Beyond Parental Educational Attainment: How Parents' High School Experiences and Grandparents' Educational Attainment Affect Young Children's Test Performance

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Draft: September 22, 2006

*The authors gratefully acknowledge support from The Russell Sage Foundation and The Spencer Foundation.

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Abstract

Using the Early Childhood Longitudinal Study – Kindergarten Cohort (ECLS-K), a nationally representative sample of kindergarteners in 1998-99, we examine how parents' high school experiences and grandparents' educational attainment are associated with children's educational achievement net of demographic and other socioeconomic differences. Overall, we find that among parents who have less than a Bachelor's Degree, high school grades, highest math course taken, and type of high school are strongly predictive of the math and reading scores of their children. Grandparents' educational attainment is also associated with test scores, although, after controlling for parental socioeconomic status, these measures are only significant in determining math achievement. Both parents' high school experiences and grandparents' educational attainment are more strongly related to math scores than reading scores. We find that high school experiences of parents and grandparents' education delineate another route of intergenerational transfer of status and may help explain the disadvantage of minority youth beyond traditional measures of socioeconomic status.

Introduction

Almost all social scientists today agree that there is a sizable correlation between the educational attainment of parents and the educational outcomes of their children. Since the early studies of Status Attainment from the Wisconsin School, we have known that parents' education leads to higher educational aspirations for their children. In addition, parents' educational attainment is linked to highest test scores, grades, and eventual educational attainment of children (Hallinan 1989). Since the studies from the Wisconsin School, researchers have discovered some of the pathways through which socioeconomic advantage of parents is converted to high academic performance of their children.

However, we know much less about the early childhood experiences of youth. Studies of young adults and adolescents show that much of the disparities along class, race, and gender lines begin at an early age. Due, in part, to data limitations, few scholars have been able to examine when and how these disparities first emerge. Moreover, while we know that parental socioeconomic status matters for educational outcomes, we actually know very little about how school experiences of parents may influence the scholastic performance of their children. Certainly educational experiences are more complex than simply the number of years of education attained by adults. In addition, while social scientists have hypothesized the intergenerational transfer of advantage, there is very little research on how grandparents' educational attainment may be related to the academic performance of their grandchildren.

Our paper addresses the gaps in this literature by examining how parents' educational experiences and grandparents' educational attainment may be associated with

test scores of young children. We argue that an often missed source of disadvantage of minority children is their parents' lower levels of academic performance (net of attainment). We use the Early Childhood Longitudinal Study - Kindergarten Cohort (ECLS-K) to examine these relationships. Our paper proceeds as follows. First, we summarize the Status Attainment literature about how parental educational attainment influences children's educational outcomes. Next, we examine the extent to which cultural capital and parenting behavior is related to academic performance. Finally, we present empirical analyses that examine the influence of parental education, parental high school experiences, and grandparents' educational attainment on test scores of children at the beginning of kindergarten.

Literature Review

Status Attainment

It is beyond the scope of this paper to adequately review the entire Status Attainment literature. However, we outline some of its basic arguments. Status Attainment researchers focused on the intergenerational transfer of educational and occupational attainment from parents to children (specifically fathers to sons). These early researchers argued that socioeconomic status was partly due to intelligence. Because intelligence has a genetic component, children of high-SES parents were more likely than children of low-SES parents to be more intelligent. Although this assumption would find many critics in modern sociological research, Status Attainment researchers actually focused on other aspects of class advantage and were most interested in the social psychological component of the maintenance of class advantage. In fact,

researchers understood parental educational aspirations to be a proxy for the day-to-day interactions between parents and children that promoted educational success. Simply put, they argued that highly educated parents had higher educational aspirations for their children that transformed into higher educational aspirations among children, which in turn raised the children's educational attainment (Sewell and Shah 1968; Sewell, Haller, and Portes 1969; Sewell, Haller, and Ohlendorf 1970; Kerckhoff and Campbell 1977; Campbell 1983; Jencks, Crouse, and Mueser 1983). For example, Sewell and Shah (1968) hypothesized that the reason that higher-SES children had better educational outcomes was partly due to the encouragement and pressure they received from their parents. They argued that test scores and parental encouragement independently affected the college plans of males and females and accounted for some, but not all, of the socioeconomic differences in plans for college. Moreover, while socioeconomic status was correlated with the test scores of high school students, social class did not completely determine achievement tests and the latter seemed to be more important in determining plans for college.

This body of research emphasized the importance of parental aspirations, peer influences, and students' academic ability on their eventual educational and occupational attainment. Some researchers have interpreted these findings as evidence of a meritocratic society, while others argue that the seemingly fair system that rewards educational success with occupational status is simply a façade that hides the persistence of class inequities (Hallinan 1989). Nonetheless, the basic finding that parental educational attainment affects children's educational attainment has not been challenged.

Cultural Capital

Bourdieu and others have argued for a more nuanced mechanism for maintaining class differences by using the concept of cultural capital. While this concept is somewhat fuzzy, it suggests that the tastes and preferences of the upper class should not have any direct bearing on economic or capitalistic measures of productivity (Bourdieu 1973, 1986). In other words, these are characteristics that ought not to directly determine one's productivity in the labor market. Bourdieu's empirical study of the French showed class variation on a wide number of artistic preferences. He argues that these symbols serve as signals of class membership. Those who are socialized to upper-class norms take them for granted and these tastes become somewhat instinctive to them. This latter trait, known as *habitus*, makes it difficult for a member of the lower class to simply learn these attributes (although it can certainly be accomplished). Tastes become the vehicle through which social exclusion takes place and only the upper class recognize the cultural symbols of class status.

Lamont and Lareau (1988) translated and clarified Bourdieu's definition of cultural capital for the U.S. population. They argue that in the U.S. context, the taste of the upper class also has a material and commercial aspect, although true members of the upper class can not only afford the material manifestation of these items but can also articulate rationales for their preferences. DiMaggio and his colleagues examine the direct effect of cultural capital on educational outcomes among adolescents in the 1960s and argue that teachers reward children who demonstrate tastes consistent with high-brow culture (DiMaggio 1982; Mohr and DiMaggio 1995). Because parents are the primary source of cultural knowledge among young children, we expect that parents with

high levels of education are better able to transfer these tastes. In addition, children with both well-educated parents and grandparents may more naturally exhibit traits of cultural capital that demarcate their class status. We also expect highly educated parents to be most able to prepare children for primary school in a manner that meets teachers' expectations (see Lareau 2000). Although previous researchers focused on class differences, racial and ethnic minorities and immigrant parents may also be disadvantaged in their cultural capital.

Parents' Educational Experiences Beyond Attainment

Although parental educational attainment is crucial to influencing children's academic outcomes, other aspects of early academic experiences of parents may be related to their children's performance. We suspect that the educational performance of parents may additionally reflect their orientation toward academic outcomes. For instance, is it possible that a parent with only a high school degree but who had straight As in school simply lacked the opportunity for additional schooling and may somehow make up for his or her low level of attainment through enthusiasm for school? Similarly, parents who attended college but had lower levels of performance in high school may be less effective in transferring the relative advantage of their educational attainment that their counterparts who earned straight As and took more difficult courses. We have found little previous research in this area, but we will continue this search between now and the start of the PAA Meetings.

