Can Schools Level the Intergenerational Playing Field? Lessons from Equal Educational Opportunity Policies

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Introduction

One of the longstanding missions of U.S. public education is to promote equality of opportunity. The question is, *"Are we there yet?"* Access to quality schools and educational resources for children are key engines of upward mobility in the United States, holding the potential to break the cycle of poverty from one generation to the next. Over the past several years, our leading national newspapers—*The New York Times, The Wall Street Journal, The Washington Post, The Los Angeles Times*—have each independently published a series of articles on mobility in the United States, describing and questioning its fluidity as a reality or an American dream deferred. While the shared values of an equitable structure of opportunity are deeply embedded in public consciousness, there remains ongoing debate regarding the underlying determinants of mobility and how it relates to notions of equity.

Recent research has shown that intergenerational mobility is much lower in the United States than previously assumed (Chetty et al. 2014; Mazumder 2005; Solon 1992), is significantly less than many other advanced developed countries (Jäntti et al. 2006), and black children experience significantly lower rates of upward mobility conditional on their parents' positions in the family income distribution (Bhattacharya and Mazumder 2011; Hertz 2005). Moreover, there is a high degree of persistence in economic status across generations in the United States, particularly in the lower and upper tails of the income distribution. What are the main transmission mechanisms of intergenerational mobility, and where does one look for the early developmental origins of inequality in life outcomes? Various dimensions of inequality in adulthood are rooted in childhood conditions, wherein schools play a pivotal role in either reinforcing or mitigating the intergenerational reproduction of socioeconomic advantage (Card and Krueger 1992). Residential segregation by race and class that leads to unequal access to quality schools is often cited as a culprit in perpetuating inequality in attainment outcomes. However, the role of school quality factors in contributing to the intergenerational persistence of economic status, and in being a source of racial differences in rates of intergenerational mobility, have received little attention in the literature.

The nature and amount of public investment in children has changed substantially during the post-World War II era. The major thrust of policies aimed at equality of opportunity over this period has been intended to ensure educational access to quality resources K–12 and beyond, and more recently greater investments in pre-school years. Over the past five decades, three major government interventions have had substantial impacts on the provision of school resources and have narrowed black-white differences in access to dimensions of school quality:

1. court-mandated school desegregation
2. state legislation and legal action aimed to change the distribution and level of school funding
3. the expansion of targeted early childhood pre-school programs for disadvantaged children through Head Start

This paper draws on recent research on the long-run impacts of school desegregation (Johnson 2015), effects of school finance reform-induced increases in school spending (Jackson, Johnson, and Persico 2015), and evidence on the long-run effects of Head Start (Johnson and Jackson 2015), and combines them with a focus on these three major school reforms' impacts on intergenerational mobility. It focuses on how school quality factors contribute to the intergenerational persistence of economic status and are a source of racial differences in rates of intergenerational mobility. The collective evidence from the roll-out of desegregation implementation, school finance reforms, and expansions of early childhood education programs is strong in providing a testbed for the study of the efficacy of the first-generation suite of equal education policy reforms. This paper explores the mechanisms that tie childhood school-level factors to aggregate mobility rates.

Court-ordered school desegregation has been described as the most controversial and ambitious social experiment of the past 60 years. Despite the magnitude of these changes, no large-scale data collection effort was undertaken to investigate school desegregation program effects, particularly on longer-run outcomes. Before the study by Johnson (2015), there were no quasi-experimental studies of the impacts of desegregation that had followed students over a long horizon beyond their early 20s. While many prior studies have examined effects of school resources on test scores and more proximate student achievement outcomes, less evidence is available on how school spending influences intergenerational mobility (Jackson, Johnson, and Persico 2015, a notable exception). Similarly, controversy about whether Head Start produces lasting benefits in practice has surrounded the program since its inception.

In parallel literature, there is an impressive body of evidence on the measurement of intergenerational mobility and the extent of mobility for different countries and over time (Bjorklund and Jäntti 1997; Solon 1992). However, little is known about the precise mechanisms underlying the persistence of economic status across generations; identifying what factors inhibit or facilitate upward mobility for those born into humble beginnings has remained illusive. Identifying the major factors and pathways that lead to economic (im)mobility is important for the optimal design of education policies and implementation of effective childhood interventions to promote greater equality of opportunity. There is currently a paucity of direct evidence from the United States on the effects of school quality on intergenerational income mobility.

This paper extends two branches of literature on economic mobility:

1. the relationship between school resources/quality and socioeconomic success

2. racial inequality in adult socioeconomic attainment outcomes that are rooted in childhood conditions

At the nexus of these two literatures, this paper examines the role of school quality as the key propeller of upward mobility. An important contribution of this work is that it uncovers sources and identifies mechanisms underlying generational mobility, integrating the analysis of the linkages between educational investment opportunities across the continuum of developmental stages of childhood—including pre-school program participation and K–12 school resources—to investigate their long-run consequences on the extent of intergenerational mobility.

The persistent residential segregation of poor and minority populations coupled with the heavy reliance on local property taxes to fund K–12 schools, often leads to disparities in school resources. In light of this, this paper investigates the extent to which patterns of segregation influence whether schools weaken or reinforce the role of family background in determining children's outcomes and compares the intergenerational mobility rates across communities and time periods with differing access to educational opportunities and school quality, separately by race. In this way, this analysis considers a narrower slice of the broader question of how where you live influences life chances and economic success.

This investigation requires not only a convincing research design to address concerns about endogeneity bias but also requires high quality income data spanning multiple years of adulthood for two generations of the same set of families. This study combines high-quality intergenerational income data with compelling research designs to identify the causal effects of school desegregation, school spending, and Head Start, respectively.

The study analyzes the economic status trajectories of children born between 1945 and 1979 followed through 2013 using data from the Panel Study of Income Dynamics (PSID) and its supplements on early childhood education, where the data have been geocoded to the census block level. This intergenerational microdata set is linked with administrative data on school district per-pupil spending, Head Start per capita spending, and comprehensive case inventories on the timing and type of court-ordered school desegregation and school finance reforms spanning the period 1965–2010. Thus, this analysis uses the longest-running U.S. nationally representative longitudinal data spanning four decades linked with multiple data sources containing detailed neighborhood attributes and school quality resources that prevailed at the time these children were growing up.

A sharp increase in generational income mobility among African Americans among successive birth cohorts born between 1955 and 1979 shows its relatedness to dimensions of access to school quality. The study explains black-white differences in upward mobility and its subsequent convergence among successive cohorts born between 1955 and 1979 with a focus on the role of school quality. The study analyzes the effects of the court-ordered desegregation plans of public schools, implemented in the 1960s, '70s, and '80s, and subsequent court-ordered school finance reforms that accelerated during the 1980s and '90s on the extent of intergenerational mobility. The wide variation in the timing of implementation of desegregation plans and school funding formula changes is exploited to identify their effects. Using policy-induced changes in school spending (school resource inputs) across cohorts within the same district and across different districts from the same cohort is used to estimate the impact of school spending on socioeconomic status attainments.

Consistent evidence demonstrates that low-income and minority students experienced both larger reform-induced increases in school spending (access to school resource inputs) and larger resultant impacts of a given change in spending on long-term outcomes. African Americans who grew up following school desegregation implementation, and poor children following court-ordered school finance reforms, were more likely to occupy a higher position in the income distribution than their parents, and distances moved across the distribution were greater, relative to those experienced for prior birth cohorts who were 18 or older at the time of their schools desegregation implementation or imposition of school finance reforms. The results highlight the role of childhood school quality in contributing to (and subsequently narrowing) racial differences in intergenerational mobility.

Extending Previous Work

Background on Desegregation

Residential segregation may affect access to quality schools and subsequent mobility prospects through its effects on school resources (e.g., school district per-pupil spending, class size, teacher quality). During the 1950s, '60s, and '70s when a majority of the individuals in the PSID sample were school-age, there was substantial variation across districts in school quality inputs (e.g., per-pupil spending, pupil-to-teacher ratio), which was generated by limited state support for K–12 education in the vast majority of states and a heavy reliance on local property taxes. During the 1960s and '70s, states, on average, contributed roughly 40 percent of the cost of K–12 education, and much of this aid was a flat per-pupil payment that was not related to local property wealth of the district (U.S. Department of Education 2001).

While the premise of *Brown v. Board of Education of Topeka* was "separate is inherently unequal," the decision alone was not sufficient to compel school districts to integrate.[1] Minimal school desegregation occurred in the 1950s and early 1960s following the *Brown I* and *II* rulings issued in 1954 and 1955.[2]

As seen most notably in the South, racial disparities in school resources were compounded by racial school segregation within districts prior to the enactment of desegregation plans. Before school desegregation plans were enacted, school district spending was directed disproportionately to the majority-white schools within districts (Johnson 2015; Cascio et al. 2010). School desegregation did not begin in earnest in the South until after 1964, and a significant share occurred over the five-year period between 1968 and 1972.

