The Intergenerational Transmission of Human Capital: Evidence from the Golden Era of Upward Mobility

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Abstract

The first half of the American 20th century was characterized by an extraordinary expansion of educational opportunity and a corresponding increase in educational attainment. We explore the intergenerational transmission of human capital during this golden age of upward mobility, using household level data from the 1940 census merged with administrative data on local school quality. A simple model of optimal schooling shows that parents choose more education for their children when the quality of local public schools is higher, with larger effects among poorer and less educated parents. Consistent with this model, we find evidence linking the average quality of public schools to upward mobility in education, particularly among children with low socioeconomic status.

Keywords: Intergenerational Mobility; Human Capital; Education; School Quality

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1 Introduction

Societies aspire to equality of opportunity—the goal that all children have the chance to achieve a prosperous life. An effective system of public education plays a potentially important role in meeting this objective. In the U.S., the widespread availability of public elementary education provided a pathway to prosperity for many children by the turn of the 20th century, and more notably, over the next 40 years the "high school movement" led to a sustained rise the availability of public secondary schooling (Goldin and Katz, 2008). In 1900 only about 10 percent of 14–17 year olds in the U.S. attended high school, but by 1940 the rate had risen to over 70 percent.[1] This era of rapidly increasing human capital set the stage for rising middle class incomes and stable or even declining inequality in the decades following World War II, resulting in what Goldin (2001) calls America's "human-capital century."

During this era of sustained average gains in educational attainment, not all children benefited equally. Black students in most Southern states had access to only low-quality segregated schools (Bond, 1934), with few opportunities to complete high school.[2] As late as 1938, for example, there were only 20 accredited black high schools in the state of South Carolina.[3] White children in poorer and more rural areas also faced fewer educational opportunities than their counterparts in richer and more urban areas.

In this paper we examine the intergenerational links between parental education and child education during this remarkable era of rapidly expanding, but unevenly distributed, educational opportunity. We use the 100% micro data files from the 1940 Census to study education choices of young people (primarily aged 14 to 18) who were living with at least one parent. The 1940 Census collected for the first time information on educational attainment and income for essentially the entire population, enabling us to study intergenerational links within millions of families. It also collected detailed information on race and place of residence, allowing us to merge in school quality metrics, which, in localities where segregation prevailed, were often recorded by race. Importantly, in 1940 most young people completed their

[1] US Department of Education (1993), Table 9.

[2] As we discuss below, black students outside the South were also often relegated to separate schools, as were some Chinese American students.

[3] By contrast there were 306 accredited white high schools offering up to 11th grade (the final grade of secondary school). See South Carolina State Superintendent of Education (1938), pp. 98–103.

education before leaving home. By age 18, for example, about 90 percent of young white men were still living with their parents, though 60 percent were already out of school. This feature allows us to use simple measures of educational attainment that capture upward mobility relative to parents (e.g., completion of the 9th grade among children whose parents have 8 grades or less) and also to estimate censored regression models of desired completed education.

The intergenerational transmission of economic success has engaged social scientists for at least a century.[4] With the recent availability of near-population micro data based on U.S. tax records, an important body of new work has emerged studying intergenerational mobility for children born in the early 1980s.[5] Chetty et al. (2014a) show that the rate of upward mobility in income for these cohorts varies widely across areas, and is negatively correlated with such local characteristics as racial segregation, the student-teacher ratio, and the high school dropout rate, and positively correlated with the average household income and local tax rates. Our work provides an historical counterpart to this research, though we focus on the intergenerational transmission of *human capital* (rather than income). Our use of Census records also has some advantages: for example, the data include such parental characteristics as education, race, and immigrant status.

At a conceptual level, our research builds on a theoretical literature originating in the seminal contributions of Becker and Tomes (1979 and 1986) and Loury (1981). Indeed, we frame our empirical analysis using a model in the spirit of these papers. We assume that parents face a trade-off between current consumption and investment in their children's human capital. More prosperous parents choose higher levels of education for their children, bequeathing some of their socioeconomic advantage to the next generation.

Using this model we argue that a key factor mediating the strength of this link in the early twentieth century was the quality of local schools. Assuming that higher quality schools yield higher returns per year of schooling (as in Card and Krueger, 1992a), parents will invest more when their children have

[4]Galton (1869) posed the issue as (largely) one of inherited ability. Prominent contributions in the 1960s, focusing on the role of educational and other institutions, included Coleman et al. (1966), Blau and Duncan (1967) and Jencks et al. (1972). There is a huge subsequent literature on intergenerational links in economic wellbeing, including many studies non-U.S. studies, reviewed in Solon (1999) and Black and Devereux (2011).

[5]Previous U.S. work on the topic (e.g., Solon, 1992, and Mazumder, 2005) typically relied on relatively small samples.

access to better schools. On the cost side, however, observed enrollment patterns suggest there was a discrete jump in the marginal cost of schooling between high school and college, inducing many families to stop schooling after high school.[6] In this setting, increases in school quality will tend to have a larger effect on children who would have otherwise stopped schooling relatively early (most of whom have lower-educated parents), contributing to relative upward mobility. It is also likely that increases in the *average* level of school quality tended to yield larger improvements for the schools attended by children from poor families (a "leveling up" effect), again leading to a link between average school quality and relative upward mobility.

As an empirical matter, our starting point is to document a strong positive gradient between parental education and the schooling attainment of children in the 1940 census. Among white females age 16 to 18, for example, those with highly educated parents (at least one parent graduating from high school) had a 0.95 probability of completing 9th grade, whereas those with poorly educated parents (neither parent beyond a 4th grade education) had only a 0.40 probability. Similar patterns are present for white males and for black children of both genders. Differences in the probability of completing 9th grade across different parental education groups vary widely by region, with the largest gradients in the South and the smallest in the Northeast. These geographic patterns had important implications for the upward mobility rates of different demographic groups. Over 80 percent of black children were educated in the South, where schooling completion rates for children from poorly educated families were relatively low, contributing to the low rate of upward mobility of African Americans. Many second generation immigrants from Europe, by comparison, were concentrated in the Northeast where schooling rates were relatively high for children with poorly educated parents, aiding their rapid assimilation to the middle class (Gordon, 1964).

We construct a simple summary measure of the upward mobility rate based on the 9th grade completion rate of children aged 16–18 with middle-educated parents (between 5 and 8 years of schooling). At the county level this rate is very highly correlated with the measure of upward mobility in income constructed by Chetty et al. (2014a) for children born in the early 1980s, underscoring the potential value of understanding the local determi-

[6] In 1940 the fraction of college-age people pursuing higher education was quite low; college enrollment as a share of the population age 19-24 was 9% in 1939 (US Department of Education, 1993, Table 24). This source shows 47% of college enrollees were at private institutions.

nants of upward mobility in the earlier time period. At the state level it is also highly correlated with simple measures of the average quality of public schools such as the average pupil-teacher ratio and average teacher salaries. The correlations are particularly strong between the upward mobility rate for black children and the quality of schools across the 18 Southern states with segregated schools.

We then proceed to a more formal statistical analysis using censored regression (Tobit) models to examine schooling outcomes for a broader age range. We fit the models separately by race/gender and parental education level, treating children who are not enrolled at the census date as having completed their schooling, and those who are enrolled as being censored. These models include unrestricted state dummies as well as a variety of control variables. In a second stage we then relate the estimated state dummies to administrative measures of average school quality at the state level (measured during the years a typical student would attend school). This analysis points to two main conclusions. First, controlling for parental education and other factors, school quality metrics are strongly related to schooling attainment for children born in the 1920s. Second, these estimated effects are largest for children with the least educated parents and smallest for those with the most educated parents. Thus, our results are consistent with the prediction that higher average school quality in a state contributed to closing the schooling gap between more and less educated families.

Finally, we pursue an analysis that has a somewhat more causal flavor. In the South, much of the local variation in resources made available to students, particularly black students attending the region's segregated public schools, seems to have been driven by rather idiosyncratic political considerations at the state level. For example, many (though not all) Southern states set minimum wages for public school teachers, with minimum wage standards that were typically lower for black teachers than white teachers. For example, in 1940 the minimum annual wage in Georgia was $280 for white teachers and $175 for black teachers, while in neighboring Tennessee, the minimum annual wage was $320 for both white and black teachers. Motivated by these features of the segregated public schooling system in the South, we study the effect of teacher pay on upward mobility, with a "border analysis" in which we study county-level outcomes among approximately 100 border-county pairs for Southern states, using state minimum wage policies to instrument for teacher salaries. We find strong evidence that higher teacher pay led to higher upward mobility among black children.

The paper proceeds as follows. In Section 2 we provide some historical context on schooling and educational attainment in the early part of the twentieth century. We set up a theoretical framework in Section 3, with the intention of imposing some order on our thought process as we head into the empirical inquiry. We report our main empirical analyses in Section 4, then our analysis of Southern border counties in Section 5. We summarize our findings and present some conclusions and directions for further research in Section 6.

2 Historical Backdrop

We study the intergenerational transmission of human capital during the first half the twentieth century—a period during which average schooling was increasing by nearly one year per decade. Our focus is on educational outcomes of sons and daughters aged 14–18 living with parents in 1940. The two generations we study are thus *parents*, who were born from roughly 1880 through 1910, and their *children,* born in the 1920s.

Two broad features in the historical landscape make these generations especially attractive for our research purposes, i.e., studying the intergenerational transmission of inequality in human capital.

The first feature is the high degree of heterogeneity in human capital within the *parent generation.* This heterogeneity was the result, in part, of the way the U.S. public school system evolved during the late 19th and early 20th centuries. Americans born 1880 though 1910 typically had access to public primary schools as children, but particularly among the earliest of these cohorts, students in many areas of the country had little access to schooling beyond the eighth grade. This place-based variation in schooling was the legacy of the decentralized nature of public schooling. As Goldin and Katz (2008) document, local finance and control was a defining feature of American public education from its inception, and continued to be important at the beginning of the high school movement.[7] In consequence, the geographic diffusion of high schools across America was uneven.

[7]See chapters 4–6 of Goldin and Katz (2008), which provide a detailed account of the provision of primary and secondary public education in the U.S. in the nineteenth and twentieth century. As to the high school movement specifically, these scholars argue, "The high school movement was, above all, a grassroots movement. It sprung from the people and was not forced upon them by a top-down campaign" (p. 245).

Racial segregation also contributed to the inequality in schooling available to the parent generation. Racial segregation was mandated throughout the South, and outside the South many states permitted segregation at the discretion of local school boards. In California, the birthplace of most Chinese Americans in the parent generation, Chinese Americans were generally placed in segregated schools. Educational opportunities afforded black and Chinese Americans (and to a lesser degree, Japanese Americans) were thereby often limited as a matter of official policy. We provide additional details in Appendix 1.

All told, it is not surprising that we observe dramatic differences in human capital within the parent generation by birth cohort, region, and race. We report relevant statistics, calculated from 1940 Census data, in Appendix 1. We find, for example, that among black men and women born in the South, 1880–89, fewer than 13 percent obtained eight or more years of education, and fewer than nine percent reached grade 12. By way of comparison, among whites born in the West, 1900–09, more than 86 percent completed eighth grade, and more than 41 percent completed grade 12.[8] In empirical work reported in Sections 4 and 5, our particular focus is upward mobility in education among children with poorly educated parents. As we shall see, in 1940 there were millions of families, spread across the country, in which the best-educated parent had four or fewer years of school, and millions more with eight or fewer grades.

The second feature of the historical landscape that is valuable for our research design is vast inequality in educational resources available at the local level to the *children's generation*. The children we study were born 1922–26, and were educated in the late 1920s and throughout the 1930s. By this time period, state policies were becoming more important for the standardization of education within states, but there was nonetheless considerable variation in school quality within states (e.g., at the county level). And across states there were very large differences in resources devoted to primary and secondary education.[9]

[8]Moreover, these statistics likely understate racial differences in human capital because in the late nineteenth century, educational resources available to black students in the South were extremely limited (Margo, 1980).

[9]In this respect our work stands in contrast to prominent stream of research on intergenerational mobility emerging from Nordic counties (made possible by linked administrative records in those countries), e.g., Meghir and Palme (2005), Meghir et al. (2013), Meghir et al. (2014), Lundborg, Nilsson, and Rooth (2014), Aakvik et al. (2010), and

In the 1930s, as a broad generalization, schools outside the South were better financed than were schools in Southern states, and the majority of black students attended schools in the South, where students attended segregated schools.[10] In these states resources devoted to black schools were much lower than those made available to white schools; resource allocation to black students was especially low in the Deep South.[11] Most Japanese American and Chinese American students attended schools in California, which in the 1930s had among the highest-quality schools in the country. Although earlier generations of Asian American students had been placed in segregated schools in California, by the 1930s nearly all Japanese and Chinese American students were educated in integrated schools.

2.1 Geographic Patterns in Upward Mobility

With these generalizations in mind, we provide some initial evidence about the relationship between parent and child education in the series of panels in Figure 1. In constructing these figures we focus on children aged 16–18 who reside with at least one parent. For these children we construct a simple metric of educational attainment—the fraction who attained at least ninth grade (whether currently in school or not). The panels in Figure 1 graph this outcome as a function of "parental schooling"—a variable equal to the higher of the parents' education, when both parents are present, or the parent's education in single-parent families.[12] We restrict attention for the moment to families in which parents and children are native born.

Panel A shows that at every level of parental education, the fraction of

Black et al. (2005). In our setting—the U.S. in 1940—we have higher levels of racial and cultural diversity, and because of the strong local control of education institutions, the U.S. had far more geographic variation in educational resources available to children.

[10]Peterson (1935) reports that in the early 1930s, all 18 Southern states, the District of Columbia, Arizona and Kansas mandated racial segregation in schooling; legislation authorized separate schools in Indiana, New York, and Wyoming; and no legal impediment existed to segregation at the local level in California, Iowa, Maine, Montana, Nebraska, Nevada, New Hampshire, North Dakota, Ohio, Oregon, Utah, Vermont, and Wisconsin.

[11]States in the Deep South are Alabama, Georgia, Louisiana, Mississippi, and South Carolina. For our purposes, the other Southern states (sometimes called the "Peripheral South") are Arkansas, Delaware, District of Columbia, Florida, Kentucky, Maryland, Missouri, North Carolina, Oklahoma, Tennessee, Texas, Virginia, and West Virginia.

[12]Notice that for families with eight or fewer years of parental education, we have a (somewhat arbitrary) measure of "upward mobility."

children with at least nine grades of education is substantially higher for white children than for black children, and within race is generally higher for daughters than for sons. Panels B and C document regional variation in schooling outcomes for white daughters and sons. These graphs show that among children of poorly educated parents, educational attainment is much higher outside the South than in the South, but this regional variation is less pronounced among children of well educated parents. Panels D and E show our gradients for black daughters and sons, separately for the Deep South and Peripheral South, and provides this same geographic breakdown for their white counterparts. Educational outcomes, conditional on parental education, are particularly poor for black children educated in the Deep South. By way of comparison, among white families the schooling attainment levels of children, conditional on parental education, is virtually identical in the Deep South and Peripheral South.

The primary focus in this paper is native-born families, but for the sake of interest in Panels F and G we provide figures for families in which at least one parent is an immigrant. There is a common perception that immigrants often move in hopes of improving prospects for children. Evidence in Panel F is consistent with that idea; children of poorly-educated immigrants have much higher levels of educational attainment than their non-immigrant counterparts. As with non-immigrant families, children in immigrant families have lower educational attainment in the South.

There many ways of measuring upward mobility. Motivated by the patterns in Figure 1, we group parents with five to eight years of education—approximately in the middle of the parental education distribution—and calculate the fraction of children who "move up the educational ladder" by earning at least nine years of education. Figure 2 shows large regional differences in this simple measure of upward mobility, and quantifies a disadvantage for black children, most prominently in the South.[13]

[13]In the West there are a substantial number of Chinese American and Japanese American families, allowing us to assess upward mobility for these groups specifically. Interestingly, upward mobility rates in the West were quite similar for black, white, and Chinese American children, but substantially higher for Japanese American children. See Hilger (2017a) for an analysis centering on Asian Americans.

2.2 Upward Mobility and School Quality

For white and black families, we provide additional documentation of geographic variation in upward mobility in education in the maps shown in Figure 3. Our measure again is the proportion of children aged 16–18 who have attained the ninth grade among children whose best-educated parent has education level 5–8.

The maps show striking geographic variation in mobility. Consider, for instance, the patterns shown for sons. Panel B shows that our upward mobility measure for white sons is lowest in Tennessee and Kentucky (0.348 and 0.370 respectively) and highest in California (0.815) and Utah (0.853). Panel D shows that upward mobility is generally much lower for black sons than white sons, and is particularly low in the Deep South.[14] For instance, upward mobility in education for black sons is only 0.088 in Mississippi, 0.146 in South Carolina, and 0.150 in Georgia, but is quite high in Nebraska (0.794), California (0.826) and Minnesota (0.833). Panels A and C show that the geography of upward mobility is quite similar for daughters.

We are interested in understanding the extent to which the patterns shown in these maps are related to school quality. Throughout this paper we use three measures of the quality of local public schools—the pupil-teacher ratio, average annual wages of teachers, and the length of the school term. At the state-wide level we use the data sets originally assembled by Card and Krueger (1992a, 1992b), which include average pupil-teacher ratios, average teacher wages, and average term lengths for all public schools in each state, as well as separate averages for the segregated black and white schools in 18 Southern states.[15] For the moment we show basic relationships with scatter plots relating state-level school quality measures to upward mobility. See Figure 4. Panel A that upward mobility for white daughters at the state level is negatively related to the student-teacher ratio, and is positively related to the teacher wage and term length. The same is true for white sons, as shown in Panel B.

