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and the Black-White Achievement Gap**

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Abstract

Intergenerational Stratification, Child Development and the Black-White Achievement Gap

This paper combines theories of racial stratification with insights from developmental psychology to test hypotheses about how disparities in family, neighborhoods, schools, and peers explain the black-white test score gap among children of different ages. We focus on the previously unexplained gap among older children by adding multi-generational resources and out-of-home contexts data from the PSID, Census, and Common Core data. We found that differential resources available to black and white grandparents affect parental neighborhoods, mother's cognitive skills, parental socioeconomic status and parenting behavior. These early disparities lead to black children having lower cognitive skills before school starts which have cumulative long-term implications for their achievement trajectories. Grandparent resources, neighborhoods, schools, and peers become more prominent determinants in the middle and high school years.

Intergenerational Stratification, Child Development and the Black-White Achievement Gap

Scholars in stratification and education have an enduring interest in the mechanisms and consequences of intergenerational transmission of advantages or disadvantages in open democratic societies (Bourdieu 1977; Khan 2010). Here we examine an example of this more general theoretical issue, specifically the black-white educational achievement gap in the United States. Racial gaps in educational achievement in the U.S. exist in standardized test scores, grade point averages, placement in gifted or special education, dropout rates, and college attendance and graduation (Jencks and Phillips 1998, Ladd 2008, Persell and Hendrie 2005). Their persistence has vital individual and societal consequences. For individuals, educational achievement is related to educational attainment, occupations and earnings (Jencks 1998; Johnson and Neal 1998) and health (Reynolds and Ross 1998). For societies, cognitive achievement gaps have implications for equal opportunity, for the skills of the workforce, and for international competitiveness.

Two studies show that racial achievement gaps among young children can be completely explained by a set of family, child, and school characteristics (Fryer and Levitt 2004 and Yeung and Pfeiffer 2009).¹ However, the same set of covariates did not explain racial achievement gaps in later school years. Fryer and Levitt (2006) found that, by the end of first grade, the achievement gap persisted even when school fixed effects were included in the models. Yeung and Pfeiffer (2009) documented that disparities in early childhood home environments explain the achievement gap in the early years but the gaps in middle schools and high schools remained substantial at half a standard deviation or more even when the same covariates are controlled. They also showed that an early achievement gap is highly predictive of later gaps (consistent with Alexander, Entwistle, and Horsey 1997). These findings suggest that different factors may affect the achievement gap at various ages and it is important to examine achievement gaps from a longitudinal perspective.

This paper introduces additional factors and considers their effects on children at different ages, in an effort to explain the remaining gaps among older children noted above. As a large set of factors are involved and the processes are complicated, we focus on math score gaps because they tend to be larger,

more persistent over time and into older ages, and more likely to be affected by out-of-home factors than verbal score gaps. We draw on two theoretical traditions: (1) racial stratification theories which emphasize the nature, size, and structural embeddedness of black and white intergenerational resource differences that shape the educational achievement of subsequent generations and (2) developmental theories that augment stratification theory with insights about how children at different ages are influenced more or less by various factors and the cumulative nature of achievement skills over a child's life course. We argue that these theoretical orientations together can more adequately explain the dynamics of racial achievement gap among children of various ages.

Largely due to data limitations, the black-white achievement gap has seldom been analyzed for children across different age groups with multi-generational data that include a broad array of resources related to stratification, including family socioeconomic status (SES) and attitudes, neighborhood characteristics, schools, and peers unfolding through three generations. We use a rich national longitudinal dataset containing information on children from preschool to high school years, allowing an examination of the impact of prior events and performance on changes in a child's cognitive skills at different ages, and better addressing unobserved heterogeneity than cross-sectional data. We extend the traditional intergenerational transmission of (dis)advantages by analyzing the extent to which grandparents' resources and factors in social contexts outside of the home, including schools, peers, and neighborhoods may contribute to black-white achievement disparities at different ages.

RACIAL STRATIFICATION THEORY

Research over at least four decades shows that socioeconomically disadvantaged children (who are disproportionately black) tend to perform less well academically (Coleman et al. 1966; Duncan and Magnuson 2005; Entwisle, Alexander, and Olson 1997; Magnuson and Waldfogel 2008; Rothstein 2004). Racial stratification theory stresses the very strong (nonrandom) relationships between race, power and socioeconomic resources (Bonilla-Silva 1996 and Omi 2001). These inequalities are mediated by families, neighborhoods, schools, and peers. Considerable research examines the effects of these contexts on academic achievement although not all of them connect specifically to the racial achievement *gap*.

FAMILIES

Racially stratified differences in family resources and characteristics may contribute to racial achievement gaps through financial, human, social, and cultural capital (Bourdieu 1977, Coleman 1988; Magnuson and Waldfogel 2008), parenting behavior and home environment (Philips et al. 1998; Duncan and Brooks-Gunn 1997), parental expectations and values (Kohn 1969; Lareau 2003), or family structure (Hill, Yeung and Duncan 2001).

Racially stratified differences in family wealth, especially intergenerationally, are far greater than income differences and can affect children's achievement (Oliver and Shapiro 1997, Conley 1999, and Yeung and Conley 2008). Wealth is a better proxy of permanent income than family income, since income may largely pay for basic living expenses and current consumption. The presence or lack of assets may mean the difference between owning a home in a better school district, extra-curricular activities, or private school attendance. Assets may act as a buffer in times of financial need (Sherradan 1992) and possibly reduce parental stress, thus leading to more positive parenting practices. Additional resources can also affect children's achievement via socio-psychological mechanisms, enabling parents to provide materials that may enhance a child's social status or acceptance by his/her peers such as a nice family car, clothing or toys, which have been found to have a positive impact on adolescents' self esteem (Walker and Greene 1986) and achievement (Evans, Hout and Mayer 2004).

Family relationships and interactions can mediate how larger contexts affect racial achievement gaps. Parental educational expectations for their children, emotional support, involvement with homework, levels of cultural capital in the home, parental involvement in the child's school, and children's time use vary by race and account for some of the achievement gap (Duncan and Magnuson 2005; Yeung and Pfeiffer 2009).

MULTI-GENERATIONAL FACTORS

Most stratification research has focused on parents and children. Adding a third (grandparental) generation permits analysis of historical inequalities of wealth, human capital such as education, knowledge, and skills; social capital from neighborhood contexts, institutional affiliations, and other

relationships; and cultural capital in the form of attitudes, values, and practices. In black families, intergenerational transfers of financial assets are more likely to be from parents to grandparents, while in white families such transfers are more likely to be from grandparents to parents or grandchildren (Johnson 2006).

Adding grandparents' characteristics to measures of family environment reduced the racial test score gap among young children by two-thirds instead of one-third without it (Phillips et al. 1998).

Maternal grandparents with higher education are more likely to raise children who use parenting strategies that positively affect the educational achievement of their own children aged 10-14 (Mandara, Varner, Greene, and Richman 2009).

When grandparents live in neighborhoods with higher levels of poverty, their adult children are also more likely to live in neighborhoods with concentrated poverty when they become adults, as are the grandchildren (Sharkey 2008). Sharkey and Elwert (forthcoming) find a strong multigenerational impact of neighborhoods on test scores although they do not examine how neighborhood effects may vary for children of different age groups.