The passage of the 1964 Civil Rights Act[3] prohibited school districts that were operating a racially dual school system from receiving federal aid, and allowed the Justice Department to join suits against school districts that were in violation of the *Brown* order to integrate. This resulted in a significant drop in the extent of racial school segregation thereafter reinforced by the actions of federal courts. A substantial portion of school districts adopted desegregation plans only after court order (or the threat of court action) due to individual cases filed.

Johnson (2015), using data linked with a comprehensive case inventory of the timing of all desegregation litigation cases, shows school district per-pupil

1 *Brown v. Board of Education of Topeka* 347 U.S. 483 (1954).

2 Ibid. *Brown v. Board of Education of Topeka* 349 U.S. 294 (1955).

3 Civil Rights Act of 1964, Pub.L. 88–352, 78 Stat. 241 (1964).

spending increased by nearly $1,000 by the end of the fourth year after court-ordered desegregation relative to the year immediately preceding the initial court order, which differed markedly from the trend leading up to the year these rulings went into effect. The large increase in school district per-pupil spending was driven solely by the infusion of state funds following the timing of court-ordered school desegregation in districts with a sizable number of black students. Johnson (2015) provides suggestive evidence that states infused greater funds into districts undergoing desegregation to ensure that black students would receive the same level whites were previously receiving (i.e., without affecting prevailing resource levels for white students).

Furthermore, Johnson (2015) finds that, for blacks, school desegregation significantly increased educational and occupational attainments, college quality, and adult earnings; reduced the probability of incarceration; and improved adult health status. Desegregation had no effects on whites across each of these outcomes. The results suggest that the mechanisms through which school desegregation led to beneficial adult attainment outcomes for blacks include improvement in access to school resources reflected in reductions in class size and increases in per-pupil spending. The idiosyncratic nature of the timing of court-ordered desegregation helps to identify its effects on intergenerational mobility separately by race (outlined and presented on pages 310–321).

School Finance Reforms

Historically, the rules that determine school funding have not necessarily helped realize the long-standing ideal of equal educational opportunities for all children. School funding disparities in K–12 education, caused in part by disparities in local taxable property wealth and concerns that school spending inequalities undermine the provision of equal educational opportunities fueled a movement toward school finance reform litigation and legislation over the past several decades. For example, in 1970, on the eve of the first successful state litigation case with regard to school finance, school spending varied dramatically, by multiples, even within the same state.[4] While average public school spending levels have increased significantly since 1970, aggregate spending levels mask substantial differences in the distribution of spending.

Courts played an important role in school-related cases during the past three decades, particularly school finance reform. The judicial landmarks of the school desegregation cases provided part of the basis upon which the

4 Note that many low-income urban districts raise local funding from commercial property, so although low-income students typically receive lower levels of funding *on average*, this is not always the case (Hoxby 2001).

movement toward school finance reform litigation and debates about the constitutionality of local finance systems would be waged. School finance cases were founded on the basis that existing local systems of school finance violated the equal protection clause of the relevant state constitution and the responsibility of the state to provide access to adequate and equitable public schooling to all children. In response to large within-state differences in per-pupil spending across wealthy and poor districts, state supreme courts overturned school finance systems in 28 states between 1971 and 2010, and many states have implemented legislative reforms leading to important changes in public education funding.[5] As documented in Jackson, Johnson, and Persico (2014) (hereafter JJP), the school finance reforms (SFRs) that began in the early 1970s and accelerated in the 1980s caused some of the most dramatic changes in the structure of K–12 education spending in U.S. history.

JJP, using a comprehensive inventory of the timing of school finance litigation across states and the type of state aid formula changes that occurred between 1970 and 2010, found that court-ordered school finance reforms have been instrumental toward the goal of equalizing per-pupil spending and have worked primarily by raising spending at the bottom of the distribution while leaving spending at the top unchanged. Well-designed SFRs successfully weakened the link between district per-pupil spending and local property wealth, while at the same time increasing the level of spending in lower-income districts thereby reduced spending disparities caused by differences in local taxable property wealth. Furthermore, JJP found that, for low-income children, a 10 percent increase in per-pupil spending throughout school-age years leads to about 0.5 additional year of completed education, 10 percent higher earnings, and a 6 percentage-point reduction in the annual incidence of adult poverty.

Head Start

Head Start is the largest targeted early childhood intervention program in the United States and was established in 1964 as part of President Lyndon B. Johnson's War on Poverty to provide education, health, and other services to poor children. Head Start is a comprehensive, national, federally funded program with the potential to improve the human capital, health capital, and school readiness of poor children and thereby reduce the intergenerational persistence of poor economic status. While Head Start has been shown to have positive long-term impacts on schooling and other outcomes (Garces et al. 2002; Ludwig and Miller 2007; Deming 2009), lack of data linking early childhood education, K–12 school experiences, and adult outcomes has limited

5 The first of these cases was the well-known California case, *Serrano v. Priest*, decided in 1971. *Serrano v. Priest*, 5 Cal.3d 584.

some prior evaluation efforts; this analysis aims to fill some of the gap with regard to economic mobility.

Failure to adequately address the endogeneity of Head Start participation and resultant selection bias issues can lead to an understatement of the potential benefit of the program, since the program targets economically disadvantaged children. Following Johnson and Jackson (2015), the research design takes advantage of the geographic expansion of Head Start programs and spending increases during the first 15 years of the program (1965–80) to overcome these selection issues. The changing availability and quality of Head Start was largely beyond the control of parents during the early years of the program's inception and roll-out and would not be expected to affect children independently of the programs themselves. As a result, residentially immobile poor families were often able to enroll younger but not older children.

Early-life interventions, such as Head Start, may not realize their potential long-term returns without subsequent investments in quality schools during the school-age years. Prior research shows that initial gains in academic achievement tests from participation in Head Start "faded out" in elementary school; perhaps this decline occurred because the former Head Start participants generally attended lower quality schools (Currie and Thomas 2000). The quality of early care may influence the ability to make use of later school opportunities and educational supports during school-age years. Accordingly, the potential interactive influences of human capital investments from pre-school through high school are investigated in this paper. In particular, children's differential exposure to Head Start spending (at age four) and SFRs during their school-age years, depending on place and year of birth, are used to analyze the interactive effects of both Head Start spending increases and school finance reform-induced spending increases on children's subsequent rates of intergenerational mobility. The roll-out of Head Start, desegregation, and school finance reform-induced increases in school spending during these birth cohorts' childhood provide a unique opportunity to evaluate the long-term impacts of ground-breaking legislation designed to improve educational investment opportunities for poor and minority children.

Intergenerational Mobility Measures

The overwhelming majority of research on intergenerational mobility focuses only on parental income (where parental income serves as a proxy for parental investments). However, investments through government spending on children may have equally significant effects in influencing future income

potential. Indeed, direct government investments in human capital are substantial in the United States.[6]

One of the predictions of the standard Becker-Tomes (1979; 1986) human capital model of intergenerational income transmission posits that greater public provision of schooling increases intergenerational income mobility (see also Solon 2004). A large increase in public investment in education is expected to increase economic mobility across generations, because it affects children from low-income families more than children from affluent families. Increases in the return to education that have occurred over the past three decades will strengthen the link between parent and child incomes (Solon 2004), other things equal, and may change the social and economic costs of unequal opportunity.

The most commonly used measure of intergenerational mobility, the intergenerational elasticity (IGE), is not well suited for comparing black-white differences in mobility with respect to the *entire* income distribution (comprising both blacks and whites). Moreover, it does not provide a detailed picture of which individuals are moving up or down in the income distribution. The IGE, which is focused on averages, offers a limited view of mobility in that it is not informative about the persistence of economic status across generations at different points of the parental income distribution (e.g., for bottom quintile, middle, versus upper quintile). The same intergenerational elasticity can characterize both a society with high levels of mobility in the middle of the parental distribution and less mobility in the tails, as well as a society with moderate levels of mobility throughout the distribution. In addition, the IGE cannot distinguish between a societal opportunity structure in which the variance in children's adult incomes, conditional on parental income, is large and one in which the variance is small as long as the expected values of the child's adult income are the same. In these ways, IGE can miss important features in characterizing differences in mobility opportunities. Therefore, the present analysis goes beyond these aggregated measures of mobility.