We provide comparable plots for black daughters and sons, restricting attention to Southern states. We analyze these states only because these states had mandated racial segregation in the 1930s *and* recorded school metrics separately for black and white school. As we have noted, some states

[14] We give results only for states for which we have a sample of at least 50 child-parent pairs in this parental education bracket.

[15] In Section 4 below we provide a more detailed discussion of these metrics.

outside the South (such as Arizona and Kansas) also mandated segregation in the 1930s, and *de jure* segregation on a local basis existed in other states. Moreover, *de facto* segregation may have been quite common in non-Southern school districts. We thus can reliably assess average school quality for black students only in the South. Results are shown in Panels C and D of Figure 4. We note that the horizontal scales (quantifying quality metrics) differ for black and white students; school quality was typically much worse for black students. As with white students, school quality is clearly associated with upward mobility in education.

Before further empirical evaluation we take a digression for the purpose of conceptual organization.

3 A Benchmark Model

Our goal is to build a simple model to study plausible links between the intergenerational transmission of human capital and the quality of schooling available to families. We work with a variant of the household model of Becker and Tomes (1979, 1986) and Loury (1981), in which the utility of a parent-child family depends on current consumption and also on future consumption of the child.

We assume that parents choose a level of schooling E for their child, given their own resources and the potential earnings of the child. Parents have income y_0 per period, which is assumed to remain constant over time, and pay out-of-pocket costs $c(t)$ for the t^{th} period of schooling, which includes tuition and living costs for post-secondary education.[16] For simplicity we assume the child's earnings while in school are 0 and $y_1(E)$ per period after completing E years of school. We assume that the child lives with his or her parents until age $L > E$, after which point the child is on his or her own. Ignoring any possibility of borrowing or lending, parents maximize

$$U(E) = \int_0^E u(y_0 - c(t))e^{-rt}dt + \int_E^L u(y_0 + y_1(E))e^{-rt}dt + \int_L^\infty \theta v(y_1(E))e^{-rt}dt, \quad (1)$$

[16]For students in areas with no local high school the out of pocket costs of secondary school may also include living and travel costs.

where u maps parental income to parental utility in period t, v maps the child's income to the child's utility in period t, $\theta \geq 0$ is an altruism factor reflecting the value of the child's utility to the parent, and r is a discount factor.

The marginal value of an additional unit of child's education is

$$U'(E) = e^{-rE}\left[\frac{y_1'(E)}{r}\lambda_1 - (y_1(E) + c(E))\lambda_2\right], \tag{2}$$

where

$$\lambda_1 = u'(y_0 + y_1(E))(1 - e^{-r(L-E)}) + \theta v'(y_1(E))e^{-r(L-E)},$$

and

$$\begin{aligned}\lambda_2 &= \frac{u(y_0 + y_1(E)) - u(y_0 - c(E))}{y_1(E) + c(E)} \\ &= u'(\widetilde{y}_0) \text{ for } \widetilde{y}_0 \in [y_0 - c(E), y_0 + y_1(E)].\end{aligned}$$

The first term on the right hand side of equation (2), $e^{-rE}\frac{y_1'(E)}{r}\lambda_1$, is the marginal benefit of an additional unit of education, which yields a flow of income $y_1'(E)$ per year starting in period E and is valued using the marginal utility λ_1.[17] The second term, $e^{-rE}(y_1(E)+c(E))\lambda_2$, represents the marginal cost of schooling, which includes an opportunity cost $y_1(E)$ and a direct cost $c(E)$, both of which are incurred in period E and are valued using the marginal utility λ_2. Note that if a parent simply maximizes the sum of parental and child income then $\lambda_1 = \lambda_2 = 1$. Otherwise we might expect $\lambda_2 > \lambda_1$ for families that are less than perfectly altruistic, or have relatively low income and cannot borrow against their children's future income.

An optimal choice of schooling (ignoring any lumpiness in schooling) sets $U'(E) = 0$, leading to the condition

$$\frac{y_1'(E)}{y_1(E)} = r\frac{\lambda_2}{\lambda_1}\left[1 + d(E)\right], \tag{3}$$

where $d(E) = \frac{c(E)}{y_1(E)}$ is the ratio of the direct cost of the E^{th} year of schooling to the opportunity cost. The left hand side of (3) is the proportional return

[17] Note that λ_1 is a weighted average of $u'(y_0+y_1(E))$ and $\theta v'(y_1(E))$, where the weights depend on the fraction of the child's life outside the parental home after completion of education.

to an additional unit of schooling, while the right hand side is the annuitized proportional cost, adjusted for any difference in the marginal utility of \$1 paid as a lump sum when the child is nearing the end of school (λ_2) versus a perpetuity paid to a combination of the parent and the child (λ_1). In the special case where parents maximize the sum of parental and child income and there are no direct costs of schooling, equation (3) reduces to the first order condition for optimal schooling in the model developed by Mincer (1958). More generally, the ratio $\frac{\lambda_2}{\lambda_1}$ serves as a measure of the extent to which the family faces intergenerational credit/liquidity constraints. Assuming that better educated parents are less likely to be constrained, and that the proportional return to schooling is decreasing in additional schooling, the model implies that better educated parents will invest in more child education, providing an intergenerational linkage as in Becker and Tomes (1986) and Mulligan (1999).

3.1 Mapping the Model to the Empirical Analysis

To operationalize this model, we assume that the proportional return to the E^{th} year of schooling, $\text{MR}(E) = \frac{y_1'(E)}{y_1(E)}$, is decreasing in E, increasing in the quality of local schooling, Q, and also depends on unobservable factors (such as cognitive or non-cognitive ability) ϕ. Adopting a simple linear formulation, we have

$$\text{MR}(E) = \gamma_0 - \gamma_1 E + \gamma_2 Q + \phi. \tag{4}$$

Likewise we assume that the proportional marginal cost of schooling, $\text{MC}(E) = r\frac{\lambda_2}{\lambda_1}\left[1 + d(E)\right]$, is increasing in E, decreasing in parental education P (in as much as P is negatively correlated with $\frac{\lambda_2}{\lambda_1}$), and also depends on unobservable factors ξ. An issue in the specification of MC is that the out-of-pocket costs may jump discretely between education levels. This seems particularly likely at the transition point between the end of high school and the start of college, since most students in the late 1930s had to move away from home to attend college and nearly one half attended private institutions. We therefore assume

$$\text{MC}(E) = \delta_0 + \delta_1(E) - \delta_2 P + \xi, \tag{5}$$

where $\delta_1(E)$ is a potentially discontinuous, increasing function of the level of schooling.

In the simple case where $\delta_1(E) = \delta_1 \times E$ (i.e., ignoring any discontinuities in marginal cost), equations (4) and (5) imply a very simple linear model of optimal schooling:

$$E = \beta_0 + \beta_1 Q + \beta_2 P + \eta, \tag{6}$$

with $\beta_1 = \frac{\gamma_2}{\gamma_1+\delta_1} > 0$ and $\beta_2 = \frac{\delta_2}{\gamma_1+\delta_1} > 0$. This model implies that the availability of higher quality schools leads to a parallel shift in the mapping from parent's education to child's education.

A more nuanced prediction arises if the cost function $\delta_1(E)$ jumps discontinuously at the end of high school:

$$\delta_1(E) = \begin{cases} k_0 E \text{ if } E \leq 12, \text{ and} \\ k_1 E \text{ if } E > 12, \end{cases}$$

with $k_1 > k_0$. This case is illustrated in Figure 5, where we consider the optimal schooling choices for two children who have the same marginal returns to schooling but different family backgrounds. The MC schedule for the child with lower-educated parents (shown in green) is relatively high, reflecting the high cost of additional investment for the family (i.e., a higher value of $\frac{\lambda_2}{\lambda_1}$) whereas the schedule for the child with higher-educated parents (shown in red) is relatively low. Both schedules, however, discontinuously jump up for post-secondary schooling levels ($E > 12$). In this setting, children of families with P in some range (say $P_1 \leq P \leq P_2$) all stop schooling at the end of high school; only the most highly educated parents send their children to college. Higher school quality (which shifts up the MB schedule in Figure 5) will lead to rising education for children of lower-educated parents, but will not necessarily change the education choices for most families that previously selected high school—only those who are relatively close to the upper cutoff P_2.

We suspect that the intuition in Figure 5 is highly relevant for many families in the 1930s. Data on 25 year olds from the 1940 Census, for example, shows a striking "mass point" in the distribution of education at exactly high school completion, representing 28 percent of young adults in this cohort. Less than one-third of those who completed high school had any college education. This suggests that most families faced a substantial jump in (perceived) costs of education beyond the completion of high school. In our empirical analysis we therefore fit models for schooling attainment of children separately by parental education group, allowing for the possibility that the effect of school quality are different for different groups.

A second reason for allowing differential effects of measured school quality across different parental groups is that we do not directly observe measures of the quality of schools available to a given student. Instead we observe the *average quality* of schools in the individual's state or county ($\bar{Q}$). If families are systematically sorted into school districts (or school attendance zones) within a given state or county, the expected quality of schools available to a given student will depend both on the average quality in the overall area and parental education. Suppose for example that:

$$E[Q|\bar{Q}, P] = \pi_0 P + \pi_1 \bar{Q} + \pi_2 P\bar{Q}. \tag{7}$$

If states with higher average quality also tend to have policies that raise resources more in the poorest districts ("leveling up" the lower tail of quality) then $\pi_2 < 0$ in this equation. In the simple benchmark case where $\delta_1(E) = \delta_1 \times E$, this leads to a modifed version of equation (6):

$$E = \beta_0' + \beta_1' \bar{Q} + \beta_2' P + \beta_3' P\bar{Q} + \eta', \tag{8}$$

where $\beta_1' = \frac{\gamma_2 \pi_1}{\gamma_1 + \delta_1} > 0$, $\beta_2' = \frac{\delta_2 + \gamma_2 \pi_0}{\gamma_1 + \delta_1} > 0$, and $\beta_3' = \frac{\gamma_2 \pi_2}{\gamma_1 + \delta_1} < 0$. In the more realistic case with a discontinuous MC schedule, shifts in $\bar{Q}$ will be associated with smaller upward shifts in the MR curve for children of high-educated parents, further attenuating the relative effect of observed quality on the schooling choices of these families.

4 Empirical Analysis of Parental-Child Links in Education

We study the relationship between parental and child education by evaluating outcomes children aged 14–18 who lived with at least one parent in 1940. In this respect we are following Goldin and Katz (1999), who evaluated education of children aged 14–18 who lived with parents, using a smaller historical dataset—the 1915 Iowa Census (a census that collected education, which was not standard on the Decennial Census at the time). Hilger (2017b) takes a similar approach, as well, examining educational outcomes among adult children (aged 26–29) who co-reside with parents.

4.1 Children in 1940 U.S. Census

As we have mentioned, in 1940 a substantial portion of children completed schooling prior to leaving home. Consider the bar graphs provided in Figure 6, in which the *blue bars* represent the proportion of individuals aged 5–20 whom we can identify as living with a parent,[18] and the *dark red bars* represent the proportion of children who live with a parent *and* are enrolled in school. Focusing, for the moment, on white males (Panel B), we see that the proportion living with a parent exceeds 90 percent at age each age, 5 through 17, declining slightly to 87 percent at age 18, and then declining further at ages 19 and 20. As for the school enrollment, a large majority of white boys aged 8–13 are enrolled in school.[19] The school enrollment rate declines at age 14, and the drop-off in enrollment is sufficiently steep that at age 18 most white sons who live at home are not enrolled in school. Panel A shows shows comparable patterns for white daughters, and Panels C and D graph these same relationships in black families.

Table 1 provides a set of statistics that characterize individuals aged 14–18 who live with parents. For sons, both black and white, there is only a modest decline in the proportion living at home over this age range. Daughters, however, tended to leave home at earlier ages; among daughters there is a 6 to 7 percentage point drop in the proportion living at home from age 16 to 17. Thus in our regression analysis below we evaluate educational attainment using sons aged 14–18 and daughters aged 14–16.

According to 1940 Census records, work was quite common among children aged 14 and older (sometimes while also being enrolled in school).[20] For example, in Kentucky 22 percent of white males aged 14 to 15 were recorded as working and not enrolled in school, and this employment rate was 37 percent at age 16, and 48 percent at age 17. To give another example, in Georgia 27 percent of black males aged 14 to 15 worked and were not enrolled in school. The employment rate increased to 52 percent at age 16 and to 67

[18] Appendix 2 provides an additional breakdown. Young children not living with a parent often instead were residing with a grandparent or other relative, but some also lived in a household with unrelated adults. At older ages, especially at age 18 and older, individuals not living with a parent more typically were in households of their own.

[19] We cannot be sure why some young children are not enrolled in school. These might include children with disabilities, children being home schooled, or children on break from school (though this last category is likely to be quite small because the 1940 Census was taken in April).

[20] Details are provided in Appendix 2.

percent at age 17.

4.2 Measures of School Quality

Our theory suggests that the decision to remain in school will be related to school quality. We have already noted that we have three state-level measures of the quality of local public schools from administrative records—the pupil-teacher ratio, average annual wages of teachers, and the length of the school term (Card and Krueger, 1992a, 1992b). We link these data to our Census household data. Figures 7(A) and 7(B) show histograms of state-wide pupil-teacher ratios and average teacher salaries in 1940, providing statistics based for 48 states plus the District of Columbia, and using data for white schools when evaluating schools in the South.[21] There is wide variation across states in both variables, with pupil-teacher ratios for the combined elementary and secondary schools in a state ranging from just over 20 to nearly 35, and average teacher salaries ranging from well under $1000 per year to more than $2000.[22]

A potential concern with the average teacher wage is that it reflects differences across states in the cost of living, rather than in the "quality" of the teaching workforce. To address this concern we used the full count 1940 Census data to extract information on wage earners who were working outside of teaching but had at least some post-secondary schooling. We then fit simple earnings equations for non-teachers that include controls for education, race, gender, and experience, as well as dummy variables for each state (or county, in our county-level analysis). These estimated state dummies are used to "deflate" observed teacher salaries in different states to a standardized level. This adjustment effectively assumes that in the absence of other factors, teacher wages would have varied across states proportionally to non-teacher wages.[23] Panel C of Figure 7 shows that the mean wages and

[21] In our regression analyses, we assign each child the average state-level quality metric for the years in which the child was aged 6–12. Here we are showing statistics near the very end of our period of analysis.

[22] The consumer price index has risen by a factor of about 17 from 1940 to today, while average wages of non-supervisory workers in manufacturing have risen by a factor of approximately 38.

[23] To be slightly more precise, we begin with a data set of all white workers aged 22-65 who (i) had at least one year of college education, (ii) reported earnings in the 1940 Census, and (iii) had an occupation *not* "teachers, n.e.c." (category 18). This gives a sample of 3.24 million observations—26.8% female, average age 36.1, mean years of education

adjusted wages are highly correlated. In our regressions we use the adjusted wage data, but we also estimated all regressions using the unadjusted series. Inferences are very similar when using unadjusted wages.

In Figure 7(D) we provide additional evidence of the relationship between teacher wage and quality. We calculate the fraction of teachers with a college degree in each state using our 1940 Census sample, and plot this variable against the mean state teacher wage, taken from the administrative data. In general, states with higher wages also have better educated teachers. Finally, in Panel E we plot the relationship between median earnings of teachers and the state median earnings of non-teachers (again restricting attention to those who attended at least one year of college). In most states, teachers earned less than non-teachers, but there are notable exceptions, including California, New York, and the District of Columbia. More generally, though, this graph is useful because it documents large variation in teacher wages within states that had similar wages among non-teachers.

4.3 Regression Results, White Families

Recall that theoretical reasoning above leads us to an empirical specification in which a child's educational attainment E_i is linearly related to parental education P_i, school quality in the child's state $Q_{s(i)}$, and an interaction of these variables. We have a large number of observations (2.15 million daughters aged 14–16 and 3.67 million sons aged 14–18), which allows for a flexible approach to estimation. Our first step is to divide households by *parental* education. For most poorly educated parents, we form two bins, $P_i \leq 2$, and $P_i = 3$ and 4; for $P_i = 5$ through 12, we use one-year parental education bins; and we then form a bin for parents with more than 12 years. We then fit statistical models separately for each bin of parental education. We also separate sons and daughters.

We proceed with a two step procedure. First we estimate a model of child

14.9, mean annual earnings \$1703 (standard deviation 1179) and mean log earnings 7.18 (standard deviation 0.78). We then fit a regression model for log earnings, including a dummy variable for female, dummies for each category of education, a cubic in potential years of experience, and unrestricted state dummies, with New York state as the omitted state. Denote the estimated fixed effect for state s as $\hat{\delta}_s$. These provide estimates of the deviation in mean wages for a representative worker, relative to earnings in New York (in 1939). Our adjustment factor for each state is then $\exp(\hat{\delta}_s)$.

educational attainment:

$$E_i^* = \beta_A A_i + \beta_C C_i + \gamma_{s(i)} + u_i, \tag{9}$$

where A_i is a vector of child age dummy variables; C_i are additional family-level control variables;[24] and $\gamma_{s(i)}$ are state dummies. We estimate (9) as a Tobit model, treating children who are no longer in school as having completed their schooling, $E_i^* = E_i$, and those who are enrolled as being censored, $E_i^* \geq E_i$. We adopt a normalization that sets the (weighted) sum of state dummies equal to zero. These state effects are important because they indicate the extent to which state-level contextual factors are associated with educational attainment choice.