NEIGHBORHOODS

Considerable research documents the growing concentration of poverty in some neighborhoods compared to others and how black Americans are much more likely than white Americans to live in areas of concentrated poverty (Wacquant and Wilson 1989; Peterson and Krivo 1999). Although the extent to which, and how, neighborhood affects children's outcomes has been heavily debated and the evidence is mixed, scholars have identified potential mechanisms through which neighborhoods may affect child development (Brooks-Gunn, Duncan, Klebanov, Sealand 1993; Roscigno, Tomaskovic-Devey, and Crowley 2006). These mechanisms include neighborhood poverty, peer influences, institutional factors, role modeling and collective monitoring, labor market opportunities, parenting behavior, and relative deprivation (Card and Rothstein 2007; Jencks and Mayer 1990). Ainsworth (2002) found that a

greater prevalence of high status individuals in a neighborhood is related to an increase in adolescent test scores, while neighborhood economic deprivation is associated with lower test scores. As children get older, they become more aware of their neighborhoods and the people in them. On the other hand, a large study based on experimental data from the “Moving to Opportunity” (MTO) program for over 5,000 children aged 6 to 20 found no neighborhood effects on test scores (Sandonmastsu et al. 2006). However, the MTO sample is highly selective, few children nationally live in neighborhood as disadvantaged as these children did, and few moved into very ethnically-integrated or affluent neighborhoods. Neighborhood effects and mechanisms for a more diverse population warrant further investigation.

SCHOOLS

Besides intergenerational racial inequalities in their families and neighborhoods, children may encounter racial and/or socioeconomic inequalities in their schools which are related to racially and economically segregated neighborhoods. Important factors include school sector (public vs. private school attendance) and the racial and socioeconomic composition of schools (Bankston and Caldas 1996, Condron 2009, Crosnoe 2009, Roscigno 1999), among others. Rumberger and Palardy (2005) found that “the average socioeconomic level of students’ schools had as much impact on their achievement growth as their own socioeconomic status, net of other background factors.... The results suggest that schools serving mostly lower-income students tend to be organized and operated differently than those serving more-affluent students, transcending other school-level differences such as public or private, large or small” (2005: 1999).

PEERS

Families, neighborhoods, and schools are all related to the potential peers a student may encounter. The importance of peers for adolescent achievement has been noted by many scholars (e.g., Cook, Herman, Phillips, and Settersten 2002; Diamond, Lewis, and Gordon 2007). As children get older, they spend less time with their families and more time with their peers, suggesting that peer attitudes and behaviors might help to explain adolescent achievement more than that of younger children.

Some scholars argue for using an integrated framework that encompasses factors from multiple contexts to understand children's achievement. For example, Wilson (2009) calls for embedding individual and cultural phenomena in structural conditions, such as the neighborhood environments families are exposed to over time. Bronfenbrenner's ecological system model underscores the importance of multiple contexts in which children learn, including family, kin, peers, schools, neighborhood, community, region, and country (1979). His framework helps connect racially stratified inequalities to child development theories, providing insight into how racially structured multiple social contexts can contribute to children's cognitive development.

DEVELOPMENTAL THEORIES

Research on children's cognitive development emphasizes that much that shapes the final human outcome takes place in the home during the first years of life (Gewirtz 1969; Plomin 1986). According to these perspectives, there are critical life stages, many in early childhood, when a child must be exposed to certain experiences, or lasting damage will be done to its cognitive development (Williams 1972). Empirical results based on longitudinal data find that the negative impact of family income and divorce on children's educational attainment is stronger in early childhood (Duncan et al. 1998; Shonkoff and Phillips, 2000). Phillips et al. (1998) and Brooks-Gunn et al. (2003) examine the black-white achievement gap for preschoolers and show that family socioeconomic status can account for about one third of the raw score difference. However, this study did not compare younger and older children.

Scholars influenced by Piaget's models of child development (1983) emphasize certain environmental influences that become more important for an older child's educational and cognitive outcomes. They argue that only from early adolescence (from 11 to 12 years) on is a child likely to

understand the full significance of the societal messages that he or she receives from a racialized and/or impoverished environment (such as neighborhoods, schools and peers). Stratification scholars such as Bourdieu (1977) also suggest that around the ages of 10-12 children become much more aware of what “someone like me” can do in the world.

Only from early adolescence on do children start to consider the consequences of decisions, and show the ability to generate and choose from a range of options (Keating 1990). As children move through upper elementary school, their grades may have an increasingly larger impact on their self-perceptions and cumulative achievement (Smith, Jussim and Eccles 1999). The developmental literature shows the greater susceptibility of adolescents to out-of-family influences in the school and neighborhood compared to younger children (Elliott et al. 1985; Lerner and Galambos 1998). The stage/environment fit theory by Eccles et al. (1993) underscores certain school factors as particularly salient for adolescents’ development.

Grandparent resources are also expected to have a stronger impact on older than younger children, and especially negatively on black children, as the much higher level of resources from grandparents available to white children tends to contribute to better neighborhoods, private school attendance, and provide positive role models that become more relevant to older children. These factors may help explain achievement gaps in older children because (1) adolescents are more aware of their influence, (2) they are likely to have a stronger negative impact on black than white adolescents, and (3) the effects from these factors are cumulative over time, resulting in an increasing disadvantage for black children as they get older.

HYPOTHESES

Guided by racial stratification, developmental theories, and multi-generational factors, our central hypothesis is that contextual and multi-generational inequalities have greater explanatory power for black-white achievement disparities among older children than among younger children and reduce the large unexplained racial achievement gap in the higher grades found in previous literature.

More specific hypotheses are:

- 1) Grandparental resources and neighborhoods affect parental neighborhoods, socioeconomic status, mother's cognitive skills, and parental educational expectations for their children. These in turn are associated with racial achievement gaps among the grandchildren.
- 2) Family factors explain more of the racial gap among younger children than among older children, while neighborhoods, schools, and peers explain more of the racial gap among older children than younger children.
- 3) Intergenerational resources have a stronger impact on older children, because the much higher level of resources from grandparents available to white children increases the likelihood of better neighborhoods, schools, and peers that offer positive role models, which become more relevant as children mature.

DATA AND METHODS

We analyze data from the Panel Study of Income Dynamics (PSID) and its Child Development Supplements (PSID-CDS). This national dataset includes cognitive assessment data for children from preschool to high school ages and contains long family histories on children, which can be matched to contextual census data over 35 years, using Geocodes. The PSID is a longitudinal study that began in 1968 with a nationally representative sample of about 5,000 American families, with an oversample of low-income black families. Over four decades, the study collected high quality annual data from these families and individuals about their demographic, socioeconomic, and employment characteristics and behaviors. One of the PSID rules was to follow children of the original sample member as they set up their own households. By 1996, the sample had grown to include over 8,700 families, with data spanning multiple generations.

In 1997, the PSID initiated a Child Development Supplement (CDS-I) to provide data on a nationally representative sample of children aged 0-12 and their families. All children in the CDS were selected from the PSID families. In families with more than one child, up to two siblings were randomly selected to participate in the study. The sample size of CDS-I is 3,563 children in 2,394 families (with a

response rate of 88% at the family level). A follow-up interview with CDS-I children who were in participating PSID families was conducted in 2003.

In CDS-II, 2,019 families were successfully re-interviewed, resulting in a sample of 2,907 children. These children were between the ages of 5-17 in 2003. The response rates are about 91% at the family level, and 84% at the child level. Longitudinal sampling weights are used to adjust for non-responses and for the original selection probability.