Similarly, we suspect that other adults can have an additional influence on the test scores of young children. Most notably, grandparents likely can exert positive

influences, and we also hypothesize that having more highly educated grandparents can provide an additional boost – above and beyond the educational attainment of the child's parents. It is likely that much of the advantage of grandparents' SES is reflected in parents' SES, but we are interested in the possibility of an additional effect of grandparent education. We will also expand this section of our literature review before the PAA Meetings.

Research Questions

Grounding our research questions in past theoretical and empirical work about Status Attainment, we seek to answer two questions. First, what is the association between parents' educational experiences in high school and academic readiness at the beginning of kindergarten? In addition to looking at a traditional measure of parental education experiences – how many years of schooling each parent received – we look at three complementary measures of high school experiences: high school grades, type of high school attended, and math courses taken. We expect that parents' academic success in high school (measured by grade point average and highest math class taken) will be strongly, positively associated with children's math and reading test scores. We expect the relationship between parents' highest math class and children's math scores to be especially strong, as these parents who took more rigorous math classes in high school might be better equipped to transmit basic math skills to their children at an early age. Additionally, we expect that children whose parents who attended academic or college preparatory high schools perform better than their counterparts whose parents did not attend such high schools.

Second, to what extent does the intergenerational transfer of advantage – measured by grandparents' educational attainment – exist? Consistent with the Status Attainment literature that suggests parents transmit educational advantage to their children, we hypothesize that grandparents transmit educational advantage to their grandchildren. We expect that both grandmothers' and grandfathers' education level, net of parents' education, will be positively associated with children's math and reading test scores.

Data and Methods

Data Source

This research uses data from the first wave of the Early Childhood Longitudinal Study – Kindergarten Cohort (ECLS-K), a study conducted by the National Center of Education Statistics (NCES).[1] These data were collected in a three-stage sampling frame. Researchers first selected a national sample of schools that contain kindergarten classrooms. Researchers then sampled kindergarten classes and teachers within each school and, finally, a sample of students within each classroom. The original sample includes 17,487 students in approximately 3,500 classrooms in 1,280 schools. Data were collected from parents and each child's school, and children were given a battery of standardized tests in math, reading, and general knowledge during each wave.

These data are well-suited to answer our research questions for several reasons. To begin with, ECLS-K is one of the only nationally representative data sources of children's early childhood experiences. Children were administered cognitive

[1] Comprehensive documentation is available from the NCES website.

assessments at the beginning of kindergarten, meaning that these data make it possible to estimate the influence of parents' and grandparents' educational experiences before children even learn anything in kindergarten. Additionally, this is perhaps one of the only nationally representative data sources that include information about both parents' high school experiences and the educational attainment of the child's grandparents. Finally, researchers oversampled for minority students and children of foreign-born parents, two populations neglected in Status Attainment literature.

Academic Readiness

The dependent variables in our analyses include test scores from math and reading assessments when children were beginning kindergarten, in the fall of 1998. Math assessments tested five levels of aptitude (easiest to most difficult): 1) identifying one-digit numerals; 2) recognizing patterns; 3) predicting the next number in a sequence; 4) computing simple addition and subtraction problems; and 5) computing simple division and multiplication problems and recognizing more complex patterns. Reading assessments included the following skills: 1) identifying lower- and upper-case letters of the alphabet; 2) knowing sounds of letters at the beginnings of words; 3) knowing sounds of letters at the ends of words; 4) recognizing common sight words; and 5) reading words in context (Downey et al. 2004: 618; Rock and Pollack 2002).

Both evaluations followed a two-stage format to reduce ceiling and floor effects. Students first took a short routing test, and responses to this test determined the difficulty level of a second, longer test. Additionally, all three evaluations are based on Item Response Theory (IRT), which places each student on a continuous scale according to the

difficulty, discriminating ability, and guess-ability of each question. This method also uses the pattern of right, wrong, and omitted responses to all questions administered to estimate the score a child would have received if they answered all questions (NCES 2001).

Parents' Educational Experiences

We use five measures of parents' educational experiences in our multivariate analyses: high school grades, type of high school attended, highest math class taken, mother's educational attainment, and father's educational attainment. Parents who met the following conditions were asked a series of questions about their high school experiences: they were the child's biological parent, they attended at least some high school, and they do not have a college degree.[2] About 56 percent of the sample met these three conditions and answered these questions. Parents were asked, "What grades did you usually get in high school?" We use categorical measures of high school grades in our descriptive analyses: mostly As (numerical average of 90-100), mostly As and Bs (85-89), mostly Bs (80-84), mostly Bs and Cs (75-79), mostly Cs (70-74), mostly Cs and Ds (65-69), and mostly Ds and lower (64 and below). In our multivariate analyses, we construct an approximate grade point average (mostly As = 4.0, mostly As and Bs = 3.5, mostly Bs = 3.0, mostly Bs and Cs = 2.5, mostly Cs = 2.0, mostly Cs and Ds = 1.5, and mostly Ds and lower = 1.0) and use this as a continuous variable. Additionally, we include dummy variables for the type of high school parents attended: academic or college preparatory, commercial or business training, and vocational or technical

[2] Thus, the analyses that use these variables cannot be generalized to the population of children beginning kindergarten in 1998-99, as the respondents who were asked these questions are systematically different than those who were not.

(reference category). Our final measure of parents' high school experiences is the highest level mathematics class taken in high school. Highest math class is represented by a series of dummy variables: no math class, Elementary Algebra or Algebra I, Plane Geometry, Intermediate Algebra or Algebra II (reference category), Trigonometry, and Calculus.[3]

In our models estimating the association between parents' educational experiences and academic readiness, mother's and father's educational attainment is represented by the following dummy variables: less than high school, high school diploma or GED (reference category), and more than high school. Because the questions regarding high school experiences were only asked of parents who attended some high school but did not graduate from college, these multivariate analyses omit the parents on the low end of educational attainment (those who only got through primary or middle school, 5 percent of mothers and 5 percent of fathers) and, more substantially, the parents on the high end of educational attainment (those who have a college degree or higher, 24 percent of mothers and 30 percent of fathers).

In the models estimating the association between grandparents' educational experiences and academic readiness, we use more fine-grained measures of parental educational attainment. Mother's and father's educational attainment is represented by the following dummy variables: primary or middle school, some high school, high school diploma or GED (reference category), some college, college degree, or beyond college.

[3] Parents were also asked if they took a Business Math or Physics class in high school, but we do not include these variables in our analysis. While it is clear that Intermediate Algebra or Algebra II is a more rigorous course than Elementary Algebra or Algebra I, it is more difficult to decide where Business Math and Physics fits in the hierarchy of courses.