We next estimate models that relate estimated state-specific differences in the propensity to attain education to state-level school quality measures—measured during the years a typical student would attend school. While we have available three measures, in our main regressions we rely on two measures only: Q_s^1 is the student-teacher ratio, and Q_s^2 is the average level of teacher salaries.[25] We estimate state-level regressions,

$$\begin{aligned}
\hat{\gamma}_s &= \theta_{10} + \theta_{11} Q_s^1 + \varepsilon_{1s}, \\
\hat{\gamma}_s &= \theta_{20} + \theta_{22} Q_s^2 + \varepsilon_{2s}, \text{ and} \\
\hat{\gamma}_s &= \theta_{30} + \theta_{31} Q_s^1 + \theta_{32} Q_s^2 + \varepsilon_{3s},
\end{aligned}$$

using weighted least squares.

Tables 2 and 3 provide estimates of coefficients for our regressions for white families—sons and daughters respectively. The estimated coefficients line up with expectations. First, controlling for parental education and other factors, school quality is strongly related to schooling attainment. Second, this effect is largest for children with the least educated parents and smallest

[24] These controls are indicator for *only mother present,* indicator for *only father present,* indicator for *both parents born in a different state,* indicator for *one parent born in a different state,* indicator for *urban area,* indicator for *living on a farm,* and indicators for parents' age (in 5 year intervals). In addition, for bins that include more than one year of parental education, we include parental education indicator variables.

[25] Term length and teacher salary are somewhat collinear. This creates no problem with our analyses using white daughters and sons, for which we have 49 state observations. However, we when we study black students we have only 18 observations, and we lose precision when we include the three variables. For consistency we use just the two quality measures, in our analyses of both whites and blacks.

for those with the most educated parents. Higher average school quality in a state appears to contribute to closing the schooling gap between more and less educated families.

To get a sense of estimated magnitudes, recall that the state effects from (9), which form the dependent variable here, are scaled in terms of years of the child's education. Suppose that the coefficient on the pupil-teacher ratio is -0.10. Then a 5-pupil reduction in the pupil-teacher ratio is associated with a one-half year increase in completed education. In our regressions, teacher wages are in hundreds of dollars on an annual basis (adjusted using New York as the norm). Now suppose the coefficient teacher salary is 0.15. Then a \$500 increase in teacher wage is associated with a three-quarters year increase in completed education. For children of parents with very low education, associations are stronger than in these examples. For children whose parents have some college education there is little evidence of a relationship between school quality and educational attainment.

A common way of characterizing the parent-child education link is with a regression of the child's education E_i on the parent's education P_i.[26] We find that for families living in states with high quality schools, those born to poorly-educated parents experienced disproportionate gains in the child's education. Put another way, in places with high quality schools, the slope must be flatter in a regression of E_i on P_i. To illustrate, we estimate a variant of regression (9) in which we include parental education P_i as regressors (dummy variables). We estimate this model for the third of states where teacher wages are highest, the third where teacher wages are at an intermediate level, and the third where they are the lowest. We plot predicted child education against parental education in Figure 8 for these three cases. Notice that in states with high teacher wages, as we move from parental education $P_i = 2$ to $P_i = 12$, child education E_i increases by about about 3.5, i.e., the slope of the gradient is approximately 0.35. In states with low teacher wages, the corresponding slope is approximately 0.75.

4.4 Regression Results, Black Families

We proceed with an analogous empirical exercise for black families located in the South. Because our samples are smaller than for whites, we form

[26] The coefficient on parental education ranges from 0.14 to 0.45 in eight papers cited by Mulligan (1999).

educational bins that are broader than for white parents.

Results for black daughters are in Table 4 and for black sons in Table 5. As with white families, we observe the expected negative relationship between the pupil-teacher ratio and educational attainment and positive relationship between the teacher wage and education. However, in black families there is little evidence that the relationship between school quality and education varies substantially according to parental education.

We have an observation about that may help in interpreting this findings. In our discussion above, we theorized that $E[Q_i|Q_{s(i)}, P_i] = \pi_0 P_i + \pi_1 Q_{s(i)} + \pi_2 P_i Q_{s(i)}$, where $\pi_2 < 0$. This asserts that across states, the quality of schools attended by children of poorly-educated parents varies relatively more, while the quality of schools attended by children of well-educated parents varies relatively less. It is possible that for black families in the South, we have an interesting exception. The disenfranchisement of black voters in the 1920s South meant that even better-educated blacks often had little control over the quality of schools their children attended.[27] If so, for black families we would expect $\pi_2 \approx 0$, in which case we would expect a "flattening" of the school quality effect across parent education groups. This would also give rise to an empirical strategy in which we simply include all black daughters or black sons into the same regression at the first stage of the analysis, regardless of parental education, i.e., in regression (9). We do so, and give the results in the final row of Tables 4 and 5.

Horace Mann Bond's (1932, 1934) analysis of the political economy of school funding in the South led him to conclude that public resources devoted to white and black students where chosen largely to satisfy the political interests of white land holders. The process, he argues, was particularly disadvantageous to black students in jurisdictions in which black children were a relatively high fraction of students being educated. Card and Krueger (1992b) show evidence at the state level consistent with the Bond hypothesis: in Southern states with relatively few blacks (West Virginia, Missouri, Oklahoma, and Kentucky) the student-teacher ratio was similar in black schools and white schools, while in states with relatively large black populations (especially South Carolina and Mississippi), the pupil-teacher ratio was much higher in black schools. Similarly, black teachers were paid especially poorly in states with large black populations.

[27]Moreover, there were very few parents with education beyond the high school level (less than two percent in our sample of Southern states).

Taken at face value, our estimates suggest that white-black differences in school resources contributed substantially to the low upward mobility in education among black families in the Deep South. For example, in the Deep South pupil-teacher ratios were typically 15 students higher for black students than for white students. Taking estimates from the bottom row of Tables 4 and 5, we infer that this created a large disadvantage in the educational attainment of black students—on the order of 1.4 to 2.3 years, conditional on parental education.

In Figure 9 we show how child education is related to parental education (following the same steps we used to construct Figure 8 for white children). We show the estimated gradient separately for three sets of states: Deep South states, which have extremely low teacher pay for black teachers; the Peripheral South, where pay to black teachers was substantially higher; and states outside of the South (where most black students attended non-segregated schools). The Non-South gradient for black families is quite similar to the "high wage" profile for white families shown in Figure 8 (noting that the scales are different in the graphs). Profiles in the Peripheral South, and especially the Deep South are much lower. To appreciate just how unfavorable the estimated outcomes are for African American children in the Deep South, it is important to realize that among families in the Deep South, approximately half had parental education of 4 grades or less. For these families predicted years of child schooling is only 5–6 grades.

The striking results we observe for black families in the South motivate an additional analysis, in which we explore local variation in the quality of local schooling at the county level. The idea is to compare outcomes across adjacent counties that lie along state borders, focusing on borders between the Deep South states and other Southern states. Because county pairs are adjacent, they presumably share similarities in terms of economic and social conditions, but because they are in different states, they are in some cases subject to very different state-mandated schooling policies.[28]

[28] An additional advantage to our county-level analysis is that the aggregation of quality measures to the state level may somehow lead to biases (e.g., Hanushek, Rivkin and Taylor, 1995).

5 Additional Empirical Analysis at the County Level

Because we are using the 100% micro data files of the 1940 Census we can evaluate place-based upward mobility for geographic units that are considerably smaller than the state level. In Panel A of Figure 10 we provide upward mobility statistics at the *county* level—using as a measure of upward mobility the fraction of children aged 14–18 who attain 9th grade, for families with parental education 5–8. We include families of all races (with native born parents). We adjust the coloring in the map to correspond to deciles in our upward mobility measure. For sake of comparison we provide in Panel B a map showing intergenerational mobility in *income* at the county level, for the cohort of children born 1980–93, i.e., approximately 60 years after the children's cohort we study. This map, which uses data generated in Chetty et al. (2014a) shows the predicted income rank for children (at age 26) among children born to parents at the 25th percentile of the income distribution. Here again, the map distinguishes counties by deciles. The similarities in the geography of upward mobility are striking. It appears there may be substantial persistence in the processes affecting intergenerational mobility rates in the U.S.

Both county-level maps show particularly low levels of upward mobility in the "black belt" that stretches from southwestern Arkansas and Louisiana to Southern Virginia. In part this is a reflection of the particularly low level of upward mobility in black families. But in Panels C and D we map upward mobility at the county level for black families and white families separately,[29] finding that for both blacks and whites upward mobility is particularly low across counties in the South. Focusing on black families in the South specifically, careful inspection indicates that along some state borders, counties on one side of the border systematically tend to have higher upward mobility than on the other side (e.g., along the border of North Carolina and South Carolina, and along the border of Tennessee and Mississippi).

This observation motivates our final piece of analysis—an exploration of differences in schooling outcomes for children who live in adjacent counties that span a state border.

[29]The analysis by Chetty et al. (2014a), which uses IRS data, cannot be broken down by the race.

5.1 Data and Approach

We employ the county adjacency file published by the US Census Bureau,[30] which allow us to identify county neighbors in the Deep South that border non-Deep South states (Deep South states are Alabama, Mississippi, Georgia, South Carolina and Louisiana, and neighboring states are Tennessee, Arkansas, Florida, North Carolina and Texas). We focus on counties with neighbors across the state border—identifying 157 county pairs, which include 216 counties, shown in Figure 11. Our goal is to find county pairs in which the counties are broadly similar; among our border counties, we formed pairs based on the average education of whites in an adjacent county across the state border. We restrict attention to border county pairs for which the difference in the average education of whites is less than one year.[31] We thereby avoid comparisons between rural counties and counties which seat relatively large cities. The resulting set of border county pairs includes 167 counties.

An initial set of summary statistics are given in Tables 6. Consider the first set of county border pairs, Alabama (AL) and Florida (FL). On the Alabama side of the border upward mobility for blacks is 0.17 while on the Florida side it is 0.31. In contrast, for white children upward mobility is very similar on the two sides of the border. Our interest in understanding the underlying causes of patterns such as these. Table 7 provides an additional set of summary statistics, giving us some indication of the extent to which people on each side of the borders differ along observable characteristics. For example, we see that along the AL-FL border, income was similar on the two sides of the border for both whites and blacks.

We do not have the administrative records of school quality at the county level.[32] However, using Census data we can construct one key school quality metric—teacher wages. We designate individuals in the 1940 Census to be "teachers" if they meet the following criteria: they are classified as "Teacher" under both the 1940 and 1950 occupational coding schemes, they are employed, they are over the age of 14, have attained at least fifth grade, and they work in the "Educational services" industry (according to the 1950 Occupational classification). We further identify *public* school teachers as

[30] https://www.census.gov/geo/reference/county-adjacency.html

[31] Years of schooling are measured based on information on highest grade completed, which is top coded at 17 years in 1940 Census data.

[32] The Card-Krueger metrics have been assembled only at the state level.

those teachers whose "class of worker" in the 1940 Census is identified as "Wage/salary, government" as opposed to "Wage/salary, private," "Working on own account," or "Unpaid family worker." Teachers who worked 20 or more hours per week the previous year are classified as full-time teachers. Column 1 of Table 8 shows the average wage for full-time teachers in public schools in the Census data. We discuss the remaining columns of Table 8 shortly.

5.2 Key Variables

We are interested in estimating the effect of teacher wages of upward mobility. Our research strategy is to estimate the relationship between county differences in upward mobility—within our matched county pairs—and corresponding county differences in teacher wages.

As we have indicated, the primary focus of this analysis is the upward mobility of human capital within black families, but we conduct parallel analyses for white families as well.

We have two approaches for characterizing upward mobility:

First, we simply use the difference between border counties in the proportion of 16–18 year olds who have attained grade 9, among children whose parents have attained grades 5–8.

Second, we use the difference between estimated county fixed effects from a Tobit regression in the same spirit as equation (9), for sons aged 14–18 and daughters aged 14–16:

$$E_i^* = \alpha_A A_i + \alpha_C C_i + \phi_{c(i)} + e_i, \tag{10}$$

where E_i^* is the intended educational attainment of the child (treated as censored if the child is still in school), A_i is a series of dummy variables for child age, and additional control variables (C_i) include indicators for whether the family lives on a farm, is in an urban area, is headed by a single mother, or is headed by a single father. Also included are indicators for parent's education (for the parent with the highest level of schooling), and indicators for parental education. Finally, our regression also includes a set of county fixed effects, which are important to us because they indicate the extent to which county-level contextual factors shape educational attainment.

As for the measurement of teacher wages, we are interested in the extent to which teachers are well paid relative to other workers within the county. We use two approaches:

First, we form a variable "teacher wage rank percentile" for each border county, by calculating the average rank percentile for teacher pay (for public school, full-time teachers) within the distribution of all workers aged 18–64. These average rank percentiles by state are shown in Figure 12, for black teachers (within the distribution of black workers) and white teachers (within the distribution of white workers), and results for the border counties are given in Table8. For black teachers in particular there is wide variation in the average rank; in Tennessee and North Carolina they are above the 80th percentile, while in Mississippi they are closer to the 50th percentile.

Second, we use a variable, "teacher pay relative to non-teacher pay," which we construct as follows. "Teachers" as identified described above, while "non-teachers" are the set of employed individuals aged 18–64 who have attained at least ninth grade. We then proceed with a wage regression for these workers,

$$W_i = \alpha_T T_i + \alpha_A A_i + \alpha_S S_i + \alpha_E E_i + \lambda_{c(i)} + \lambda_{Tc(i)} + \epsilon_i, \tag{11}$$

where W_i is the annual wage,[33] and regressors include and indicator for being a teacher (T_i), age (A_i), sex (S_i), and education (E_i). We also include a county fixed effect that applies to worker i if he or she lives in county $c(i)$, and most importantly for our purposes an additional county effect that applies if that worker is also a teacher, $\lambda_{Tc(i)}$. This latter fixed effect is the county-specific indicator of the teacher-non-teacher wage gap for each county. Figure 13 provides results. White teachers are paid similarly to other white workers. Black teachers earn less, and the extent to which they earn less varies substantially by state; in Tennessee and North Carolina the gap is small, while in Mississippi it is large.[34]

5.3 State Minimum Wages for Teachers

As we have noted, much of the variation in black teacher wages across states was driven by policies that differed dramatically among the Southern states.

[33]To maintain comparability to results presented above, we continue to use the adjustments described in footnote 23, but this makes virtually no difference, since both teacher and non-teacher wages are adjusted.

[34]Figures 12 shows that black teachers were generally among the better paid workers in these Southern counties, but Figure 13 shows that they were not better paid that comparably educated black workers. This is a reflection of the extremely low levels of average education level of adult blacks in these counties.

In 1940, minimum teacher wages were explicitly set by a salary schedule in twenty-four states, including five of the Southern states in our analysis.[35] The minimum wage provisions were generally part of broader legislation, through which State Boards of Education provided funds to counties in order to supplement local expenditure for schooling. The supplementary funding was generally intended to finance the lengthening of the school term, and increases in teacher pay. In exchange for state funds, counties were required to abide by a minimum salary schedule for teachers. Such minimum salary standards also aimed to reduce inequalities in teacher pay that resulted from differences in local tax revenues.

Figure 14 shows the black and white minimum wages for each of the five states that had minimum teacher wages, Alabama, Georgia, North Carolina, Tennessee, and Mississippi,[36] For states that did not have a statutory minimum wage, we provide the teacher wage at the 10th percentile, separately by race, for the purpose of providing a comparison point.[37] Table 8 provides additional detail.

In all Southern states except Tennessee, salary schedules explicitly provided lower minimum wages for blacks, even for comparable levels of education, experience, and teacher certification. Such practices were challenged in court by black teachers and the National Association for the Advancement of Colored People.[38] The first case to reach Federal courts was Mills v. Anne Arundel County Board of Education. In 1939, Walter Mills, a teaching principal in Anne Arundel County, sued the Maryland State Board of Education for providing lower minimum salaries for black teachers. The Federal Court ruled that the practice of paying black teachers different minimum wages was discriminatory. In 1941, the Maryland legislature responded by equalizing minimum wages for black teachers. Similar lawsuits were filed across most Southern states during the 1940s, in what came to be known as the "salary equalization movement." For the time period we study (wages measured for

[35]Unless otherwise noted, this discussion draws from a research report of the National Educational Association, *State Minimum-Salary Standards for Teachers*, 1940, Washington D.C.

[36]As explained below, the Mississippi statewide minimum wage applied to black teachers by not white teachers.

[37]We conduct these analyses using full-time public school teachers in border county states.

[38]This discussion draws from Coleman, Ada.1947. The Salary Equalization Movement, *The Journal of Negro Education*, vol.16, no.2 (Spring 1947), pp.235-241.

1939 and reported in the 1940 Census), however, the discriminatory wages schedules had yet to face court challenges.

We briefly describe below the specific requirements of minimum wage standards in the Southern states included in our analysis.

- Alabama. Districts which received state funding under the "Minimum Program Fund" were required to comply with a teacher salary schedule and a seven-month school term. Salaries of black teachers were set at 75 per cent of white teacher wages. The minimum was set for a Class E Certificate (one year of college or less) at 50 dollars per month, or 350 for the seven-month required term. For black teachers, this was equivalent to 262.50 dollars for the seven-month term. In 1940, all counties in Alabama received funding under the "Minimum Program," and were therefore required to comply with the minimum wage schedule.[39]

- Georgia. Through its equalization program, Georgia financed counties so that they could provide a seven month school term and a minimum wage schedule for teachers. Counties had the option to supplement funding to extend the school term, or increase teacher wages. The salary schedule was differentiated according to teacher education. Minimum wages were set lower for blacks for all levels of schooling.

- Mississippi. In 1924, Mississippi passed legislation setting an 80 dollar minimum wage for teachers, for the four-month minimal school term provided in the state constitution. In addition, counties which received state equalization funds were required to pay white teachers a minimum of 532 per month, for an eight-month term. The minimum for blacks was set at a total of 161.50, for a six-month term. However, these higher minimum wages did not apply to school districts independent of county boards. We therefore use the constitutional minimum of 80 dollars for black teachers, and consider Mississippi to a state for which there was not a binding minimum annual wage for white teachers.