SAMPLE

Only children who were aged three to twelve received achievement assessments in 1997, and the response rate for the assessments was about 81%. The analysis sample consists of children who received assessments in either wave of the CDS. We include black and white children only (about 88% of the sample) due to the limited representation of other ethnic groups in CDS. Finally, we include those with valid neighborhood data from census and school data from the Common Core data. Due to these selection criteria, the final longitudinal study sample is 1,529 to 1,675 children depending on which models we estimate. While not a large sample this dataset permits detailed intergenerational analyses.

KEY CONCEPTS AND MEASURES

The dependent variable, children's cognitive skills, is measured with the Woodcock Johnson (W-J) Achievement Test-Revised Applied Problems scores. The main independent variables, selected based on previous literature, include grandparents' resources (grandparents' wealth, education, poverty in grandparents' neighborhoods, and grandparental self-efficacy), family characteristics and resources (parental self-efficacy, poverty and the presence of positive role models in the census tracts where parents reside, parental SES, parental educational expectations), school characteristics (the degree of economic segregation in schools and whether a child attended private school), peers (the number of friends a young person has who avoid trouble and the academic orientation of their peers), and the child's prior test scores. Child and home characteristics as well as family interaction variables identified in previous research are also included in the analysis. See Appendix 1 for detailed descriptions of these covariates.

ANALYTICAL STRATEGY

To examine how the achievement gap can be explained differently at various developmental stages, we examine three age cohorts separately, based on child's grade in school in CDS-I (1997), and follow their test scores over time from CDS-I to CDS-II. We do this for the following reasons: (1) Educational research shows that the patterns of racial achievement test score gaps vary over time; (2) Developmental theories suggest that factors contributing to racial achievement gaps in different childhood stages may vary; and (3) Given the cumulative nature of learning, it is important to understand children's performance over time. Our exploratory analysis also indicates that there is an interaction effect between race and age cohorts on some of the test score measures.²

The youngest cohort, the "transitioning to elementary school" cohort, includes children who were not yet in formal schooling in 1997 and had transitioned to grades 4–6 in 2003. The middle cohort, the "transitioning to middle school" cohort, includes children attending grades 1-3 in 1997 who had transitioned to middle school (grades 7–9) in 2003. The oldest cohort, the "transitioning to high school" cohort, includes children who were attending grades 4-7 in 1997 and had transitioned to high-school (grades 10–12) in 2003.

After comparing the racial differences on the variables, we analyze how grandparents' characteristics may affect parents' socioeconomic status, cognitive skills, parenting values and behavior, and neighborhoods. Then we use stage-wise regression analysis to examine the extent to which the racial achievement gap is reduced as we add different clusters of covariates to the explanatory models.³ We begin with grandparental characteristics and other family background variables that were found to be significant in past research by Fryer and Levitt (2004) and Yeung and Pfeiffer (2009). We then add neighborhood contextual variables, school context variables, and peer variables. In the final models for the wave-II (2003) test scores, we add child's prior test scores in 1997. Subsequently, we use Oaxaca Decomposition analysis to analyze the relative importance of different clusters of variables— family, neighborhood, school, and peers— for explaining the black-white achievement gap among children in different age cohorts.

RESULTS

COMPARING BLACKS AND WHITES

Table 1 shows the weighted means and standard deviations of the major variables used in the analyses. The test score gap between black and white children and the socioeconomic disparities between black and white families are striking. Black grandparents, on average, have two and a half years fewer schooling and a much higher proportion have debts or zero wealth than white grandparents do (40% vs. 13%). The racial differences in characteristics of neighborhoods and schools are stunning. Both black grandparents and parents are much more likely than their white counterparts to live in neighborhoods with high poverty and fewer positive role models (measured by percent of college graduates and professionals), and in many cases the differences are even larger in the parental generation.

Figure 1 depicts the racial disparities in neighborhood characteristics for grandparental and parental generations. All characteristics have worsened for black parents compared to black grandparents except for the percent of college graduates and professionals in the neighborhoods due to the increasing level of education in the U.S. (Berends, Lucas, and. Penaloza 2008).

[Table 1 and Figure 1 about here]

Black children on average attend schools in which a majority of students are eligible for free lunches (i.e., high poverty schools), while whites on average attend schools where only one out of five children are eligible for free lunches. Whites are almost twice as likely as blacks to attend private school. White adolescents are more likely than blacks to report having more peers who are more academically oriented.

INFLUENCE OF GRANDPARENT RESOURCES AND CHARACTERISTICS

How do the racial stratification experienced by grandparents related to racial stratification in the parents' generation? The data show that when grandparents live in neighborhoods with higher levels of poverty, parents are more likely to live in neighborhoods with concentrated poverty when they become adults (Pearson correlation = .66). We regressed parental education, occupation, income, wealth, mother's cognitive skills, and parenting practices on grandparental education, degree of self-efficacy, whether they had any assets, degree of neighborhood poverty, and proportion of positive role models in

their neighborhoods, while controlling for the race and gender of the parent. Table 2 shows that grandparents' educational levels are positively associated, sometimes strongly, with parental education, occupation, family income, mothers' cognitive skills, parents' educational expectations for their own children, and the cognitive stimulation parents provide for children in the home.

[Table 2 about here]

Given that on average black grandparents have two and a half years fewer schooling than white grandparents, this is a significant intergenerational disadvantage experienced by blacks that is significantly related to their children's life chances. Grandparents' self-efficacy is positively associated with the level of education parents obtain, parental family income, net wealth, the cognitive stimulation parents provide to their children, and parents' educational expectations for their children. Grandparents' lack of assets is negatively associated with parents' occupational prestige and net wealth. One particularly interesting finding is that parents whose own parents lived in neighborhoods with higher proportions of positive role models are more likely to have higher prestige occupations.

Parental neighborhood characteristics in turn are related to the type of schools children attend and the peers they have. We regressed children's school and peer characteristics on family neighborhood characteristics, controlling for the race and gender of the child (results not shown but available on request). Children whose families live in neighborhoods with concentrated poverty are more likely to attend economically more segregated schools with higher proportions of students receiving free lunches and more likely to have peers who engage in problem behaviors.

Having established a number of associations between grandparental and parental resources, as well as parental social contexts and the characteristics of their children's peers and schools, we consider the extent to which these indicators of intergenerational and contextual racial stratification help to explain the racial gap in achievement test scores for older children.

DO INTERGENERATIONAL AND CONTEXTUAL FACTORS HELP TO EXPLAIN RACIAL GAPS?

Table 3 summarizes the results for the three age cohorts assessed in both waves of the survey. The race coefficients in these models represent the magnitude of the black-white achievement gap. We

observe how the gaps shrink as grandparent characteristics, other family characteristics, neighborhood, school, peer factors, and prior test scores are added sequentially to the model. Unfortunately, no prior test scores are available in CDS-I. Due to space constraints, we only show coefficients for our hypothesized variables on grandparents, neighborhood, school, and peers. Other family covariates are not presented but available upon request. We checked all models for potential multicollinearity problems.⁴ All models use Huber–White adjusted standard errors that allow for multiple respondents from the same family.

GAP IN APPLIED PROBLEMS SCORES ACROSS AGE COHORTS

The key points in Table 3 are that (1) racial gap was already large before formal schooling started (at .78 of a standard deviation) and grew over time for the first two birth cohorts, and (2) for all three age cohorts, the racial achievement gaps assessed in both waves were reduced to non-statistically significant levels after intergenerational and contextual factors are controlled. In contrast to the large and statistically significant gaps in previous studies, the gaps in middle and high school years were reduced to a non-significant level. Adding prior test score of a child further reduces the gap to a much smaller level, suggesting the cumulative nature of achievement gap.