Grandparents' Educational Attainment

To estimate the intergenerational transfer of advantage, we measure grandmother's and grandfather's educational attainment by the following dummy variables: primary or middle school, some high school, high school diploma or GED (reference category), some college, college degree, or beyond college.[4]

In these models that estimate the relationship between grandparents' educational experiences and academic readiness, we include five additional variables that attempt to hold constant grandparents' involvement in the child's life. Past research has demonstrated that grandparents' involvement with grandchildren is heterogeneous (Cherlin and Furstenberg 1992). Ideally, we would like to be able to include a direct measure of time children spend with grandparents, but the ECLS-K data set does not contain this information. Instead, we include more indirect measures. Parents were asked how many of the child's grandparents are still living and how many grandparents with whom the child has a close relationship. Number of living grandparents is represented by a continuous variable that ranges from 0 to 5. About 9 percent of the sample is coded as 5 in the ECLS-K data set, meaning that the parent reported that the child has more than four living grandparents. Number of grandparents close with is represented by a continuous variable that ranges from 0 to 5. About 2 percent of the sample is coded as 5 in the ECLS-K data set, meaning that the parent reported that the child is close to more than four grandparents. Third, we control for the number of adults in the child's household, a continuous variable that ranges from 0 to 9. Fourth, parents were asked if

[4] The survey respondent (the child's mother 92 percent of the time, the child's father 7 percent of the time, and another person 1 percent of the time) was asked to recall his or her mother's and father's highest level of school completed. Therefore, we most often have data on the educational attainment of the child's maternal grandparents, sometimes have data on the educational attainment of the child's paternal grandparents, but never have data on both sets of grandparents.

the child was currently receiving care from a relative on a regular basis (including care provided before or after school) and, if they reported relative care, which relative was providing the most care. We capture this with a dummy variable: 0 = child receives no relative care, or child receives relative care from a relative other than a grandparent, 1 = child receives care from a grandparent. Finally, we include a dummy variable if a grandparent has ever lived with the child: 0 = grandparent never lived with child, or grandparent lived with child for less than four months, 1 = grandparent lived with child for four months or more.

Other Socioeconomic Characteristics

In order to rule out the possibility that the relationship between parents' high school experiences and academic readiness is not solely due to differences in socioeconomic status, we control for additional measures of SES in our multivariate analyses.[5] We control for mother's and father's occupational prestige, which ranges from 29 to 77.5. Mothers and fathers who are unemployed are coded as having an occupational prestige score of 0; to account for this in our multivariate analyses, we include dummy variables indicating if the mother and/or father is unemployed (0 = employed part- or full-time, 1 = unemployed). Additionally, we control for family income. Because family income is highly skewed, we use income quintiles instead of the continuous measure (with the middle quintile serving as our reference category).

[5] The ECLS-K data set provides a five-category composite family SES measure that includes mother's education, mother's occupational prestige, father's education, father's occupational prestige, and household income (NCES 2001). Because we estimate the relationship between parental education and tests scores separately, we do not use this composite family SES measure in our multivariate analyses. Instead, we include the additional controls – mother's occupational prestige, father's occupational prestige, and household income – separately.

Demographic Characteristics

Demographic characteristics used in the multivariate analyses include child's race/ethnicity, mother's immigrant status, child's gender, parents' marital status, and number of siblings. Child's race is represented by a series of dummy variables: white (reference group), black, Hispanic, Asian, and other race.[6] We measure mother's immigrant status by the mother's country of birth reported in the fourth wave of data collection; if a child's mother reports being born outside of the United States, we consider the child a child of immigrants. Mother's immigrant status is represented by a dummy variable (0 = native-born mother, 1 = foreign-born mother). We use the immigrant status of the mother – as opposed to the immigrant status of the child – because children in our sample are quite young and very few were born outside of the United States. Additionally, young children are likely to be exposed to the cultural norms of their parents. We also control for child's gender, as researchers have demonstrated gender differences in early childhood cognitive outcomes (Lee and Burkam 2002). Child's gender is represented by a dummy variable (0 = female, 1 = male).

Additionally, all of our multivariate analyses include two measures of family environment. First, we control for family structure, as children from traditional families typically demonstrate higher achievement than children from non-traditional families (Lee 1993; McLanahan and Sandefur 1994). Parents' marital status is represented by a series of dummy variables: married (reference category), separated, divorced, widowed, and never married. Second, we control for number of siblings in the child's household,

[6] Because some race groups are too small to analyze separately, we combine the following children into an other race category: Hawaiian/Pacific Islander (N=198), American Indian/Alaska Native (N=313), and non-Hispanic multiracial (N=443).

because parents with more children have fewer resources to devote to each individual child (Downey 1995; Downey and Condron 2004). Number of siblings is represented by a series of dummy variables: zero siblings (reference category), one sibling, two siblings, and three or more siblings.

Description of Sample

Table 1 presents descriptive tabulations of the variables used in the multivariate analyses. In terms of racial/ethnic composition of the sample, more than half (55 percent) of the sample is non-Hispanic white. Blacks comprise about 14 percent of the sample, Hispanics comprise about 17 percent, and Asians comprise about 6 percent. Additionally, just under one-fifth (18 percent) of the sample has a mother who was not born in the United States. About 7 in 10 children (73 percent) have married parents, and more than two-thirds of the sample have one or two siblings (43 percent and 26 percent, respectively).

[Table 1 about here.]

Parental educational attainment is quite heterogeneous. About 15 percent of both mothers and fathers did not graduate high school, and about 30 percent of both mothers and fathers have only a high school diploma or a GED. Mothers are more likely than fathers to have received some college education but no college degree, and fathers are more likely than mothers to have a college degree and post-college education. The vast majority of parents report receiving mostly As and Bs, mostly Bs, or mostly Bs and Cs in high school (26 percent, 20 percent, and 30 percent, respectively, of those parents who were asked that question). About 78 percent of parents report attending an academic or

college preparatory high school, about 12 percent attended a commercial or business training high school, and 11 percent attended a vocational or technical high school. Finally, nearly one-third of parents took Intermediate Algebra/Algebra II as their most difficult math class. About 15 percent report taking no math courses, and 20 percent of parents took either Trigonometry or Calculus.

Not surprisingly, the educational attainment of grandparents is lower than the educational attainment of parents. About 14 percent of grandmothers and 18 percent of grandfathers never attended high school, while about 43 percent of grandmothers and 37 percent of grandfathers report a high school diploma or GED as their highest level of educational attainment. Additionally, about 13 percent of grandmothers and 21 percent of grandfathers graduated college and/or received post-college education. In terms of grandparents' involvement with their grandchildren, the average child has three living grandparents and is close to two of them. About 16 percent of children receive primary child care from a grandparent and 6 percent of children have had a grandparent live with them in the past.

We do not weight our multivariate analyses to correct for the sampling design, and readers should keep this in mind when interpreting our results. Because test scores, parents' high school experiences, grandparents' educational attainment, and grandparents' involvement are crucial to our analyses, individuals who are missing these variables are not included in our multivariate analyses. However, relatively few observations are missing control variables, and we impute these missing values using a

regression-based approach.[7] In results not shown here, we handle missing data by listwise deletion. This does not substantively change our results.