- North Carolina. In 1940, North Carolina provided funds for an eight-month school term and set teacher wages according to a statewide schedule. The teacher salary schedule acted as both a minimum and a maximum amount that local administrative units were required to pay

[39] Alabama Department of Education 1939 report, p.196-197

teachers from state funds. Any additional pay was to be covered from local funds. The Teacher's Salary Fund had been introduced in 1921, when the school term was extended from a constitutional minimum of four months to six months. At the time, state legislators also provided funding to support local counties in extending the school term to six months. The requirement for counties to abide by the minimum teacher salary schedule was clarified in communication between the State Superintendent and the Attorney General.[40]

- Tennessee. The state equalization fund was introduced in 1925. In order to receive equalization funding, local school districts were required to follow the minimal teacher pay schedule and the required to provide an eight-month term. In elementary schools, the salary schedule was the same for white and black teachers. According to Bergeron, et al. (1999), the 1925 General Education Bill was hotly contested at the time by conservatives, especially rural politicians who did not favor state intervention nor the levying of taxes to support the state university. The law also involved an implicit redistribution of funds from city taxes to support the extension of the school term and higher teacher wages for poorer rural communities. Teachers were very much in favor of the law, to such extent that State Teacher's Association lobbyists, who had packed the State capitol building, were ordered off the floor of the senate. It seems that Governor Austin Peay achieved the necessary political support for this Bill through a political compromise, gaining favor with fundamentalists by not vetoing the Butler Act—legislation banning the teaching of evolution in public schools (Fitzgerald, 2007).

5.4 Empirical Strategy

Using border county pairs we estimate the following relationship:

$$\Delta_{UM} = \beta_0 + \beta_1 \Delta_{TW} + \beta_2 \Delta_X + \epsilon, \tag{12}$$

[40]The *Biennial Report of the Attorney-General of the State of North Carolina* (Department of Justice, Edwards & Broughton and E.M. Uzzell, state printers, 1922) provides the following quote from the Honorable E. C. Brooks, State Superintendent Public Instruction, Raleigh, N.C.: "Dear Sir: You ask whether or not a county board of education may adopt a salary schedule for the teachers in the county less than that adopted by the State Board of Education. We think not. ..."

where Δ_{TW} is the border pair difference in measures of relative teacher pay ("teacher-non-teacher relative pay" or "teacher rank percentile"), and Δ_X is a set of controls: differences between counties in fraction urban, fraction living on a farm, average parental income, and average parental education. For blacks, the regression also controls for differences in the average education of whites aged 25–55. As for the dependent variable, Δ_{UM} is the difference between the paired counties in upward mobility indicators. In one specification, upward mobility is defined as the difference in the fraction of 16–18 year olds who attained ninth grade, among children with parental education 5–8. The second measure of upward mobility is the difference in the county-specific fixed effects from the Tobit regression described above. These regressions are estimating impacts on completed education.

Importantly, some of the differences in teacher wages across our paired counties is driven by policies set by state policy. We exploit this variation by constructing for each paired county, the variable Δ_{MW}, which is the differences between border counties in minimum teacher wages.[41] We estimate our key regression by OLS and then by 2SLS, instrumenting Δ_{TW} with Δ_{MW}.

5.5 Results

[This section is still under construction.]

Table 9 shows the effect of relative teacher pay on the county-level differences in 9th grade attainment among children with parental education 5–8. Our focus is on the black students. Inferences from the OLS regression suggest that a one hundred dollar increase in the teacher wage is associated with a 1.4 percentage point increase in this upward mobility measure. When we proceed to IV estimation we find that black teacher wages are driven to a large extent by state minimum wage policies; as indicated by the first stage results, an increase of one dollar in the minimum wage results in an increase of 0.86 in relative teacher pay. The 2SLS coefficient indicates that a one hundred dollar increase in teacher pay results in a 2.3 percentage rise in upward mobility for black children. The estimated effects using "teacher wage rank percentiles" are similar. A 100 dollar increase in the minimum wage is associated with a 7.8 percentile point increase in rank. For a one percentile rank point increase, the 2SLS estimate is a 0.25 percentage point increase in upward mobility. This effect is comparable to estimates using "adjusted

[41] For states with no minimum wage we use the 10th percentile instead.

teacher pay;" a 100 dollar increase in minimum wages would translate into a 1.95 percentage point increase in upward mobility. We present results for white students as well, but they are less compelling than for black students, as F-statistics in the first stage are dangerously low.

Results are similar when we employ our alternative indicator of upward mobility—differences in the county-specific effects from our Tobit regression (10). When we use adjusted teacher wages as the independent variable, the OLS estimate indicates that a 100 dollar difference across border counties in black teacher wages is associated with 0.15 increase in completed education among black students. The 2SLS estimate suggests that the increase in completed schooling resulting from this pay increase is 0.35 years. Very similar inferences pertain if we use the "teacher wage rank percentile" approach instead.[42]

The OLS results we report in Table 10 are very similar to those reported in the state-level analyses, in the second column of estimates in the bottom row of Table 4, for daughters, and Table 5, for sons. The advantage of the pair-county analysis is that we are able to use mandated state-level minimum wage standards to instrument for the key independent variable (teacher wages), thereby adding credibility concerning the causal nature of the relationships we estimate.

6 Conclusion

[This section is still under construction.]

This paper provides the most comprehensive evaluation to date of the intergenerational transmission of human capital during the golden era of upward mobility in United States. We find systematic variation in upward mobility in education by race and by location.

A plausible explanation for the variation in upward mobility relates to differential access to educational opportunities. In a state-level analysis we find that educational outcomes for children in families with poorly-educated parents is indeed strongly tied to school quality, more so than for children in families with well-educated parents. An empirical investigation of adjacent counties across state borders reinforces this basic message. These findings

[42] Again, for the sake of comparison we provide analyses for white students, and again we note that our F-statistics are low enough to cast doubt on the exercise.

focus attention on the potential role of high quality public education for ensuring equality of opportunity.

Table 1: Characteristics of Individuals Aged 14–18, Living with a Parent in 1940

	White Female			White Male			Black Female			Black Male		
Age	Pr.	In Sch.	Med. Grade	Pr.	In Sch.	Med. Grade	Pr.	In Sch.	Med. Grade	Pr.	In Sch.	Med. Grade
14	0.92	0.92	8	0.93	0.92	7	0.82	0.88	6	0.82	0.84	5
15	0.91	0.88	9	0.92	0.87	8	0.80	0.81	7	0.82	0.76	6
16	0.88	0.80	10	0.91	0.76	9	0.77	0.69	7	0.81	0.60	6
17	0.82	0.69	11	0.90	0.63	10	0.70	0.53	8	0.80	0.42	7
18	0.71	0.45	11	0.87	0.42	11	0.60	0.36	8	0.77	0.27	7

Note: Authors' calculations, 1940 U.S. Census. "Proportion" reports the proportion of all children (of the given age) living with at least one parent, "In School" reports the proportion of children in school among those living with a parent, and "Median Grade" gives the grade attained among these same children.

Table 2: The Relationship between State-Level School Quality Measures and Educational Attainment—White Daughters

	Regressions (1) and (2)		Regression (3)		
Parent's Education	Pupil-Teacher Ratio	Teacher Salary	Pupil-Teacher Ratio	Teacher Salary	Percent in Population
Grades ≤ 2	-0.226**	0.317**	-0.121**	0.333**	1.60
	(0.047)	(0.048)	(0.044)	(0.050)	
Grades 3–4	-0.180**	0.281**	-0.115**	0.247**	4.64
	(0.039)	(0.027)	(0.031)	(0.024)	
Grade 5	-0.109**	0.205**	-0.067**	0.186**	4.33
	(0.037)	(0.026)	(0.028)	(0.023)	
Grade 6	-0.109**	0.183**	-0.071**	0.165**	6.04
	(0.036)	(0.025)	(0.028)	0.020)	
Grade 7	-0.085**	0.156**	-0.051	0.143**	8.62
	(0.036)	(0.026)	(0.028)	(0.020)	
Grade 8	-0.085**	0.126**	-0.071**	0.117**	30.23
	(0.033)	(0.025)	(0.024)	(0.019)	
Grade 9	-0.063**	0.107**	-0.046**	0.099**	8.00
	(0.019)	(0.015)	(0.015)	(0.014)	
Grade 10	-0.051**	0.071**	-0.041**	0.065**	8.42
	(0.019)	(0.015)	(0.015)	(0.013)	
Grade 11	-0.019	0.042**	-0.014	0.040**	4.25
	(0.016)	(0.012)	(0.015)	(0.012)	
Grade 12	-0.031	0.048**	-0.026	0.046**	13.11
	(0.018)	(0.014)	(0.016)	(0.013)	
Grade > 12	-0.008	0.020	-0.006	0.019	8.41
	(0.016)	(0.014)	(0.015)	(0.013)	

Note: Authors' calculations, 1940 U.S. Census. Dependent variable is the state fixed effect from regression (17), a measure of the state-level upward mobility in child education. (1) and (2) are bivariate regressions; (3) are multiple regression. $n = 49$. Significance: $^{**}p < 0.01$; $^{*}p < 0.05$.

Table 3: The Relationship between State-Level School Quality Measures and Educational Attainment—White Sons

	Regressions (1) and (2)		Regression (3)		
Parent's Education	Pupil-Teacher Ratio	Teacher Salary	Pupil-Teacher Ratio	Teacher Salary	Fraction in Population
Grades ≤ 2	-0.271**	0.363**	-0.170**	0.307**	1.75
	(0.039)	(0.039)	(0.037)	(0.040)	
Grades 3–4	-0.220**	0.277**	-0.154**	0.230**	4.93
	(0.032)	(0.035)	(0.025)	(0.033)	
Grade 5	-0.168**	0.223**	-0.118**	0.187**	4.54
	(0.027)	(0.029)	(0.020)	(0.027)	
Grade 6	-0.143**	0.181**	-0.104**	0.153**	6.21
	(0.026)	(0.026)	(0.018)	(0.023)	
Grade 7	-0.124**	0.155**	-0.092**	0.131**	8.67
	(0.027)	(0.024)	(0.020)	(0.021)	
Grade 8	-0.106**	0.138**	-0.090**	0.126**	30.43
	(0.026)	(0.026)	(0.016)	(0.021)	
Grade 9	-0.078**	0.125**	-0.059**	0.115**	7.79
	(0.019)	(0.020)	(0.115)	(0.018)	
Grade 10	-0.059**	0.088**	-0.049**	0.081**	8.15
	(0.014)	(0.015)	(0.010)	(0.014)	
Grade 11	-0.033*	0.065**	-0.025**	0.061**	4.09
	(0.013)	(0.013)	(0.011)	(0.013)	
Grade 12	-0.036**	0.058**	-0.031**	0.055**	12.8
	(0.012)	(0.011)	(0.009)	(0.010)	
Grade 12+	0.007	0.023*	0.009	0.024*	8.31
	(0.010)	(0.010)	(0.010)	(0.009)	

Note: Authors' calculations, 1940 U.S. Census. Dependent variable is the state fixed effect from regression (17), a measure of the state-level upward mobility in child education. (1) and (2) are bivariate regressions; (3) are multiple regressions. $n = 49$. Significance: $^{**}p < 0.01$; $^{*}p < 0.05$.

Table 4: The Relationship between State-Level School Quality Measures and Educational Attainment—Black Daughters

	Regressions (1) and (2)		Regression (3)		
Parent's Education	Pupil-Teacher Ratio	Teacher Salary	Pupil-Teacher Ratio	Teacher Salary	Percent in Population
Grades 0–4	-0.135**	0.212**	-0.076*	0.121**	37.8
	(0.022)	(0.034)	(0.028)	(0.031)	
Grades 5–8	-0.111**	0.157**	-0.076*	0.069	49.9
	(0.018)	(0.033)	(0.028)	(0.036)	
Grade > 8	-0.107**	0.133**	-0.084**	0.042	12.2
	(0.016)	(0.030)	(0.027)	(0.028)	
All	-0.150**	0.218**	-0.096**	0.107**	100.0
	(0.023)	(0.038)	(0.035)	(0.042)	

Note: Authors' calculations, 1940 U.S. Census. Dependent variable is the state fixed effect from regression (17), a measure of the state-level upward mobility in child education. (1) and (2) are bivariate regressions; (3) are multiple regression. $n = 18$. Significance: $^{**}p < 0.01$; $^{*}p < 0.05$.

Table 5: The Relationship between State-Level School Quality Measures and Educational Attainment—Black Sons

	Regressions (1) and (2)		Regression (3)		
Parent's Education	Pupil-Teacher Ratio	Teacher Salary	Pupil-Teacher Ratio	Teacher Salary	Percent in Population
Grades 0–4	-0.134**	0.215**	-0.072*	0.126**	38.9
	(0.022)	(0.040)	(0.029)	(0.041)	
Grades 5–8	-0.119**	0.173**	-0.076**	0.085*	49.3
	(0.019)	(0.040)	(0.026)	(0.038)	
Grade > 8	-0.118**	0.155**	-0.080*	0.070	11.9
	(0.019)	(0.031)	(0.029)	(0.035)	
All	-0.153**	0.229**	-0.090*	0.125*	100.0
	(0.026)	(0.043)	(0.035)	(0.045)	

Note: Authors' calculations, 1940 U.S. Census. Dependent variable is the state fixed effect from regression (17), a measure of the state-level upward mobility in child education. (1) and (2) are bivariate regressions; (3) are multiple regression. $n = 18$. Significance: $^{**}p < 0.01$; $^{*}p < 0.05$.

Table 6: Summary Statistics, Border County Pairs

State	Neighbor	Number of counties	Upward mobility, Black	Upward mobility, White	Black sample size (ages 16–18)
AL	FL	4	0.17	0.44	439
FL	AL	5	0.31	0.47	249
AL	GA	10	0.16	0.42	689
GA	AL	13	0.21	0.47	453
AL	MS	6	0.19	0.42	546
MS	AL	8	0.18	0.51	548
AL	TN	2	0.19	0.37	546
TN	AL	3	0.21	0.40	270
AR	LA	3	0.20	0.56	966
LA	AR	4	0.23	0.59	794
AR	MS	4	0.15	0.33	124
MS	AR	3	0.05	0.38	1810
FL	GA	6	0.20	0.49	430
GA	FL	7	0.21	0.49	449
GA	NC	3	0.50	0.34	3
NC	GA	4	0.17	0.41	27
GA	SC	11	0.20	0.50	815
SC	GA	10	0.17	0.56	938
GA	TN	3	0.14	0.34	39
TN	GA	3	0.73	0.38	87
LA	MS	7	0.15	0.57	554
MS	LA	9	0.15	0.53	564
LA	TX	5	0.24	0.58	566
TX	LA	5	0.29	0.58	793
MS	TN	4	0.10	0.43	563
TN	MS	5	0.26	0.46	2031
NC	SC	11	0.33	0.54	723
SC	NC	9	0.24	0.46	1239

Note: Authors' analysis, 1940 Census IPUMS 100 per cent sample. Summary statistics are displayed for 167 counties in border county pairs for which the difference in the average educational attainment of whites aged 25-55 is less than one year. Upward mobility is defined as fraction of 16–18 year olds who have attained 9th grade in families with parental education 5–8.

Table 7: Summary Statistics, Border County Pairs (Continued)

State	Neighbor	Counties	Average education, Whites	Average education, Blacks	Fraction on farm	Fraction urban	Income, White	Income, Black
AL	FL	4	7.68	4.63	0.55	0.13	619	310
FL	AL	5	7.44	4.82	0.45	0.12	642	330
AL	GA	10	7.55	4.38	0.67	0.15	807	303
GA	AL	13	7.78	4.56	0.57	0.21	792	351
AL	MS	6	8.12	4.73	0.68	0.07	679	313
MS	AL	8	8.61	5.10	0.65	0.11	627	293
AL	TN	2	7.57	4.34	0.68	0.17	635	257
TN	AL	3	7.77	5.31	0.72	0.12	688	351
AR	LA	3	8.99	5.19	0.58	0.16	994	351
LA	AR	4	8.53	4.34	0.77	0.07	961	350
AR	MS	4	8.05	4.72	0.77	0.10	870	300
MS	AR	3	8.58	4.14	0.88	0.00	1007	264
FL	GA	6	8.09	4.15	0.58	0.13	773	323
GA	FL	7	8.01	4.11	0.51	0.11	781	315
GA	NC	3	7.00	5.47	0.82	0.00	455	565
NC	GA	4	7.29	5.37	0.76	0.00	530	358
GA	SC	11	8.37	4.52	0.60	0.21	865	322
SC	GA	10	8.72	4.26	0.66	0.06	890	291
GA	TN	3	6.69	5.46	0.65	0.11	679	359
TN	GA	3	7.46	7.45	0.38	0.11	811	522
LA	MS	7	8.98	3.81	0.74	0.09	930	273
MS	LA	9	9.04	4.86	0.68	0.15	779	314
LA	TX	5	8.02	4.36	0.55	0.17	831	403
TX	LA	5	8.47	5.60	0.68	0.12	776	348
MS	TN	4	8.45	4.99	0.82	0.07	515	224
TN	MS	5	8.32	5.46	0.65	0.15	769	301
NC	SC	11	7.89	5.16	0.61	0.11	863	409
SC	NC	9	7.77	4.64	0.57	0.14	887	384

Note: Authors' analysis, 1940 Census IPUMS 100 per cent sample. Summary statistics are displayed for 167 counties in border county pairs for which the difference in the average educational attainment of whites aged 25–55 is less than one year. The average education refers to the average education of individuals aged 25–55. Fraction urban and fraction living on farm indicate what fraction of parents live in urban areas, and respectively in a farm household.