Building on the recent methodological contributions of Bhattacharya and Mazumder (2011), measures of upward mobility that compare the relative positions of parents and children are used in the income distribution of each

6 Currently, education expenditures alone exceed $450 billion annually, or more than $5,800 per person between the ages of 5 and 24. In addition, federal outlays for health exceed $350 billion per year. Public school spending and other government expenditures targeted toward disadvantaged families may, in principle, substantially narrow the investment gap between children of rich and poor families, and thereby reduce the resultant education and earnings gap. This will depend in part on the progressivity of the education policy and other public investments in children's human capital (i.e., the degree to which children from disadvantaged backgrounds disproportionately benefit from public programs).

respective generation. For example, upward mobility can be measured by an indicator for whether the child's rank in the distribution is higher than the parents' rank in the prior generation (and the extent of generational change in rank). These measures are well suited for comparing group differences in intergenerational mobility rates. A key advantage of these measures is that, unlike the transition probability that imposes an arbitrary threshold for measuring mobility, these upward mobility measures use the parents' rank as a yardstick for mobility.

Following Bhattacharya and Mazumder (2011), this paper uses a measure of upward rank mobility (UP), which estimates the likelihood that an individual will surpass their parent's position in the income distribution by a given amount, conditional on their parents being at or below a given percentile.

$$UP_{t,s} = \Pr(Y_1 - Y_0 > \tau \mid Y_0 \leq s) \quad (1)$$

In the simple case where $\tau = 0$, this is simply the probability that the child exceeds the parents place in the distribution. Positive values of τ enable measurement of the *amount* of the gain in percentiles across generations. Results are presented for τ =0, 0.1, 0.2, 0.3 and also as s is progressively increased and estimates are presented based on parental rank intervals.

The regression models also use as a mobility measure the generational change in rank position in the (respective generation's) income distribution as a dependent variable, which is simply the child's rank minus parent's rank. Importantly, the mobility measures use distributions that pool across races so that mobility is compared using a common distribution. The regression models also control for the parent's rank and, in some models, condition the sample on being born in the bottom half of the parental income distribution.

$$UP_{\tau,s} = \Pr(Y_1 - Y_0 > \tau \mid s_1 \leq Y_0 \leq s_2) \quad (2)$$

Measures of permanent family income for each generation are utilized to create the mobility measures. The measure of permanent family income of parents uses multi- year averages of income when children were between the ages of 12 and 17.[7] The measure of permanent family income of children in adulthood is constructed using data on the adult family income of the children during all survey years when sample members were between the ages of 28 and 40 and were not in school and were not pregnant. Observation of adults in their

7 For a small subset of children for which this information is not available (e.g., children born 1945–49), information collected in the 1988 survey reports of parental income and retrospective reports of parental economic status collected in other waves is used (when this information was unavailable it was imputed based on mother's and father's occupation and education). Results are very similar when the sample is restricted to only those in which parental income is available when children are ages 12–17.

30s are used to compare measures of permanent family income of children from different birth cohorts at the same age. Years of zero income are included in the multi-year averages between ages 28 and 40 if the individual was not in school and not pregnant. Family income is converted into real 2000 dollars using Consumer Price Index for All Urban Consumers (CPI-U) inflation adjustments. Haider and Solon (2006) demonstrate that lifecycle bias can affect estimates of the intergenerational elasticity in permanent income, but that such bias is minimized in the United States when income is measured between the ages of 35 and 40. Upward rank mobility measures utilized here appear less sensitive to life cycle bias than IGE measures of mobility, and the construction of permanent family income of children in adulthood on average is evaluated at age 35, when any such potential bias is minimized. This paper focuses on measures of *relative* mobility across generations and the measures are relevant for answering questions concerning the relative progress of blacks compared to whites.

Data

This paper compiles data on school spending, which is linked to databases on Head Start budgets and data describing the timing of school desegregation and various school finance reforms. These data are linked to a nationally representative longitudinal dataset that tracks individuals from childhood into adulthood. Education funding data from several sources is combined to form a panel of per-pupil spending for U.S. school districts in 1967 and annually from 1970 through 2010.[8] County-level Head Start spending during the first 15 years of the program (1965–80), when these individuals were three to five years old, were acquired from the National Archives and Records Administration (NARA). To avoid confounding nominal changes with real changes in spending over time, school spending is converted across all years to 2000 dollars using the CPI. School district boundaries that prevailed in 1969 are used to link school districts to counties and pull county-level median family income data from the 1970 Census. The spending data are then linked to databases of initial timing of court-ordered desegregation and SFRs between 1954 and 2010.[9]

8 The Census of Governments has been conducted every five years since 1972 and records school spending for every school district in the United States. The Historical Database on Individual Government Finances, contains school district finance data annually for a sub-sample of districts from 1967, and 1970 through 1991. After 1991, the Common Core of Data School District Finance Survey (F-33) includes data on school spending for every school district in the United States. Additional details on the data and the coverage of districts in these data are contained in Jackson, Johnson, and Persico (2015).

9 Additional details on the data and the coverage of districts in these data are contained in Jackson, Johnson, and Persico (2015).

The intergenerational data of adult economic outcomes come from the PSID (1968–2013) that links individuals to their census blocks during childhood.[10] The sample consists of PSID sample members born between 1945 and 1979 who have been followed into their 30s through 2013. This corresponds to cohorts that both straddle the first major waves of desegregation implementation and first set of court-mandated SFRs (the first court order was in 1971) and who are also old enough to have completed formal schooling and be observed with valid family income measures in their 30s by 2013. Sixty-six percent of those cohorts in the PSID grew up in a school district that was subject to a desegregation court order sometime between 1954 and 1990, and two-thirds of those cohorts in the PSID grew up in a school district that was subject to a court-mandated school finance reform between 1971 and 2000. Both the Survey Research Center component and the Survey of Economic Opportunity component, commonly known as the "poverty sample," of the PSID sample are included. The PSID oversampled low-income and black families, which enables sufficient sample sizes of Head Start eligible children among these birth cohorts. All of the analyses utilize the PSID sampling weights to produce nationally representative estimates.

To avoid complications arising from endogenously changing district boundaries over time, the earliest available childhood residential address is matched to the school district boundaries that prevailed in 1969. The algorithm is outlined in Jackson, Johnson, and Persico (2015).[11] Each record is merged with data on school spending, county-level Head Start spending per four year old, and the aforementioned school desegregation and school finance variables at the school district level that correspond with the prevailing levels during their school-age years. Finally, In-county characteristics from the 1962 Census of Governments and 1970 Census are merged with information on other key policy changes (described on pages 310–13) during childhood,

10 The PSID began interviewing a national probability sample of families in 1968. These families were re-interviewed each year through 1997, when interviewing became biennial. All persons in PSID families in 1968 have the PSID "gene," which means that they are followed in subsequent waves. When children with the "gene" become adults and leave their parents' homes, they become their own PSID "family unit" and are interviewed in each wave. The original geographic cluster design of the PSID enables comparisons in adulthood of childhood neighbors who have been followed over the life course. Studies have concluded that the PSID sample remains representative of the national sample of adults (Fitzgerald, Gottschalk, and Moffit 1998).

11 Many school districts were counties during this period, including more than one-half of Southern school districts. Prior work (Johnson 2014; Jackson, Johnson, and Persico 2015) shows that the results are not biased by endogenous residential mobility and are robust to using only those who lived in their childhood residence prior to initial court orders.

allowing for an unusually rich set of controls.[12]

The final sample includes 13,540 individuals (5,063 black children; 8,127 white children; 7,285 low-income children;[13] 6,255 non-poor children) from 4,735 childhood families, 1,570 school districts, 1,229 counties, and all 50 states and the District of Columbia.

Unconditional Estimates of Intergenerational Mobility

Upward mobility estimates are presented for all children and separately by race among cohorts born between 1945 and 1979. Table 1, figures 1A-1B, and figure 2 present estimates of upward rank mobility based on equation (1). In addition, the black-white difference is plotted along with 95 percent confidence bands.[14] The results reveal significant black-white differences in rates of upward mobility at virtually every parental percentile rank interval. For example, 48.5 percent of blacks whose parents were between the 21st and 25th percentile surpass their parents' percentile in the family income distribution, whereas that percent is 69.6 among whites (a statistically significant 21 percentile-point race difference) (figure 1A). Blacks exhibit especially lower rates of substantial mobility (i.e., surpass their parents' percentile in the family income distribution by more than 20 percentile points) than corresponding rates of whites at the same parental percentile rank interval (figure 1B). As shown in table 1 and figure 1B, 32.6 percent of blacks whose parents were between the 21st and 25th percentile surpass their parents' percentile in the family income distribution by more than 20 percentile points, whereas that percent is 47 among whites (a statistically significant 14.4 percentile-point race difference).