[Table 3 about here]

The racial achievement gap (as indicated by the race coefficients) becomes non-significant after the family covariates are controlled when the youngest and middle cohorts were in pre-school and in Grades 1-3 respectively in 1997 (Table 3 Panels A and B). Grandparents' characteristics account for about a quarter and a third of the gap in each group respectively. However, grandparents' characteristics do not have a direct effect on the grandchildren's achievements, but operate indirectly through parents' characteristics (data available on request). Neighborhood factors are not significant, consistent with previous findings that family factors account for most of the gap in the early school years.

Since family factors have been the focus in previous studies and this paper focuses on intergenerational and out-of-home contexts, we will not detail the findings about family in this paper but only note that the data have consistently shown that factors prior to or at the child's birth matter a great deal. Markers of mother's early economic disadvantage and health risk behaviors such as being a teenage

mother or having a low birth weight baby are negatively associated with test scores in childhood. Mother's cognitive skills, early childhood family income, parents' education and occupational prestige, and parental expectations for children's educational attainment are also significant explanatory factors for early racial achievement gaps. Many of these factors are significantly related to grandparents' characteristics as shown in Table 2.

For children in grades 4-8 in 1997, however, the gap in applied problems scores is reduced to .29 of a standard deviation after the home covariates are controlled for, but remains significant (Table 3, Panel C). Grandparents' characteristics account for almost 40 percent of the gap, but again operate indirectly through parents' characteristics. The neighborhood covariates explain an additional 2 percent of the total variance and reduce the gap to a non-significant .27 of a standard deviation. In particular, the percent of college graduates and professionals living in the census tract in which the family resides (the role model mediating pathway) is positively and significantly related to children's math skills at this age.

When these children were re-interviewed in 2003, the youngest cohort was in elementary school (grades 4-6) when the gap in the test scores had grown to almost one standard deviation (Table 3, Panel A). A quarter of this gap is accounted for by the grandparents. When all family covariates are controlled, the gap is reduced to a non-significant .3 of a standard deviation and remains non-significant when neighborhood and school covariates are added.⁵

For the middle cohort who had transitioned to middle school (grades 7-9) in wave II, the gap had also grown to one standard deviation (Table 3, Panel B). When grandparental covariates are added, this gap is reduced to .80 of a standard deviation, which remains significant. Middle school students whose grandparents had zero assets or were in debt scored almost a quarter of a standard deviation lower on applied problems than those students whose grandparents had some assets. Parental characteristics reduce the gap to .42 of a standard deviation. When neighborhood and school covariates are added, they do not reduce the gap further. However, peers are significantly associated with test scores for this age group (Table 3, Panel B). Early adolescents who have more friends who avoid gangs, using drugs, or fighting have higher applied problems test scores than those with fewer friends who avoid trouble. When peer

covariates are added, the racial gap decreases to .34 of a standard deviation and becomes non- significant. Finally, when the prior test score of a child is controlled, the gap is reduced by half, underscoring the cumulative nature of the racial test score trajectories.

For the oldest cohort who had transitioned to high school (grades 10-12) in Wave II, the racial gap in applied problems scores was .78 of a standard deviation, without controlling for any other factors (Table 3, Panel C). When grandparental characteristics, including their education, wealth, and neighborhood contexts, are added to the regression analysis, it reduces the test score gap by about 22 percent to .61 of a standard deviation, but the gap remains significant. The gap is larger for children whose grandparents have no wealth or are in debt. When child and parental personal characteristics, educational expectations, and parenting practices are all added to the regression, the size of the race coefficient drops to .42 of a standard deviation (Table 3, Panel C). Clearly, parental factors are important, but the racial gap remains significant. Adding parental neighborhood characteristics does not reduce the race coefficient. However, controlling for school economic segregation reduces the race coefficient to .36 of a standard deviation which is no longer statistically significant at .05 level. Controlling for the child's prior (1997) test score has a strong and significant effect on their 2003 achievement, and reduces the gap to nearly nil (-.03). This suggests that the test score gap did not continue to grow between the two waves for this oldest cohort and that factors contributing to test score gaps in grades 4–7 (and the prior test score) can account for the remaining gaps in high school.⁶

DO DIFFERENT FACTORS EXPLAIN APPLIED PROBLEMS ACHIEVEMENT GAPS AT DIFFERENT DEVELOPMENTAL STAGES?

To address this question more directly, we conducted a two-fold Oaxaca decomposition analysis using the Stata command developed by Jann (2008). This counterfactual decomposition technique popularized by Blinder (1973) and Oaxaca (1973) is used to study mean outcome differences between groups. Here we wish to see the degree to which different clusters of covariates explain the achievement gap at various developmental stages. The decomposition involved running separate regressions for black and white children in our sample and decomposing the gap in test scores between them into a part

explained by differences in group characteristics (as measured by differences in group means at a given predictor level) and a part of the gap due to different returns to those characteristics (as measured by differences in the coefficients, weighted by predictor levels). Algebraically, the decomposition can be expressed in the following equations:

$$R = Q + U$$

where the first component “Q” is the part of the outcome differential that is explained by group differences in the predictors such as family SES, or the “quantity effect”. Q is expressed as:

$$Q = [E(X_A) - E(X_B)]' \beta^*$$

Identifying the contributions of the individual predictors to the explained part of the differential is easy because the total component is a sum over the individual contributions. For example:

$$\hat{Q} = (\bar{X}_A - \bar{X}_B)' \hat{\beta}_A = (\bar{X}_{1A} - \bar{X}_{1B}) \hat{\beta}_{1A} + (\bar{X}_{2A} - \bar{X}_{2B}) \hat{\beta}_{2A} + \dots$$

where $\bar{X}_1, \bar{X}_2 \dots$ are the means of the single regressors and $\hat{\beta}_1, \hat{\beta}_2 \dots$ are the associated coefficients.

The first summand reflects the contribution of the group differences in \bar{X}_1 , the second differences in \bar{X}_2 and so on.

The second component, “U,” is the “coefficients” part. U is expressed as:

$$U = E(X_A)' (\beta_A - \beta^*) + E(X_B)' (\beta^* - \beta_B)$$

The latter component is usually described as the *returns on the coefficients* of the predictors, if predictor levels were the same for both groups. Similarly, the individual contributions to the coefficients/unexplained part are the summands in

$$\hat{U} = \bar{X}'_B (\hat{\beta}_A - \hat{\beta}_B) = \bar{X}'_{1B} (\hat{\beta}_{1A} - \hat{\beta}_{1B}) + \bar{X}'_{2B} (\hat{\beta}_{2A} - \hat{\beta}_{2B}) + \dots$$

It is important to note that this second component may also capture all potential effects of differences in unobserved variables. Therefore, Jann refers to it as the “unexplained” part while the first component is the “explained” part.

The decomposition results are in Table 4. We cluster all of the covariates into groups to better determine the overall contribution of that cluster of variables to the black-white test score gap.⁷ The

largest cluster is the “family” group of variables which includes covariates that capture the child’s characteristics, grandparental characteristics, and parental family background (see Table 1). The other clusters are “Neighborhood,” “School” and “Peer” (the covariates in these clusters are also shown in Table 1. The “Overall Difference” at the bottom of table 4, representing the achievement gap between black and white children, is decomposed into the explained and unexplained components.

