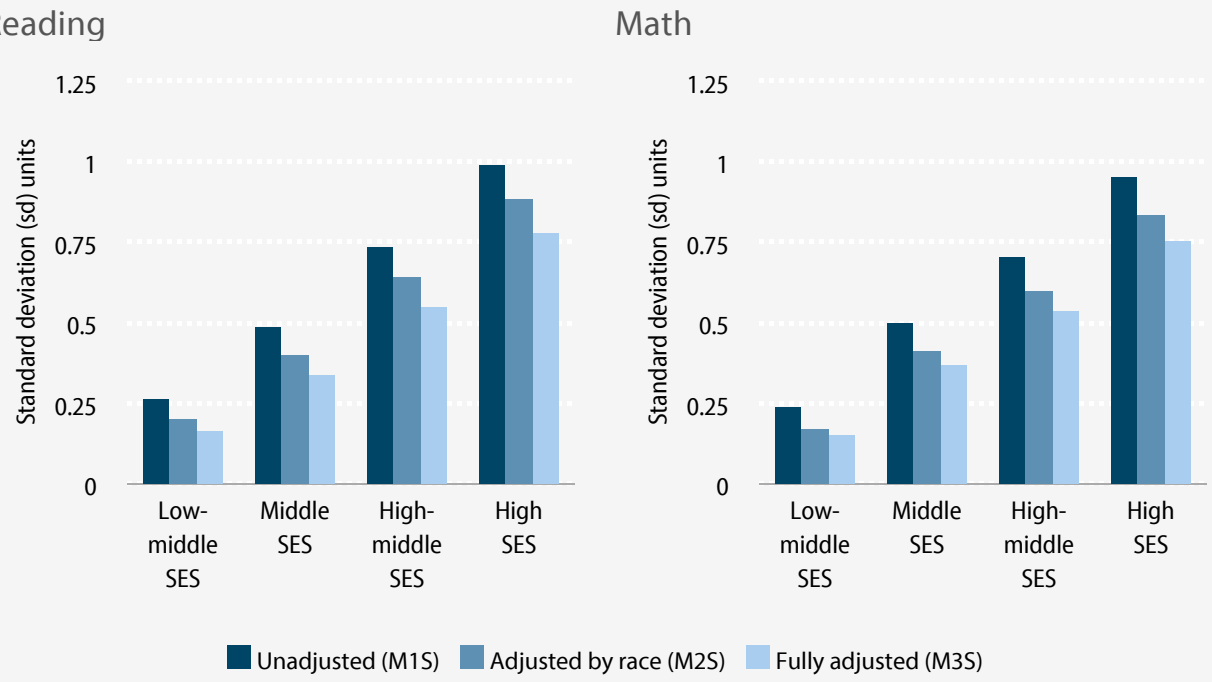
FIGURE D1

Reading and math achievement at the beginning of kindergarten, compared with low socioeconomic status achievement, by SES quintile



Note: SES refers to socioeconomic status. Model 1 (M1S) shows the baseline unadjusted standard deviation score for each socioeconomic group, relative to low-SES children. Model 2 (M2S) shows each group's relative performance after controlling for race/ethnicity. Model 3 (M3S) shows relative performance after adjusting for all family and child characteristics, pre-K schooling, and enrichment activities with parents. See Appendix A and Tables D1 and F1.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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TABLE D2

Executive function at the beginning of kindergarten, by SES quintile, under unadjusted to fully adjusted models

	Cognitive flexibility			Working memory		
	M1S	M2S	M3S	M1S	M2S	M3S
Low-middle SES	0.144*** (0.047)	0.100** (0.048)	0.098** (0.049)	0.201*** (0.039)	0.145*** (0.040)	0.101*** (0.037)
Middle SES	0.264*** (0.048)	0.201*** (0.049)	0.192*** (0.051)	0.399*** (0.042)	0.318*** (0.043)	0.259*** (0.041)
High-middle SES	0.266*** (0.047)	0.192*** (0.049)	0.182*** (0.051)	0.582*** (0.043)	0.489*** (0.045)	0.416*** (0.043)
High SES	0.346*** (0.047)	0.272*** (0.048)	0.254*** (0.051)	0.705*** (0.045)	0.608*** (0.046)	0.513*** (0.045)
Controlling for race	No	Yes	Yes	No	Yes	Yes
Controlling for other variables	No	No	Yes	No	No	Yes
Observations	10,220	10,220	10,220	9,570	9,570	9,570
Adj.R2	0.0803	0.0860	0.0974	0.168	0.176	0.255

Note: Robust standard errors are in parentheses. For statistical significance, *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. The number of observations is rounded to the nearest multiple of 10. SES refers to socioeconomic status. See Appendix A, Figure D2, and Table F2.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010-2011 (National Center for Education Statistics)

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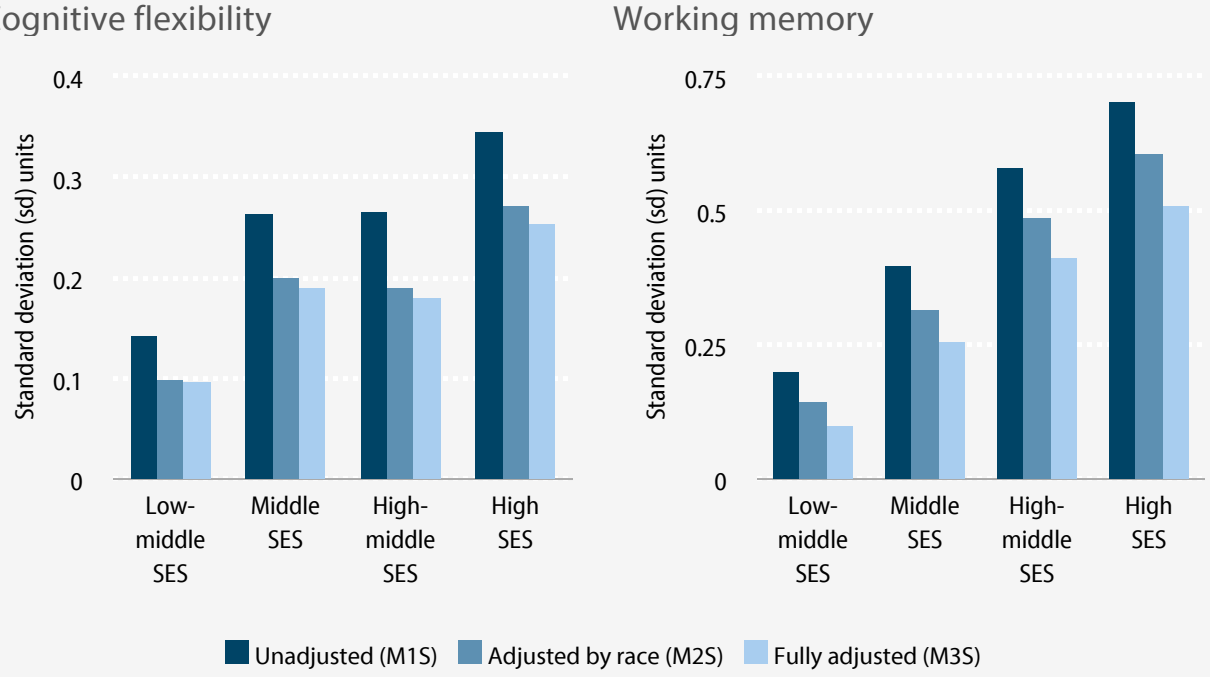
FIGURE D2

Executive function at the beginning of kindergarten, compared with low socioeconomic status executive function, by SES quintile



Note: SES refers to socioeconomic status. Model 1 (M1S) shows the baseline unadjusted standard deviation score for each socioeconomic group, relative to low-SES children. Model 2 (M2S) shows each group's relative performance after controlling for rache/ethnicity. Model 3 (M3S) shows relative performance after adjusting for all family and child characteristics, pre-K schooling, and enrichment activities with parents. See Appendix A and Tables D2 and F2.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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TABLE D3

Principal noncognitive skills at the beginning of kindergarten, as reported by teachers, by SES quintile, under unadjusted to fully adjusted models

	Self-control			Approaches to learning			Internalizing problems			Externalizing problems		
	M1S	M2S	M3S	M1S	M2S	M3S	M1S	M2S	M3S	M1S	M2S	M3S
Low-middle SES	0.085* (0.045)	0.110** (0.047)	0.073 (0.045)	0.148*** (0.040)	0.172*** (0.042)	0.132*** (0.040)	-0.046 (0.045)	-0.073 (0.045)	-0.043 (0.045)	-0.000 (0.046)	-0.030 (0.048)	0.016 (0.046)
Middle SES	0.201*** (0.047)	0.228*** (0.048)	0.162*** (0.047)	0.278*** (0.043)	0.305*** (0.044)	0.230*** (0.043)	-0.127*** (0.045)	-0.162*** (0.046)	-0.110** (0.046)	-0.111** (0.050)	-0.147*** (0.052)	-0.066 (0.050)
High-middle SES	0.352*** (0.047)	0.375*** (0.050)	0.286*** (0.048)	0.512*** (0.043)	0.531*** (0.045)	0.432*** (0.043)	-0.188*** (0.046)	-0.224*** (0.048)	-0.151*** (0.048)	-0.218*** (0.048)	-0.250*** (0.051)	-0.150*** (0.049)
High SES	0.396*** (0.048)	0.417*** (0.051)	0.311*** (0.050)	0.618*** (0.044)	0.632*** (0.046)	0.507*** (0.045)	-0.224*** (0.048)	-0.257*** (0.049)	-0.163*** (0.050)	-0.284*** (0.049)	-0.313*** (0.052)	-0.191*** (0.051)
Controlling for race	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controlling for other variables	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Observations	8,910	8,910	8,910	9,690	9,690	9,690	9,360	9,360	9,360	9,440	9,440	9,440
Adj.R2	0.112	0.116	0.176	0.105	0.109	0.202	0.084	0.085	0.103	0.067	0.071	0.147

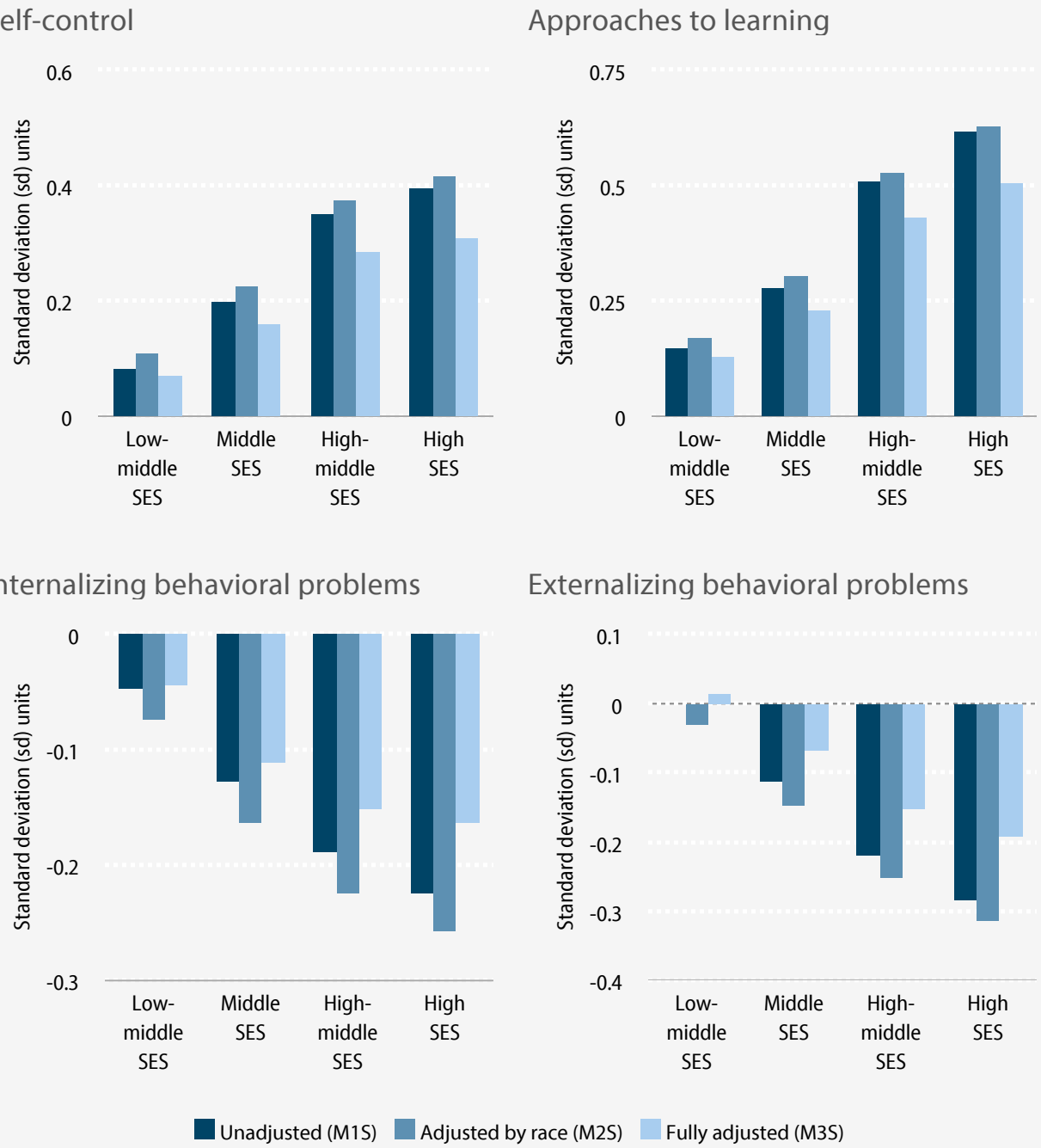
Note: Robust standard errors are in parentheses. For statistical significance, *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. The number of observations is rounded to the nearest multiple of 10. SES refers to socioeconomic status. See Appendix A, Figure D3, and Table F3.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010-2011 (National Center for Education Statistics)