12 The data include measures from 1968–88 Office of Civil Rights data; 1960, 1970, 1980, and 1990 Census data; 1962–99 Census of Governments data; Common Core Data compiled by the National Center for Education Statistics; Regional Economic Information System data; a comprehensive case inventory of court litigation regarding school desegregation over the 1955–90 period (American Communities Project); and the American Hospital Association's Annual Survey of Hospitals (1946–90) and the Centers for Medicare and Medicaid Services data files (dating back to the 1960s) to identify the precise date in which a Medicare-certified hospital was established in each county of the United States (an accurate marker for hospital desegregation compliance).

13 Following Ben-Shalom, Moffitt, and Scholz (2011) and Short and Smeeding (2012), a child is defined as "low income" if parental family income falls below two times the poverty line for any year during childhood. This captures both the poor and the near poor.

14 These are produced by using the bootstrap method. Bhattacharya and Mazumder (2011) show that the bootstrap method is a valid method of inference for these measures.

Table 1. Upward mobility estimates by race using intervals of parental income

$$UP_{\tau,s} = \Pr(Y_1 - Y_0 > \tau \mid s_1 \leq Y_0 \leq s_2)$$

PARENT INCOME RANK (S)	$\tau = 0$				$\tau = 0.1$			
	ALL	WHITES	BLACKS	W-B	ALL	WHITES	BLACKS	W-B
1 to 5	0.960094	0.956975	0.963021	-0.006047	0.685064	0.742234	0.618715	0.123519
	0.007517	0.012506	0.007282	0.014246	0.017251	0.027263	0.021505	0.035593
6 to 10	0.857048	0.900065	0.769841	0.130224	0.665150	0.747107	0.484472	0.262635
	0.014546	0.017365	0.026784	0.032246	0.020330	0.026240	0.028770	0.039440
11 to 15	0.770869	0.796608	0.698573	0.098035	0.652069	0.685164	0.555835	0.129328
	0.019871	0.025215	0.033356	0.042917	0.023499	0.029125	0.038698	0.047878
16 to 20	0.729591	0.763878	0.587921	0.175957	0.603372	0.638755	0.439337	0.199418
	0.022349	0.024973	0.037505	0.044455	0.023228	0.027221	0.042826	0.050976
21 to 25	0.670662	0.695512	0.485347	0.210165	0.545073	0.569630	0.409578	0.160051
	0.022504	0.025263	0.049516	0.054579	0.021346	0.025216	0.047517	0.054132
26 to 30	0.610259	0.638741	0.485314	0.153428	0.491663	0.519455	0.371162	0.148293
	0.020758	0.023372	0.045614	0.052879	0.023277	0.026788	0.049263	0.057967
31 to 35	0.595934	0.622267	0.450275	0.171992	0.492705	0.513551	0.360157	0.153395
	0.023318	0.025202	0.064036	0.066555	0.023485	0.025325	0.055819	0.062389
36 to 40	0.575779	0.592950	0.296073	0.296878	0.447899	0.462280	0.212991	0.249289
	0.024286	0.025889	0.072146	0.080124	0.026498	0.028252	0.059039	0.066851
41 to 45	0.530750	0.539638	0.382038	0.157601	0.428393	0.434632	0.320205	0.114427
	0.023057	0.023883	0.067294	0.071458	0.022127	0.023169	0.077964	0.081786
46 to 50	0.537554	0.547191	0.403047	0.144144	0.434219	0.443258	0.285319	0.157940
	0.025098	0.026956	0.076582	0.081956	0.023672	0.025749	0.068855	0.074381

TABLE 1 CONTINUED ON NEXT PAGE

TABLE 1 CONTINUED

PARENT INCOME RANK (S)	$\tau = 0.2$				$\tau = 0.3$			
	ALL	WHITES	BLACKS	W-B	ALL	WHITES	BLACKS	W-B
1 to 5	0.502154	0.564924	0.439008	0.125916	0.375359	0.448003	0.299662	0.148341
	0.019494	0.030367	0.022726	0.038369	0.020835	0.033274	0.026194	0.044088
6 to 10	0.502917	0.552696	0.389579	0.163117	0.386359	0.425868	0.304348	0.121520
	0.022468	0.029494	0.031087	0.042915	0.017783	0.025396	0.026200	0.038673
11 to 15	0.528285	0.570976	0.399664	0.171311	0.403770	0.455714	0.285894	0.169820
	0.023332	0.027960	0.038819	0.046764	0.022723	0.027551	0.034587	0.043455
16 to 20	0.515719	0.556944	0.336184	0.220760	0.399662	0.437934	0.249599	0.188335
	0.026313	0.031819	0.039496	0.049123	0.022792	0.027383	0.032182	0.039438
21 to 25	0.448168	0.469921	0.325947	0.143974	0.335782	0.352125	0.238027	0.114098
	0.025792	0.030793	0.040930	0.051120	0.022035	0.025169	0.045511	0.052044
26 to 30	0.396582	0.423600	0.279706	0.143894	0.298690	0.325184	0.166222	0.158963
	0.022702	0.026156	0.045677	0.054465	0.020433	0.024699	0.031878	0.041841
31 to 35	0.388555	0.404243	0.314096	0.090147	0.294985	0.309146	0.203268	0.105879
	0.024244	0.026324	0.059752	0.063905	0.020413	0.023285	0.049668	0.055762
36 to 40	0.318380	0.327804	0.160121	0.167683	0.219474	0.221544	0.137462	0.084081
	0.024711	0.026662	0.051676	0.058213	0.020758	0.021671	0.054310	0.054578
41 to 45	0.302060	0.304104	0.262789	0.041316	0.212612	0.213481	0.185498	0.027983
	0.024704	0.025322	0.068290	0.071817	0.021835	0.023104	0.056872	0.063442
46 to 50	0.327918	0.329326	0.250693	0.078633	0.213841	0.213483	0.134349	0.079134
	0.022135	0.024048	0.064474	0.071469	0.019208	0.019469	0.055563	0.056042

Note: Analysis sample includes all PSID individuals born 1945–79, followed into at least their 30s through 2013, and their parents' income. 13,540 individuals (5,063 black children; 8,127 white children; 7,285 low-income children ; 6,255 non-poor children) from 4,735 childhood families, 1,570 school districts, 1,229 counties, and all 50 states. Bootstrapped standard errors presented below mobility estimates.
Source: Intergenerational income data: PSID (1968–2013).

Figures 1A-B. Upward mobility estimates by race using intervals of parental income