Table 8: Teacher Wages in Border Counties, by State and Race

	Average wage	Percentile rank in income distribution	Minimum wage or 10th percentile†	Fraction paid less
A. Black teachers				
Alabama	433	71.32	262.5	22.36
Arkansas	341	61.84	160†	17.91
Florida	494	78.49	315†	12.88
Georgia	436	68.73	175	12.4
Louisiana	414	69.42	226†	14.67
Mississippi	305	56.68	80	5.00
North Carolina	687	83.61	504	21.49
South Carolina	438	73.71	240†	10.26
Tennessee	727	76.43	320	12.7
Texas	589	74.71	344†	21.33
B. White teachers				
Alabama	769	63.89	350	9.06
Arkansas	751	50.52	250†	7.58
Florida	844	62.32	400†	12.15
Georgia	811	58.35	280	7.23
Louisiana	1031	60.63	390†	8.60
Mississippi	786	59.49	300†	11.72
North Carolina	955	65.61	656	18.15
South Carolina	891	67.19	500†	10.2
Tennessee	1010	59.51	320	6.49
Texas	1036	54.8	720†	23.94

Note: Authors' analysis, 1940 Census IPUMS 100 per cent sample. †These cases indicate the 10th percentile of the statewide teacher wage annual income distribution (for states that do not have a statutory minimum).

Table 9: Effect of Teacher Wage on Upward Mobility (Fraction Attaining 9th Grade among Children with Parental Education 5–8)

	OLS	First stage	Reduced form	2SLS	F-stat	n
A. Black students						
Adjusted teacher wage	.014*** (.004)	.856*** (.105)	.020*** (.005)	.023*** (.006)	55.29	111
Teacher wage rank percentile	.0018*** (.0004)	7.816*** (1.124)	.020*** (.005)	.0025*** (.0007)	48.25	111
B. White students						
Adjusted teacher wage	.011*** (.003)	.251*** (.086)	.008* (.004)	.029*** (.014)	10.27	122
Teacher wage rank percentile	.0012 (.0009)	1.284*** (.431)	.008* (.004)	.0065** (.0033)	9.78	122

Note: Each coefficient comes from a separate regression. Controls include differences between counties in fraction urban, fraction living on farm, race-specific parental income and education, difference in education of whites. Robust standard errors in parentheses,***p<0.01, **p<0.05, *p<0.1

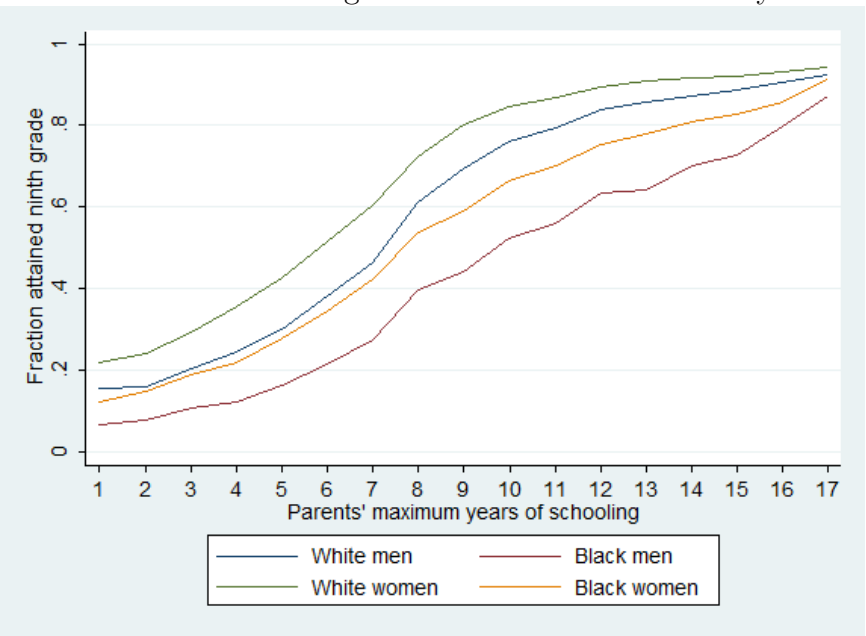
Table 10: Effect of Teacher Pay on Upward Mobility (County-Level Difference in Tobit Coefficients for Educational Attainment)

	OLS	First stage	Reduced form	2SLS	F-stat	n
A. Black students						
Adjusted teacher wage	.149*** (.032)	.915*** (.110)	.323*** (.041)	.352*** (.063)	69.95	103
Teacher wage rank percentile	.0184*** (.0039)	6.915*** (1.059)	.323*** (.041)	.0462*** (.0089)	42.64	97
B. White students						
Adjusted teacher wage	.028 (.023)	.369*** (.106)	.038 (.050)	.183 (.142)	11.72	106
Teacher wage rank percentile	.0059 (.0058)	1.328** (.5300)	.066 (.055)	.0498 (.0402)	6.27	97

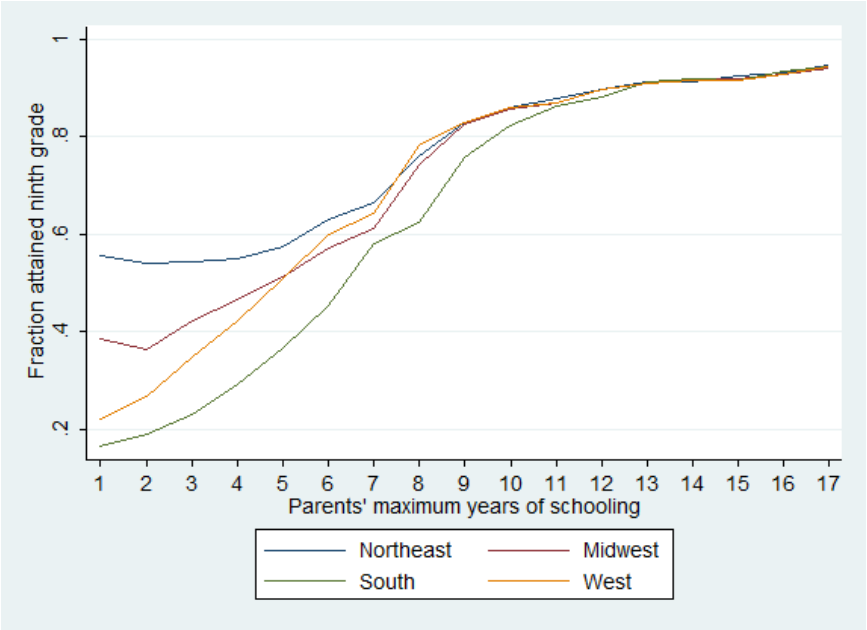
Note: Each coefficient comes from a separate regression. The sample is restricted to border pairs for which the difference in the education of whites is less than one year. Robust standard errors in parentheses, ***p<0.01, **p<0.05, *p<0.1

Figure 1: Relationship between Parent and Child Education, Children Aged 16–18 in 1940, by Race

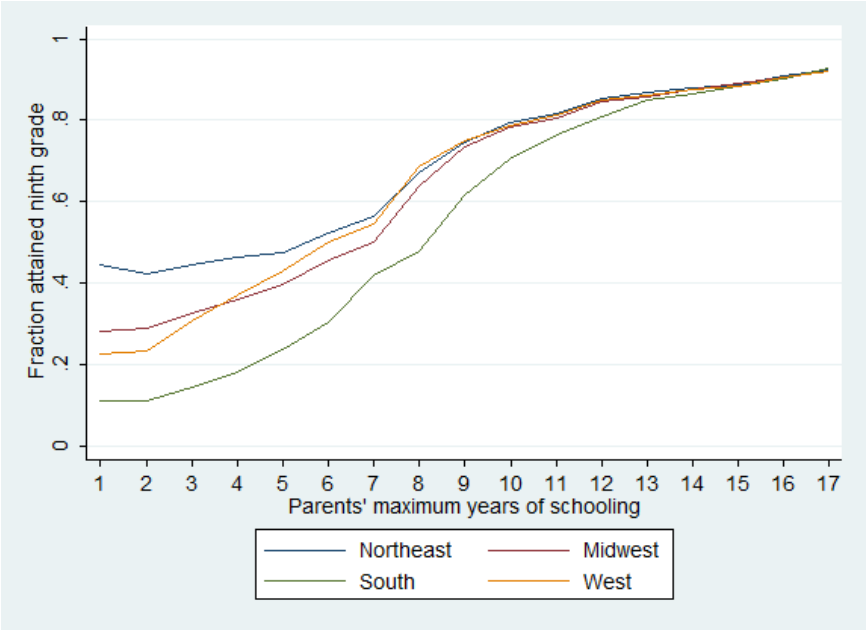
Panel A. Differences among Black and White Children by Gender



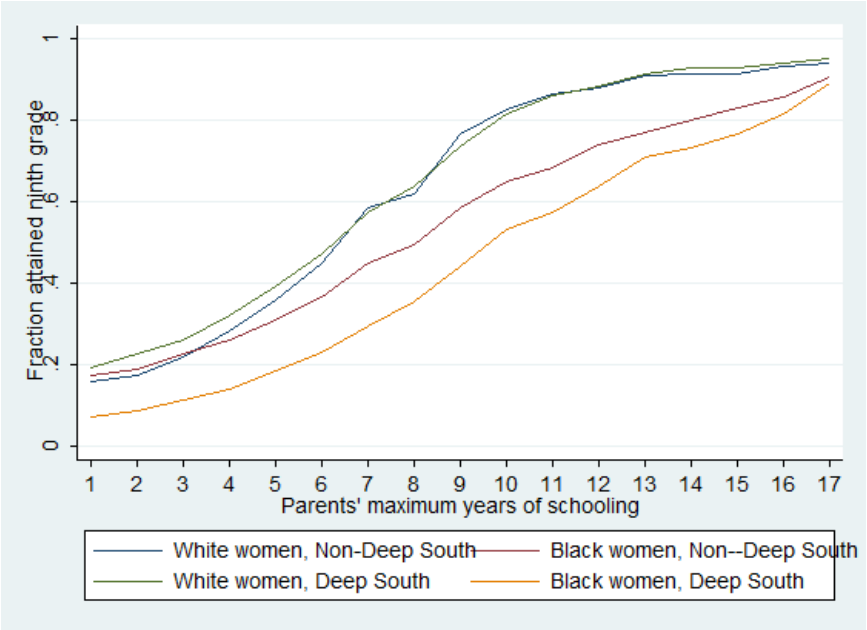
Panel B. Regional Differences for White Daughters



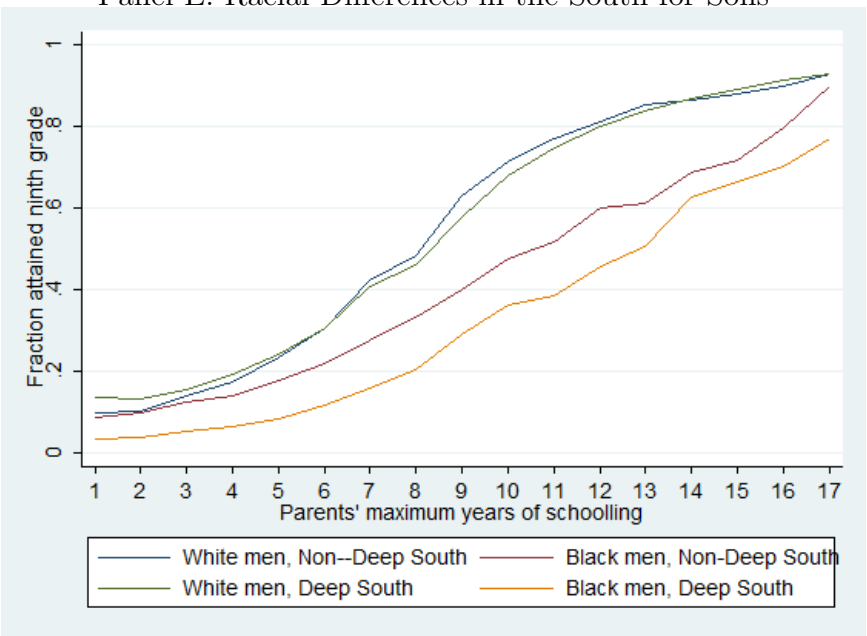
Panel C. Regional Differences for White Sons



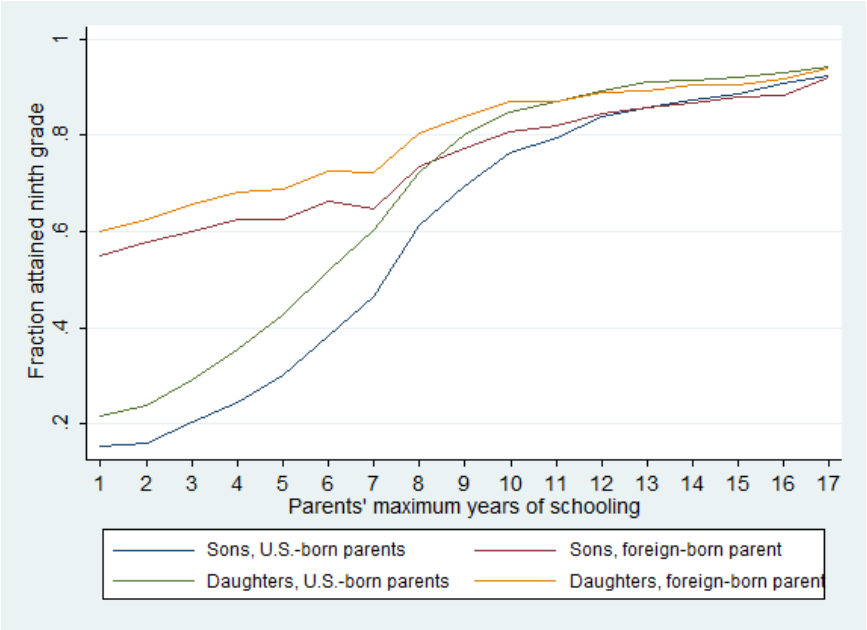
Panel D. Racial Differences in the South for Daughters