ECONOMIC POLICY INSTITUTE

FIGURE D3

Principal noncognitive skills at the beginning of kindergarten, as reported by teachers, compared with teachers' reports of low socioeconomic status achievement, by SES quintile



Note: SES refers to socioeconomic status. Model 1 (M1S) shows the baseline unadjusted standard deviation score for each socioeconomic group, relative to low-SES. Model 2 (M2S) shows each group's relative performance after controlling for race/ethnicity. Model

3 (M3S) shows relative performance after adjusting for all family and child characteristics, pre-K schooling, and enrichment activities with parents. See Appendix A and Tables D3 and F3.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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TABLE D4

Principal noncognitive skills at the beginning of kindergarten, as reported by parents, by SES quintile, under unadjusted to fully adjusted models

	Self-control			Approaches to learning			Social interactions		
	M1S	**M2S**	**M3S**	**M1S**	**M2S**	**M3S**	**M1S**	**M2S**	**M3S**
Low-middle SES	0.110** (0.048)	0.110** (0.049)	0.068 (0.048)	0.265*** (0.041)	0.202*** (0.043)	0.151*** (0.040)	0.271*** (0.042)	0.188*** (0.042)	0.163*** (0.041)
Middle SES	0.224*** (0.047)	0.227*** (0.050)	0.175*** (0.050)	0.321*** (0.043)	0.243*** (0.045)	0.175*** (0.043)	0.323*** (0.044)	0.219*** (0.044)	0.184*** (0.044)
High-middle SES	0.250*** (0.049)	0.257*** (0.052)	0.192*** (0.051)	0.419*** (0.044)	0.339*** (0.047)	0.259*** (0.044)	0.324*** (0.044)	0.216*** (0.045)	0.177*** (0.045)
High SES	0.335*** (0.050)	0.342*** (0.052)	0.258*** (0.052)	0.492*** (0.045)	0.416*** (0.048)	0.302*** (0.046)	0.344*** (0.046)	0.245*** (0.047)	0.186*** (0.047)
Controlling for race	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controlling for other variables	No	No	Yes	No	No	Yes	No	No	Yes
Observations	10,240	10,240	10,240	10,260	10,260	10,260	10,260	10,260	10,260
Adj.R2	0.0296	0.0311	0.0682	0.0641	0.0717	0.186	0.0537	0.0677	0.112

Note: Robust standard errors are in parentheses. For statistical significance, *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. The number of observations is rounded to the nearest multiple of 10. SES refers to socioeconomic status. See Appendix A, Figure D4, and Table F4.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010-2011 (National Center for Education Statistics)

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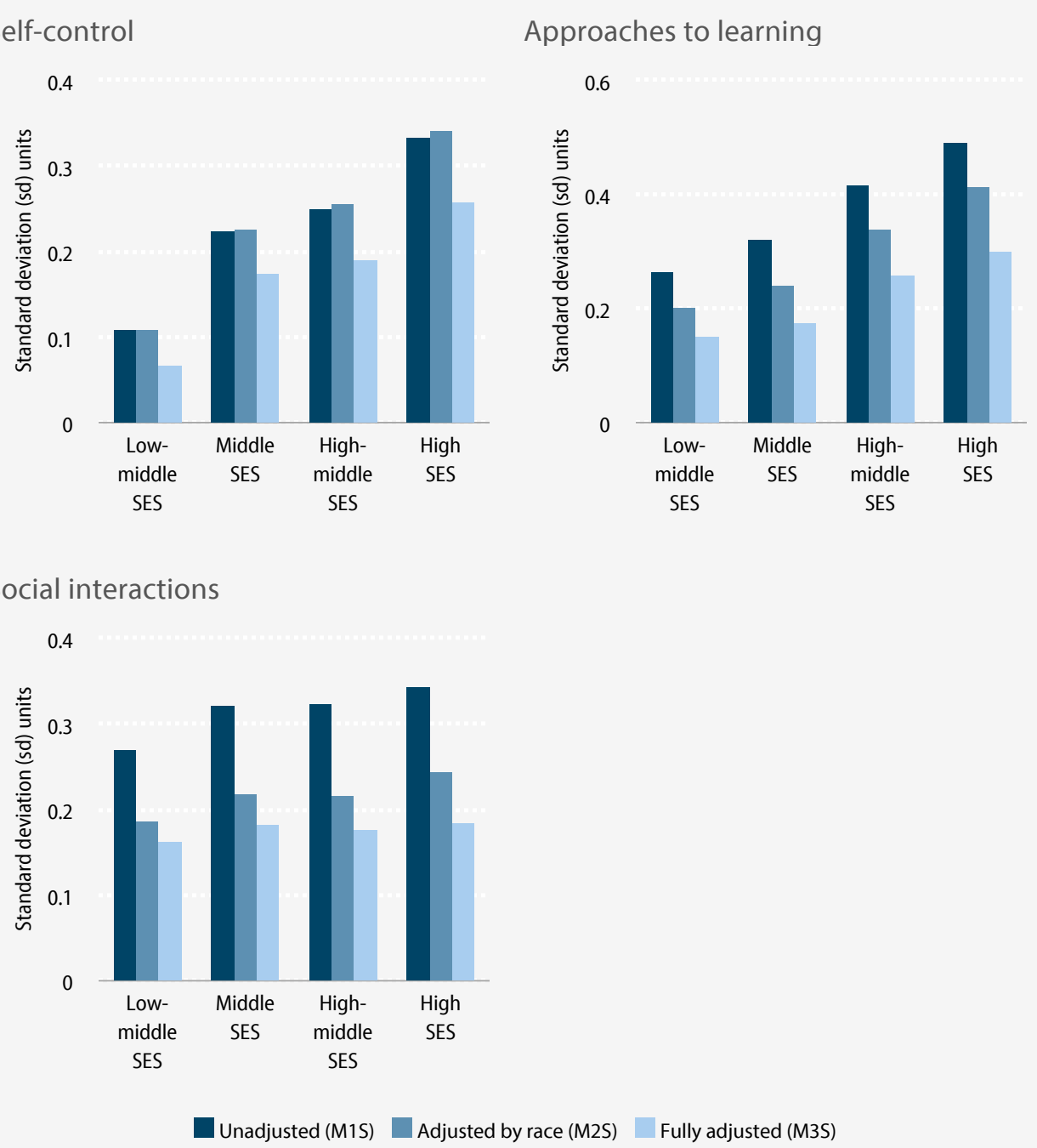
FIGURE D4

Principal noncognitive skills at the beginning of kindergarten, as reported by parents, compared with parents' reports of low socioeconomic status achievement, by SES quintile



Note: SES refers to socioeconomic status. Model 1 (M1S) shows the baseline unadjusted standard deviation score for each group, relative to low-SES children. Model 2 (M2S) shows each group's relative performance after controlling for race/ethnicity. Model 3 (M3S)

shows relative performance after adjusting for all family and child characteristics, pre-K schooling, and enrichment activities with parents. See Appendix A and Tables D4 and F4.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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TABLE D5

Other noncognitive skills at the beginning of kindergarten, as reported by teachers, by SES quintile, under unadjusted to fully adjusted models

	Interpersonal relationships			Closeness to teacher			Eagerness to learn			Pays attention well			Persistence in completing tasks		
	M1S	M2S	M3S	M1S	M2S	M3S	M1S	M2S	M3S	M1S	M2S	M3S	M1S	M2S	M3S
Low-middle SES	0.123*** (0.044)	0.130*** (0.045)	0.088** (0.044)	0.091** (0.042)	0.078* (0.043)	0.046 (0.043)	0.116*** (0.042)	0.130*** (0.043)	0.092** (0.043)	0.118*** (0.040)	0.141*** (0.040)	0.104*** (0.039)	0.118*** (0.040)	0.144*** (0.041)	0.116*** (0.041)
Middle SES	0.248*** (0.046)	0.250*** (0.047)	0.176*** (0.047)	0.191*** (0.044)	0.168*** (0.046)	0.120*** (0.046)	0.237*** (0.044)	0.249*** (0.045)	0.189*** (0.046)	0.229*** (0.043)	0.254*** (0.045)	0.185*** (0.043)	0.200*** (0.041)	0.229*** (0.043)	0.177*** (0.043)
High-middle SES	0.415*** (0.045)	0.410*** (0.047)	0.319*** (0.046)	0.280*** (0.044)	0.247*** (0.046)	0.192*** (0.046)	0.430*** (0.044)	0.434*** (0.046)	0.355*** (0.047)	0.430*** (0.043)	0.449*** (0.045)	0.360*** (0.044)	0.392*** (0.041)	0.416*** (0.043)	0.346*** (0.044)
High SES	0.461*** (0.047)	0.456*** (0.049)	0.348*** (0.049)	0.324*** (0.046)	0.295*** (0.047)	0.229*** (0.048)	0.502*** (0.046)	0.502*** (0.047)	0.407*** (0.048)	0.534*** (0.044)	0.549*** (0.046)	0.438*** (0.045)	0.497*** (0.043)	0.512*** (0.046)	0.422*** (0.046)
Controlling for race	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controlling for other variables	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Observations	9,020	9,020	9,020	9,640	9,640	9,640	9,730	9,730	9,730	9,730	9,730	9,730	9,710	9,710	9,710
Adj.R2	0.120	0.124	0.181	0.127	0.133	0.170	0.109	0.112	0.146	0.0879	0.0909	0.163	0.121	0.125	0.174

Note: Robust standard errors are in parentheses. For statistical significance, *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. The number of observations is rounded to the nearest multiple of 10. SES refers to socioeconomic status. See Appendix A, Figure D5 and Table F5.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010-2011 (National Center for Education Statistics)

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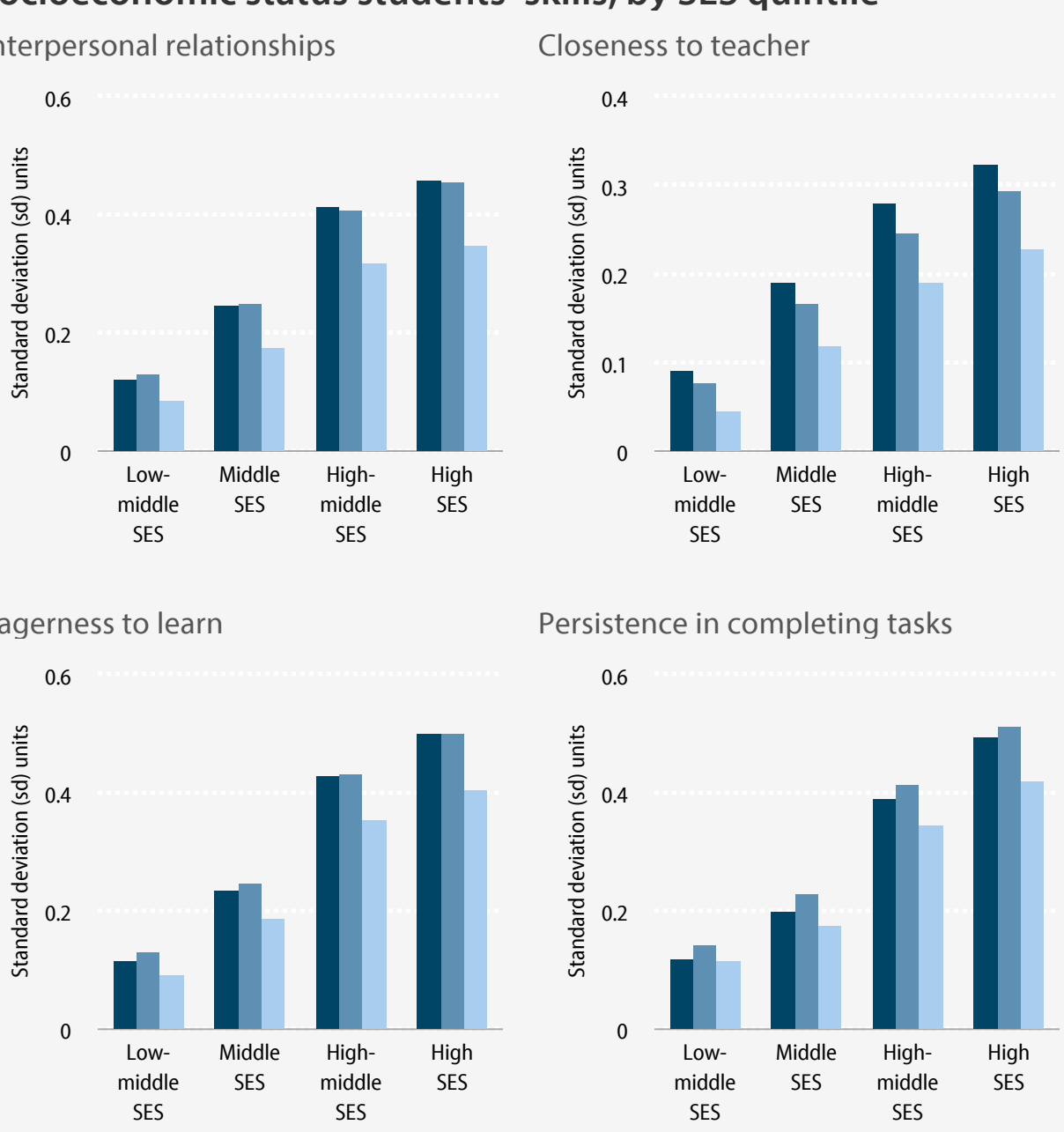
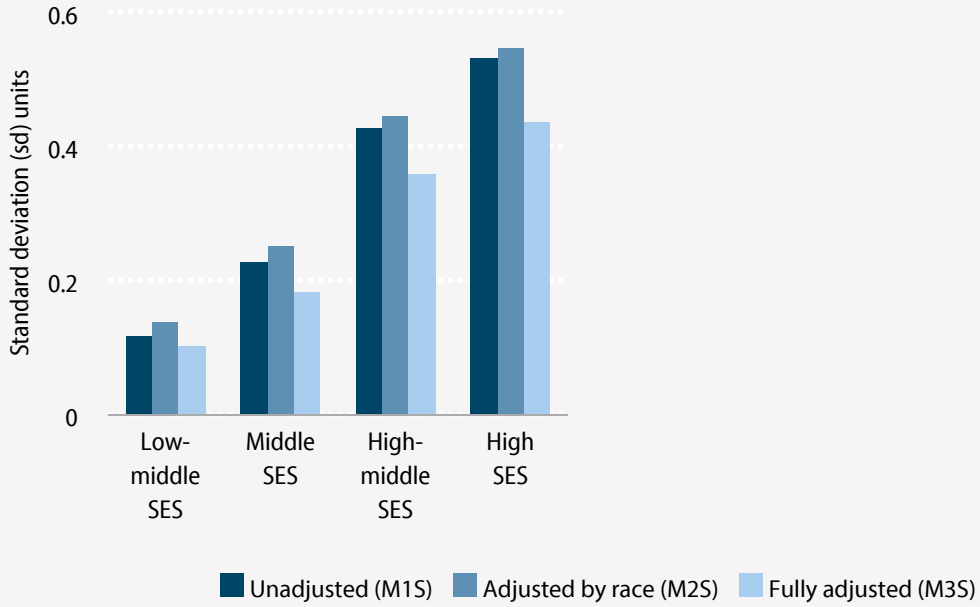
FIGURE D5