Results

Table 2 provides interesting descriptive information about the relationship between parents' high school experiences, grandparents' educational attainment, and academic readiness. Looking first at parental educational attainment, we find that both mother's and father's educational attainment is strongly, positively related to child's math and reading test scores at the beginning of kindergarten. This relationship is linear; children of mothers who received a high school diploma or GED, for example, perform better than children of mothers who received some high school education. In turn, children of mothers who received some high school education perform better than children of mothers who only attended primary or middle school. This linear relationship exists for both mother's and father's educational attainment and math and reading test scores.

[Table 2 about here.]

Similarly, parents' high school experiences are associated with academic readiness. Compared with children of parents who report receiving mostly Bs in high school, children of parents who received mostly As in high school perform better on both math and reading test scores. Children of parents who report receiving grades lower than mostly Bs, on the other hand, have lower test scores than children of parents who

[7] We impute the missing values based on the following covariates that are traditionally associated with them, including socioeconomic status, race, immigrant status, gender, and marital status.

received mostly Bs. Interestingly, the comparison between children of parents who received mostly Bs and children of parents who received mostly Ds or lower is not as strong; perhaps this is because of the small number of parents who report receiving Ds or lower in high school. Additionally, compared with children of parents who attended a vocational or technical high school, children of parents who attended academic or college prep high schools, and commercial or business training high schools, posted higher math or reading scores. The relationship between highest math class and academic readiness is a little more nuanced. Compared to Intermediate Algebra/Algebra II, taking less challenging math courses or no math courses is negatively associated with children's math and reading scores. Trigonometry, compared to Intermediate Algebra/Algebra II, is positively associated with children's math and reading scores. Parents who have taken Calculus in high school have children with math and reading scores comparable to their counterparts who have taken only Intermediate Algebra/Algebra II.

Turning now to the association between grandparents' educational attainment and academic readiness, we find that this relationship resembles that of parents' educational attainment and academic readiness. Children whose grandparents graduated high school or have a GED post higher math and reading test scores than those children whose grandparents did not complete high school. Similarly, children whose grandparents graduated high school or have a GED post lower math and reading test scores than children whose grandparents have higher levels of educational attainment.

Table 3 also presents information about the relationship between academic readiness and various demographic characteristics, including race, mother's immigrant status, child's gender, parents' marital status, and number of siblings. Black, Hispanic,

and other race children post lower test scores than whites, and Asian children post higher test scores than whites. Additionally, children of native-born mothers perform better on math and reading tests, although this association is stronger for the math tests. Males and females have similar math test scores, but females outperform males on the reading test. Children of married parents perform better than children of non-married parents. Interestingly, children with one sibling outperform their zero-sibling counterparts on the math test, although this relationship does not exist for the reading test.

[Table 3 about here.]

Using Parents' High School Experiences to Estimate Academic Readiness

Table 2 illustrates interesting associations between parents' high school experiences and children's academic readiness, but it is important to see if this relationship is due to other factors such as parental educational attainment or family income. Table 4 shows substantial race differences in both parental educational attainment and high school experiences. To begin with, white mothers and fathers are more likely than black and Hispanic parents to have graduated from college. Hispanic parents are particularly well-represented in less than high school categories (primary/middle school and some high school). There is great variation among Asian parents; while 18 percent of mothers did not graduate high school, 39 percent received college and/or post-college education.

[Table 4 about here.]

Additionally, ECLS asked only the parents who went to high school but did not complete college for information about their high school experiences. This means that

only about 56 percent of parents reported on their high school experiences, and only these parents are included in our multivariate estimates of the relationship between high school experiences and academic readiness. Although this is not ideal, we believe it is still important to document the influence of high school experiences net of educational attainment. Race differences exist among those parents asked these questions (who are disproportionately minority). Interestingly, Hispanic and Asian parents report higher high school grades than white parents, and black parents report lower high school grades. Asian parents are more likely than white parents to report attending an academic or college preparatory high school. About equal numbers of white, black, and Hispanic parents attended these high schools. Particularly interesting race differences emerge when looking at the distribution of highest math class taken. All minority parents are more likely than white parents to have taken Trigonometry or Calculus, and these differences are particularly sharp between white and Asian parents.

In Tables 5a and 5b, we use ordinary least squares (OLS) regression to estimate the relationship between parents' high school experiences and academic readiness. The first three models estimate the influence of parents' high school grades, type of high school, and highest math class on child's math test scores at the beginning of kindergarten. In the fourth model, we add in parent's educational attainment so that we can look at the independent influence of high school experiences. Finally, we include controls for additional socioeconomic characteristics (occupational prestige and income) and demographic characteristics (child race, mother's immigrant status, child's gender, family structure, and number of siblings). We use a similar series of models to predict reading test scores.

Table 5a presents results from our OLS models predicting children's math scores at the beginning of kindergarten, and Table 5b presents results from our OLS models predicting children's reading scores. The first three models in both tables show significant relationships similar to the ones presented in Table 2. For every one-unit increase in parent's high school grade point average, for example, children experience a 1.310 increase in their math test score and a 1.488 increase in their reading test score. Additionally, children of parents who attended an academic or college preparatory high school, compared to children of parents who attended a vocational or technical high school, posted math scores that are 2.024 points higher and reading scores that are 1.704 points higher.

[Tables 5a and 5b about here.]

We next include measures of mother's and father's educational attainment. Not surprisingly, children of mothers who did not graduate high school, compared with children of mothers who received a high school diploma or GED, score 2.245 points lower on the math test and 2.690 points lower on the reading test. On the other hand, children of mothers who received more than a high school education score 1.154 points higher on the math test and 1.040 points higher on the reading test. The relationship between father's educational attainment and test scores is similar. Interestingly, even after we include these controls for parents' educational attainment, parents' high school experiences are still associated with children's academic achievement at the beginning of kindergarten, particularly math test scores. The coefficient of parent's grade point average decreased in both sets of models, but it is still significant. Interestingly, although type of high school is still a strong predictor of math test scores, these variables are only

mildly associated with reading test scores. Attending a commercial or business training high school, compared to attending a vocational or technical high school, is not related to reading test scores. Attendance at an academic or college preparatory high school is associated with higher children's reading scores, but this relationship is only statistically significant at the 10 percent level.

Our final models include controls for other socioeconomic and demographic variables. Parent's grade point average and high school type remain significant in the models predicting math scores, which suggests that these high school experiences remain important net of parental educational attainment and other socioeconomic factors. Every one-unit increase in parent's grade point average, for example, is associated with a 0.37 increase in children's math scores. The inclusion of these additional control variables reduces the relationship between highest math class and math achievement. Although children of parents who took no math courses in high school have lower math scores than their counterparts – children of parents who took Intermediate Algebra/Algebra II – the other highest math class variables are not strongly predictive of math scores at the beginning of kindergarten.

Turning now to the full models that predict reading scores, we see that some aspects of parents' high school experiences are associated with academic readiness. Every one-unit increase in parent's grade point average is associated with a 0.38 increase in reading scores, controlling for a variety of other factors. Type of high school, however, falls from significance in this full model and does not predict children's reading scores. Similarly, only one math class variable is predictive of reading scores; children perform

better on the reading test when their parents took an intermediate-level math class, compared to children of parents who did not take math in high school.