[Table 4 here]

Panel A shows that differences in family endowments are large and significant for explaining the Wave I (1997) test score gap for pre-school children, those in grades 1-3, and those in grades 4-8. Neighborhood characteristics become significant for children in grades 4-8. Data for peer and school characteristics were not available for young children in 1997. The large majority of the difference in test scores between black and white children is explained by differences in family endowments for the two younger cohorts, but among the oldest cohort in wave I (in grades 4-8) the portion explained by differences in *returns* to those endowments (the coefficients or unexplained portion) rises to a significant 36.5 percent ($.27/.74=36.5\%$) of the total gap.

In wave II of the study (2003), when the youngest cohort had transitioned to grades 4-6, the racial gap in applied problems score was .94 of a standard deviation (Table 4, Panel B). Two-thirds (.65) of the gap was explained by differences in endowments between black and white children, specifically racial differences in family characteristics explain 90 percent of the gap within endowments.

For children who had transitioned to middle school in Wave II (Table 4, Panel B, grades 7 to 9), 67 percent of the applied problems gap is explained by differences in endowments (.67 of the total gap of one standard deviation) and 34 percent by the difference in coefficients (returns). Of the gap due to endowments, more than half is explained by differences in family characteristics. While the Neighborhood group of variables is not significant overall, decomposition of the individual variables (available on request) as well as the OLS findings above confirm that having more positive role models in a child’s neighborhood explains a significant part of the test score gap for middle school children. In

addition, having more peers who avoid trouble accounts for a significant .14 of the standard deviation gap.

The oldest cohort who had transitioned to high school in Wave II shows a somewhat different pattern (Table 4, Panel B, grades 10-12). First, less of the gap is explained by differences in endowments than for elementary and middle school students and the endowment portion (.39) is only slightly larger than the coefficient portion (.36). Second, the importance of family characteristics continues to shrink relative to the total (explaining only .20 of a standard deviation, or 27 percent of the total gap). Finally, in high school, attending schools with more low income students explains 23 percent of the achievement gap (.17).

The coefficients column for the high school cohort shows that returns to endowments are not significant for separate clusters of variables. However, overall the differences in coefficients (controlling for levels of endowment) explain almost half the total gap (.36 of a standard deviation in test scores). The significance of the coefficients column among middle and high school cohorts suggests that in the upper grades, in addition to having different personal and social endowments, black and white adolescents are achieving differently for reasons that we cannot fully explain here.⁸

In sum, family factors are important for all age groups, but seem to shrink steadily in importance as children get older. Neighborhood and peer factors, on the other hand, seem to account for a greater portion of the achievement gap for middle school children, and be somewhat relevant for high school students, compared to elementary students. Also, while differences in family and personal characteristics explain most of the achievement gap at the elementary school level, children in middle and high school may experience different returns to those same characteristics or be affected by unobserved factors, one of which could be discrimination. These differential returns to similar endowments among adolescents of different races warrant further research.

DISCUSSION AND CONCLUSIONS

The results support our hypothesis that racially stratified contextual and intergenerational inequalities can help account for the large unexplained achievement differences in math achievement between black and white children in middle and high school. Consistent with both developmental and stratification theories, the black-white differences in early resources and home environments are largely responsible for setting off the initial racial achievement gap before children start school. There are deep intergenerational roots to the racial achievement gaps, starting with the differential resources available to black and white grandparents, which in turn affect mothers' cognitive skills, parental socioeconomic status, and parents providing a cognitively stimulating home environment. Grandparental characteristics are related to the racial achievement gaps among children at all ages, though in most cases indirectly through parents' characteristics, except for grandparents' wealth which is directly related to older children's achievement. Early gaps have cumulative implications for achievement trajectories in later school years, as evidenced by the generally increasing importance of prior test scores as children move to higher grades.

As developmental theories suggest, when children reach early adolescence (at age nine or ten) they become increasingly aware of their larger surroundings. When they see more adults in their neighborhoods who have obtained college educations and achieved professional jobs, they may gain a better sense of how education connects to their future. Their peers become increasingly important, while families become less so, although families remain important. The influence of neighborhoods and peers seems to become important in late elementary school and is significant for adolescents in grades 7-9 and 10-12.

For decades, social commentators and theorists have been arguing that racial differences in achievement are due more to historical racial inequalities and racially stratified access to key economic, social, and cultural resources than to race per se, but there has been limited longitudinal research to support such claims. By combining three generations of data on individuals and measures of school achievement at two points in time with census data on neighborhoods of both grandparental and parental families, data on school socioeconomic and racial composition, and data on peers, we have been able to

examine how intergenerational, racially-stratified contexts and experiences affect racial achievement gap. We show that a set of interrelated structural, behavioral, and attitudinal conditions operate cumulatively and intergenerationally to explain the racial achievement gap. Clearly, the processes are more complex than we fully understand but some general patterns have emerged. Family differences start black and white children on different paths when they are young. As children get older, the highly concentrated poverty and shortage of role models and the more economically segregated schools that black children are much more likely to experience and grandparental resources also contribute to their divergent achievement trajectories.

Because different factors affect children's achievement at different ages, policy interventions should be tailored to the child's age. Given the intergenerational nature of the racial achievement gap, both parent-based and child-based interventions are needed to eliminate the early achievement gap. Efforts to reduce early economic hardship for mothers, including measures to reduce (mothers') dropping out of high school and teenage pregnancies and to provide adequate prenatal care to prevent low weight babies are important. In early childhood, facilitating young parents to help their children learn math skills and to raise parents' educational expectations could be useful. Expanding Early Head Start and pre-kindergarten programs that have a strong parental involvement component are likely to have large payoffs. For older children, neighborhood role models and peers become more important, and mentorship programs might be helpful for middle and high school students. The intergenerational nature of the inequalities experienced by black Americans and the relationship of those inequalities to their school achievement suggests that the Supreme Court's 2003 statement regarding affirmative action may be setting too short a time limit. The Court wrote, "We expect that 25 years from now, the use of racial preferences will no longer be necessary to further the interest approved today." The legacy of inequality extends beyond a single generation, however. Policy makers also need to recognize the multi-faceted nature of social inequalities and how they affect children over their life course. Future research on the racial achievement gap should consider children's developmental stage and be more attentive to intergenerational influences.