FIGURE 1A. $\tau = 0$

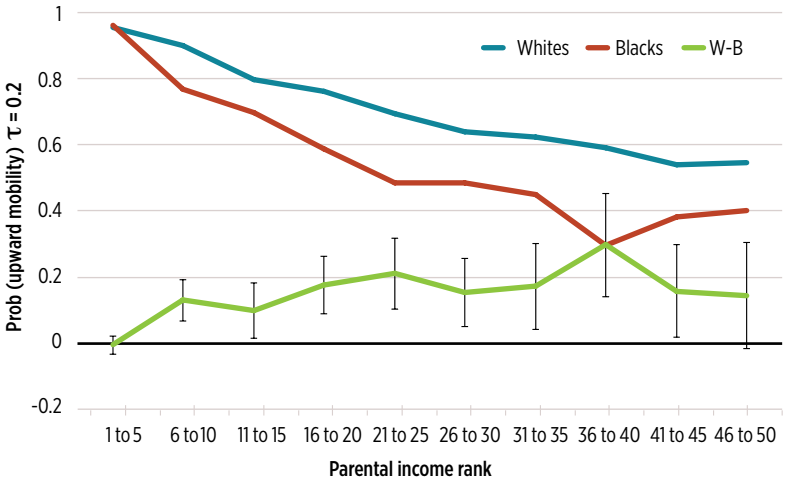


FIGURE 1B. $\tau = 0.2$

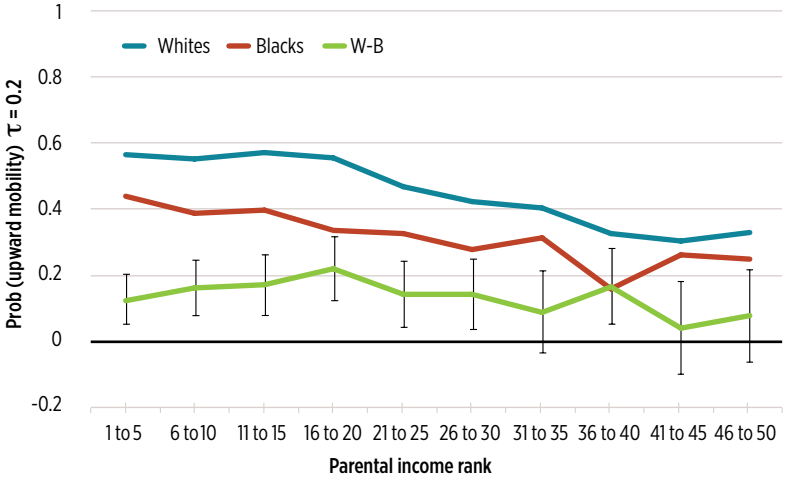
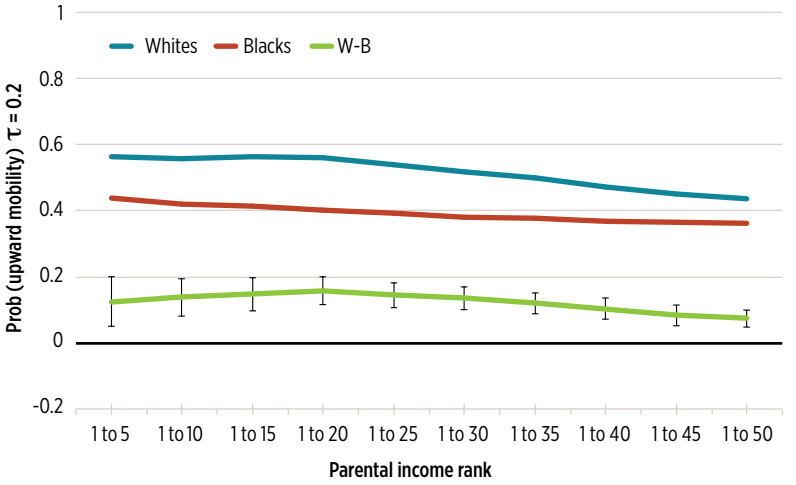


Figure 2. Upward mobility estimates by race: $\tau = 0.2$



Figures 1A-1B and figure 2 present similar patterns of race differences in upward mobility rates throughout the range of parental percentile rank intervals among children born in the bottom half of the income distribution.

In order to estimate how rates of upward mobility differ by birth cohort for both blacks and whites using a non-parametric approach, samples of children born in the bottom half of the income distribution are used to estimate locally weighted regressions, by race, where the outcome is an indicator for children exceeding their parents' rank as an adult. The models control for parental percentile rank in the income distribution. A series of plots of the upward mobility probability are produced for each of the various birth cohorts spanning 1945–79 for blacks and whites (conditional on parental percentile rank). Since there are a large number of potential estimates of upward mobility, the analysis is simplified by focusing only on the probability that children surpass their parents' position in the income distribution and the probability that they surpass their parent's position by at least 20 percentile points (i.e., substantial mobility), both conditional on their parents' rank. The birth cohort patterns of the conditional mobility outcomes are calculated using a Jianqing Fan (1992) locally weighted regression smoother, which allows the data to determine the shape of the function, rather than imposing a functional form. The racial differences presented are all statistically significant.

As shown in figures 3A-3C, whites exhibit roughly similar rates of upward mobility across the various cohorts born between 1950 and 1979; for example,

Figures 3A-C. Intergenerational mobility estimates among children born into bottom half of income distribution, by race and year of birth

FIGURE 3A. $\tau = 0$

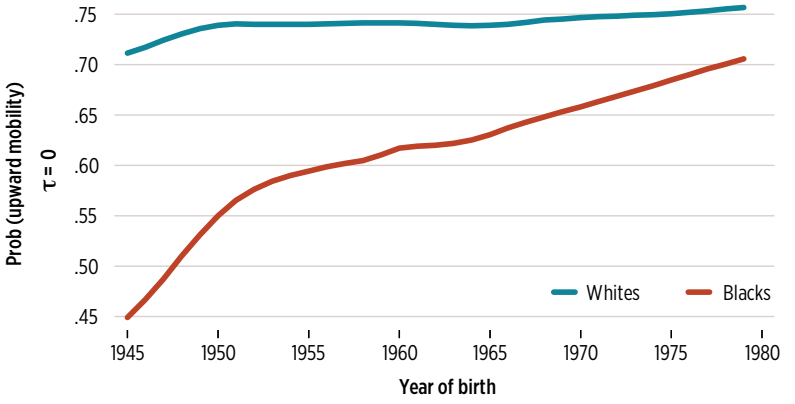
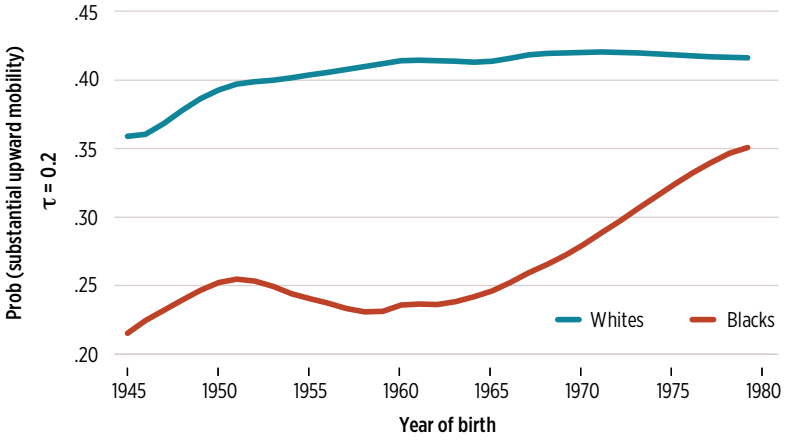
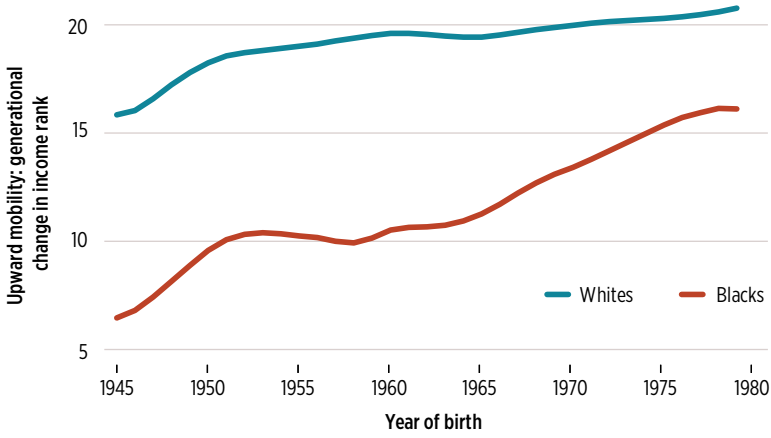


FIGURE 3B. $\tau = 0.2$



about 75 percent of white children whose parents were at the 20th percentile surpassed their parents' percentile in the family income distribution (figure 3A), and roughly 41 percent of whites experienced substantial mobility (figure 3B). These rates did not significantly change for successive cohorts of whites born between 1950 and 1979. In stark contrast, rates of upward mobility for

FIGURE 3C.



blacks rose sharply for successive cohorts born between 1945 and 1979. The rapid convergence of blacks' rates of upward mobility with that of whites is highlighted in the fact that for cohorts born in the late 1940s and early 1950s (cohorts that were not exposed to desegregation implementation and SFRs during their school-age years), the black-white difference in the likelihood of upward mobility among children whose parents were at the 20th percentile was nearly 20 percentile points (about 0.55 vs. 0.74); for cohorts born in the late 1970s this mobility gap narrowed to only a 5 percentile-point difference (about 0.70 vs. 0.75) (figure 3A). As shown in figure 3B, a similar pattern of rapid racial convergence emerges for successive cohorts born between 1960 and 1979 when the probability of substantial mobility is examined (albeit not as stark), which is driven by significant improvements for blacks over this period. Figure 3C presents the results for the generational change in income rank, where we see that for cohorts born in the late 1950s and early '60s the black-white difference in the average generational change in rank among children whose parents were at the 20th percentile was nearly 10 percentile points (about 10 vs. 19); for cohorts born in the late 1970s this racial mobility gap had shrunk by more than half (about 16 vs. 20).[15]

15 In a related study, Chetty et al. (2014) find measures of intergenerational mobility have remained stable for more recent cohorts born between 1971 and 1993. The present paper finds a sharp increase in generational income mobility among African Americans among successive birth cohorts born between 1955 and 1979 and shows its relatedness to dimensions of access to school quality. The two sets of findings do not necessarily conflict, as the study time periods barely overlap and Chetty et al. cover the whole population for more recent cohorts while the present study focuses on mobility rates for blacks and whites among older birth cohorts that overlap these policy changes.

Using the National Longitudinal Survey of Youth, Bhattacharya and Mazumder (2011) find that cognitive skills during adolescence appear to explain much of the difference in the racial gap in men's upward mobility. This paper focuses on reform-induced changes in dimensions of school quality during pre-K–12 that may influence both cognitive and non-cognitive skill development and thereby affect upward mobility prospects.