Other noncognitive skills at the beginning of kindergarten, as reported by teachers, compared with teachers' reports of low socioeconomic status students' skills, by SES quintile



Attention



Note: SES refers to socioeconomic status. Model 1 (M1S) shows the baseline unadjusted standard deviation score for each group, relative to low-SES children. Model 2 (M2S) shows each group's relative performance after controlling for race/ethnicity. Model 3 (M3S) shows relative performance after adjusting for all family and child characteristics, pre-K schooling, and enrichment activities with parents. See Appendix A and Tables D5 and F5.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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TABLE D6

Other noncognitive skills at the beginning of kindergarten, as reported by parents, by SES quintile, under unadjusted to fully adjusted models

	Persistence			Eagerness to learn			Creativity in work or play		
	M1S	M2S	M3S	M1S	M2S	M3S	M1S	M2S	M3S
Low-middle SES	0.149*** (0.043)	0.117*** (0.045)	0.076* (0.043)	0.248*** (0.044)	0.204*** (0.046)	0.166*** (0.045)	0.198*** (0.042)	0.130*** (0.043)	0.081** (0.041)
Middle SES	0.198*** (0.045)	0.159*** (0.048)	0.099** (0.047)	0.295*** (0.045)	0.241*** (0.047)	0.189*** (0.047)	0.213*** (0.044)	0.125*** (0.046)	0.062 (0.044)
High-middle SES	0.284*** (0.046)	0.246*** (0.049)	0.169*** (0.048)	0.292*** (0.046)	0.237*** (0.048)	0.174*** (0.048)	0.276*** (0.045)	0.184*** (0.046)	0.109** (0.045)
High SES	0.343*** (0.047)	0.306*** (0.050)	0.203*** (0.050)	0.371*** (0.048)	0.319*** (0.050)	0.232*** (0.050)	0.320*** (0.046)	0.232*** (0.048)	0.136*** (0.047)
Controlling for race	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controlling for other variables	No	No	Yes	No	No	Yes	No	No	Yes
Observations	10,260	10,260	10,260	10,260	10,260	10,260	10,250	10,250	10,250
Adj.R2	0.0298	0.0315	0.0771	0.0435	0.0469	0.0987	0.0489	0.0598	0.132

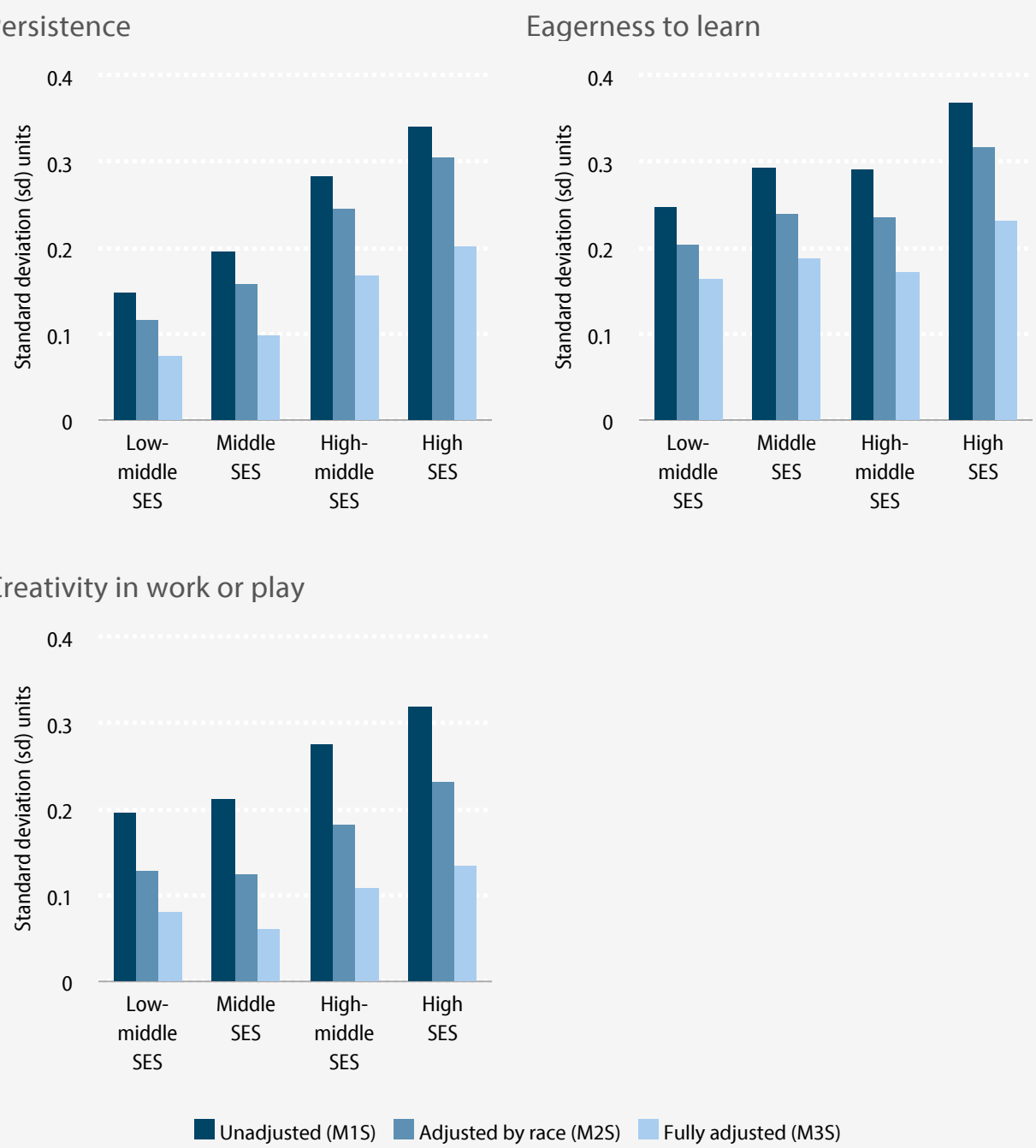
Note: Robust standard errors are in parentheses. For statistical significance, *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. The number of observations is rounded to the nearest multiple of 10. SES refers to socioeconomic status. See Appendix A, Figure D6, and Table F6.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010-2011 (National Center for Education Statistics)

ECONOMIC POLICY INSTITUTE

FIGURE D6

Other noncognitive skills at the beginning of kindergarten, as reported by parents, compared with parents' reports of low socioeconomic status achievement, by SES quintile



Note: SES refers to socioeconomic status. Model 1 (M1S) shows the baseline unadjusted standard deviation score for each group, relative to low-SES children. Model 2 (M2S) shows each group's relative performance after controlling for race/ethnicity. Model 3 (M3S)

shows relative performance after adjusting for all family and child characteristics, pre-K schooling, and enrichment activities with parents. See Appendix A and Tables D6 and F6.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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TABLE E1

Reading and math achievement at the beginning of kindergarten, compared with white achievement, by race and ethnicity (Hispanic ELL and English)

	Reading			Math		
	M1R	**M2R**	**M3R**	**M1R**	**M2R**	**M3R**
Black	-0.235*** (0.045)	-0.114*** (0.043)	-0.069* (0.042)	-0.386*** (0.042)	-0.271*** (0.041)	-0.236*** (0.039)
Hispanic ELL	-0.661*** (0.047)	-0.369*** (0.047)	-0.200*** (0.074)	-0.688*** (0.044)	-0.408*** (0.045)	-0.256*** (0.070)
Hispanic English	-0.222*** (0.036)	-0.124*** (0.035)	-0.083** (0.034)	-0.291*** (0.036)	-0.198*** (0.035)	-0.155*** (0.033)
Asian	0.319*** (0.058)	0.301*** (0.056)	0.373*** (0.062)	0.200*** (0.054)	0.183*** (0.052)	0.267*** (0.059)
Other	-0.003 (0.047)	0.053 (0.045)	0.060 (0.044)	-0.060 (0.046)	-0.008 (0.045)	0.006 (0.043)
Controlling for SES	No	Yes	Yes	No	Yes	Yes
Controlling for other variables	No	No	Yes	No	No	Yes
Observations	10,240	10,240	10,240	10,220	10,220	10,220
Adj.R2	0.231	0.286	0.339	0.247	0.297	0.362

Note: Robust standard errors are in parentheses. For statistical significance, *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. The number of observations is rounded to the nearest multiple of 10. ELL stands for English-language learner. English refers to English-language speaker. SES refers to socioeconomic status. See Appendix A, Figure E1, and Table F1.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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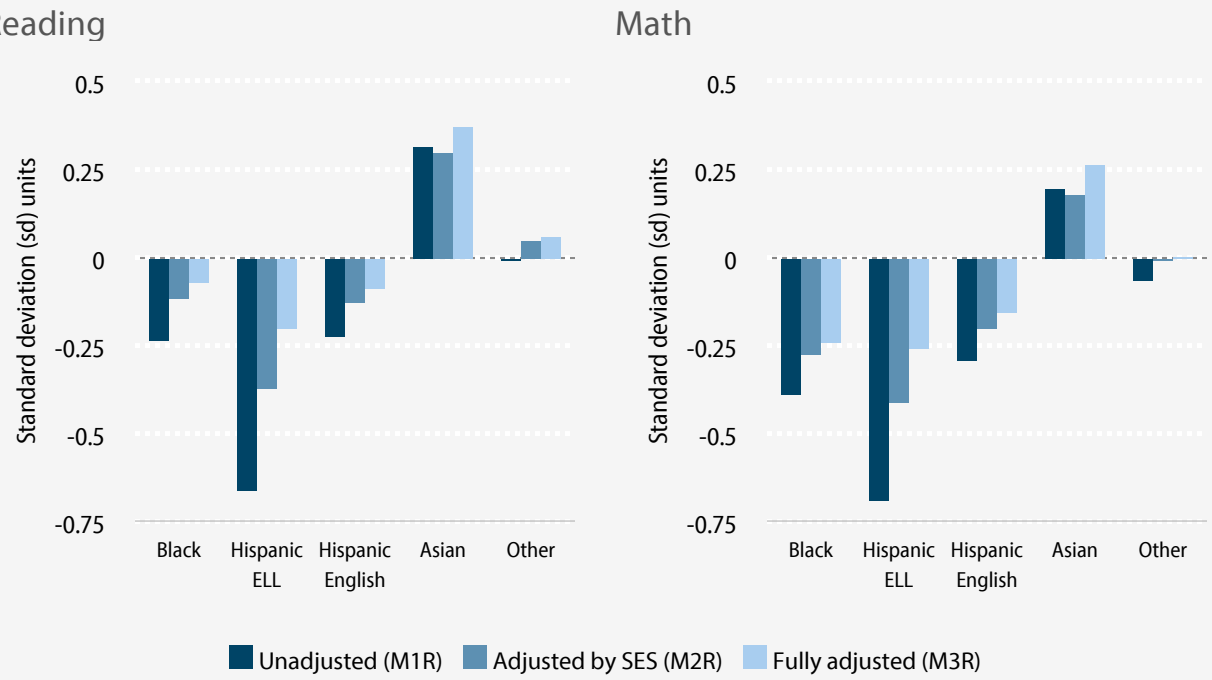
FIGURE E1