Using Grandparents' Educational Attainment to Estimate Academic Readiness

Table 2 shows that grandparents' educational attainment has a linear relationship with academic readiness, and we further explain this relationship in Table 6.
Here we use ordinary least squares (OLS) regression to estimate the relationship between grandparents' educational experiences and academic readiness at the beginning of kindergarten. The first model estimates the bivariate relationship of grandparents' educational experiences and math scores. We then include controls for grandparent involvement in the child's life: number of living grandparents, number of grandparents with whom child is close, number of adults in household, grandparent provides primary care, and grandparent ever lived with child. We next extend the models to include mother's and father's educational experiences and, finally, include controls for additional socioeconomic and demographic characteristics.

Parents who are missing data about their high school experiences – either because they are not the child's biological parent, they never attended high school, or they graduated from college – are included in our models that look at the influence of grandparents' educational attainment. The first models show results similar to the ones in Table 2 – both grandmother's and grandfather's educational attainment exert a considerable influence on children's math and reading scores. Children whose grandparents only received primary or middle school education are especially penalized;

on the other hand, children whose grandparents graduated college or received post-college education seem to especially benefit.

[Table 6 about here.]

We next add measures of grandparents' involvement into the models. All of the grandparents' educational attainment variables remain significant in these models, although controlling for grandparent involvement causes some of the coefficients to decrease slightly. Interestingly, there is a negative relationship between number of living grandparents and children's math and reading scores. It is possible that what matters in predicting academic readiness is the involvement of grandparents, and those with living grandparents who are not involved in children's lives are negatively associated with their achievement outcomes. However, being close with one's grandparents is associated with higher test scores. We can only speculate on the mechanisms underlying these results. On one hand, children may benefit solely from having close relationships with their grandparents. However, parents who report that their children are close to their grandparents are likely to have close relationships with the grandparents themselves. It is possible that parents who maintain friendly, supportive relationships with their own parents receive support from them that, in turn, lead to increased cognitive benefits for their children.

Two other grandparent involvement variables – "grandparent provides primary child care" and "grandparent ever lived with child" – are negatively associated with math scores. Additionally, grandparent involvement with child care is negative associated with reading scores. It is likely that these variables, however, are a function of socioeconomic status. Relative care, for example, is more common among families of lower

socioeconomic status (Stack 1974). Similarly, grandparents often live with their children and their grandchildren. Adult children who are young and financially dependent live with their parents; hence this characteristic may be associated with low socioeconomic status.

We next control for parents' educational attainment, as researchers have demonstrated a strong correlation between parents' educational attainment and child's academic success. Controlling for mother's and father's educational attainment substantially reduces the variation in children's test scores. Grandmothers with relatively low levels of education (primary or middle school, or some high school), compared to those with high school diplomas or GEDs, have grandchildren with lower math scores. This relationship, however, does not exist for reading scores. Grandfathers with relatively high levels of education (those who received at least some kind of post-college training), on the other hand, are likely to transmit both math and reading skills to their grandchildren.

Similar to the models presented in Tables 5a and 5b, parents' education exerts a considerable influence on children's academic readiness. In general, parents who did not graduate high school have children with lower test scores compared to their counterparts who received a high school diploma or GED. Similarly, mothers and fathers who received more than a high school education (including some college, college degree, or post-college education), compared to those who only received a high school diploma or GED, have children with higher test scores.

Finally, we include other socioeconomic and demographic characteristics into our models. The coefficients for grandparents' educational attainment decrease slightly, but

the significance of these coefficients does not change. Therefore, most of the relationship between grandparents' educational attainment and test scores is explained away with the inclusion of parental educational attainment. Children of grandmothers who stopped their education before high school, compared with children of grandmothers with a high school diploma or GED, have, on average, math scores that are 0.939 points lower. Similarly, children of grandmothers who only attended some high school, compared with children of grandmothers with a high school diploma or GED, have math scores that are 0.596 points lower. Additionally, having a grandmother who received post-college education, compared to having one with just a high school diploma or GED, is positively associated with reading test scores. Grandfather's post-college education is still positively associated with both math and reading scores.

Discussion

Overall, our findings are consistent with what we already know – parental SES matters. However, we find that it is not a simple story of educational attainment; in addition, the experiences of parents in high school are associated with their children's academic readiness at the beginning of kindergarten. Parents' grade point average is strongly associated with children's math and reading test scores, and parents' type of high school exerts a considerable influence on math test scores. The most difficult math course taken in high school is more inconsistent in its relationship with academic readiness, but it appears that children are more likely to suffer when their parents did not take a math course in high school.

Additionally, while parents' educational attainment is strongly predictive of children's academic readiness, grandparents' educational attainment also plays a role in getting children ready for school. Grandmothers with low levels of educational attainment and grandfathers with high levels of educational attainment are particularly predictive of math and reading test scores.

These results suggest that parents' high school experiences are an important predictor of children's academic readiness. It is important to keep in mind that because we have no information on high school experiences of parents with more than a college degree, these results are only applicable to children who meet the following criteria: (a) at least one biological parent filled out the survey; (b) parent(s) attended at least some high school and (c) parent(s) do(es) not have a college degree. Therefore, these results cannot be generalized to all kindergarteners in 1998-99.

Still, our results are quite robust. It is still possible that parents misreport their grades. However, even though there may be a tendency to overestimate one's GPA, there is no reason to suspect that this is true more for some groups than others. Parents' highest math class serves as a reasonable proxy for the difficulty of their high school curriculum. Similarly, high school type also serves to describe the relative quality of peers in school. While these are relatively rough indicators, it is rare to have such detailed information about parental experiences when examining children's educational outcomes.

We also found some support that grandparents' educational attainment is associated with children's test scores above and beyond the influences of parental educational attainment, household income, and occupational prestige. These effects are much stronger in determining math test scores than reading test scores.

In conclusion, our analyses point to the multifaceted manner in which parents' and grandparents' education are important to the schooling experiences of young children. Children whose parents had better educational achievement in high school performed better in K than their counterparts whose parents had lower grades in high school. This suggests that minority parents who have similar levels of education relative to white parents, but whose average grades in school may have been lower, are likely to transfer this disadvantage to their children.

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Table 1. Means and Standard Deviations of Variables Used in Analysis.