Empirical Strategy

The main difficulty in disentangling the relative importance of childhood family, neighborhood, and school quality factors is isolating variation in school quality characteristics that are unrelated to family and neighborhood factors. The primary interest is shedding light on the causal school-related factors that may explain the observed patterns of intergenerational mobility and the impacts of equal educational opportunity policies designed to address racial differences in mobility. For example, this paper investigates whether school desegregation improved the prospects for upward mobility of black children and whether it reduced the racial gap in upward mobility rates. Similarly, it examines the extent to which both school finance reform-induced spending increases and Head Start spending led to increases in upward mobility for poor children.

It is hypothesized that school desegregation may have long-run impacts on the upward mobility of African Americans through several potential mechanisms:

1. school quality resource effects (e.g., the distribution and level of per-pupil spending, class size, teacher quality)
2. peer exposure effects (e.g., children in classrooms with highly motivated and high-achieving students are likely to perform better due to positive spillover effects on other students in the classroom)
3. effects on parental, teacher, and community-level expectations of child achievement

The long-run effects of each hypothesized mechanism operate via their influence on the quality and quantity of educational attainment, examining the hypothesized primary mechanism: changes in school quality resulting from abrupt shifts in racial school segregation.

Following Johnson (2015), an event-study difference-in-difference framework is used to exploit the wide quasi-random variation in the timing and scope of court-ordered desegregation during the 1960s, '70s and '80s to identify the impacts of school desegregation on intergenerational mobility,

separately by race. Treatment dosage in this context is the product of the number of school-age years of exposure and the treatment intensity (i.e., the amount of reform-induced changes in school segregation and school spending). This paper tests for a dose-response effect with years of exposure (see Johnson 2015 for full details and discussion of the estimation methods). Specifically, this paper estimates equations of the form:

$$Y_{idb} = \sum_{T=-20}^{-1} \alpha_T^r \bullet I_{T_{idb}=T} + \sum_{T=1}^{12} \theta_T^r \bullet I_{T_{idb}=T} + \sum_{T=13}^{20} \delta_T^r \bullet I_{T_{idb}=T} \quad (3)$$
$$+ X_{idb}\beta + Z_{db}\gamma + (W_{1960d} * b)\phi^r + \eta_d^r + \lambda_b^r + \varphi_g^r * b + \varepsilon_{idb}$$

where i indexes the individual, d the school district, b the year of birth, g the region of birth (defined by 9 census division categories), and r the racial group. The variable T_{idb} is the year individual i from school district d turned age 17 minus the year of the initial desegregation court order in school district d. Accordingly, the timing indicators, $I_{T_{idb}=T}$, are equal to 1 if the year individual i from school district d turned age 17 minus the year of the initial desegregation court order in school district d equals T and zero otherwise. I include indicators for values of T between -20 and 20, which is the full support of years individuals were age 17 relative to initial court order years in the sample. Values of T between -20 and -1 represent unexposed cohorts who turned between the ages of 18 and 37 in the year of the initial court order; a value of 0 is our reference category and represents individuals who turned 17 in the year of the initial court order and were thus not exposed; values between 1 and 11 represent exposed cohorts who were "partially treated" because they were of school-going age (6 through 16) at the time of the initial court order but had less than 12 years of expected exposure; and values of 12 and greater represent fully treated exposed cohorts who turned 5 or younger during the year court-ordered desegregation was enacted and were therefore expected to attend desegregated schools for all 12 years of public schooling.

The model includes race-specific school district fixed effects (η_d^r), race-specific birth year fixed effects (λ_b^r), race-by-region of birth cohort trends ($\varphi_g^r * b$), controls for an extensive set of child and childhood family characteristics (X_{idb}: parental education and occupational status, mother's marital status at birth, birth weight, child health insurance coverage, gender). To control for trends in factors hypothesized to influence the timing of court orders, interactions are included between 1960 characteristics of the county of birth and linear trends in the year of birth ($W_{1960d} * b$): 1960 county poverty rate, percent black, average education level, percent urban, population size, percent of the county that voted for Strom Thurmond in the 1948 Presidential election (as a proxy for white segregationist preferences). Finally, to account for the effect of

other policies, county-by-birth year level measures are included of per capita expenditures on Head Start (at age four), hospital desegregation, community health centers, state funding for kindergarten, imposition of tax limit policies, in addition to Title I school funding (average during ages 5–17), and average childhood spending on food stamps, Aid to Families with Dependent Children, Medicaid, and unemployment insurance, (Z_{db}). Few studies simultaneously account for so comprehensive a set of policies.

The analyses of the effects of school finance reform-induced increases in per-pupil spending employ a similar set-up following Jackson, Johnson, and Persico (2015) and use both the timing of passage of court-mandated reforms and the type of funding formula introduced by that reform as exogenous shifters of school spending. Specifically, for each district the spending change that the district would experience after the passage of court-mandated school finance reform is predicted based on the experiences of similar districts facing similar reforms in different states. It is then determined if "treated" cohorts (those young enough to have been in school during or after the reforms were passed) have better mobility outcomes relative to "untreated" cohorts (children who were too old to be affected by reforms at the time of passage) in districts predicted (based on the experiences of similar districts in other states) to experience larger reform-induced spending increases (see Jackson, Johnson, and Persico 2015 for full details and discussion of the estimation methods).

Finally, the identification strategy used to isolate effects of county-level Head Start spending compares mobility outcomes among those who grew up in communities where Head Start was not available by the age of four with individuals from those same areas (the same childhood county of upbringing) after Head Start became available (controlling for year of birth and age effects, and the inclusion of school district fixed effects). The changing availability and quality of Head Start was largely beyond the control of parents during these early years of the program's inception and roll-out (1965–80), and would not be expected to affect children independently of the programs themselves. As a result, residentially immobile poor families were often able to enroll younger but not their older children.

A key innovation here is modeling early and later educational investments jointly, as the impact of policies at each childhood-specific investment stage may have long-run consequences for investment at other stages. Accordingly, this paper explores potential synergies between the effects of increases in Head Start spending and effects of reform-induced increases in K–12 school spending due to SFRs (or desegregation) on children's subsequent economic mobility outcomes. In particular, interactions are included between Head Start spending increases and instrumented school spending increases during K–12 (resultant from SFRs, where the timing of court-mandated reforms

and the type of funding formula introduced are used as instrumental variables for average K–12 per-pupil spending). All models include the same main set of controls:

- school district fixed effects
- race-specific region and year of birth effects
- controls for linear cohort trends in 1960 county characteristics
- controls at the county-level for the timing of hospital desegregation interacted with race
- roll-out of "War on Poverty" and related safety-net programs
- childhood family characteristics[16]

Standard errors are all clustered at the school district level.

Regression Results

The mean probability of upward mobility for black children whose parents were between the 16th and 20th percentile rank of the income distribution was 0.588 and that likelihood was 0.336 for the probability of substantial mobility (i.e., surpass their parents' percentile in the family income distribution by more than 20 percentile points). In contrast, the mean probability of upward mobility for white children whose parents were between the 16th and 20th percentile rank of the income distribution was 0.764 and that likelihood was 0.557 for the probability of substantial mobility (table 1, figures 1A-1B). Similarly, among children born in the bottom quintile, the probability of substantial mobility for blacks is 0.402, whereas that probability is 0.561 for whites (a statistically significant 16 percentile-point race difference) (figure 2). As documented on pages 313–21, there was rapid racial convergence in upward mobility rates over this period. This section examines the role of equal education opportunity policies as a potential factor that fueled this convergence.

16 The models that analyze effects of desegregation also include an indicator for whether the school district was ever under court order at some point between 1954–90 and interaction terms of this indicator with all controls, since districts that were never under a court order may exhibit different time trends independent of desegregation implementation as these districts typically had small fractions of minority students. The identification in these models thus relies exclusively on the quasi-random timing of desegregation court orders. The desegregation models focus on cohorts born between 1945 and 1968, given the earlier timing of desegregation implementation (relative to SFRs).

Effects of Desegregation

Figures 4A and 4B present results from fully non-parametric event-study models of the effects of school desegregation exposure on intergenerational mobility, separately for blacks and whites. Three key patterns clearly emerge from the analysis.

First, there is no evidence of pre-existing trends in mobility outcomes before desegregation orders are enacted.