Reading and math achievement at the beginning of kindergarten, compared with white achievement, by race and ethnicity (Hispanic ELL and English)



Note: ELL stands for English-language learner. English refers to English-language speaker. Model 1 (M1R) shows the baseline unadjusted standard deviation score for each group, relative to white children. Model 2 (M2R) shows each group's relative performance after controlling for socioeconomic status (SES). Model 3 (M3R) shows relative performance after adjusting for all family and child characteristics, pre-K schooling, and enrichment activities with parents. See Appendix A and Tables E1 and F1.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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TABLE E2

Executive function at the beginning of kindergarten, by race and ethnicity (Hispanic ELL and English), under unadjusted to fully adjusted models

	Cognitive flexibility			Working memory		
	M1R	M2R	M3R	M1R	M2R	M3R
Black	-0.265*** (0.057)	-0.233*** (0.057)	-0.240*** (0.057)	-0.373*** (0.052)	-0.285*** (0.051)	-0.291*** (0.048)
Hispanic ELL	-0.383*** (0.062)	-0.283*** (0.064)	-0.077 (0.094)	-0.570*** (0.051)	-0.349*** (0.053)	-0.361*** (0.086)
Hispanic English	-0.114*** (0.040)	-0.086** (0.039)	-0.079** (0.039)	-0.217*** (0.040)	-0.147*** (0.040)	-0.167*** (0.038)
Asian	-0.132*** (0.049)	-0.134*** (0.049)	-0.038 (0.060)	-0.003 (0.063)	-0.009 (0.062)	-0.015 (0.067)
Other	-0.102** (0.044)	-0.089** (0.043)	-0.090** (0.044)	0.008 (0.051)	0.047 (0.051)	0.047 (0.050)
Controlling for SES	No	Yes	Yes	No	Yes	Yes
Controlling for other variables	No	No	Yes	No	No	Yes
Observations	10,220	10,220	10,220	9,570	9,570	9,570
Adj.R2	0.0809	0.0860	0.0974	0.149	0.176	0.255

Note: Robust standard errors are in parentheses. For statistical significance, *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. The number of observations is rounded to the nearest multiple of 10. ELL stands for English-language learner. English refers to English-language speaker. SES refers to socioeconomic status. See Appendix A, Figure E2, and Table F2.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010-2011 (National Center for Education Statistics)

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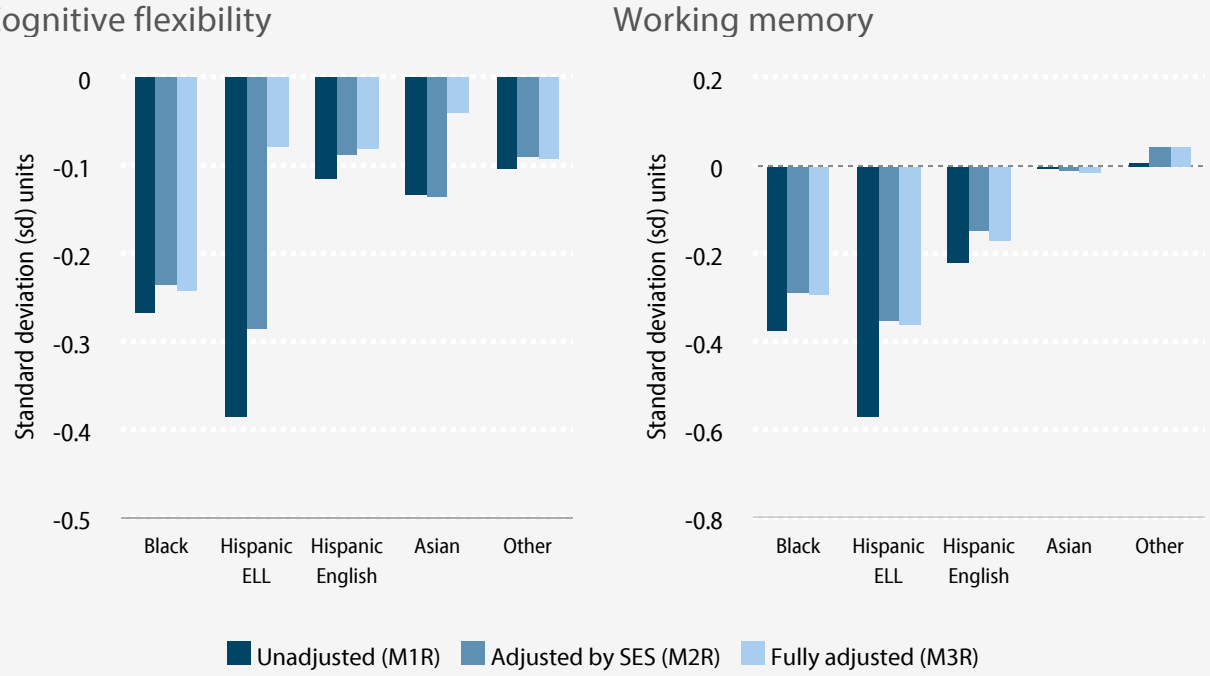
FIGURE E2

Executive function at the beginning of kindergarten, compared with white executive function, by race and ethnicity (Hispanic ELL and English)



Note: ELL stands for English-language learner. English refers to English-language speaker. Model 1 (M1R) shows the baseline unadjusted standard deviation /percentile score for each group, relative to white children. Model 2 (M2R) shows each group's relative performance after controlling for socioeconomic status (SES). Model 3 (M3R) shows relative performance after adjusting for all family and child characteristics, pre-K schooling, and enrichment activities with parents. See Appendix A and Tables E2 and F2.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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TABLE E3

Principal noncognitive skills at the beginning of kindergarten, as reported by teachers, by race and ethnicity (Hispanic ELL and English), under unadjusted to fully adjusted models

	Self-control			Approaches to learning			Internalizing problems			Externalizing problems		
	M1R	M2R	M3R	M1R	M2R	M3R	M1R	M2R	M3R	M1R	M2R	M3R
Black	-0.288*** (0.054)	-0.231*** (0.053)	-0.194*** (0.052)	-0.318*** (0.053)	-0.228*** (0.052)	-0.185*** (0.049)	0.011 (0.059)	-0.024 (0.059)	-0.043 (0.058)	0.239*** (0.055)	0.192*** (0.054)	0.160*** (0.052)
Hispanic ELL	-0.019 (0.057)	0.137** (0.060)	0.075 (0.088)	-0.094* (0.054)	0.130** (0.056)	0.051 (0.086)	-0.059 (0.058)	-0.156*** (0.059)	-0.052 (0.086)	-0.075 (0.060)	-0.183*** (0.064)	-0.040 (0.087)
Hispanic English	-0.025 (0.042)	0.022 (0.042)	0.005 (0.042)	-0.123*** (0.042)	-0.051 (0.042)	-0.038 (0.039)	0.044 (0.045)	0.014 (0.045)	0.007 (0.046)	-0.027 (0.043)	-0.065 (0.044)	-0.043 (0.043)
Asian	0.044 (0.056)	0.039 (0.056)	-0.010 (0.066)	0.139** (0.055)	0.131** (0.056)	0.079 (0.062)	-0.136** (0.055)	-0.135** (0.055)	-0.090 (0.065)	-0.120** (0.055)	-0.113** (0.056)	-0.031 (0.065)
Other	-0.074 (0.056)	-0.041 (0.057)	-0.052 (0.056)	-0.086 (0.053)	-0.042 (0.053)	-0.049 (0.051)	0.017 (0.058)	-0.001 (0.059)	-0.003 (0.058)	0.068 (0.059)	0.045 (0.059)	0.051 (0.058)
Controlling for SES	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controlling for other variables	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Observations	8,910	8,910	8,910	9,690	9,690	9,690	9,360	9,360	9,360	9,440	9,440	9,440
Adj.R2	0.103	0.116	0.176	0.0795	0.109	0.202	0.0804	0.0851	0.103	0.0627	0.0710	0.147

Note: Robust standard errors are in parentheses. For statistical significance, *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. The number of observations is rounded to the nearest multiple of 10. ELL stands for English-language learner. English refers to English-language speaker. SES refers to socioeconomic status. See Appendix A, Figure E3, and Table F3.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010-2011 (National Center for Education Statistics)

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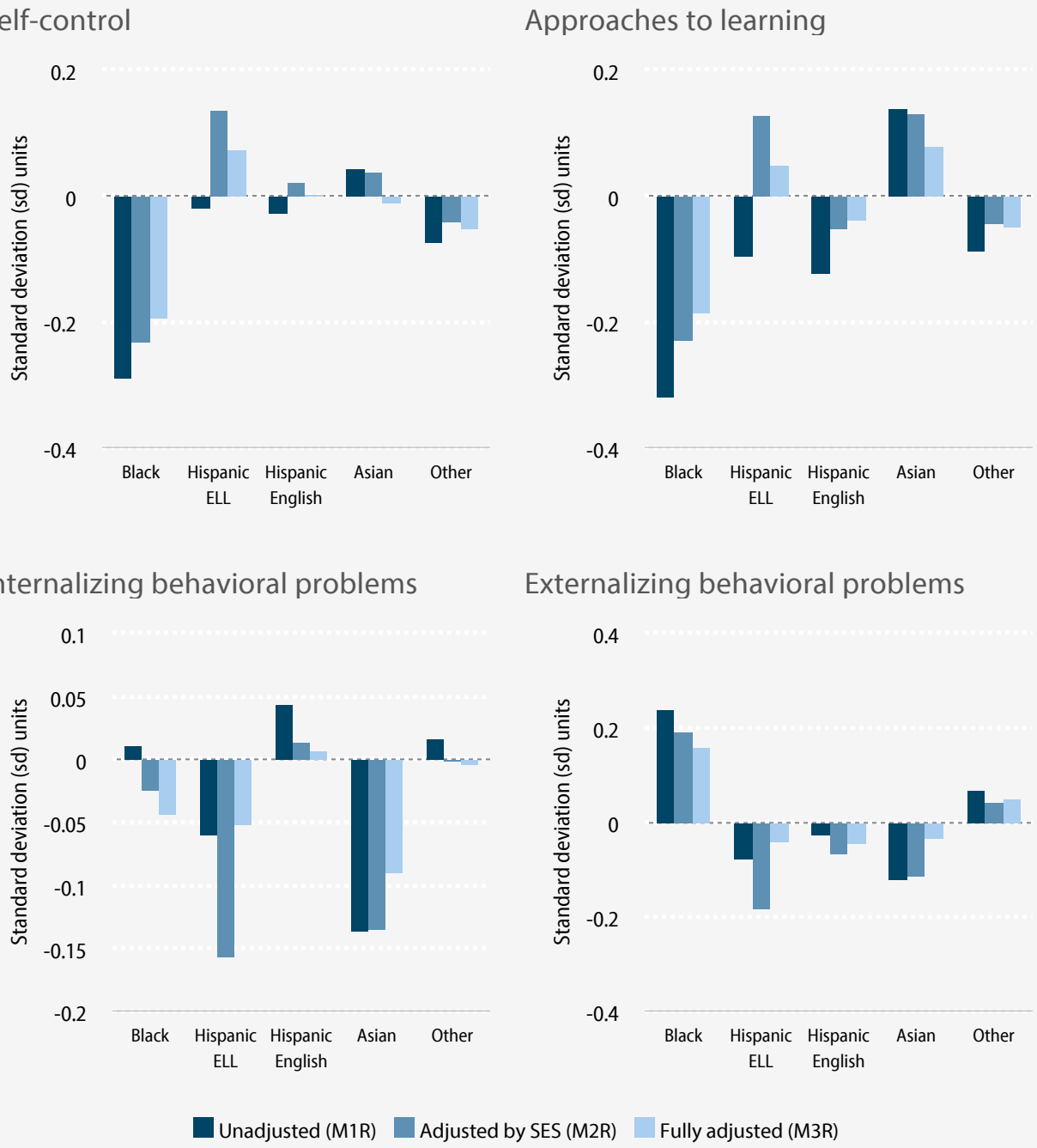
FIGURE E3

Principal noncognitive skills at the beginning of kindergarten, as reported by teachers, compared with teachers' reports of white students' skills, by race and ethnicity (Hispanic ELL and English)



Note: ELL stands for English-language learner. English refers to English-language speaker. Model 1 (M1R) shows the baseline unadjusted standard deviation score for each group, relative to white children. Model 2 (M2R) shows each group's relative performance

after controlling for socioeconomic status (SES). Model 3 (M3R) shows relative performance after adjusting for all family and child characteristics, pre-K schooling, and enrichment activities with parents. See Appendix A and Tables E3 and F3.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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TABLE E4

Principal noncognitive skills at the beginning of kindergarten, as reported by parents, compared with parents' reports of white students' skills, by race and ethnicity (Hispanic ELL and English)