Table 1: Weighted Descriptive Statistics for Black and White Children

	Blacks			Whites		
	N	Mean	S.D.	N	Mean	S.D.
Applied problems test score						
2003 standardized score	800	-0.47	0.82	875	0.45	0.94
1997 standardized score	711	-0.36	0.84	818	0.36	0.93
Childs Characteristics						
Child's race (1=black)	856	1.00	0.00	938	0.00	0.00
Child's gender (1=female)	856	0.42	0.49	938	0.49	0.50
Low birth weight child	838	0.11	0.32	933	0.05	0.22
Child motivation-index* (range: 1=low, 5=high)	856	3.39	1.46	938	3.12	1.68
Grandparent characteristics						
Grandparents with zero or negative assets (including home equity)	856	0.40	0.49	938	0.13	0.33
Highest grandparental years of educational attainment	856	11.03	2.85	938	13.67	2.92
Percent poverty in grandparents' neighborhood*	623	0.25	0.11	624	.082	0.07
Role models in grandparents' neighborhoods standardized*	856	-0.37	0.56	938	0.38	0.83
Grandparents self-efficacy scale* (range: low= 1, high=7) †	856	2.27	1.51	938	3.55	1.51
Parental Family Background						
Mother's cognitive score*	856	22.27	11.93	938	28.79	12.53
Teenage mother at birth	826	0.14	0.35	927	0.04	0.20
Highest parental years of education	812	12.52	2.22	923	14.26	2.18
Occupational prestige score of head of household (range: 3=low, 82=high)	847	32.24	11.64	926	43.88	15.18
Parental self-efficacy scale (range: 1=low, 4=high)	847	3.06	0.64	934	3.15	0.55
Log of average income when child was age 0 to 5	819	10.01	0.83	908	10.90	0.63
Log of net wealth	851	6.12	4.68	921	9.86	3.59
Parent education expectations for child (range: low=1, high=8)	841	4.37	2.06	929	5.51	1.58
Parent school talk (range: low=1, high=4)	672	3.59	0.60	699	3.83	0.32
Mother's cognitive stimulation of child-scale (range: low=2, high=14)	856	9.43	2.07	938	11.01	1.76
Emotional support of child-scale (range: low=2, high=14)	856	9.18	2.08	938	10.68	1.82

(Table 1 continued) Descriptive Statistics for Black and White Children

	Blacks			Whites		
	N	Mean	S.D.	N	Mean	S.D.
Neighborhood Characteristics						
Concentrated poverty in parents' neighborhoods standardized (range: low= -1.3, high=4.5)	854	0.73	0.82	934	-0.54	0.42
Role models in neighborhoods standardized (range: low= -1.4, high=4.6)	854	-0.47	0.58	934	0.34	1.03
School Characteristics						
Percent of students in child's school receiving free lunch*	684	0.52	0.24	627	0.20	0.16
Child attended a private school in 2003	855	.05	.20	938	.09	.29
Peer Characteristics						
Peer avoidance of trouble index* ^ (range: low=1, high=5)	856	3.39	1.53	938	3.48	1.87
Peer academic orientation index* (range: low=1, high=5)	856	3.40	1.35	938	3.16	1.40

* Missing cases imputed for these variables

†Used only in Table 2.

^ Variables do not vary statistically by race, as confirmed by two-tailed t-tests.

Table 2: OLS Regressions of grandparents' characteristics on parent characteristics

Grandparents' Characteristics	Parent Characteristics							
	Years of schooling	Occupation	Income	Wealth	Mothers' cognitive skills	Parents' educational expectations	Parents' emotional support	Cognitive stimulation
Years of education	0.18** (0.03)	1.04** (0.16)	0.06** (0.01)	0.06 (0.05)	0.43** (0.14)	0.09** (0.02)	0.01 (0.02)	0.11** (0.02)
Self-efficacy scale	0.17** (0.05)	0.30 (0.35)	0.05** (0.02)	0.28** (0.10)	0.13 (0.30)	0.09* (0.04)	0.07+ (0.04)	0.17** (0.04)
Zero or negative assets (including home equity)	-0.03 (0.15)	-2.31* (0.90)	-0.09+ (0.05)	-0.72* (0.31)	0.17 (0.90)	-0.07 (0.14)	-0.21+ (0.12)	0.01 (0.14)
Percent poverty in neighborhood	-0.15 (0.67)	0.69 (4.02)	-0.60** (0.22)	-2.45 (1.50)	-6.74** (1.92)	-0.15 (0.62)	0.06 (0.56)	-0.77 (0.64)
Role models in neighborhood	0.23+ (0.12)	2.71** (0.79)	0.03 (0.03)	0.05 (0.22)	-0.43 (0.65)	0.08 (0.08)	-0.01 (0.08)	0.11 (0.08)
Constant	9.83** (0.41)	24.87** (2.56)	9.31** (0.13)	5.45** (0.78)	21.04** (2.30)	3.32** (0.35)	8.82** (0.29)	8.50** (0.34)
R-squared	0.277	0.210	0.446	0.242	0.076	0.111	0.229	0.175

Robust standard errors in parentheses

** p<0.01, * p<0.05, + p<0.1

Note: The race and gender of the parents were also held constant as control variables (not shown here).

Table 3: OLS Estimates of Applied Problem Scores, Panel A – Transitioning to elementary school cohort

	Race only	+Grand- parents	+parent & child	+ngbhd	Race only	+Grand- parents	+parent & child	+ngbhd	+school	+prior test
	<u>Wave 1 (1997, Pre-School)</u>				<u>Wave 2 (2003, Grades 4-6)</u>					
Child's Race (black=1)	-0.78** (0.11)	-0.60** (0.13)	-0.23 (0.13)	-0.20 (0.16)	-0.98** (0.13)	-0.73** (0.15)	-0.30 (0.15)	-0.28 (0.17)	-0.29 (0.17)	-0.31 (0.17)
Grandpt zero or negative wealth		0.01 (0.12)	0.05 (0.12)	0.04 (0.12)		-0.13 (0.15)	-0.05 (0.15)	-0.08 (0.16)	-0.10 (0.15)	-0.17 (0.16)
Grandpt education		0.04+ (0.02)	-0.01 (0.02)	-0.01 (0.02)		0.04 (0.02)	0.01 (0.02)	0.01 (0.03)	0.01 (0.03)	0.01 (0.03)
Grandpt neighborhood poverty		-0.78 (0.53)	-0.19 (0.58)	-0.07 (0.56)		-0.88 (0.53)	-0.24 (0.53)	-0.16 (0.53)	-0.27 (0.52)	-0.38 (0.55)
Parent neighborhood poverty				-0.05 (0.13)				-0.02 (0.10)	-0.08 (0.11)	0.02 (0.13)
Parent neighborhood role models				0.05 (0.06)				0.04 (0.06)	0.05 (0.06)	0.04 (0.06)
Percent free lunch in school									0.46 (0.38)	0.16 (0.32)
Private school									-0.22 (0.21)	-0.14 (0.18)
1997 test score										0.37** (0.06)
Observations	537	537	490	487	583	583	510	507	506	439
R-squared	0.103	0.119	0.211	0.213	0.151	0.196	0.292	0.293	0.301	0.407