Variable Name	Mean	S.D.	Min	Max
Direct Child Assessments at Beginning of Kindergarten				
Math IRT test score	21.607	8.893	6.16	97.70
Reading IRT test score	27.532	10.042	12.89	113.81
Parents' Educational Experiences				
Mother's education				
Primary or middle school	0.046	---	0	1
Some high school	0.091	---	0	1
High school diploma or GED	0.302	---	0	1
Some college	0.321	---	0	1
College degree	0.159	---	0	1
Beyond college	0.081	---	0	1
Father's education				
Primary or middle school	0.048	---	0	1
Some high school	0.082	---	0	1
High school diploma or GED	0.311	---	0	1
Some college	0.261	---	0	1
College degree	0.175	---	0	1
Beyond college	0.123	---	0	1
High school grades[a]				
GPA	2.866	0.658	1	4
Mostly As	0.073	---	0	1
Mostly As and Bs	0.262	---	0	1
Mostly Bs	0.198	---	0	1
Mostly Bs and Cs	0.304	---	0	1
Mostly Cs	0.110	---	0	1
Mostly Cs and Ds	0.037	---	0	1
Mostly Ds or lower	0.010	---	0	1
High school type[a]				
Academic or college prep	0.777	---	0	1
Commercial or business training	0.117	---	0	1
Vocational or technical	0.106	---	0	1
Highest math class[a]				
No math	0.146	---	0	1
Elementary Algebra/Algebra 1	0.171	---	0	1
Plane Geometry	0.183	---	0	1
Intermediate Algebra/Algebra 2	0.308	---	0	1
Trigonometry	0.095	---	0	1
Calculus	0.097	---	0	1
Grandparents' Educational Experiences				
Grandmother's education				
Primary or middle school	0.144	---	0	1
Some high school	0.147	---	0	1
High school diploma or GED	0.427	---	0	1
Some college	0.152	---	0	1
College degree	0.088	---	0	1
Beyond college	0.043	---	0	1

Table 1 continued

Variable Name	Mean	S.D.	Min	Max
Grandfather's education				
Primary or middle school	0.179	---	0	1
Some high school	0.124	---	0	1
High school diploma or GED	0.367	---	0	1
Some college	0.120	---	0	1
College degree	0.118	---	0	1
Beyond college	0.091	---	0	1
Grandparent Involvement				
Number of living grandparents	3.302	1.084	0	5
Number of grandparents close with	2.164	1.246	0	5
Adults in household	2.041	0.686	0	9
Grandparent provides primary child care	0.162	---	0	1
Grandparent ever lived with child	0.064	---	0	1
Other Socioeconomic Variables				
Mother's occupational prestige	28.846	22.511	0	77.5
Mother unemployed	0.324	---	0	1
Father's occupational prestige	32.355	21.084	0	77.5
Father unemployed	0.056	---	0	1
Family income				
Quintile 1	0.205	---	0	1
Quintile 2	0.195	---	0	1
Quintile 3	0.219	---	0	1
Quintile 4	0.185	---	0	1
Quintile 5	0.196	---	0	1
Demographic Variables				
Child race				
White	0.566	---	0	1
Black	0.142	---	0	1
Hispanic	0.174	---	0	1
Asian	0.063	---	0	1
Other race	0.055	---	0	1
Immigrant mother	0.181	---	0	1
Male	0.512	---	0	1
Parent's marital status				
Married	0.727	---	0	1
Separated	0.045	---	0	1
Divorced	0.087	---	0	1
Widowed	0.008	---	0	1
Never married	0.133	---	0	1
Number of siblings				
Zero	0.170	---	0	1
One	0.428	---	0	1
Two	0.259	---	0	1
Three or more	0.093	---	0	1

Note: Means of some dummy variables may not sum to 1 due to rounding.

[a]*The means of these variables are not representative of the entire sample. Parents were only asked these questions if the following conditions were met: 1.) they are the child's biological parent 2.) they attended at least some high school and 3.) they do not have a college degree.*

Table 2. Means and T-Tests of Children's Math and Reading IRT Scores at the Beginning of Kindergarten, by Parents' and Grandparents' Educational Background.

	Math			Reading		
Variable	N	Mean	S.D.	N	Mean	S.D.
Parents' Educational Experiences						
Mother's education						
Primary or middle school	635	14.98	5.72 ***	292	22.24	6.27 ***
Some high school	1,313	16.34	6.44 ***	1,171	21.85	5.95 ***
High school diploma or GED (comparison)	4,429	19.82	7.39	4,222	25.26	8.12
Some college	4,733	22.13	8.11 ***	4,653	27.69	9.34 ***
College degree	2,360	26.35	9.69 ***	2,346	31.85	10.64 ***
Beyond college	1,203	28.16	10.52 ***	1,195	34.64	14.21 ***
Father's education						
Primary or middle school	556	15.28	6.34 ***	262	21.76	5.77 ***
Some high school	978	17.29	6.27 ***	847	23.26	6.70 ***
High school diploma or GED (comparison)	3,763	20.30	7.45	3,608	25.65	7.79
Some college	3,128	22.58	8.16 ***	3,081	28.03	9.24 ***
College degree	2,106	25.90	9.41 ***	2,091	31.65	11.43 ***
Beyond college	1,498	28.70	11.22 ***	1,486	34.86	14.14 ***
High school grades[a]						
Mostly As	681	22.76	9.28 ***	645	28.38	10.38 **
Mostly As and Bs	2,467	21.13	8.18	2,350	26.80	9.39
Mostly Bs (comparison)	1,845	21.29	7.86	1,757	27.03	9.08
Mostly Bs and Cs	2,855	19.92	7.51 ***	2,780	25.50	8.15 ***
Mostly Cs	1,038	19.85	7.53 ***	1,005	25.06	7.26 ***
Mostly Cs and Ds	347	18.46	6.40 ***	345	23.64	6.50 ***
Mostly Ds or lower	92	19.40	6.82 *	91	25.06	9.26 *
High school type[a]						
Academic or college prep	7,144	20.88	7.98 ***	6,898	26.48	9.01 ***
Commercial or business training	1,090	20.95	7.64 ***	1,048	25.99	7.82 ***
Vocational or technical (comparison)	974	18.86	7.23	913	24.78	7.82
Highest math class[a]						
No math	1,336	18.37	6.65 ***	1,254	24.12	7.21 ***
Elementary Algebra/Algebra 1	1,568	20.37	7.47 ***	1,529	25.73	8.21 ***
Plane Geometry	1,682	20.37	7.92 ***	1,586	25.98	8.36 **
Intermediate Algebra/Algebra 2 (comparison)	2,843	21.46	8.08	2,794	26.86	9.05
Trigonometry	869	22.12	8.06 *	856	27.66	9.56 *
Calculus	881	21.27	8.76	820	27.36	10.08
Grandparents' Educational Experiences						
Grandmother's education						
Primary or middle school	1,699	18.51	8.01 ***	1,274	25.95	10.38 ***
Some high school	1,800	20.35	7.59 ***	1,773	26.15	8.80 ***
High school diploma or GED (comparison)	5,244	22.84	8.78	5,220	27.93	9.46
Some college	1,871	23.86	9.33 ***	1,854	29.54	10.92 ***
College degree	1,081	25.91	9.85 ***	1,075	31.66	11.87 ***
Beyond college	527	26.48	10.38 ***	526	32.61	14.19 ***
Grandfather's education						
Primary or middle school	1,968	19.46	8.30 ***	1,599	26.04	9.34 ***
Some high school	1,384	21.07	7.98 ***	1,359	26.60	8.94 ***
High school diploma or GED (comparison)	4,126	22.59	8.63	4,106	27.86	9.42
Some college	1,337	23.74	9.17 ***	1,324	29.39	11.03 ***
College degree	1,318	25.38	9.61 ***	1,304	30.91	11.14 ***
Beyond college	1,032	27.31	10.49 ***	1,024	33.42	13.51 ***

*Notes: ^ p< 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001. Symbols signify that the mean is statistically different from the comparison group.*

[a]*The means of these variables are not representative of the entire sample. Parents were only asked these questions if the following conditions were met: 1.) they are the child's biological parent 2.) they attended at least some high school and 3.) they do not have a college degree.*

Table 3. Means and T-Tests of Children's Math and Reading IRT Scores at the Beginning of Kindergarten, by Demographic Characteristics.