	Self-control			Approaches to learning			Social interactions		
	M1R	**M2R**	**M3R**	**M1R**	**M2R**	**M3R**	**M1R**	**M2R**	**M3R**
Black	0.106**	0.151***	0.174***	-0.059	-0.009	0.009	-0.020	0.006	0.002
	(0.054)	(0.053)	(0.051)	(0.052)	(0.051)	(0.048)	(0.049)	(0.050)	(0.049)
Hispanic ELL	-0.127**	-0.002	-0.066	-0.499***	-0.346***	-0.172**	-0.580***	-0.475***	-0.212**
	(0.057)	(0.060)	(0.092)	(0.056)	(0.060)	(0.084)	(0.058)	(0.060)	(0.092)
Hispanic English	-0.094**	-0.056	-0.029	-0.016	0.029	0.057	-0.058	-0.033	-0.007
	(0.045)	(0.044)	(0.045)	(0.040)	(0.040)	(0.039)	(0.041)	(0.041)	(0.041)
Asian	0.006	0.004	-0.022	-0.221***	-0.222***	-0.154***	-0.388***	-0.383***	-0.255***
	(0.057)	(0.057)	(0.074)	(0.053)	(0.053)	(0.059)	(0.063)	(0.063)	(0.071)
Other	0.045	0.065	0.062	0.022	0.046	0.025	-0.031	-0.019	-0.027
	(0.050)	(0.049)	(0.049)	(0.047)	(0.048)	(0.044)	(0.051)	(0.051)	(0.050)
Controlling for SES	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controlling for other variables	No	No	Yes	No	No	Yes	No	No	Yes
Observations	10,240	10,240	10,240	10,260	10,260	10,260	10,260	10,260	10,260
Adj.R2	0.0235	0.0311	0.0682	0.0610	0.0717	0.186	0.0636	0.0677	0.112

Note: Robust standard errors are in parentheses. For statistical significance, *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. The number of observations is rounded to the nearest multiple of 10. ELL stands for English-language learner. English refers to English-language speaker. SES refers to socioeconomic status. See Appendix A, Figure E4, and Table F4.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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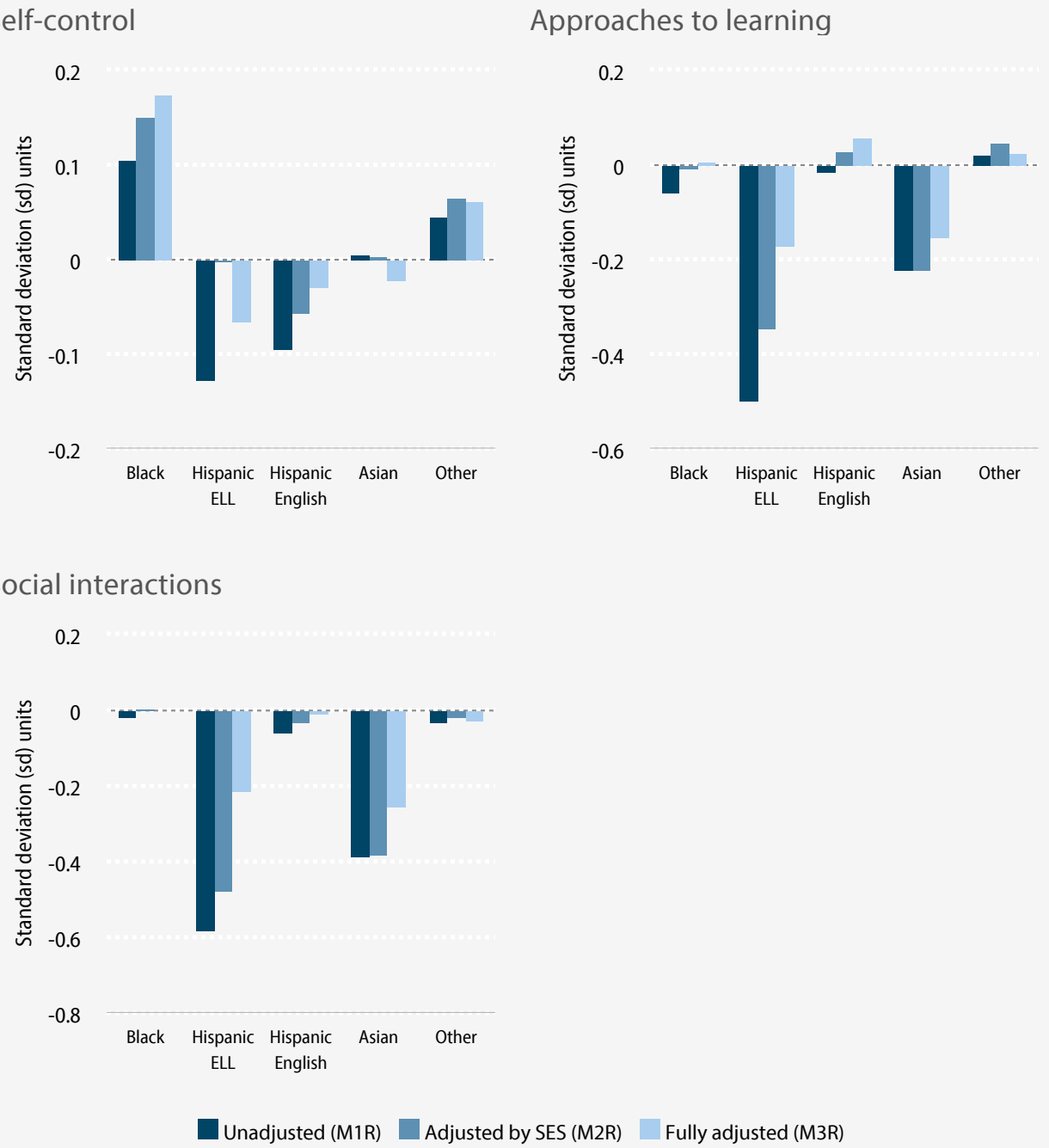
FIGURE E4

Principal noncognitive skills at the beginning of kindergarten, as reported by parents, compared with parents' reports of white students' skills, by race and ethnicity (Hispanic ELL and English)



Note: ELL stands for English-language learner. English refers to English-language speaker. Model 1 (M1R) shows the baseline unadjusted standard deviation score for each group, relative to white children. Model 2 (M2R) shows each group's relative performance

after controlling for socioeconomic status (SES). Model 3 (M3R) shows relative performance after adjusting for all family and child characteristics, pre-K schooling, and enrichment activities with parents. See Appendix A and Tables E4 and F4.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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TABLE E5

Other noncognitive skills at the beginning of kindergarten, as reported by teachers, by race and ethnicity (Hispanic ELL and English), under unadjusted to fully adjusted models

	Interpersonal relationships			Closeness to teacher			Eagerness to learn			Attention			Persistence in completing tasks		
	M1R	M2R	M3R	M1R	M2R	M3R	M1R	M2R	M3R	M1R	M2R	M3R	M1R	M2R	M3R
Black	-0.306*** (0.054)	-0.244*** (0.053)	-0.200*** (0.052)	-0.305*** (0.051)	-0.263*** (0.050)	-0.246*** (0.050)	-0.299*** (0.051)	-0.227*** (0.050)	-0.188*** (0.049)	-0.248*** (0.053)	-0.173*** (0.052)	-0.136*** (0.050)	-0.243*** (0.049)	-0.174*** (0.049)	-0.144*** (0.048)
Hispanic ELL	-0.151*** (0.058)	0.019 (0.061)	0.061 (0.089)	-0.208*** (0.056)	-0.099* (0.059)	0.015 (0.089)	-0.125** (0.056)	0.055 (0.058)	0.061 (0.084)	-0.076 (0.055)	0.113** (0.057)	0.061 (0.086)	-0.042 (0.056)	0.134** (0.058)	0.027 (0.087)
Hispanic English	-0.080* (0.042)	-0.026 (0.042)	-0.020 (0.041)	-0.053 (0.038)	-0.017 (0.038)	-0.003 (0.039)	-0.151*** (0.042)	-0.092** (0.042)	-0.069 (0.042)	-0.127*** (0.042)	-0.064 (0.042)	-0.055 (0.040)	-0.139*** (0.043)	-0.081* (0.043)	-0.071* (0.041)
Asian	-0.074 (0.062)	-0.079 (0.062)	-0.047 (0.067)	-0.241*** (0.062)	-0.241*** (0.063)	-0.193*** (0.072)	0.035 (0.054)	0.030 (0.054)	0.031 (0.064)	0.088* (0.053)	0.080 (0.054)	0.040 (0.064)	0.202*** (0.055)	0.195*** (0.057)	0.132** (0.064)
Other	-0.088 (0.056)	-0.054 (0.056)	-0.050 (0.056)	-0.191*** (0.050)	-0.171*** (0.050)	-0.164*** (0.049)	-0.060 (0.050)	-0.023 (0.050)	-0.019 (0.050)	-0.095* (0.054)	-0.057″ (0.053)	-0.063 (0.053)	-0.036 (0.051)	-0.002 (0.050)	-0.008 (0.049)
Controlling for SES	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controlling for other variables	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Observations	9,020	9,020	9,020	9,640	9,640	9,640	9,730	9,730	9,730	9,730	9,730	9,730	9,710	9,710	9,710
Adj.R2	0.107	0.124	0.181	0.126	0.133	0.170	0.0929	0.112	0.146	0.0687	0.0909	0.163	0.107	0.125	0.174

Note: Robust standard errors are in parentheses. For statistical significance, *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. The number of observations is rounded to the nearest multiple of 10. ELL stands for English-language learner. English refers to English-language speaker. SES refers to socioeconomic status. See Appendix A, Figure E5, and Table F5.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010-2011 (National Center for Education Statistics)

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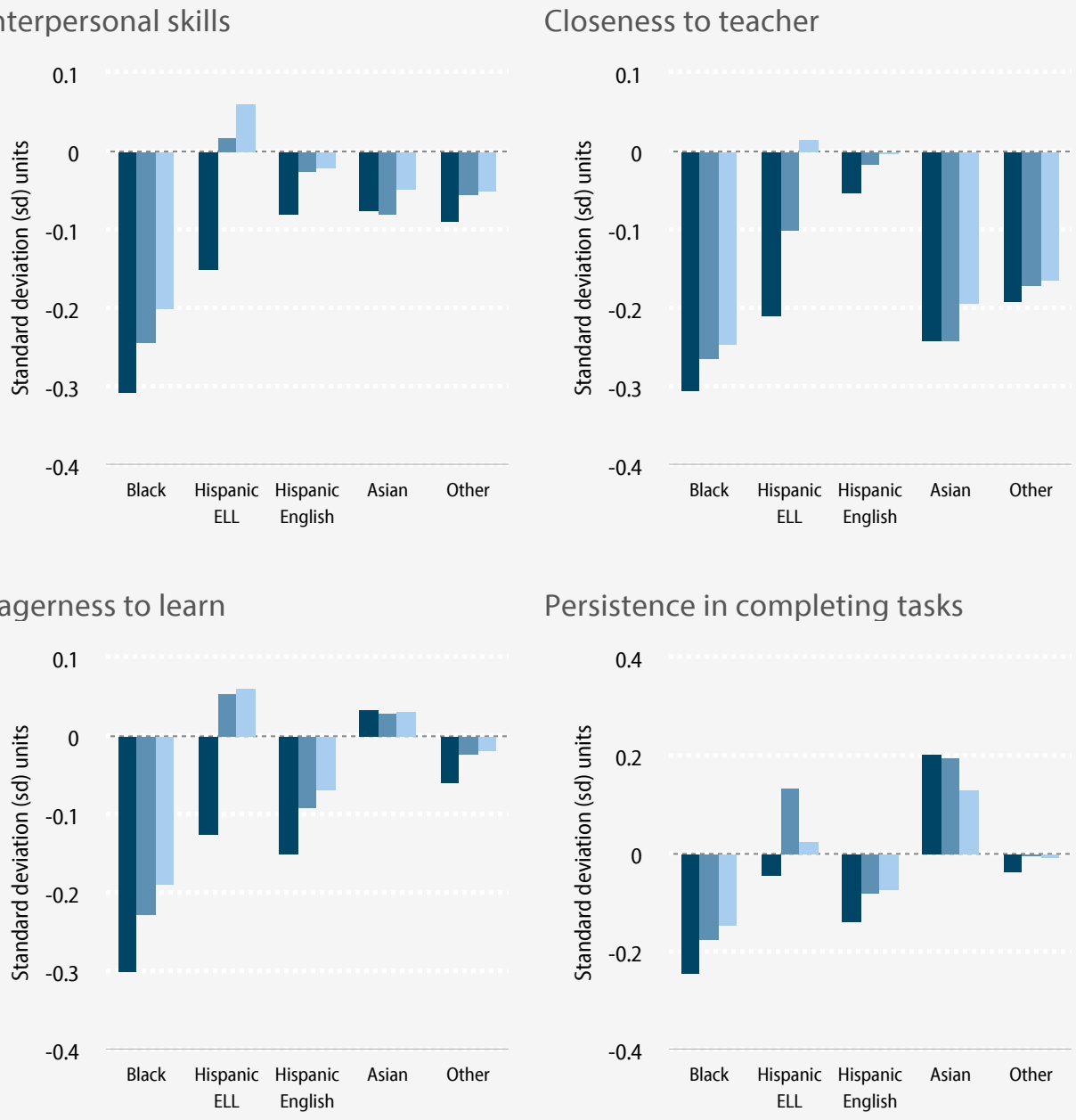
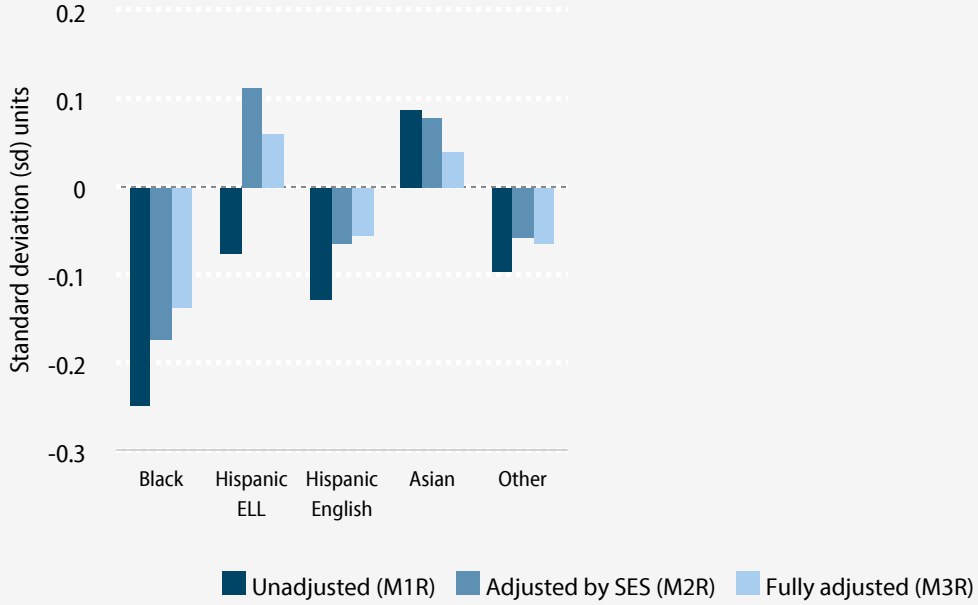
FIGURE E5