(Table 3 continued) Panel B – Transitioning to middle school cohort

Race only	+Grand- parents	+parent & child	+ngbhd	Race only	+Grand- parents	+parent & child	+ngbhd	+school	+peers	+prior test
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	<u>Wave I (1997, Grades 1-3)</u>				<u>Wave II (2003, Grades 7-9)</u>						
Child's Race (black=1)	-0.67** (0.11)	-0.44** (0.14)	-0.12 (0.16)	-0.08 (0.19)	-1.00** (0.11)	-0.80** (0.14)	-0.42** (0.15)	-0.42** (0.16)	-0.41* (0.20)	-0.34 (0.17)	-0.17 (0.15)
Grandpt zero or negative wealth		-0.23+ (0.12)	-0.14 (0.13)	-0.15 (0.13)		-0.24 (0.14)	-0.22 (0.13)	-0.25* (0.12)	-0.25* (0.12)	-0.25* (0.11)	-0.13 (0.10)
Grandpt education		0.05* (0.02)	-0.02 (0.02)	-0.02 (0.02)		0.04 (0.03)	0.00 (0.02)	-0.00 (0.02)	-0.00 (0.02)	-0.01 (0.02)	0.00 (0.02)
Grandpt nghbrhd poverty *		-0.46 (0.62)	-0.15 (0.31)	-0.03 (0.61)		-0.38 (0.60)	0.46 (0.50)	0.55 (0.50)	0.56 (0.49)	0.54 (0.48)	0.29 (0.44)
Parent nghbrhd poverty				-0.01 (0.12)				0.07 (0.13)	0.07 (0.12)	0.06 (0.12)	-0.07 (0.11)
Parent nghbrhd role models				0.12 (0.08)				0.23** (0.08)	0.23** (0.08)	0.21** (0.08)	0.18** (0.07)
Percent free lunch in school									-0.11 (0.30)	-0.11 (0.29)	0.06 (0.28)
Private school									0.06 (0.15)	0.10 (0.15)	0.08 (0.15)
Peer avoidance of trouble										0.25** (0.07)	0.21** (0.07)
Peer academic orientation										-0.02 (0.05)	-0.03 (0.05)
1997 test score standardized											0.43** (0.05)
Observations	453	453	434	433	487	487	453	452	452	452	397
R-squared	0.080	0.106	0.251	0.259	0.166	0.188	0.384	0.407	0.408	0.442	0.575

Table 3: OLS Estimates of Applied Problem Scores, Panel C – Transitioning to high school cohort

	Race only	+Grand- parents	+parent & child	+ngbhd	Race only	+Grand- parents	+parent & child	+ngbhd	+school	+peers	+prior test
	<u>Wave I (1997, Grades 4-8)</u>				<u>Wave II (2003, Grades 10-12)</u>						
Child's Race (black=1)	-0.77** (0.08)	-0.47** (0.11)	-0.29* (0.12)	-0.27 (0.14)	-0.78** (0.10)	-0.61** (0.15)	-0.42* (0.16)	-0.42* (0.19)	-0.36 (0.19)	-0.36 (0.19)	-0.03 (.15)
Grandpt zero or negative wealth		-0.34* (0.15)	-0.26 (0.17)	-0.27 (0.17)		-0.21 (0.13)	-0.28* (0.12)	-0.29* (0.12)	-0.31** (0.11)	-0.33** (0.11)	-0.23* (0.10)
Grandpt education		0.01 (0.02)	-0.01 (0.02)	-0.02 (0.02)		-0.01 (0.02)	0.04 (0.03)	0.04 (0.03)	0.03 (0.03)	0.04 (0.03)	0.03 (0.02)
Grandpt nghbrhd poverty *		-1.39** (0.47)	-1.11* (0.54)	-0.75 (0.52)		-1.11 (0.68)	-0.38 (0.67)	-0.25 (0.67)	-0.29 (0.66)	-0.04 (0.65)	0.58 (0.57)
Parent nghbrhd poverty				-0.05 (0.10)				0.02 (0.09)	0.08 (0.09)	0.10 (0.09)	0.03 (0.08)
Parent nghbrhd role models				0.19** (0.07)				0.13 (0.07)	0.13 (0.07)	0.12 (0.07)	0.02 (.005)
Percent free lunch in school									-0.76** (0.28)	-0.76** (0.28)	-0.91** (0.25)
Private school									0.36* (0.16)	0.31 (0.16)	0.11 (0.14)
Peer avoidance of trouble										0.19** (0.06)	0.08 (0.05)
Peer academic orientation										-0.01 (0.05)	-0.00 (0.05)
1997 test score											0.55** (0.07)
Observations	534	534	470	469	600	600	511	510	510	510	417
R-squared	0.117	0.173	0.244	0.274	0.115	0.145	0.332	0.342	0.359	0.398	0.575

** $p < 0.01$, * $p < 0.05$; Robust standard errors in parentheses

Table 4: Oaxaca Decomposition Applied Problems Test Score Gap (Z score)**Panel A: Wave I (1997)**

VARIABLES	Pre-School (youngest cohort)		Grades 1 - 3 (middle cohort)		Grades 4 – 8 (oldest cohort)	
	Endow.	Coeff.	Endow.	Coeff.	Endow.	Coeff.
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Family	0.41** (0.14)	3.71* (1.69)	0.43** (0.12)	1.32 (1.70)	0.28* (0.12)	0.53 (1.40)
Neighborhood	0.10 (0.15)	0.02 (0.05)	0.11 (0.13)	-0.06 (0.06)	0.21* (0.10)	-0.01 (0.05)
Constant		-3.39* (1.70)		-1.51 (1.72)		-0.19 (1.45)
Total	0.54** (0.13)	0.20 (0.15)	0.58** (0.15)	0.08 (0.18)	0.47** (0.13)	0.27* (0.13)
Overall Difference	0.78**		0.66**		0.74**	
Observations	487	487	433	433	469	469

Panel B: Wave II (2003)

VARIABLES	Grades 4-6		Grades 7-9		Grades 10-12	
	Endow.	Coeff.	Endow.	Coeff.	Endow.	Coeff.
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Family	0.62** (0.16)	1.55 (1.81)	0.37** (0.11)	-0.25 (1.63)	.20 (0.15)	.97 (1.47)
Neighborhood	0.13 (0.12)	0.11 (0.06)	0.12 (0.13)	0.01 (0.08)	-0.02 (0.11)	-0.01 (0.08)
School	-0.12 (0.10)	0.03 (0.27)	0.01 (0.08)	0.24 (0.19)	0.17** (0.06)	-0.12 (0.17)
Peers			0.14** (0.05)	-0.67 (0.49)	0.06 (0.03)	0.63 (0.39)
Constant		-1.37 (1.88)		0.69 (1.63)		-1.15 (1.55)
Total	0.65** (0.14)	0.29 (0.16)	0.67** (0.16)	0.34* (0.16)	0.39* (0.17)	0.36* (0.18)
Overall Difference	0.94**		1.01**		0.74**	
Observations	506	506	452	452	510	510

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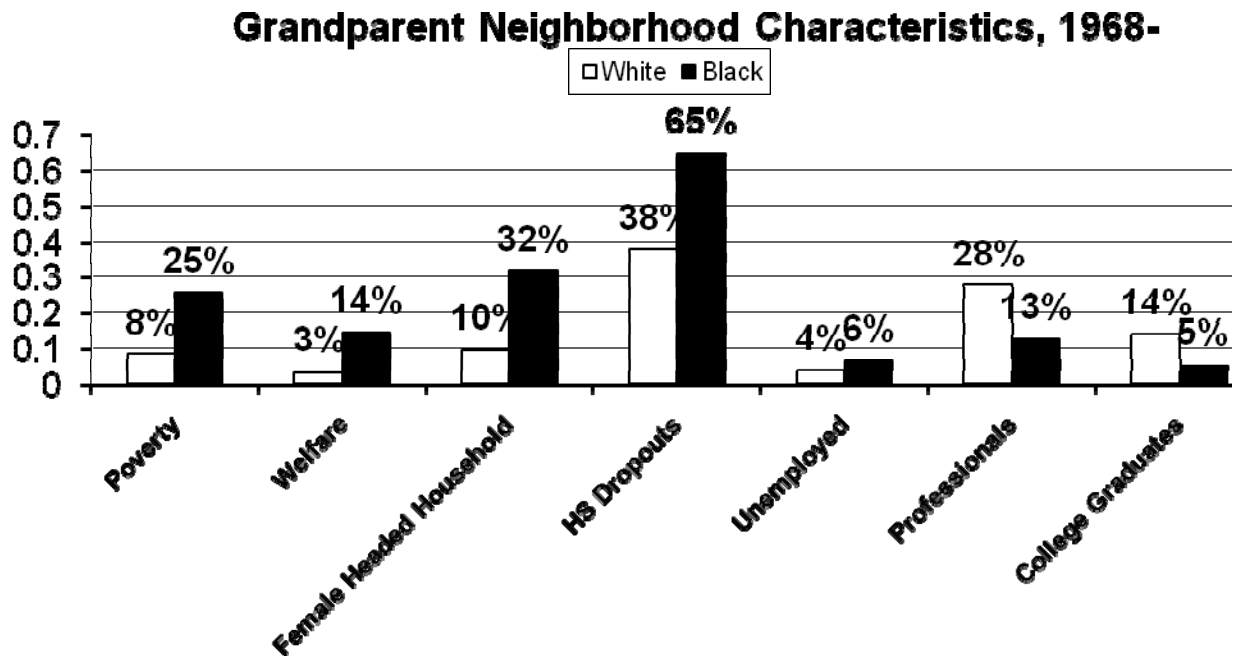
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Figure 1