	Math			Reading		
Variable	N	Mean	S.D.	N	Mean	S.D.
Child race						
White (comparison)	8,759	23.72	9.08	8,759	28.74	10.08
Black	2,206	18.08	6.40 ***	2,203	24.69	7.81 ***
Hispanic	2,712	17.51	7.08 ***	1,877	24.78	8.76 ***
Asian	738	24.67	10.31 **	737	31.39	14.10 ***
Other race	884	19.53	8.28 ***	885	25.19	9.56 ***
Mother's immigrant status						
Foreign-born mother (comparison)	2,291	19.66	9.02	1,627	28.42	12.72
Native-born mother	13,030	21.95	8.83 ***	12,856	27.42	9.65 *
Child gender						
Male (comparison)	7,799	21.68	9.42	7,388	26.84	10.07
Female	7,522	21.53	8.32	7,095	28.25	9.96 ***
Parents' marital status						
Married (comparison)	10,157	23.07	9.32	9,626	29.02	10.75
Separated	649	18.78	7.03 ***	594	24.64	7.21 ***
Divorced	1,226	20.69	7.64 ***	1,201	25.92	8.25 ***
Widowed	112	19.02	7.23 ***	104	25.86	8.97 **
Never married	1,874	17.62	6.65 ***	1,739	23.67	7.12 ***
Number of siblings						
Zero (comparison)	2,445	21.58	8.52	2,345	28.42	10.53
One	6,226	22.67	8.95 ***	5,971	28.68	10.54
Two	3,748	21.80	9.23	3,546	27.16	9.51 ***
Three or more	1,326	20.14	8.62 ***	1,204	25.45	9.32 ***

*Notes: ^ p< 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001. Symbols signify that the mean is statistically different from the comparison group.*

Table 4. Means and Standard Deviations of Parents' High School Experiences, by Race.
(Parents with less than a B.A. Degree Only).

Variable	White	Black	Hispanic	Asian	Other race
Mother's education					
Primary or middle school	0.01	0.02	0.18	0.10	0.02
Some high school	0.05	0.16	0.17	0.08	0.10
High school diploma or GED	0.29	0.37	0.30	0.23	0.35
Some college	0.34	0.34	0.26	0.20	0.36
College degree	0.20	0.08	0.06	0.27	0.11
Beyond college	0.11	0.03	0.03	0.12	0.05
Father's education					
Primary or middle school	0.01	0.02	0.20	0.06	0.02
Some high school	0.06	0.09	0.16	0.06	0.10
High school diploma or GED	0.30	0.43	0.32	0.20	0.36
Some college	0.28	0.29	0.20	0.24	0.28
College degree	0.20	0.12	0.08	0.25	0.15
Beyond college	0.15	0.04	0.05	0.20	0.09
Parent's GPA	2.88	2.78	2.90	3.02	2.80
	(0.67)	(0.62)	(0.66)	(0.59)	(0.67)
Type of high school					
Academic or college prep	0.77	0.76	0.77	0.84	0.83
Commercial or business training	0.14	0.10	0.09	0.08	0.08
Vocational or technical	0.09	0.14	0.14	0.08	0.09
Highest math class					
No math	0.15	0.12	0.16	0.13	0.17
Elementary Algebra/Algebra 1	0.18	0.15	0.16	0.08	0.2
Plane Geometry	0.18	0.18	0.21	0.16	0.19
Intermediate Algebra/Algebra 2	0.33	0.32	0.26	0.20	0.28
Trigonometry	0.09	0.12	0.08	0.18	0.08
Calculus	0.07	0.11	0.14	0.25	0.09

Table 5a. Association Between Parents' High School Experiences and Children's Math IRT Scores
(Parents with less than a B.A. Degree Only).

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Parents' Educational Experiences					
Parent's GPA	1.310 ***			0.454 **	0.374 *
	(0.124)			(0.153)	(0.149)
Type of high school					
Academic or college prep		2.024 ***		1.125 ***	0.747 *
		(0.269)		(0.314)	(0.306)
Commercial or business training		2.085 ***		1.552 ***	0.975 *
		(0.347)		(0.297)	(0.387)
Vocational or technical (omitted)		---		---	---
Highest math class					
No math			-3.097 ***	-1.631 ***	-1.458 ***
			(0.259)	(0.312)	(0.304)
Elementary Algebra/Algebra 1			-1.099 ***	-0.327	-0.295
			(0.246)	(0.285)	(0.277)
Plane Geometry			-1.091 ***	-0.728 **	-0.492 ^
			(0.241)	(0.275)	(0.268)
Intermediate Algebra/Algebra 2 (omitted)			---	---	---
Trigonometry			0.653 *	0.105	0.170
			(0.303)	(0.344)	(0.335)
Calculus			-0.199	-0.418	0.171
			(0.302)	(0.343)	(0.341)
Mother's education					
Less than high school				-2.245 ***	-1.153 **
				(0.359)	(0.356)
High school diploma or GED (omitted)				---	---
More than high school				1.154 ***	0.679 **
				(0.207)	(0.205)
Father's education					
Less than high school				-2.200 ***	-1.228 ***
				(0.312)	(0.311)
High school diploma or GED (omitted)				---	---
More than high school				1.990 ***	1.132 ***
				(0.208)	(0.211)
N	9,325	9,208	9,179	7,019	7,019
Adjusted R-squared	0.012	0.006	0.019	0.085	0.139

*Notes: ^ p< 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001.*

Model 5 adds controls for mother and fathers' occupational prestige, unemployment status, income quintile, race, immigrant status, male, parent's marital status, and number of siblings.

Table 5b. Association Between Parents' High School Experiences and Children's Reading IRT Scores.
(Parents with less than a B.A. Degree Only).