Other noncognitive skills at the beginning of kindergarten, as reported by teachers, compared with teachers' reports of white students' skills, by race and ethnicity (Hispanic ELL and English)



Attention



Note: ELL stands for English-language learner. English refers to English-language speaker. Model 1 (M1R) shows the baseline unadjusted standard deviation score for each group, relative to white children. Model 2 (M2R) shows each group's relative performance after controlling for socioeconomic status (SES). Model 3 (M3R) shows relative performance after adjusting for all family and child characteristics, pre-K schooling, and enrichment activities with parents. See Appendix A and Tables E5 and F5.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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TABLE E6

Other noncognitive skills at the beginning of kindergarten, as reported by parents, by race and ethnicity (Hispanic ELL and English), under unadjusted to fully adjusted models

	Persistence			Eagerness to learn			Creativity in work or play		
	M1R	M2R	M3R	M1R	M2R	M3R	M1R	M2R	M3R
Black	0.011 (0.054)	0.051 (0.054)	0.071 (0.052)	-0.021 (0.052)	0.012 (0.052)	0.026 (0.051)	-0.173*** (0.050)	-0.147*** (0.051)	-0.112** (0.049)
Hispanic ELL	-0.285*** (0.058)	-0.177*** (0.062)	-0.178* (0.093)	-0.358*** (0.059)	-0.237*** (0.063)	-0.080 (0.089)	-0.456*** (0.059)	-0.374*** (0.061)	-0.082 (0.090)
Hispanic English	-0.045 (0.041)	-0.011 (0.042)	0.007 (0.042)	0.017 (0.040)	0.047 (0.040)	0.072* (0.040)	0.037 (0.039)	0.060 (0.039)	0.091** (0.039)
Asian	-0.101* (0.059)	-0.104* (0.058)	-0.105 (0.069)	-0.123** (0.056)	-0.122** (0.056)	-0.056 (0.063)	-0.275*** (0.057)	-0.276*** (0.057)	-0.151** (0.065)
Other	0.011 (0.052)	0.030 (0.052)	0.022 (0.051)	-0.025 (0.051)	-0.011 (0.051)	-0.022 (0.050)	0.037 (0.048)	0.050 (0.048)	0.043 (0.046)
Controlling for SES	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controlling for other variables	No	No	Yes	No	No	Yes	No	No	Yes
Observations	10,260	10,260	10,260	10,260	10,260	10,260	10,250	10,250	10,250
Adj.R2	0.0257	0.0315	0.0771	0.0409	0.0469	0.0987	0.0567	0.0598	0.132

Note: Robust standard errors are in parentheses. For statistical significance, *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. The number of observations is rounded to the nearest multiple of 10. ELL stands for English-language learner. English refers to English-language speaker. SES refers to socioeconomic status. See Appendix A, Figure E6, and Table F6.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010-2011 (National Center for Education Statistics)

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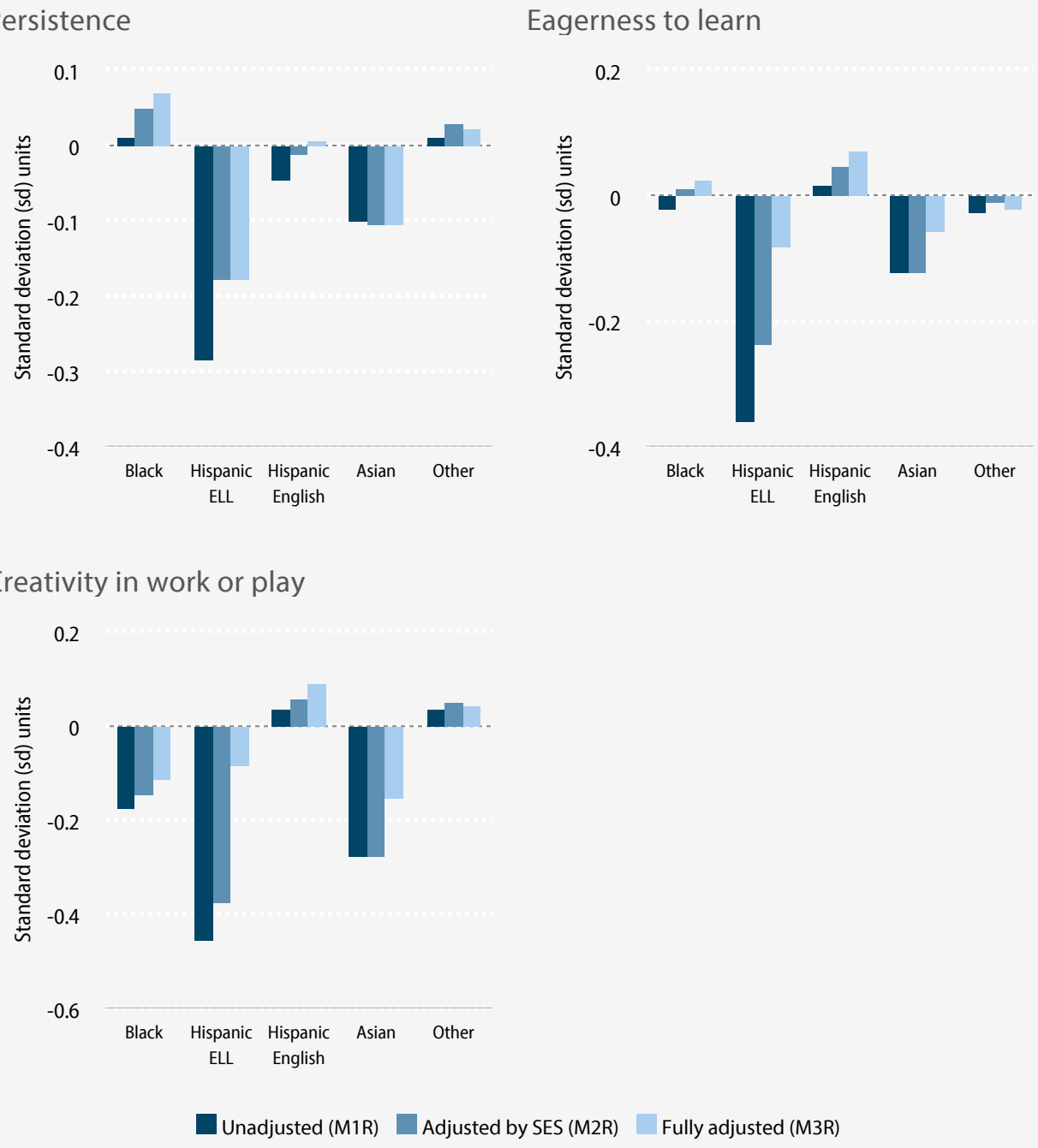
FIGURE E6

Other noncognitive skills at the beginning of kindergarten, as reported by parents, compared with parents' reports of white students' skills, by race and ethnicity (Hispanic ELL and English)



Note: ELL stands for English-language learner. English refers to English-language speaker. Model 1 (M1R) shows the baseline unadjusted standard deviation score for each group, relative to white children. Model 2 (M2R) shows each group's relative performance

after controlling for socioeconomic status (SES). Model 3 (M3R) shows relative performance after adjusting for all family and child characteristics, pre-K schooling, and enrichment activities with parents. See Appendix A and Tables E6 and F6.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010–2011 (National Center for Education Statistics)

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APPENDIX TABLE F1

Reading and math achievement at the beginning of kindergarten, under fully adjusted models

	Reading	Math
	M3R/M3S	M3R/M3S
Black	-0.069* (0.042)	-0.236*** (0.039)
Hispanic ELL	-0.200*** (0.074)	-0.256*** (0.070)
Hispanic English	-0.083** (0.034)	-0.155*** (0.033)
Asian	0.373*** (0.062)	0.267*** (0.059)
Other	0.060 (0.044)	0.006 (0.043)
Low-middle SES	0.167*** (0.032)	0.153*** (0.032)
Middle SES	0.345*** (0.034)	0.372*** (0.035)
High-middle SES	0.555*** (0.036)	0.539*** (0.037)
High SES	0.784*** (0.039)	0.761*** (0.038)
Girl	0.069*** (0.019)	-0.075*** (0.018)
Age of student	0.039*** (0.002)	0.052*** (0.002)
Has a disability	-0.243*** (0.025)	-0.283*** (0.025)
Language at home is not English	-0.122* (0.064)	-0.102* (0.060)
Not living with two parents	-0.141*** (0.023)	-0.117*** (0.024)
Number of siblings	-0.080*** (0.008)	-0.051*** (0.008)
Immigrant	-0.016 (0.032)	-0.030 (0.031)
Center-based pre-K	0.108*** (0.020)	0.069*** (0.019)

APPENDIX TABLE F1 (CONTINUED)

	Reading	Math
	M3R/M3S	M3R/M3S
Enrichment activities with parents	0.144*** (0.017)	0.094*** (0.017)
Constant	-2.850*** (0.164)	-3.595*** (0.171)
Observations	10,240	10,220
Adj.R2	0.339	0.362

Note: Robust standard errors are in parentheses. For statistical significance, *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. The number of observations is rounded to the nearest multiple of 10. ELL stands for English-language learner. English refers to English-language speaker. SES refers to socioeconomic status. See Appendix A.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010-2011 (National Center for Education Statistics)

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APPENDIX TABLE F2

Executive function at the beginning of kindergarten, under fully adjusted models

	Cognitive flexibility	Working memory
	M3R/M3S	M3R/M3S
Black	-0.240*** (0.057)	-0.291*** (0.048)
Hispanic ELL	-0.077 (0.094)	-0.361*** (0.086)
Hispanic English	-0.079** (0.039)	-0.167*** (0.038)
Asian	-0.038 (0.060)	-0.015 (0.067)
Other	-0.090** (0.044)	0.047 (0.050)
Low-middle SES	0.098** (0.049)	0.101*** (0.037)
Middle SES	0.192*** (0.051)	0.259*** (0.041)
High-middle SES	0.182*** (0.051)	0.416*** (0.043)
High SES	0.254*** (0.051)	0.513*** (0.045)
Girl	0.055*** (0.021)	0.023 (0.021)
Age of student	0.012*** (0.003)	-0.060*** (0.003)
Has a disability	-0.198*** (0.029)	-0.280*** (0.027)
Language at home is not English	-0.180** (0.072)	-0.014 (0.073)
Not living with two parents	0.006 (0.029)	-0.042 (0.027)
Number of siblings	0.008 (0.011)	-0.023** (0.009)
Immigrant	-0.036 (0.035)	-0.043 (0.036)
Center-based pre-K	0.012 (0.022)	0.032 (0.022)

APPENDIX TABLE F2 (CONTINUED)

	Cognitive flexibility	Working memory
	M3R/M3S	M3R/M3S
Enrichment activities with parents	0.044** (0.021)	0.073*** (0.020)
Constant	-0.868*** (0.198)	4.064*** (0.191)
Observations	10,220	9,570
Adj.R2	0.0974	0.255

Note: Robust standard errors are in parentheses. For statistical significance, *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. The number of observations is rounded to the nearest multiple of 10. ELL stands for English-language learner. English refers to English-language speaker. SES refers to socioeconomic status. See Appendix A.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010-2011 (National Center for Education Statistics)