Panel E. Racial Differences in the South for Sons



Panel F. Differences among Immigrants and Native-Born Families



Panel G. Differences among Immigrants by Region

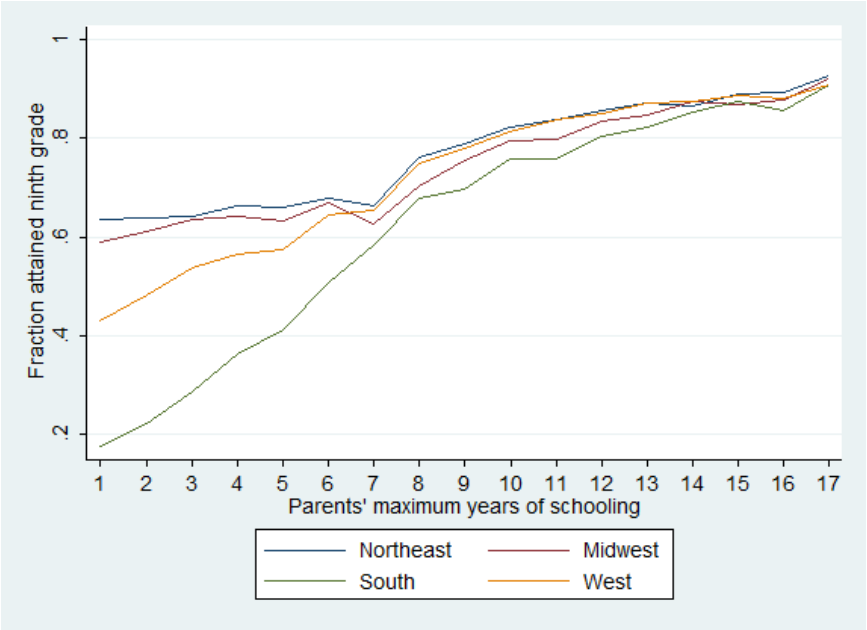


Figure 2: Upward Mobility for Children Aged 16–18 in 1940, by Region

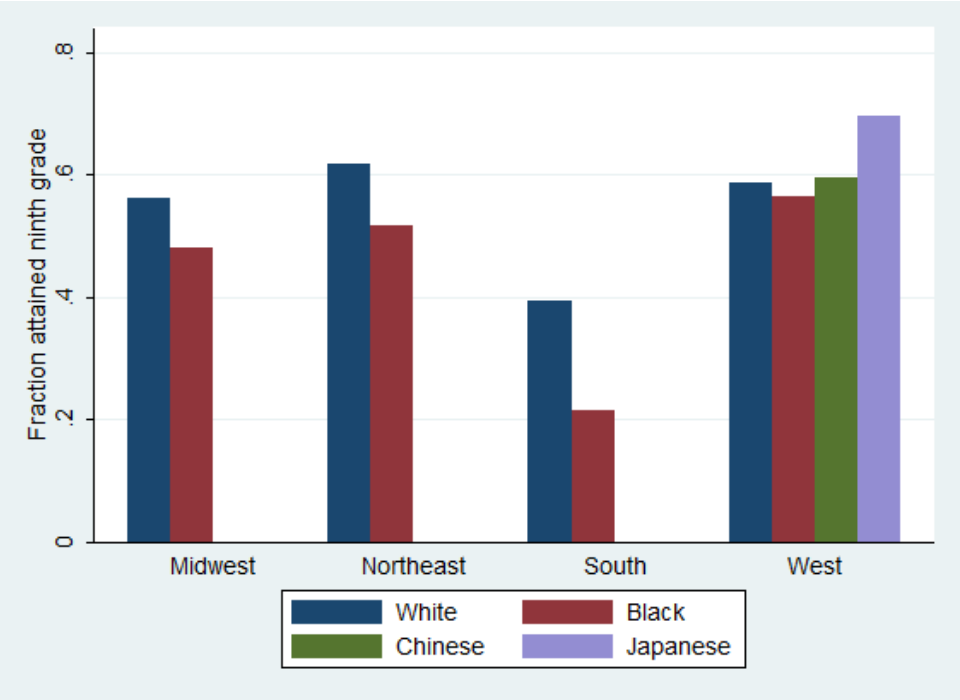
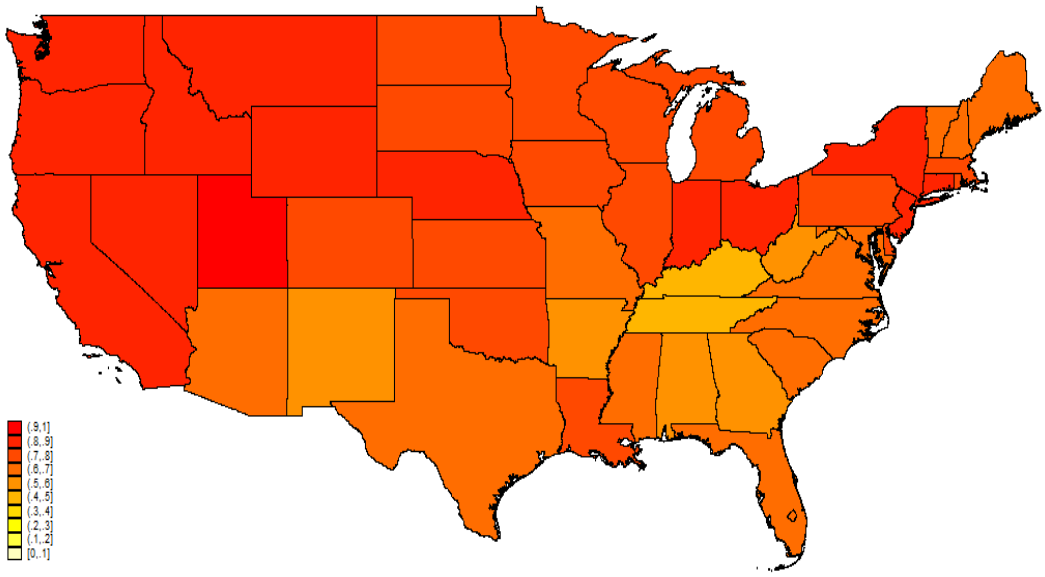
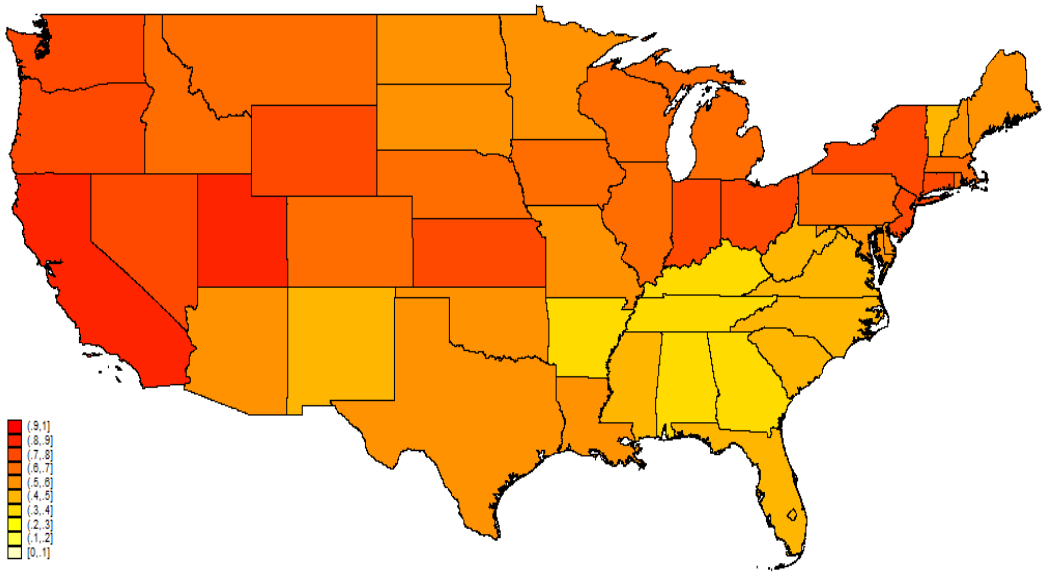


Figure 3: Proportion with 9+ Grades of Education, Children Aged 16–18 whose Parents Have 5–8 Years of Education

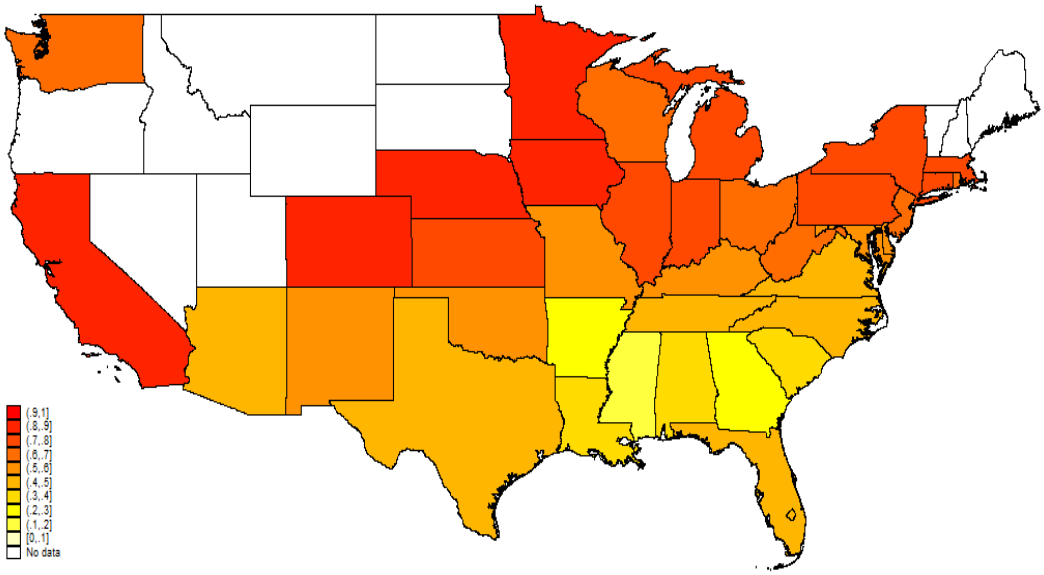
Panel A. Upward Mobility for White Daughters by State



Panel B. Upward Mobility for White Sons by State



Panel C. Upward Mobility for Black Daughters by State



Panel D. Upward mobility for Black Sons by States

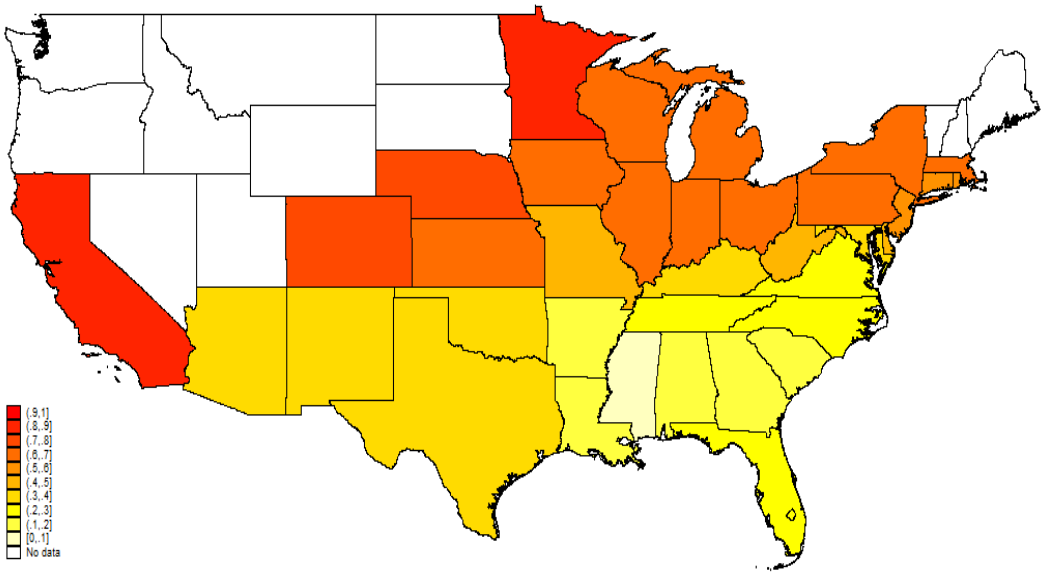
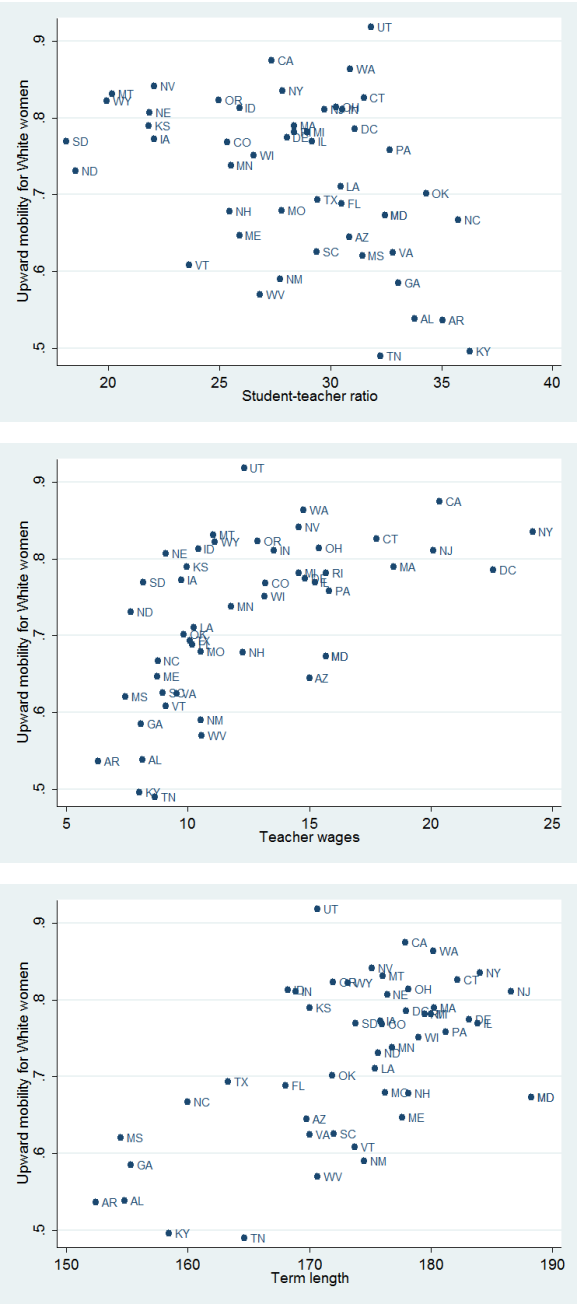
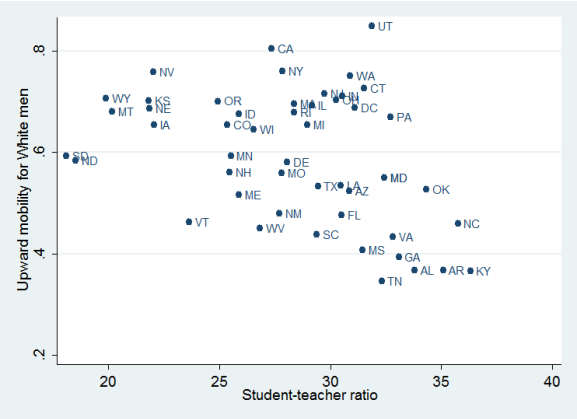


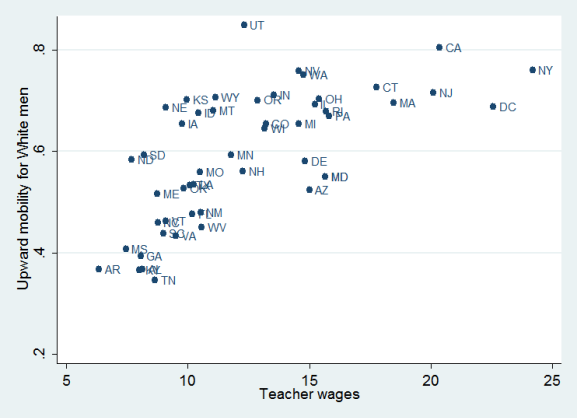
Figure 4: Relationship between Upward Mobility in Education and School Quality Measures

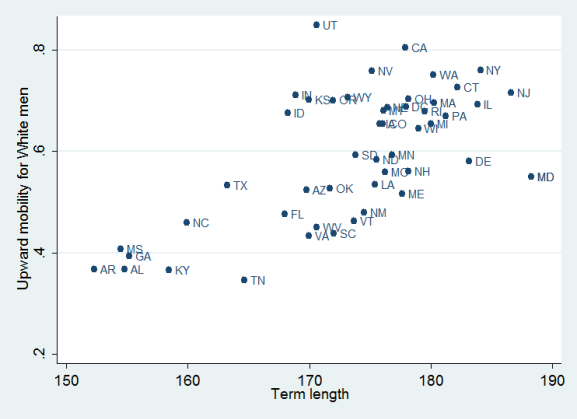
Panel A. White females



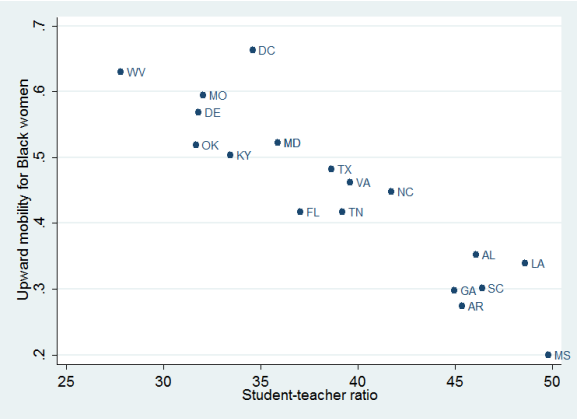
Panel B. White males

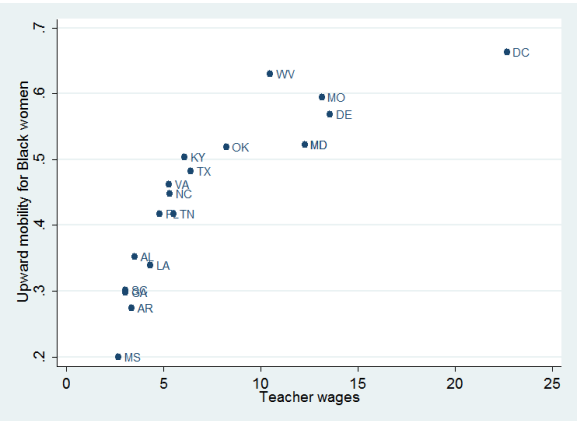






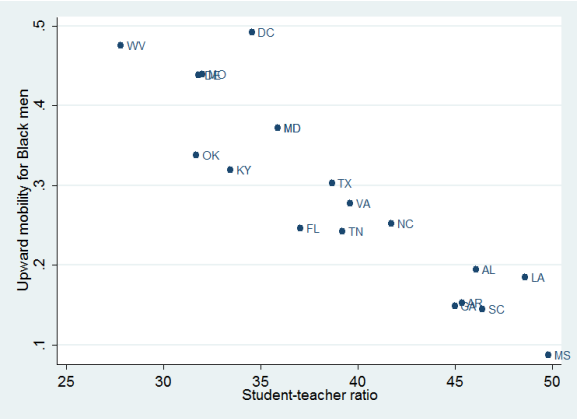
Panel C. Black females in southern states