Second, after enactment, there is a structural break in the trend for blacks. The results indicate that, for blacks, the onset of desegregation exposure produces an immediate jump in mobility prospects. Each additional year of exposure leads to a 1.5 percentile-point increase in the generational relative rank in the income distribution with an additional jump for those exposed throughout their school-age years (figures 4A–4B). Similarly, conditional on their parents' rank, there are large, statistically significant effects on the likelihood of substantial upward mobility (i.e., the probability that they surpass their parents' position by at least 20 percentile points) for blacks. Each additional year of exposure to court-ordered desegregation leads to a significant increase in the likelihood of experiencing substantial upward mobility; in particular, a generational change in income rank of nearly 20 percentile points on average is found when comparing blacks who attended segregated schools throughout their school-age years to blacks who were exposed to desegregated schools throughout K–12 (controlling for birth cohort differences and other factors) (figures 4A-4B). The mean and standard deviation change in exposure to court-ordered desegregation for the sample is roughly five years; thus, a five-year increase in exposure translates into a generational change in income rank of 10 percentile points on average for blacks.

Third, in stark contrast, for whites there are consistently no significant effects of desegregation exposure on mobility outcomes, and the point estimates are negligible (figure 4A). The small, insignificant effects for whites provide further evidence to rule out the competing hypothesis that blacks' improvements in upward mobility were driven by secular trends in desegregated districts.

Effects of School Spending

Figure 5 presents results from fully non-parametric event study models of SFR-induced spending effects on intergenerational mobility. Table 2 presents two-stage least squares (2SLS) estimates of the effects of reform-induced spending increases on mobility outcomes of all children and children born into the bottom half of the income distribution, respectively. Once again, three key patterns clearly emerge from the analysis.

Figures 4A-B. The effects of court-ordered school desegregation on intergenerational mobility, by race

FIGURE 4A

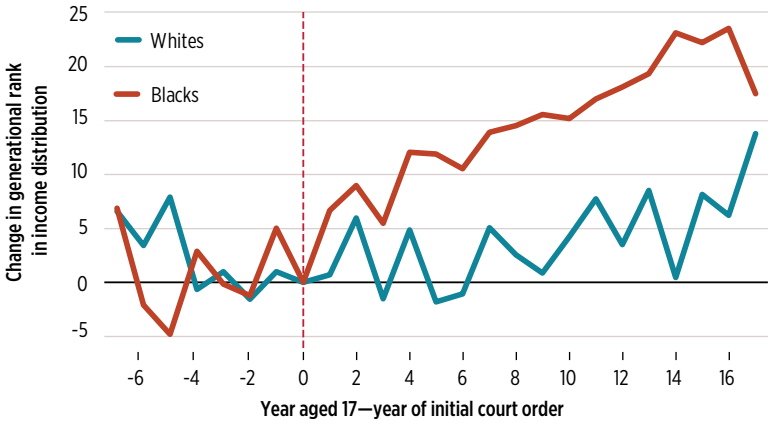
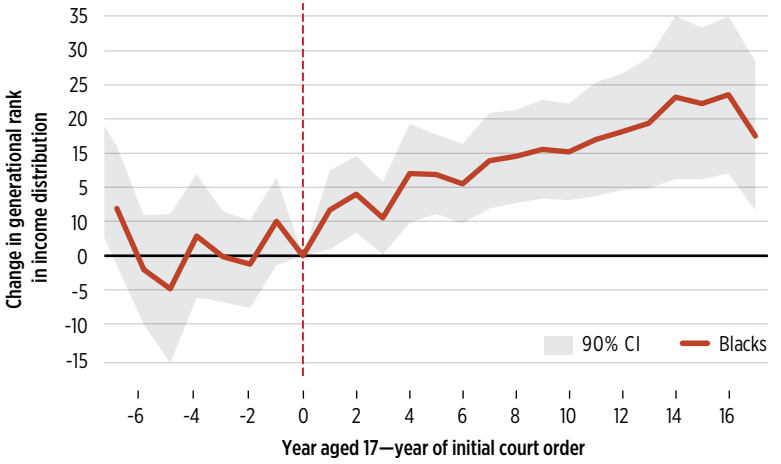


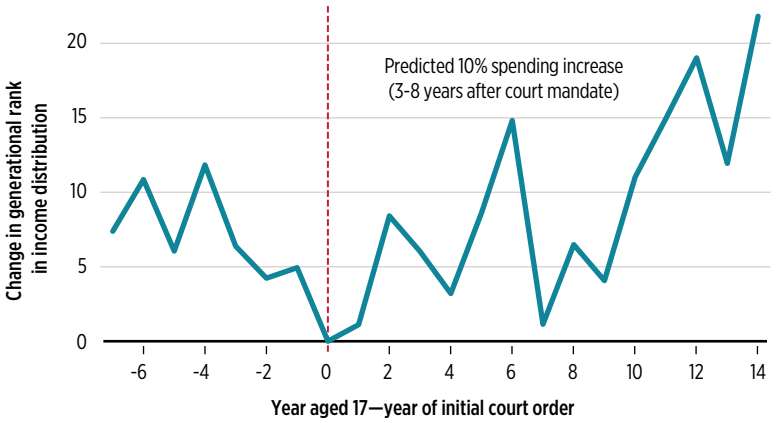
FIGURE 4B



First, there is no evidence of positive pre-existing trends in mobility outcomes before court-ordered SFRs are enacted (if anything, there is pre-existing downward trend in mobility) (figure 5).

Second, after enactment, there is a structural break in the trend for children who grew up in districts that experienced significant increases in school spending (due to SFRs); this pattern is particularly pronounced for children

Figure 5. The effect of court-ordered school finance reform on intergenerational mobility, all kids



born into the bottom half of the income distribution. While the fully nonparametric event study estimates of SFR effects on mobility face significant precision issues, the post-reform coefficients for districts predicted to experience significant increases in spending due to reforms are statistically significantly different from the pre-reform trends (p-value <0.01). The 2SLS/instrumental variables (IV) results indicate that, for low-income children, a 10 percent increase in per-pupil spending each year for all 12 years of public school leads to a generational change in income rank of 7.3 percentile points on average (p-value <.01) (table 2, column 4). Additionally, no effects on mobility outcomes are found when SFRs led to negligible changes in school spending.

Third, the results indicate that the positive impacts of school spending increases on upward mobility prospects are most pronounced for lower-income children, as no significant relationship is found between reform-induced changes in spending on the mobility outcomes of children from higher-income families (i.e., those whose parents were in the top half of the income distribution). These results mirror the findings reported in Jackson, Johnson, and Persico (2015).

Effects of Head Start Spending

As shown in table 2, the results from these models also indicate significant impacts of county-level Head Start spending on mobility outcomes (independent of exposure to desegregation or SFRs). The results indicate that a $1,000

Table 2. 2SLS/IV estimates of court-ordered school finance reform induced effects of per-pupil spending on intergenerational mobility

	DEPENDENT VARIABLE: GENERATIONAL CHANGE IN RELATIVE RANK IN INCOME DISTRIBUTION			
	ALL KIDS		KIDS BORN INTO BOTTOM HALF OF INCOME DISTRIBUTION	
	(1)	(2)	(3)	(4)
Number of years of SFR exposure$_{(age\ 5–17)}$	0.2925		0.6586*	
	(0.2567)		(0.3524)	
Number of years of SFR exposure$_{(age\ 5–17)}$ * Predicted SFR-induced district spending change (in logs)$_{(3–8yrs\ after\ court\ mandate)}$	4.0830***		5.2678***	
	(1.1250)		(1.8617)	
Instrumented Ln (school district per-pupil spending)$_{(age\ 5–17)}$		42.6781**		72.9640***
		(19.5633)		(26.0591)
County Head Start spending per 4-year old$_{(age\ 4)}$ (in 000s)	0.1730***	0.1711***	0.1840***	0.1812***
	(0.0537)	(0.0541)	(0.0547)	(0.0553)
Number of individuals	13,442	13,442	9,737	9,737
Number of childhood families	4,713	4,713	3,788	3,788
Number of school districts	1,561	1,561	1,353	1,353

Robust standard errors in parentheses (clustered at school district level)
Note: *** p<0.01, ** p<0.05, * p<0.10
Data: PSID geocode data (1968–2013), matched with childhood school and neighborhood characteristics. Analysis sample includes all PSID individuals born 1945–1979, followed into at least their 30s through 2013.
Models: Results are based on 2SLS/IV models that include: parents' relative rank in income distribution, school district fixed effects, race-specific year of birth fixed effects, race*census division-specific birth year fixed effects; controls at the county-level for the timing of school desegregation*race, hospital desegregation*race, roll-out of "War on Poverty" & related safety-net programs (community health centers, food stamps, medicaid, AFDC, UI, Title-I (average during childhood yrs.)), timing of state-funded Kindergarten intro and timing of tax limit policies; controls for 1960 county characteristics (poverty rate, percent black, education, percent urban, population size, percent voted for Strom Thurmond in 1948 Presidential election*race (proxy for segregationist preferences)) each interacted with linear cohort trends; and controls for childhood family characteristics (parental income/education/occupation, mother's marital status at birth, birth weight, gender). The first-stage model include as predictors the school-age years of exposure to school finance reform interacted with the quartile of the respective school district's predicted reform-induced change in school spending based on the timing and type of court-ordered reform interacted with 1970 (within-state) district income and spending percentile categories. There exists a significant first-stage.