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APPENDIX TABLE F3

Principal noncognitive skills at the beginning of kindergarten, as reported by teachers, under fully adjusted models

	Self-control	Approaches to learning	Internalizing problems	Externalizing problems
	M3R/M3S	M3R/M3S	M3R/M3S	M3R/M3S
Black	-0.194*** (0.052)	-0.185*** (0.049)	-0.043 (0.058)	0.160*** (0.052)
Hispanic ELL	0.075 (0.088)	0.051 (0.086)	-0.052 (0.086)	-0.040 (0.087)
Hispanic English	0.005 (0.042)	-0.038 (0.039)	0.007 (0.046)	-0.043 (0.043)
Asian	-0.010 (0.066)	0.079 (0.062)	-0.090 (0.065)	-0.031 (0.065)
Other	-0.052 (0.056)	-0.049 (0.051)	-0.003 (0.058)	0.051 (0.058)
Low-middle SES	0.073 (0.045)	0.132*** (0.040)	-0.043 (0.045)	0.016 (0.046)
Middle SES	0.162*** (0.047)	0.230*** (0.043)	-0.110** (0.046)	-0.066 (0.050)
High-middle SES	0.286*** (0.048)	0.432*** (0.043)	-0.151*** (0.048)	-0.150*** (0.049)
High SES	0.311*** (0.050)	0.507*** (0.045)	-0.163*** (0.050)	-0.191*** (0.051)
Girl	0.325*** (0.023)	0.414*** (0.021)	-0.045** (0.023)	-0.386*** (0.022)
Age of student	0.011*** (0.003)	0.028*** (0.003)	-0.003 (0.003)	-0.005 (0.003)
Has a disability	-0.270*** (0.031)	-0.342*** (0.029)	0.289*** (0.032)	0.274*** (0.032)
Language at home is not English	-0.034 (0.072)	0.033 (0.069)	-0.066 (0.068)	-0.012 (0.068)
Not living with two parents	-0.221*** (0.030)	-0.233*** (0.029)	0.144*** (0.032)	0.255*** (0.032)
Number of siblings	0.046*** (0.011)	0.009 (0.010)	0.016 (0.012)	-0.050*** (0.011)
Immigrant	0.036 (0.040)	0.011 (0.036)	0.010 (0.038)	-0.048 (0.039)
Center-based pre-K	-0.062*** (0.024)	-0.006 (0.022)	-0.047* (0.025)	0.098*** (0.024)

APPENDIX TABLE F3 (CONTINUED)

	Self-control	Approaches to learning	Internalizing problems	Externalizing problems
	M3R/M3S	M3R/M3S	M3R/M3S	M3R/M3S
Enrichment activities with parents	0.084*** (0.022)	0.104*** (0.020)	-0.020 (0.023)	-0.075*** (0.023)
Constant	-0.949*** (0.199)	-2.237*** (0.192)	0.211 (0.218)	0.466** (0.214)
Observations	8,910	9,690	9,360	9,440
Adj.R2	0.176	0.202	0.103	0.147

Note: Robust standard errors are in parentheses. For statistical significance, *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. The number of observations is rounded to the nearest multiple of 10. ELL stands for English-language learner. English refers to English-language speaker. SES refers to socioeconomic status. See Appendix A.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010-2011 (National Center for Education Statistics)

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APPENDIX TABLE F4

Principal noncognitive skills at the beginning of kindergarten, as reported by parents, under fully adjusted models

	Self-control	Approaches to learning	Social interactions
	M3R/M3S	M3R/M3S	M3R/M3S
Black	0.174*** (0.051)	0.009 (0.048)	0.002 (0.049)
Hispanic ELL	-0.066 (0.092)	-0.172** (0.084)	-0.212** (0.092)
Hispanic English	-0.029 (0.045)	0.057 (0.039)	-0.007 (0.041)
Asian	-0.022 (0.074)	-0.154*** (0.059)	-0.255*** (0.071)
Other	0.062 (0.049)	0.025 (0.044)	-0.027 (0.050)
Low-middle SES	0.068 (0.048)	0.151*** (0.040)	0.163*** (0.041)
Middle SES	0.175*** (0.050)	0.175*** (0.043)	0.184*** (0.044)
High-middle SES	0.192*** (0.051)	0.259*** (0.044)	0.177*** (0.045)
High SES	0.258*** (0.052)	0.302*** (0.046)	0.186*** (0.047)
Girl	0.092*** (0.022)	0.176*** (0.020)	0.123*** (0.021)
Age of student	0.004 (0.003)	0.006** (0.003)	0.002 (0.003)
Has a disability	-0.270*** (0.031)	-0.271*** (0.027)	-0.275*** (0.029)
Language at home is not English	0.122 (0.075)	-0.043 (0.068)	-0.139* (0.077)
Not living with two parents	-0.087*** (0.031)	-0.036 (0.027)	0.030 (0.028)
Number of siblings	-0.058*** (0.013)	-0.010 (0.011)	-0.017* (0.010)
Immigrant	-0.029 (0.038)	-0.007 (0.035)	-0.077** (0.037)

APPENDIX TABLE F4 (CONTINUED)

	Self-control	Approaches to learning	Social interactions
	M3R/M3S	M3R/M3S	M3R/M3S
Center-based pre-K	-0.029 (0.024)	0.028 (0.022)	0.060*** (0.023)
Enrichment activities with parents	0.241*** (0.022)	0.548*** (0.020)	0.280*** (0.021)
Constant	-0.320 (0.199)	-0.561*** (0.176)	-0.189 (0.194)
Observations	10,240	10,260	10,260
Adj.R2	0.0682	0.186	0.112

Note: Robust standard errors are in parentheses. For statistical significance, *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. The number of observations is rounded to the nearest multiple of 10. ELL stands for English-language learner. English refers to English-language speaker. SES refers to socioeconomic status. See Appendix A.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010-2011 (National Center for Education Statistics)

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APPENDIX TABLE F5

Other noncognitive skills at the beginning of kindergarten, as reported by teachers, under fully adjusted models

	Interpersonal relationships	Closeness to teacher	Eagerness to learn	Attention	Persistence in completing tasks
	M3R/M3S	M3R/M3S	M3R/M3S	M3R/M3S	M3R/M3S
Black	-0.200*** (0.052)	-0.246*** (0.050)	-0.188*** (0.049)	-0.136*** (0.050)	-0.144*** (0.048)
Hispanic ELL	0.061 (0.089)	0.015 (0.089)	0.061 (0.084)	0.061 (0.086)	0.027 (0.087)
Hispanic English	-0.020 (0.041)	-0.003 (0.039)	-0.069 (0.042)	-0.055 (0.040)	-0.071* (0.041)
Asian	-0.047 (0.067)	-0.193*** (0.072)	0.031 (0.064)	0.040 (0.064)	0.132** (0.064)
Other	-0.050 (0.056)	-0.164*** (0.049)	-0.019 (0.050)	-0.063 (0.053)	-0.008 (0.049)
Low-middle SES	0.088** (0.044)	0.046 (0.043)	0.092** (0.043)	0.104*** (0.039)	0.116***
Middle SES	0.176*** (0.047)	0.120*** (0.046)	0.189*** (0.046)	0.185*** (0.043)	0.177*** (0.043)
High-middle SES	0.319*** (0.046)	0.192*** (0.046)	0.355*** (0.047)	0.360*** (0.044)	0.346*** (0.044)
High SES	0.348*** (0.049)	0.229*** (0.048)	0.407*** (0.048)	0.438*** (0.045)	0.422*** (0.046)
Girl	0.345*** (0.023)	0.318*** (0.021)	0.210*** (0.022)	0.385*** (0.022)	0.270*** (0.022)
Age of student	0.014*** (0.003)	-0.001 (0.003)	0.018*** (0.003)	0.023*** (0.003)	0.026*** (0.003)
Has a disability	-0.254*** (0.031)	-0.124*** (0.028)	-0.217*** (0.029)	-0.287*** (0.029)	-0.279*** (0.029)
Language at home is not English	-0.065 (0.073)	-0.066 (0.074)	0.005 (0.066)	0.009 (0.069)	0.064 (0.070)
Not living with two parents	-0.221*** (0.030)	-0.074** (0.029)	-0.162*** (0.029)	-0.209*** (0.029)	-0.172*** (0.029)
Number of siblings	0.024** (0.011)	-0.026** (0.011)	-0.029*** (0.010)	0.016 (0.010)	0.004 (0.010)
Immigrant	-0.053 (0.039)	-0.066* (0.036)	-0.021 (0.039)	0.010 (0.036)	0.023 (0.037)

APPENDIX TABLE F5 (CONTINUED)

	Interpersonal relationships	Closeness to teacher	Eagerness to learn	Attention	Persistence in completing tasks
	M3R/M3S	M3R/M3S	M3R/M3S	M3R/M3S	M3R/M3S
Center-based pre-K	-0.032 (0.024)	0.019 (0.022)	0.005 (0.023)	-0.012 (0.023)	-0.002 (0.023)
Enrichment activities with parents	0.065*** (0.022)	0.086*** (0.021)	0.115*** (0.021)	0.099*** (0.021)	0.069*** (0.021)
Constant	-1.123*** (0.203)	0.012 (0.188)	-1.373*** (0.196)	-1.811*** (0.191)	-1.987*** (0.190)
Observations	9,020	9,640	9,730	9,730	9,710
Adj.R2	0.181	0.170	0.146	0.163	0.174

Note: Robust standard errors are in parentheses. For statistical significance, *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. The number of observations is rounded to the nearest multiple of 10. ELL stands for English-language learner. English refers to English-language speaker. SES refers to socioeconomic status. See Appendix A.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010-2011 (National Center for Education Statistics)

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APPENDIX TABLE F6

Other noncognitive skills at the beginning of kindergarten, as reported by parents, under fully adjusted models

	Persistence	Eagerness to learn	Creativity in work or play
	M3R/M3S	M3R/M3S	M3R/M3S
Black	0.071 (0.052)	0.026 (0.051)	-0.112** (0.049)
Hispanic ELL	-0.178* (0.093)	-0.080 (0.089)	-0.082 (0.090)
Hispanic English	0.007 (0.042)	0.072* (0.040)	0.091** (0.039)
Asian	-0.105 (0.069)	-0.056 (0.063)	-0.151** (0.065)
Other	0.022 (0.051)	-0.022 (0.050)	0.043 (0.046)
Low-middle SES	0.076* (0.043)	0.166*** (0.045)	0.081** (0.041)
Middle SES	0.099** (0.047)	0.189*** (0.047)	0.062 (0.044)
High-middle SES	0.169*** (0.048)	0.174*** (0.048)	0.109** (0.045)
High SES	0.203*** (0.050)	0.232*** (0.050)	0.136*** (0.047)
Girl	0.133*** (0.022)	0.122*** (0.022)	0.187*** (0.021)
Age of student	0.005* (0.003)	0.002 (0.003)	0.008*** (0.003)
Has a disability	-0.225*** (0.029)	-0.221*** (0.030)	-0.115*** (0.027)
Language at home is not English	0.058 (0.075)	-0.053 (0.070)	-0.168** (0.074)
Not living with two parents	-0.099*** (0.030)	-0.028 (0.028)	-0.057** (0.028)
Number of siblings	0.007 (0.011)	-0.025** (0.011)	-0.038*** (0.010)
Immigrant	-0.009 (0.038)	-0.028 (0.038)	-0.027 (0.035)
Center-based pre-K	0.021 (0.023)	0.057** (0.024)	0.016 (0.022)

APPENDIX TABLE F6 (CONTINUED)

	Persistence	Eagerness to learn	Creativity in work or play
	M3R/M3S	M3R/M3S	M3R/M3S
Enrichment activities with parents	0.318*** (0.021)	0.354*** (0.022)	0.427*** (0.020)
Constant	-0.446** (0.204)	-0.279 (0.195)	-0.543*** (0.184)
Observations	10,260	10,260	10,250
Adj.R2	0.0771	0.0987	0.132

Note: Robust standard errors are in parentheses. For statistical significance, *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. The number of observations is rounded to the nearest multiple of 10. ELL stands for English-language learner. English refers to English-language speaker. SES refers to socioeconomic status. See Appendix A.

Source: EPI analysis of ECLS-K, Kindergarten Class of 2010-2011 (National Center for Education Statistics)

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Endnotes

1. Their study drew on the National Center for Education Statistics' Early Childhood Longitudinal Study, Kindergarten Class of 1998–1999 (ECLS-K, NCES), and addressed inequalities at the 1998–1999 starting gate (for children born five years prior). Gaps certainly arise at earlier ages, as research on neuroscience and developmental psychology shows (Shonkoff 2010; Shonkoff and Levitt 2010). Rothstein (2004) explains different factors that boost them. Lee and Burkam's work was further used to motivate other analyses of the causes of the gaps. Some of this literature is also summarized in the current study.

2. For example, for the school population, the proportion of minority students outweighed the proportion of white students in the current academic year (see projected enrollments in NCES 2014). Changes in the demographic composition are discussed in Robert Putnam's recent book, *Our Kids: The American Dream in Crisis* (Putnam 2015).