DATA APPENDIX 1: KEY THEORETICAL CONSTRUCTS AND MEASURES

DEPENDENT VARIABLES. Children's cognitive skills are measured with the Woodcock Johnson (W-J) Achievement Test-Revised. The applied math test assesses the ability to analyze and solve practical mathematical problems, using examples like time and money. The scores are age-standardized by children's birth months. The test scores in the analysis are standardized to have a mean of 0 and a standard deviation of 1.

INDEPENDENT VARIABLES. This paper uses a set of parental home environment variables that can potentially affect children's test scores, including factors prior to or at the child's birth, child's characteristics, family socioeconomic background, parental expectations about the child's education, family structure, parental feelings of self-efficacy, the cognitive stimulation parents provided to a child, and emotional support in the home.

INTERGENERATIONAL RESOURCES.

Grandparents' socioeconomic background is measured with maternal and paternal grandparents' completed years of schooling, selecting the higher of the two in each set of grandparents. A dummy variable indicating whether either grandparent had 12 or more years of school, or some college education (13 years or more) yielded similar results.

Percent Living in Poverty in Grandparents' Neighborhoods captured the environment in which the grandparents lived and the parents grew up in during the years 1968 to 1975. It is operationalized as the percent of residents living in poverty in the grandparents' neighborhood.

Grandparent Wealth is operationalized as a dummy variable indicating whether the grandparents of matched PSID children reported zero or negative assets (debt) including home equity in 1984. Many black grandparents have no or negative wealth.

Grandparent Self-efficacy is measured by an index of responses from the grandparents of CDS children asking whether they plan for life events, carry out plans, save for the future, see limitations in their lives, and think about things that might happen in the future. These responses come from the PSID surveys for the years 1968-1972. This variable is not utilized in our full regression models, as it was highly correlated with the parental self-efficacy variable.

A **Parental Concentrated neighborhood disadvantage Index** measures the number of poor people in the census tract where a PSID family resided, at various points in time. The five indicators in this index are percent of residents on welfare, percent of female headed households, percent of residents who are high school dropouts, percent unemployed, and percent living below the poverty line in the census tract. Each individual variable was standardized and then the five were averaged into one standardized index, with a mean of 0 and a standard deviation of 1 ($\alpha = 0.96$). The index was interpolated using data from the U.S. Census for the years 1980, 1990 and 2000, by calculating adjustment increments for each variable in each year and adding that incremental value to the decennial base value for each case.

A **Role Model Index** was constructed to measure the “presence of role models” in the census tracts where grandparents and parents reside. The indicators were the percent of professionals in the census tract and the percent of college graduates in the census tract ($\alpha = 0.97$) using data from the US Census. The index measure is standardized with a mean of 0 and a standard deviation of 1.

SCHOOL FACTORS. We focus on the degree of economic and racial segregation in schools, which has been found to vary by race and to affect educational achievement. We matched PSID-CDS child data to the Common Core Data and Private School Survey by the ID of the school that the child was attending at the time of the interview. Data for public schools

from the National Center for Education Statistics (NCES) Common Core of Data (CCD), unfortunately, do not have school-level student-teacher ratios, expenditures, or teacher qualifications. Measures of the **percent of students receiving free lunch within the school**, and **whether or not the student attended a private school** were created to capture the effect of school characteristics on children. “Percent non-white students” and “Percent of Students Eligible for Free Lunch” correlated at .73, and high VIF scores revealed problems of multicollinearity, so we excluded percent non-white. The child’s perception of their school environment from CDS interviews was not significant predictor so were not included in the final models.

To measure the impact of peers on achievement, an index called **Number of Friends Who Avoid Trouble** was created for children aged 10 and older in 2003 for whom data are available. The index was constructed as an average score of children’s responses to the following questions "How many of your friends do the following things: "Are in gangs?" "Refuse to use drugs when offered?" and "Get in a lot of fights with other kids?" The first and third questions were reverse coded, so all scales were ordered in the same direction and scored on a five point scale, with the lowest score being 1 "none," and the highest score being 5, "Almost all or all.". The higher the score, the more friends someone has who try to avoid trouble.

An index of **Peer Academic Orientation**, based on interviews with children (age 10 and older) in CDS-II, was constructed as an average score of children’s responses to the following questions: “How many of your friends do the following things: “Think schoolwork is very important”; and “Plan to attend a four year college”. Both questions were scored on a five-point

scale ($\alpha = .57$). The higher the score, the more friends a child has who are more academically orientated.

Children's time spent on homework was also included in the exploratory analysis but this was not significant and was not included in the final models. Finally, CDS assessments of children's global and math self-concept were explored, but each of these variables had too much missing data to be included in the final models.

ENDNOTES

¹ These covariates were parental education, parental occupational status, and household income, gender, child's age at time of enrollment in kindergarten, WIC participation (a nutrition program aimed at low income mothers and children), mother's age at first birth, birth weight, and the number of children's books in the home (Fryer and Levitt 2004). Yeung and Peiffer (2009) also controlled for mother's cognitive skills, family wealth, parental expectation, and children's time use.

² Chow test results revealed a significant difference between age cohorts as opposed to a pooled sample at the .0000 level. Therefore we modeled each age cohort separately.

³ We cannot conduct school fixed-effects models because very few of the children in the PSID sample attend the same school. Since there are only two waves of assessment data, we cannot conduct a growth curve analysis either.

⁴ We used the VIF (variance inflation factor) post estimation option in Stata to check for multicollinearity.

Variables with a VIF greater than 10 were removed from the regression models.

⁵ Children were not asked about their friends until the age of 10.

⁶ We investigated the possibility of an interaction effect between race and prior test score and found that there is only one significant interaction. In preschool years, for 1997 scores, the coefficient for prior test score is .53 for blacks and .29 for whites. No other significant interaction effect between race and prior test score is found.

⁷ The decomposition is a summation of the individual contributions of each variable to the overall difference in test scores, so the "group" contribution is a summation of all individual variables' contributions in that group.

⁸ Jann observes that the Coefficients column from a "two-fold" decomposition may also contain "all potential effects of differences in unobserved variables." (2008: 3) and he calls it the "Unexplained" portion. In the high school cohort, we believe it is appropriate to consider the significant differences in coefficients as unexplained.