increase in Head Start spending leads to a generational change in income rank of 0.18 percentile points on average (p-value <.01) (table 2, column 4), and is associated with statistically significant increases in both the probability of upward mobility and substantial upward mobility among low- income children. While the point estimates for Head Start spending per four-year-old children in the county may appear small in magnitude, these should be viewed as intent-to-treat estimates, since many children in these communities were not eligible and/or did not attend Head Start, so the treatment-on-the-treated (TOT) estimate would likely be sizable.[17]

Importantly, no significant interactive effects are found of Head Start spending increases and increases in K–12 per-pupil spending (due to SFRs) on the mobility outcomes of low-income children, where the long-run effects of increases in Head Start spending are amplified when followed up by attending schools that experienced significant increases in per-pupil spending (table 3). And vice versa, the effects of school spending increases on mobility for low-income children were elevated if they were preceded by growing up in a community with higher Head Start spending per four-year-old child during their pre-school years, presumably because of boosts to school-readiness and other child developmental trajectories. Thus, for low-income children, the combined effects on mobility prospects of growing up in districts with greater Head Start spending and higher K–12 school spending are significantly greater than the sum of their parts (i.e., the independent effects of increases in Head Start and school spending in isolation).

Similarly, interactive effects of Head Start spending and desegregation exposure for poor black children can be seen, where the long-run effects of increases in Head Start spending are amplified when followed up by attending desegregated schools (table 4). And vice versa, the effects of desegregation exposure for black children were enhanced if they were preceded by growing up in a community with higher Head Start spending per four-year-old child during their pre-school years. Another way of interpreting this evidence is that it suggests the effects of Head Start are more likely to fade out when they are not followed by access to quality schools during the K–12 years.

The results highlight the importance of modeling early and later educational investments jointly, as the impact of policies at each investment stage has long-run consequences for investment at other stages. The findings provide suggestive evidence that when health care and education providers have more interaction, as in the case of children who participate in early intervention

17 Insufficient information is available from the NARA data on how many Head Start participants there were at the county level for these early years (1965–80) to compute an implied TOT effect from these estimates.

Table 3. 2SLS/IV estimates of interactive effects of Head Start spending and school finance reform-induced effects of per-pupil spending on the intergenerational mobility of low-income children

	DEPENDENT VARIABLE: GENERATIONAL CHANGE IN RELATIVE RANK IN INCOME DISTRIBUTION
	KIDS BORN INTO BOTTOM QUARTILE OF INCOME DISTRIBUTION
	(1)
County Head Start spending per 4-year old$_{(age\ 4)}$ (in 000s)	1.0701**
	(0.4739)
(SFR) instrumented Ln (school district per-pupil spending)$_{(age\ 5–17)}$	54.7257**
	(22.0752)
Head Start spending per 4-year old$_{(age\ 4)}$ * instrumented school spending$_{(age\ 5–17)}$	8.9386**
	(4.6398)
Number of individuals	5,307
Number of childhood families	2,231
Number of school districts	840

Robust standard errors in parentheses (clustered at school district level)
Note: *** p<0.01, ** p<0.05, * p<0.10
Data: PSID geocode data (1968–2013), matched with childhood school and neighborhood characteristics. Analysis sample includes all PSID individuals born 1945–79, followed into at least their 30s through 2013.
Models: Head Start spending per 4-year old in the county is centered around $5,000 (and measured in 000s) and instrumented ln (school district per-pupil spending during ages 5–17) is centered around 0.1, to facilitate interpretation of the main effects as these are roughly the mean increases among low-income districts that underwent reforms. Results are based on 2SLS/IV models that include: parent's relative rank in income distribution, school district fixed effects, race-specific year of birth fixed effects, race*census division-specific birth year fixed effects; controls at the county-level for the timing of school desegregation*race, hospital desegregation*race, roll-out of "War on Poverty" & related safety-net programs (community health centers, food stamps, medicaid, AFDC, UI, Title-I (average during childhood yrs)), timing of state-funded Kindergarten intro and timing of tax limit policies; controls for 1960 county characteristics (poverty rate, percent black, education, percent urban, population size, percent voted for Strom Thurmond in 1948 Presidential election*race (proxy for segregationist preferences)) each interacted with linear cohort trends; and controls for childhood family characteristics (parental income/education/occupation, mother's marital status at birth, birth weight, gender). The first-stage model include as predictors the school-age years of exposure to school finance reform interacted with the quartile of the respective school district's predicted reform-induced change in school spending based on the timing and type of court-ordered reform interacted with 1970 (within-state) district income and spending percentile categories. There exists a significant first-stage.

Table 4. Interactive effects of Head Start spending and school desegregation on intergenerational mobility

	DEPENDENT VARIABLE: GENERATIONAL CHANGE IN RELATIVE RANK IN INCOME DISTRIBUTION
	ALL KIDS
	(1)
County Head Start spending per 4-year old$_{(age\ 4)}$ (in 000s)	0.1459+
	(0.0978)
Years of desegregation exposure$_{(age\ 5–17)}$ * Head Start spending per 4-year old$_{(age\ 4)}$ * black	0.1333*
	(0.0714)
Years of desegregation exposure$_{(age\ 5–17)}$ * Head Start Spending per 4-year old$_{(age\ 4)}$ * white	0.2066*
	(0.0)
F-TEST OF JOINT SIGNIFICANCE OF HEAD START SPENDING VARIABLES: P-VALUE <0.01	
Number of individuals	8,091
Number of childhood families	3,733
Number of school districts	1,190

Robust standard errors in parentheses (clustered at school district level)
Note: *** p<0.01, ** p<0.05, * p<0.10
Data: PSID geocode data (1968–2013), matched with childhood school and neighborhood characteristics. Analysis sample includes all PSID individuals born in 1950s and 1960s, followed into at least their 30s through 2013.
Models: Head Start spending per 4-year old in the county is centered around $5,000 (and measured in 000s) and school-age years of desegregation exposure is centered around 12, to facilitate interpretation of the main effects as representing the mean effects of Head Start spending when it is followed up with exposure to desegregated schools throughout one's K-12 years. The main desegregation exposure variables are included in model (non-parametric specification) but suppressed in table—see event study figure B to view effects of school desegregation on mobility by race (which are evaluated at mean Head Start spending among low-income districts that had Head Start programs). Results are based on models that include controls for: parent's relative rank in income distribution, school district fixed effects, race-specific year of birth fixed effects, race*census division-specific birth year fixed effects; controls at the county-level for the timing of school desegregation*race, hospital desegregation*race, roll-out of "War on Poverty" & related safety-net programs (community health centers, county expenditures on Head Start (at age 4), food stamps, medicaid, AFDC, UI, Title-I (average during childhood yrs)), timing of state-funded Kindergarten intro and timing of tax limit policies; controls for 1960 county characteristics (poverty rate, percent black, education, percent urban, population size, percent voted for Strom Thurmond in 1948 Presidential election*race (proxy for segregationist preferences)) each interacted with linear cohort trends; and controls for childhood family characteristics (parental income/education/occupation, mother's marital status at birth, birth weight, gender).

pre-school programs, it accelerates child development, enhances school readiness and educational achievement, and leads to significantly greater likelihood of upward mobility prospects later in life.

Summary Discussion and Conclusions

The key contributions of this study are three-fold.

First, the paper provides a more detailed descriptive portrait of intergenerational economic mobility in the United States.

Second, the paper attempts to explain why black-white mobility differences narrowed significantly for successive cohorts born between 1955 and 1979, with a focus on the role of three major equal educational opportunity policies pursued over this period: school desegregation, school finance reforms, and roll-out and expansions of Head Start, improving the understanding of the intergenerational mobility process in the United States and illuminating the central role schools play in the transmission of economic success from one generation to the next.

Third, the paper emphasizes differences in early education and school quality—in particular, Head Start and school spending—as important components of the persistence in income across generations.

Indeed, schools—and policies that influence their optimal functioning—are transformative agents that either provide or deprive children of the opportunity to reach their full potential. These equal educational opportunity policies were instrumental in the making of a growing black middle class. The evidence shows that the footprints of paths toward upward mobility are preceded by access to high quality schools beginning in early childhood through 12th grade. These school reforms expanded on-ramps to poor and minority children to get on that path.

Evidence on the long-term productivity of education spending demonstrates that equal education policy initiatives can play a pivotal role in reducing the intergenerational transmission of poverty. ■

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