3. Unfortunately, data availability limits our ability to assess how much inequalities changed over the cohort's passage. However, the study also sets up the framework for future projects to analyze which changes in the determinants of inequalities over the cohort's school passage contributed to narrowing, or not narrowing, the gaps. Upon data availability, a companion study to this will focus on how the gaps have evolved over time, and specifically how and why they have changed in the last decade, for the two kindergarten cohorts mentioned in this introduction, the classes of 1998 and 2010. See "Dataset and Methodology" section for more details.

4. A fourth area would cover the policies and programs to address/close the gaps. Since this paper focuses on size of the gaps and how they are generated at very early stages in children's development, to call attention on the need of policies, we will refer to some of these studies in later sections.

5. Coleman and colleagues' seminal 1966 report helped shape subsequent policies, including the Elementary and Secondary Education Act of 1965, school desegregation, and the general "War on Poverty" strategy begun in the 1960s.

6. See references in the introduction section.

7. The convergence was also the result of the effects of policies enacted to combat poverty and inequality in the 1960s, as mentioned in the previous footnote. Scholars would tend to largely attribute this closing to a combination of such policies, which helped improve the employment, income, and education statuses of black parents.

8. The current paper uses the methodology proposed in Nores and García (2014) for creating different groups of the population according to more homogeneous, educationally relevant characteristics. This methodology is also used by Nores and Barnett (2014) and applied to the study of educational gaps using the ECLS-K, class of 2010–2011 study as well. We build on this work by expanding some of their analyses regarding the cognitive skills and incorporating the study of noncognitive skills. See more details in the "Dataset and methodology" section and Appendix A.

9. Besides income status or level, inequality, as an index summarizing the distribution of economic (dis)advantage, correlates with lower absolute levels of performance, although it is not statistically significantly associated with gaps or changes in the gaps (Magnuson, Rosenbaum, and Waldfogel 2008).

10. This is very clearly argued in Nisbett's book, *Intelligence and How to Get It,* which starts by explaining how new evidence on psychology, genetics, neuroscience, and effectiveness of education interventions has "overturned" the genetic position on intelligence. A few paragraphs later, he says that intelligence and education and professional success depend on environmental factors "that have nothing to do with genes" (Nisbett 2009, p. 2). Flynn (2007) also dismisses the genetic mediated relationship.

11. We also note that these works have been expanded upon by multiple researchers who followed these lines of thought.

12. Updated research on this, and overviews of it, include Olson (2012), Knudsen et al. (2006), Nisbett (2009), Putnam (2015), and Tough (2012). Also, seminal research was published by Bloom (1964): his book not only acknowledged the importance of the environment, but also clarified that understanding the environment is key to more fully explaining the development and change in human characteristics.

13. In constant dollars of 2008.

14. A repercussion for this finding is that using noncognitive skills to explain cognitive skill development helps explain performance gaps between black and white children, as argued by Grissmer and Eiseman (2008).

15. Because they have lower baseline odds of graduating from high school, black and Hispanic students who do not read well in third grade are twice as likely as their white peers to fail to graduate. This disadvantage is further exacerbated if the student grows up in poverty, as is true of a range of other academic outcomes (Hernandez 2011). Researchers suggest that third grade is the time at which school transitions from a place in which students are "learning to read" to one that expects them to be "reading to learn," and those who cannot do so thus experience behavioral and other problems that lead to diminished odds of subsequently completing high school (Miles and Stipek 2006; Griffin, Burns, and Snow 1998).

16. While largely acknowledged in other disciplines, noncognitive skills have been relatively ignored in the economics area, at least when considered from an empirical point of view. Major recent compendiums studying individuals' personality skills in economics are Borghans et al. (2008) and Almlund et al. (2011). The interest in this area is in great expansion and includes a long lifetime perspective. Better earlier skills can affect the success on the education ladder, but also be consequential for the work and well-being of the individuals. Some of these associations are also covered in Heckman and Kautz (2012).

17. "Self-productivity" of skills means that current levels of skills increase the skills attained at later stages. "Dynamic complementarity" between investments in the two types of skills implies that current levels raise the productivity of investment at later stages (see Cunha and Heckman 2007 for more details).

18. ECLS-K: 2010–2011 includes assessments of the children's cognitive performance and knowledge, interviews with parents, and information on teachers and schools, completed by teachers and administrators. The announced calendar for the successive waves of the 2010–2011 cohort study is as follows: kindergarten, in the 2010–11 school year, through fifth grade, in the 2015–16 school year. Over 18,000 (18,174) children studied were enrolled in nearly 1,000 (968) schools. Children, their parents, teachers, school administrators, and before- and after-school care providers participated in the study during the fall and spring data collections of the 2010–2011 school year. The sample design used to select the individuals in the study was a three-stage process that involved using primary sampling units and schools with probabilities proportional to the number of children and the selection of a fixed number of children per school. In the last stage, children enrolled in kindergarten or ungraded schools were selected within each sampled school. A clustered design was used to limit the number of geographic areas and minimize schools and costs (Tourangeau et al. 2013, 4–1).

19. This feature will be exploited in the second paper of this project (forthcoming). As Tourangeau et al. 2013 note, "It must be emphasized that the assessment scores described below are not directly comparable with those developed for the Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K). Although the IRT procedures used in the analysis of data were similar in the ECLS-K and in the ECLS-K: 2011, each study incorporated different items and the resulting scales are different. A subsequent release of the ECLS-K: 2010–2011 data will include IRT scores that are comparable with the ECLS-K cohort." Up to the point of publication of the current study, this information had not been yet released.

20. Tourangeau et al. (2013, 2-4). Children who speak Spanish and did not pass the basic reading skills language-screener were administered the assessments in reading, mathematics, and executive function in Spanish. For instance, the reading assessment measured the child's Spanish early reading skills (Tourangeau et al. 2013, 2-5 and 2-6).

21. For a discussion on the distribution of these variables see Appendix B.

22. As explained earlier, Nores and García (2014) also divided Hispanic children into two groups depending on their immigrant status (immigrant versus native). Their results show that educationally, relative to immigrant status, the ELL or non-ELL status is more important for children at the earlier school years. However, the immigration status becomes more important in middle school years. For this reason, the estimates of most interest in this paper are the ELL/English groups. Estimates for immigrant/native Hispanic children are available upon request.

23. Compared with other options. These alternatives include no nonparental care arrangements; being looked after by a relative, a nonrelative, at home or outside; or a combination of options. Any finding associated with this variable may be interpreted as the association between attending prekindergarten programs, compared with other options, but must be interpreted with caution. In other words, the child may have attended a high-quality prekindergarten program, which could have been either private or public, or a low-quality one, which would have different impacts. He or she might have been placed in (non-educational) child care, either private or public, high- or low-quality, for few or many hours per day, with very different implications for his or her development (Barnett 2011; Nores and Barnett 2010; Barnett 2008; Magnuson, Ruhm, and Waldfogel 2007; Magnuson et al. 2004). For the extensive literature explaining the benefits of pre-K schooling see Camilli et al. (2010) and for a meta-analysis of results, see Duncan and Magnuson (2013).

24. These include reading books, telling stories to the child, playing games or doing puzzles, building something while playing with construction toys, singing songs with the child, helping the child with arts and crafts, talking about nature or doing science projects, practicing reading, practicing writing, working with numbers, reading picture books outside of school, and reading to or pretending to read to himself or to others outside of school (alpha 0.7605).

25. To identify each gap, the race and SES variables are normally included as dummies or indicator variables representing each group of interest, which are in turn compared with a chosen reference group (white and bottom quintile/low SES group, respectively).

26. The school fixed effect is represented by in the equations in Appendix A, where s indicates the child i's school.

27. Alternatively, the specifications above are estimated using ordinary least squares with clustered standard errors at the school level (to account for lack of independence of observations of students who attend the same school). See Appendix B for other details on alternative estimation methods. These estimates are available upon request.

28. This statistical drawback is present in multiple sources of data, including the earlier ECLS-K study (1998–1999). Limitations associated with lack of response are well known, especially when some sort of pattern in the missing observations is suspected. Some references are Allison (2002), McKnight et al. (2007), Graham (2009).

29. The poverty variable indicates whether the household income is below 200 percent of the U.S. Census Bureau poverty threshold. More details are provided in Tourangeau et al. (2013), see pages 7-53 and 7-54.

30. Compared with low SES students, the relative advantage in reading of children in the low-middle SES quintile is a substantial 0.27 sd, climbing to nearly half a standard deviation (0.49 sd) in the middle SES group, to virtually three quarters (0.74) for the high-middle SES group, and a full sd for the high SES students. These very large gaps are almost equivalent in math at each step up in the SES distribution: 0.24, 0.50, 0.71, and 0.96 sd respectively, before controls are included.

31. Low-SES children's reading performance is, on average, 0.17 sd below performance of students in the low-middle quintile, 0.35 sd below students in the middle quintile, 0.56 sd below students in high-middle quintile and 0.78 sd below the average student in the high SES quintile. Again, the differences in math are comparable, with low-SES children at 0.15, 0.37, 0.54, and 0.76 sd below students in each of the subsequent quintiles up in the distribution.

32. Although the references are scarce for across-group comparisons (of assessments by SES, race/ethnicity, or relationship with the student), the literature has identified differences in assessment of socioemotional variables across countries. According to this research, differences across countries can be explained by differences in response styles of individuals in different countries (due to cultural, linguistic, or other references) and differences in the reference groups they may use when reporting their views (called "reference bias"). See details in Kyllonen and Bertling (2013) and Duckworth and Yeager (2015). Table 1 in Duckworth and Yeager (2015) also includes a list of limitations in teacher-reported assessments.

33. In all of our comments, the white children group is the reference group. Education gaps of minorities included in the group called "other" races are not reported in the text. Interested audience can find more information on these gaps in the tables.

34. From the unadjusted to the fully adjusted model, black children increase from 0.11 to 0.17 standard deviations ahead of white children on self-control, as reported by parents.

35. That is, under the fully adjusted model, Asian parents' ratings of their children's approaches to learning, social interactions, and creativity are between 0.15 and 0.26 standard deviations worse than white parents' ratings of their children on these noncognitive skills.

36. Adjusted differences are 0.27 sd in math and as high as 0.37 sd in reading.

37. We have also looked at Hispanic children depending on their immigrant status. The estimates suggest that Hispanic immigrant children perform better than Hispanic ELL children in all cognitive and executive function skill measures studied (with the exception of cognitive flexibility). This is consistent with findings by Nores and García (2014), who use the earlier ECLS-K study. Their study shows that as they grow up, Hispanic ELL children perform better but Hispanic immigrant children perform worse. Tables and figures of findings by immigrant status are available from the author upon request.

38. English speakers have a small relative advantage compared with whites, of 0.09 sd in creativity and of 0.07 sd in eagerness to learn new things as perceived by parents and a relative disadvantage compared with whites, of 0.07 sd, in persistence as perceived by teachers.

39. Fully adjusted gaps are -0.21, -0.17 , and -0.18 sd respectively.

40. Unadjusted differences are -0.13 and -0.46 sd respectively.

41. The problem of wage stagnation extends far beyond the lowest-paid workers. Hourly wages of the vast majority of American workers have either stagnated or declined since 1979, with the exception of a period of strong across-the-board wage growth in the late 1990s (Bivens et al. 2014).

42. The federal minimum wage has failed to keep up with inflation and productivity; by a wide range of measures, the current federal minimum wage of $7.25 per hour is well below the historical peak reached in 1968 (Cooper, Schmitt, and Mishel 2015).

43. The EITC also provides an effective incentive to enter the workforce, especially for single mothers (Hungerford and Thiess 2013).

44. Research shows it would also benefit states economically.

45. There are two analyses focused on the child's race/ethnicity: In this report, we discuss the model dividing Hispanic children into English speaking and non-English speaking children. In companion estimates, we divide Hispanic children into children with immigrant origin and children with native origin; figures and tables of results of these companion estimates are available upon request.

46. Children who speak Spanish and did not pass the basic reading skills language-screener were administered the assessments in reading, mathematics, and executive function in Spanish. For instance, the reading assessment measured the child's Spanish early reading skills (Tourangeau et al., 2-5 and 2-6).

47. Cognitive assessment scores are calculated using Item Response Theory procedures. IRT is a method used to model assessment data that ensures that scores for any domain—mathematics, reading, etc.—are comparable across students even when students were administered different items. As explained by Tourangeau et al. 2013, the IRT method uses the patterns of correct and incorrect responses as well as the characteristics of each item, in terms of difficulty, to assess the child's ability. IRT also make possible longitudinal measurement of gain in achievement (Tourangeau et al. 2013, 3-2).

48. Spanish-speaking children who did not pass the language screener completed the full mathematics assessment administered in Spanish (Tourangeau et al. 2013, 2-6).

49. Spanish-speaking children who did not pass the language screener completed the full executive function assessment administered in Spanish (Tourangeau et al. 2013, 2-6 and 2-7).

50. In other words, the child may have attended a high-quality prekindergarten program, which could have been either private or public, or a low-quality one. Or the child might have been placed in non-educational child care, either private or public, and of high- or low-quality, for few hours or long periods per day, and all of these factors would affect the child's development (Barnett 2008, 2011; Magnuson et al. 2004; Magnuson, Ruhm, and Waldfogel 2007; Nores and Barnett 2010).

51. The traditional solutions for this problem are to impute values using multiple imputation techniques or conduct analyses for subgroups, rather than an average analysis. This second option is not possible in our study because of the need to compare students from different groups.

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