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Parents' Educational Experiences					
Parent's GPA	1.488 ***			0.528 **	0.380 *
	(0.140)			(0.177)	(0.174)
Type of high school					
Academic or college prep		1.704 ***		0.707 ^	0.499
		(0.308)		(0.369)	(0.362)
Commercial or business training		1.214 **		0.493	0.059
		(0.396)		(0.463)	(0.455)
Vocational or technical (omitted)		---		---	---
Highest math class					
No math			-2.742 ***	-1.279 ***	-1.133 **
			(0.296)	(0.364)	(0.358)
Elementary Algebra/Algebra 1			-1.133 ***	-0.277	-0.168
			(0.277)	(0.326)	(0.320)
Plane Geometry			-0.880 **	-0.539 ^	-0.414
			(0.274)	(0.318)	(0.312)
Intermediate Algebra/Algebra 2 (omitted)			---	---	---
Trigonometry			0.804 *	0.480	0.371
			(0.340)	(0.394)	(0.387)
Calculus			0.497	0.318	0.321
			(0.346)	(0.402)	(0.403)
Mother's education					
Less than high school				-2.690 ***	-1.861 **
				(0.430)	(0.430)
High school diploma or GED (omitted)				---	---
More than high school				1.040 ***	0.616 *
				(0.239)	(0.237)
Father's education					
Less than high school				-1.501 ***	-0.915 *
				(0.376)	(0.374)
High school diploma or GED (omitted)				---	---
More than high school				2.214 ***	1.342 ***
				(0.239)	(0.245)
N	8,973	8,859	8,839	6,770	6,770
Adjusted R-squared	0.012	0.003	0.014	0.063	0.104

*Notes: ^ p< 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001.*

Model 5 adds controls for mother and fathers' occupational prestige, unemployment status, income quintile, race, immigrant status, male, parent's marital status, and number of siblings.

Table 6. Association Between Grandparents' Education and Children's Math and Reading IRT Scores.

	Math				*Reading*			
Variable	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Grandparent's Education								
Grandmother's education								
Primary/middle school	-3.264 ***	-3.042 ***	-1.777 **	-0.939 *	-0.794 *	-0.709 ^	0.217	0.127
	(0.316)	-3.042	(0.354)	(0.367)	(0.392)	(0.397)	(0.435)	(0.446)
Some high school	-1.784 ***	-1.605 ***	-0.786 *	-0.596 *	-0.980 **	-0.850 **	0.108	0.221
	(0.280)	(0.280)	(0.304)	(0.300)	(0.327)	(0.328)	(0.361)	(0.356)
High school diploma or GED (omitted)	---	---	---	---	---	---	---	---
Some college	0.409	0.446 ^	0.004	0.260	0.845 **	0.862 **	0.286	0.467
	(0.259)	(0.259)	(0.276)	(0.272)	(0.302)	(0.302)	(0.327)	(0.322)
College degree	1.396 ***	1.404 ***	0.198	0.438	1.861 ***	1.895 ***	0.551	0.618
	(0.330)	(0.330)	(0.347)	(0.342)	(0.384)	(0.385)	(0.411)	(0.405)
Beyond college	1.325 **	1.331 **	0.174	0.412	2.111 ***	2.170 ***	1.043 ^	1.222 *
	(0.445)	(0.445)	(0.467)	(0.461)	(0.518)	(0.518)	(0.552)	(0.544)
Grandfather's education								
Primary/middle school	-1.363 ***	-1.333 ***	-0.534 ^	-0.084	-1.317 ***	-1.272 ***	-0.676 ^	-0.394
	(0.293)	(0.293)	(0.319)	(0.316)	(0.349)	(0.350)	(0.383)	(0.380)
Some high school	-0.707 *	-0.754 *	-0.591 ^	-0.465	-0.842 *	-0.862 *	-0.506	-0.467
	(0.294)	(0.294)	(0.315)	(0.310)	(0.344)	(0.344)	(0.374)	(0.368)
High school diploma or GED (omitted)	---	---	---	---	---	---	---	---
Some college	0.846 **	0.807 **	-0.231	-0.176	1.143 **	1.122 **	0.058	-0.010
	(0.289)	(0.288)	(0.306)	(0.302)	(0.337)	(0.336)	(0.363)	(0.358)
College degree	2.080 ***	1.994 ***	0.309	0.248	2.216 ***	2.098 ***	0.434	0.308
	(0.300)	(0.300)	(0.319)	(0.315)	(0.350)	(0.351)	(0.378)	(0.374)
Beyond college	3.791 ***	3.578 ***	1.013 **	1.049 **	4.424 ***	4.228 ***	1.427 **	1.381 **
	(0.344)	(0.344)	(0.366)	(0.362)	(0.401)	(0.402)	(0.434)	(0.429)
Grandparent Involvement								
Number of living grandparents		-0.410 ***	-0.163	-0.165		-0.263 *	0.119	0.172
		(0.100)	(0.109)	(0.108)		(0.120)	(0.132)	(0.130)
Number of grandparents close with		0.547 ***	0.226 **	0.103		0.345 ***	0.037	-0.018
		(0.081)	(0.085)	(0.085)		(0.096)	(0.103)	(0.103)
Adults in household		0.112	-0.642 ***	-0.662 ***		0.422 *	-0.221	-0.456 *
		(0.135)	(0.181)	(0.181)		(0.165)	(0.229)	(0.229)
Grandparent provides primary child care		-1.112 ***	-0.091	0.103		-1.240 ***	-0.155	-0.132
		(0.234)	(0.268)	(0.272)		(0.277)	(0.322)	(0.326)
Grandparent ever lived with child		-1.153 **	-0.881 *	-0.667 ^		-0.119	0.487	0.381
		(0.345)	(0.365)	(0.362)		(0.406)	(0.436)	(0.433)

	Math				*Reading*			
Variable	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Parent's Education								
Mother's education								
Primary/middle school			-2.188 **	-1.198 ^			-1.747	-1.203
			(0.714)	(0.712)			(1.161)	(1.152)
Some high school			-2.390 ***	-1.638 **			-3.113 ***	-2.398 ***
			(0.478)	(0.476)			(0.603)	(0.601)
High school diploma or GED (omitted)			---	---			---	---
Some college			0.999 ***	0.788 **			1.101 ***	0.848 **
			(0.244)	(0.242)			(0.292)	(0.290)
College degree			2.930 ***	2.159 ***			2.985 ***	2.061 ***
			(0.306)	(0.315)			(0.365)	(0.375)
Beyond college			3.972 ***	3.071 ***			4.857 ***	3.809 ***
			(0.382)	(0.409)			(0.455)	(0.487)
Father's education								
Primary/middle school			-1.911 **	-0.669			-2.045 *	-1.307
			(0.660)	(0.660)			(1.030)	(1.021)
Some high school			-1.705 ***	-1.043 *			-1.340 *	-0.890 ^
			(0.418)	(0.416)			(0.520)	(0.517)
High school diploma or GED (omitted)			---	---			---	---
Some college			1.225 ***	0.890 ***			1.291 ***	0.874 **
			(0.248)	(0.246)			(0.295)	(0.293)
College degree			3.222 ***	2.150 ***			3.834 ***	2.560 ***
			(0.292)	(0.304)			(0.347)	(0.362)
Beyond college			4.943 ***	3.348 ***			5.469 ***	3.533 ***
			(0.338)	(0.380)			(0.402)	(0.453)
N	10,866	10,772	9,020	9,020	10,441	10,351	8,662	8,662
Adjusted R-squared	0.075	0.080	0.172	0.198	0.046	0.048	0.130	0.158

*Notes: ^ p< 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001.*

Model 4 adds controls for mother and fathers' occupational prestige, unemployment status, income quintile, race, immigrant status, male, parent's marital status, and number of siblings.