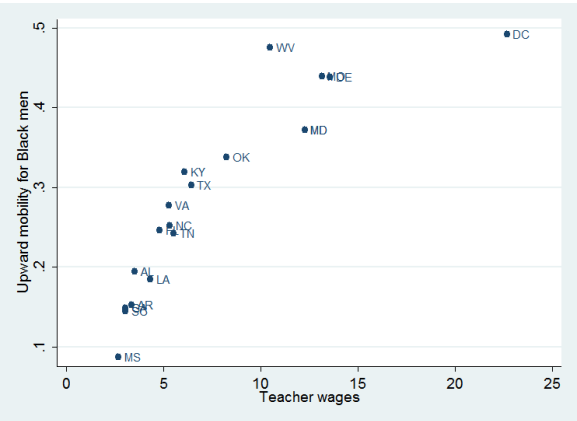






Panel D. Black males in southern states





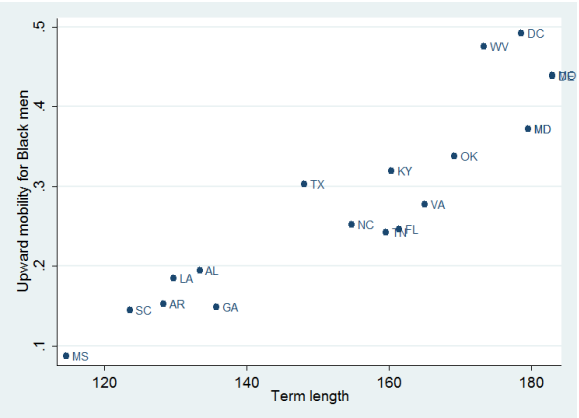


Figure 5: Determination of Optimal E with Higher Out-of-Pocket Costs for College

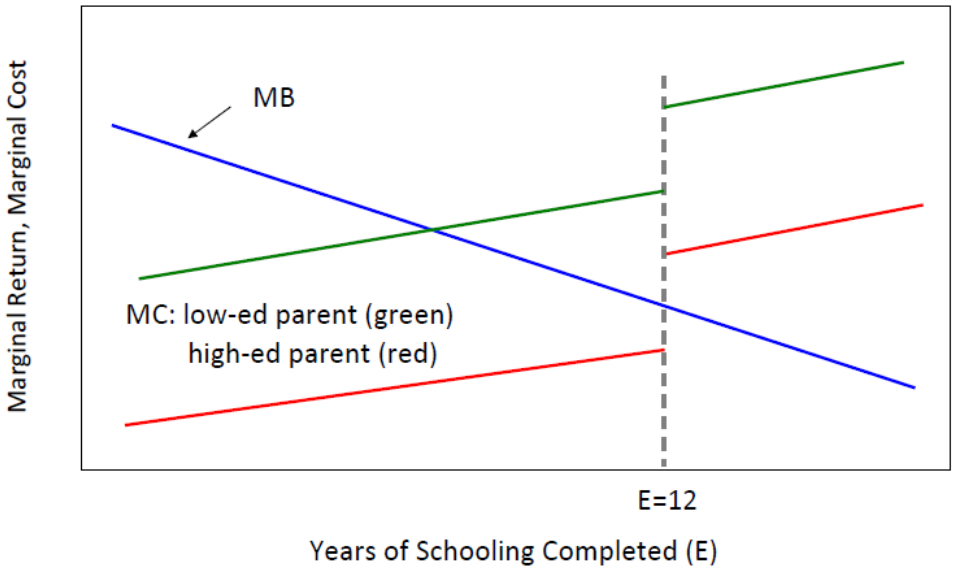
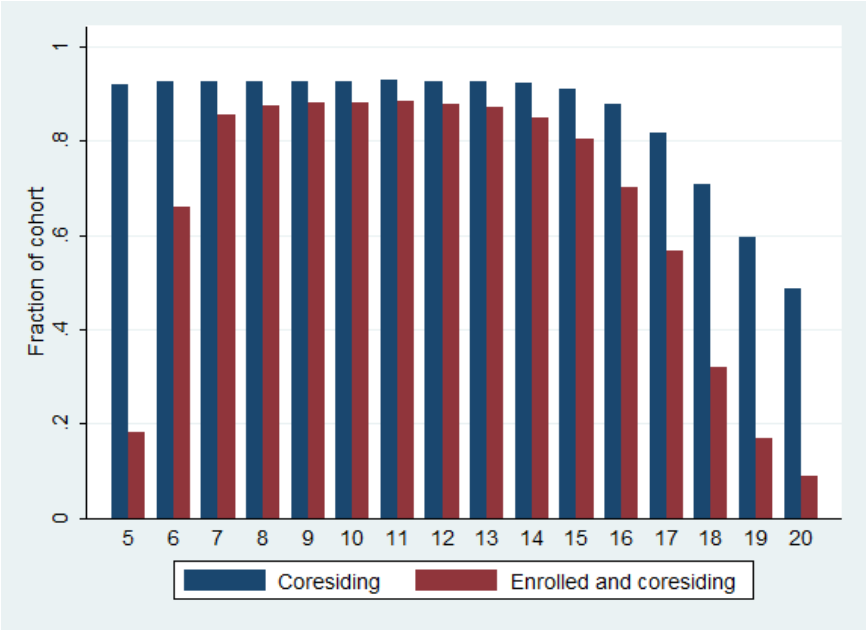
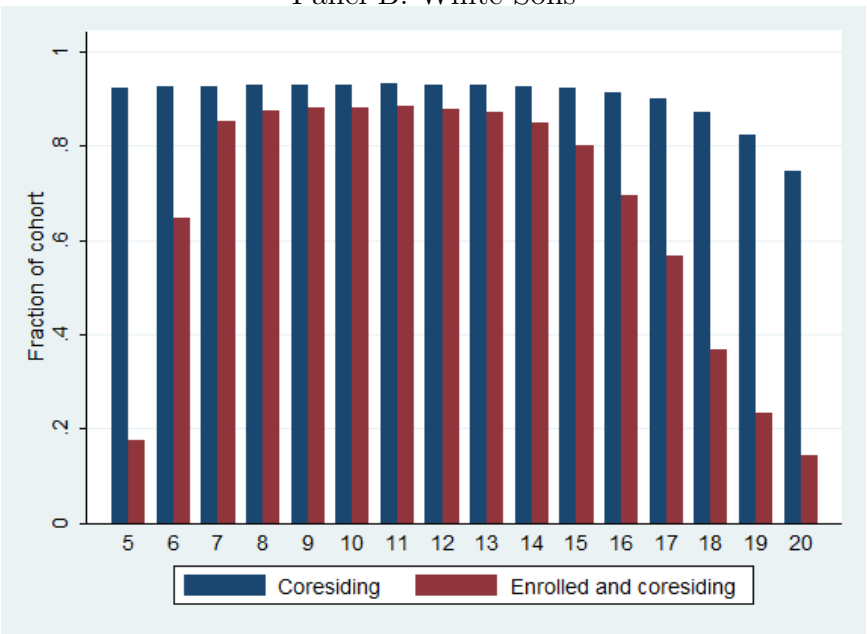


Figure 6: Proportion of Individuals Aged 5 to 20 Living with a Parent and Enrolled in School

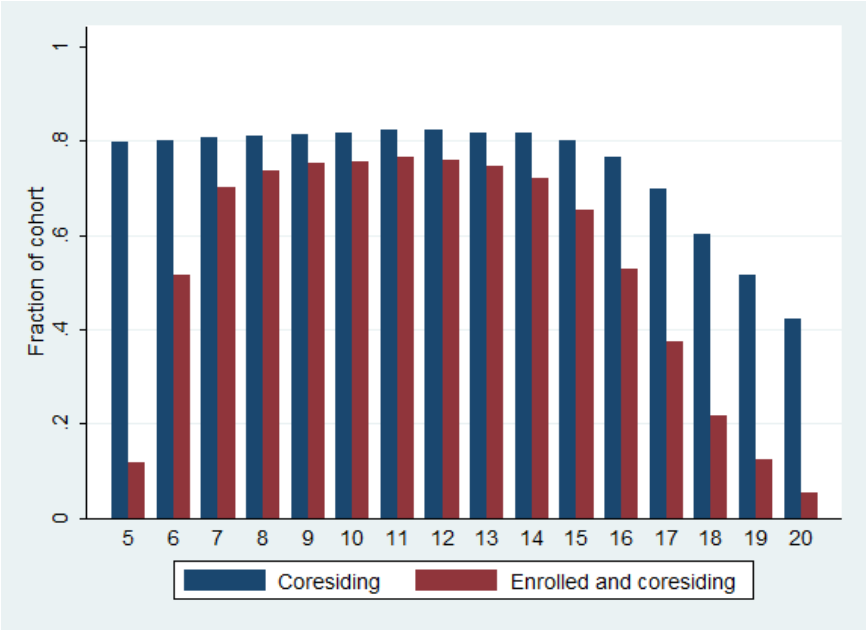
Panel A. White Daughters



Panel B. White Sons



Panel C. Black Daughters



Panel D. Black Sons

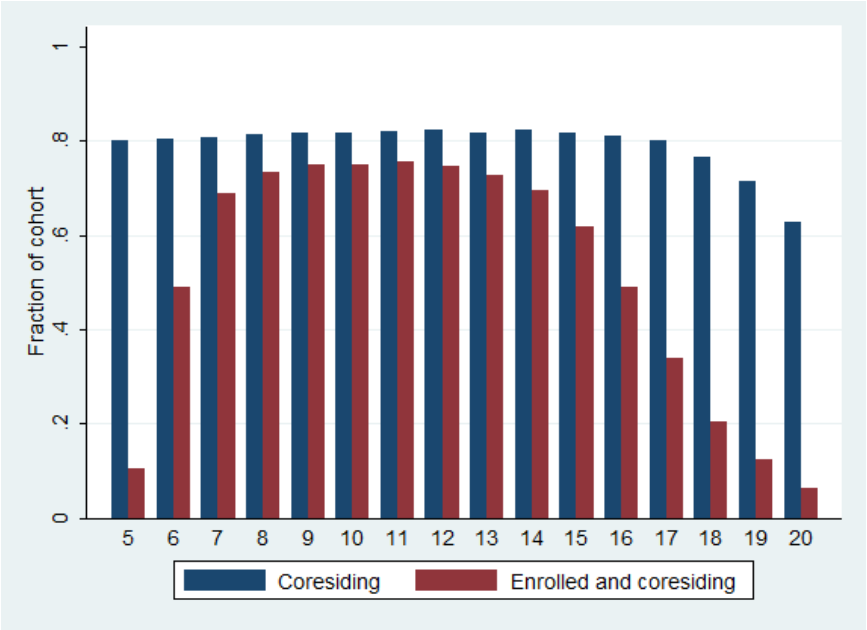
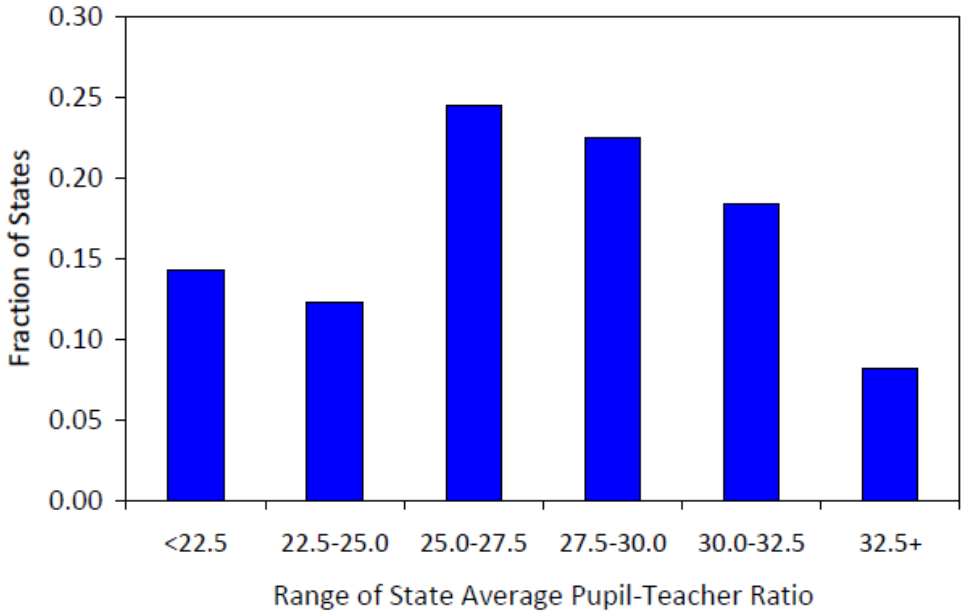
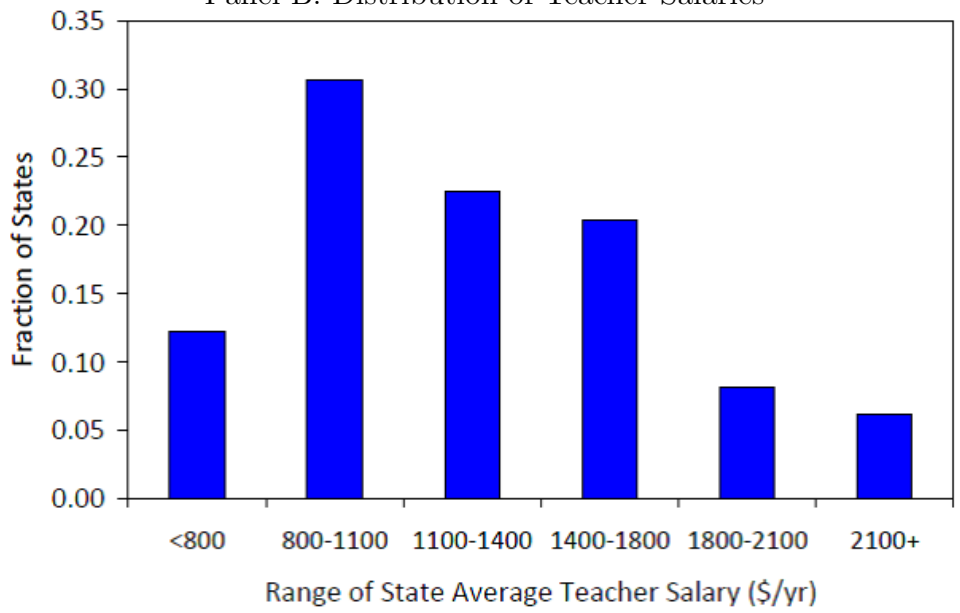


Figure 7: Characteristics of School Quality Measures in 1940 (White Schools)

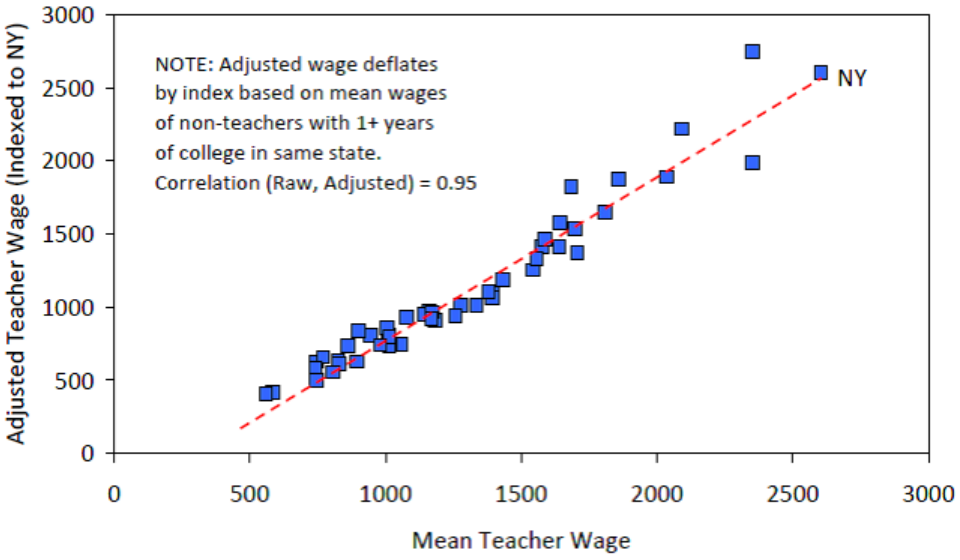
Panel A. Distribution of Pupil-Teacher Ratio



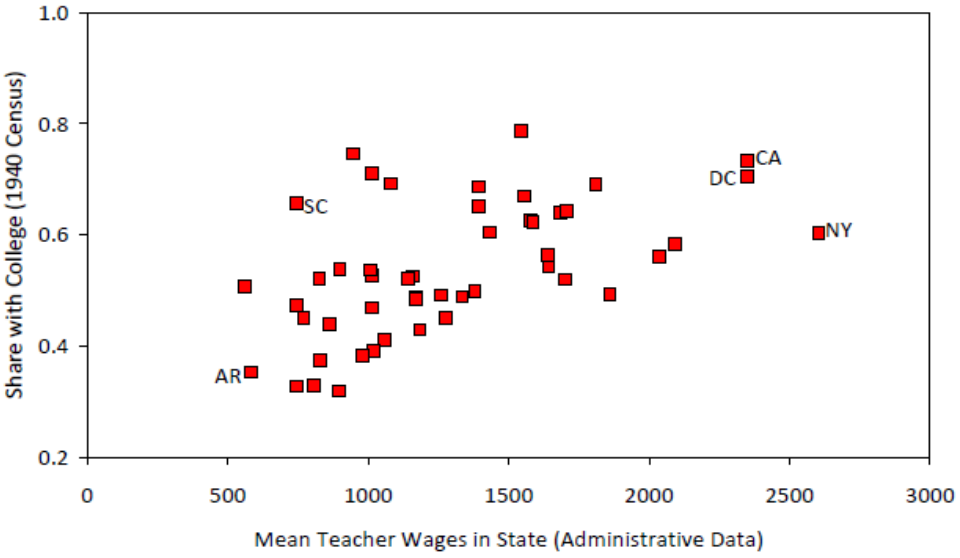
Panel B. Distribution of Teacher Salaries



Panel C. Relationship between Mean Teacher Wages and Adjusted Wages



Panel D. Relationship between Mean Teacher Wages (1940 Administrative Records)
and the Fraction of Teachers with a College Degree (1940 Census)



Panel E. Relationship between Teacher and Non-Teacher Annual Earnings in the 1940 Census: Whites Only, with One or More Years of College

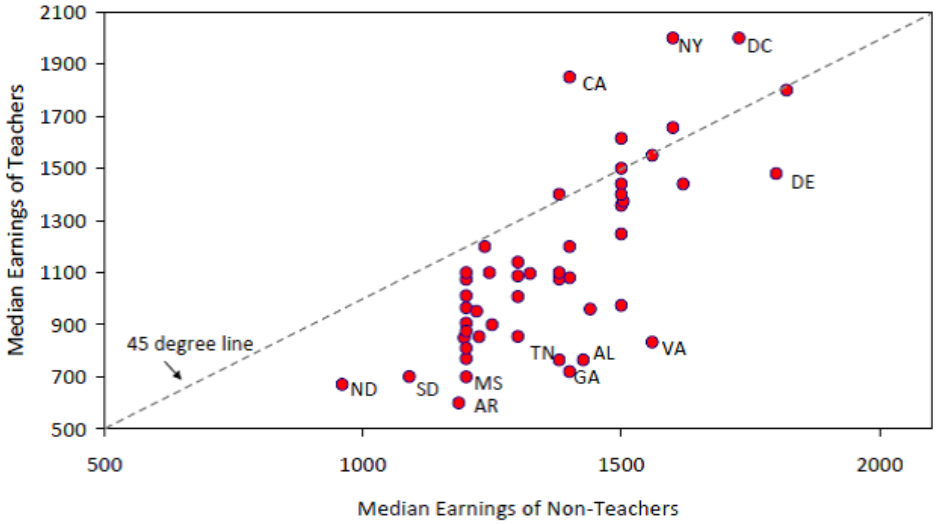


Figure 8. Relationship between Predicted Child Education (at Ages 14–18) and Parental Education, White Families

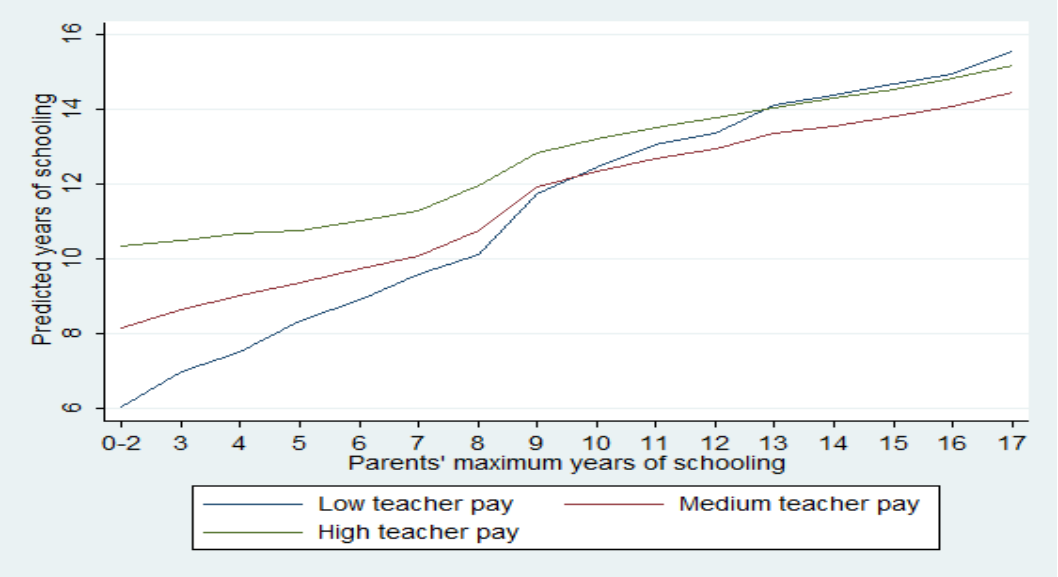


Figure 9. Relationship between Predicted Child Education (at Ages 14–18) and Parental Education, Black Families

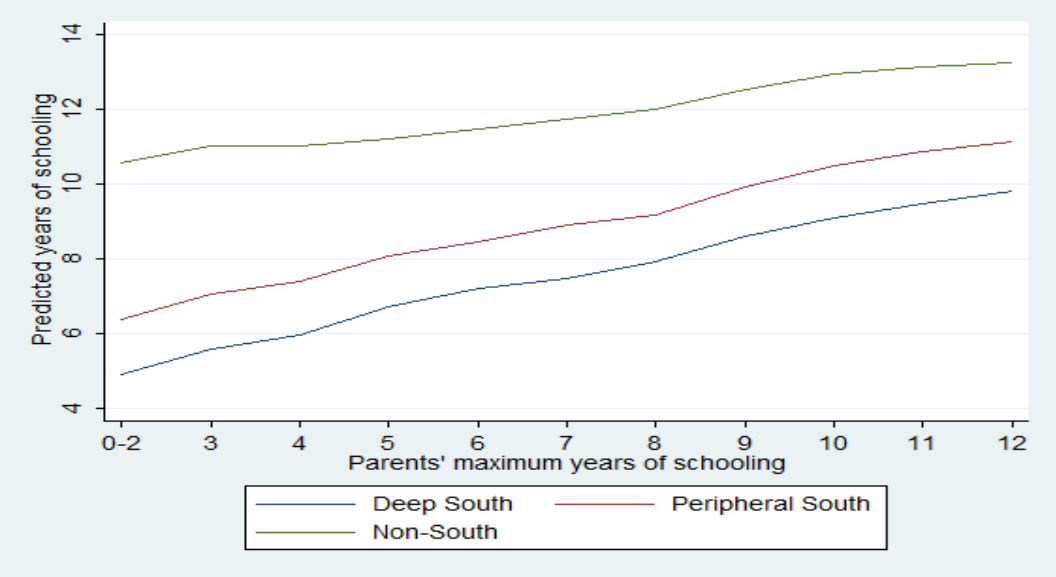
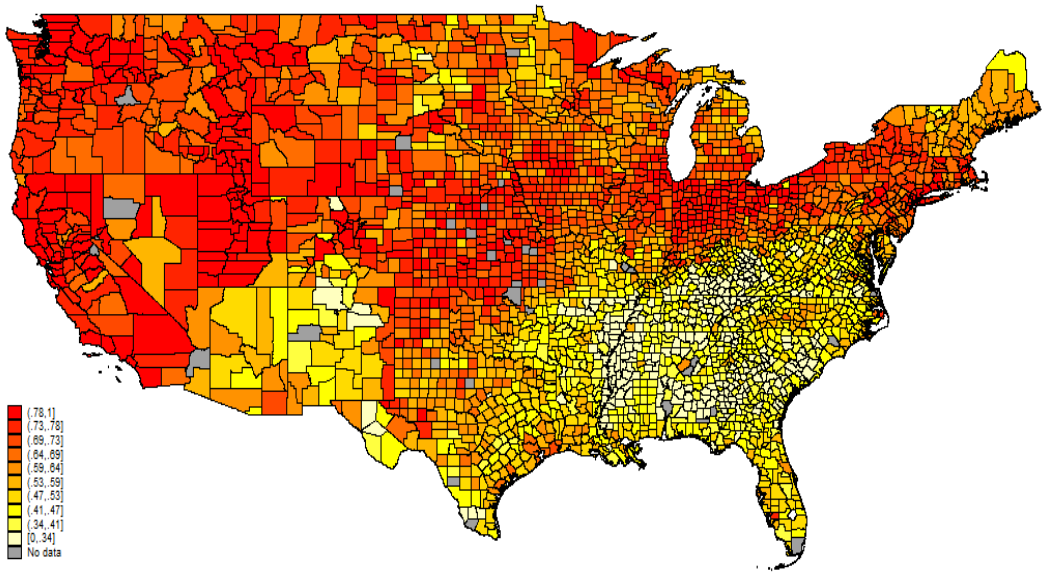
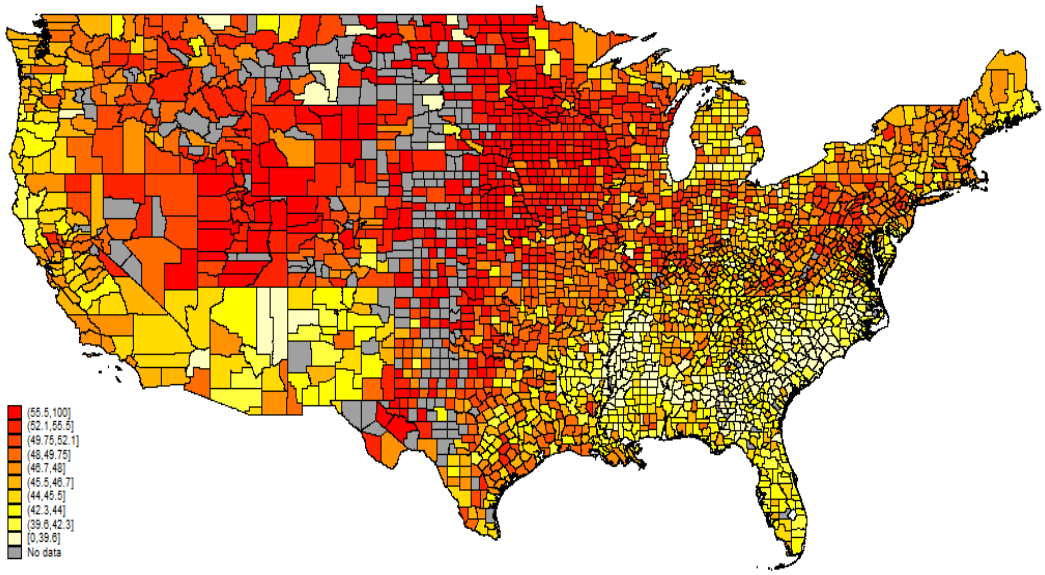


Figure 10. The Geography of Upward Mobility at the County Level

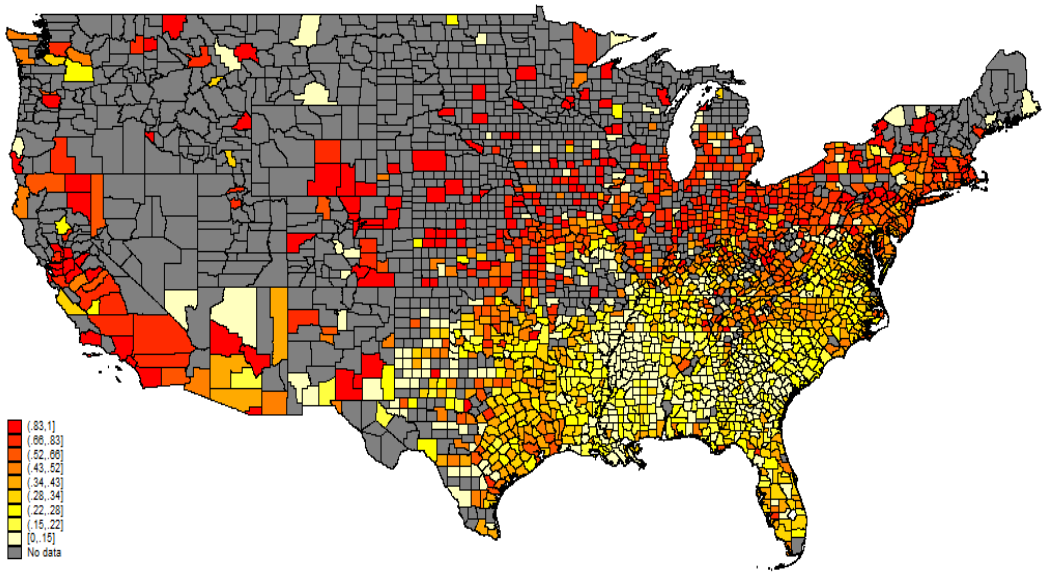
A. Upward Mobility in Education, 1922-26 Birth Cohorts



B. Upward Mobility in Income, 1980-93 Birth Cohorts (Chetty et al., 2014a)



C. Upward Mobility in Education, 1922-26 Birth Cohorts, Black Families



D. Upward Mobility in Education, 1922-26 Birth Cohorts, White Families

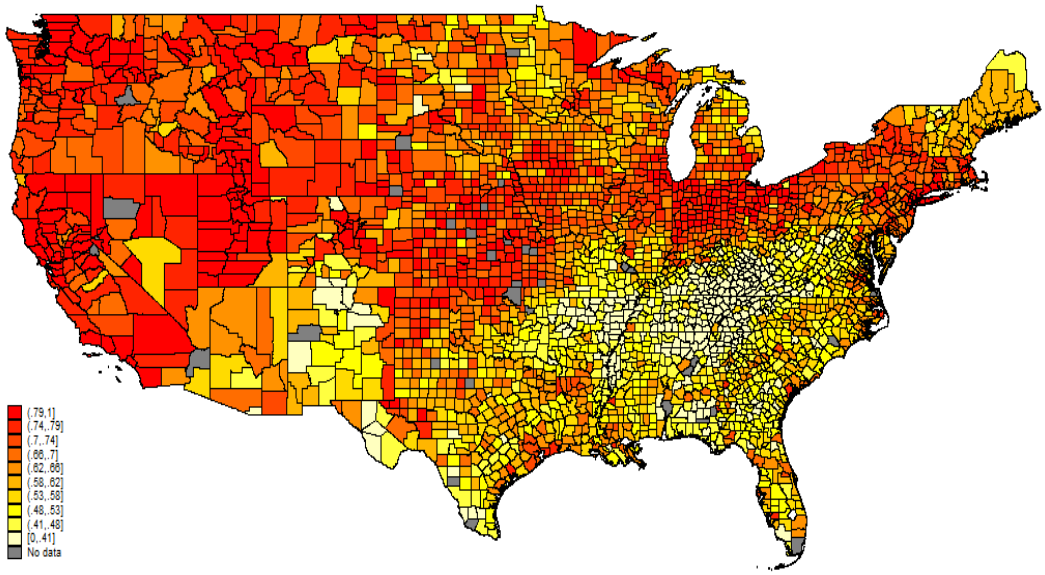


Figure 11. Border Counties Used in the County-Level Analysis

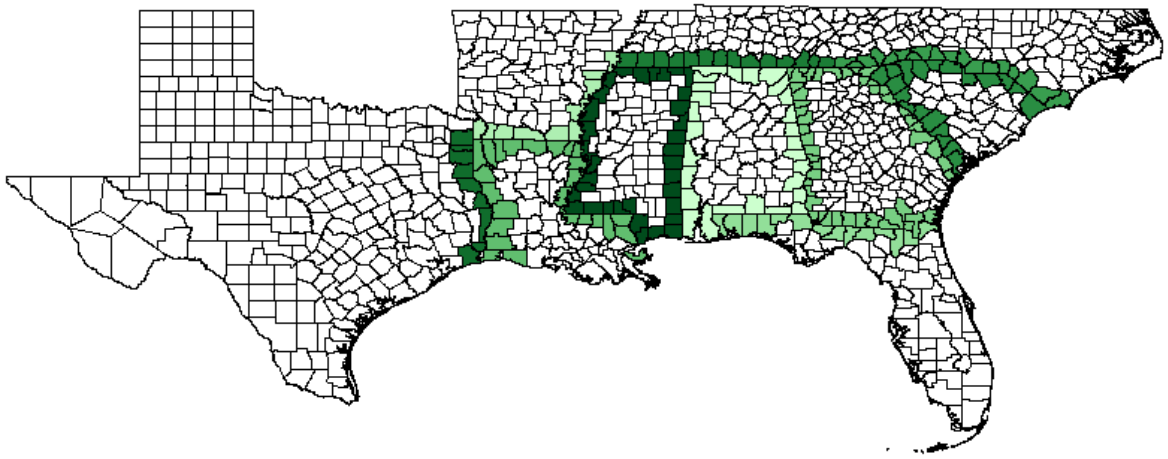


Figure 12. Percentile Rank of Teacher Wages in the Income Distribution, Border Counties

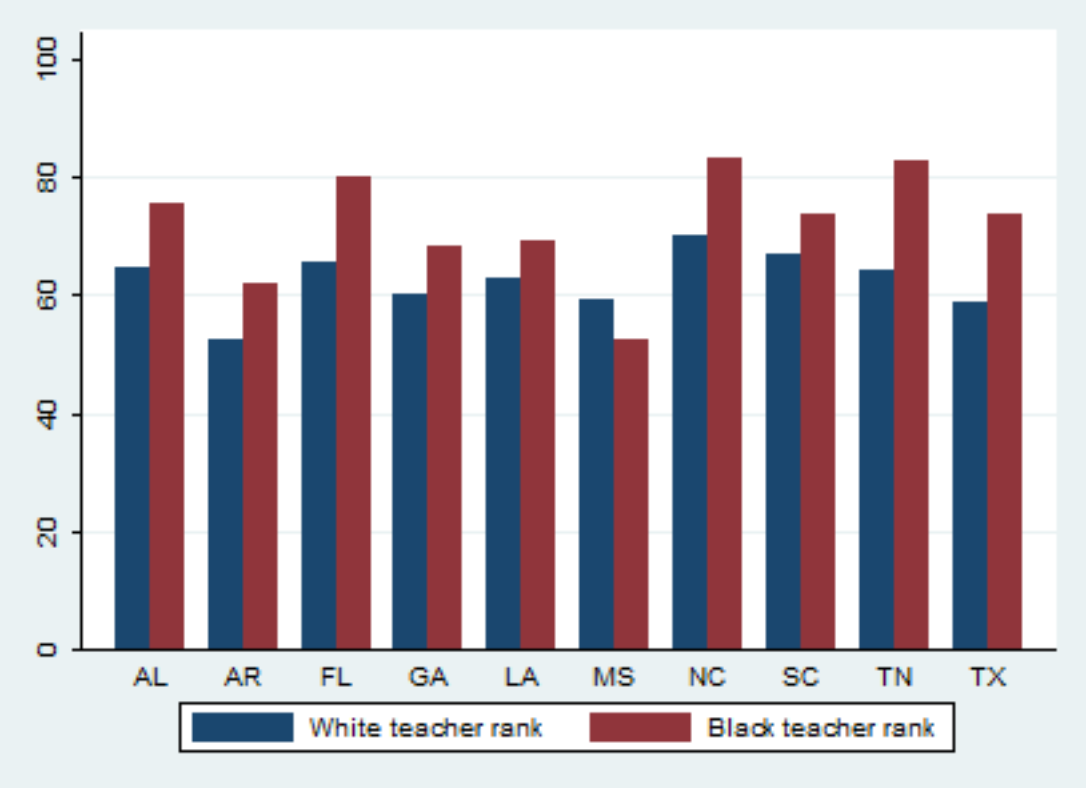


Figure 13. Wages of Teachers Relative of Non-Teachers with Similar Education, Border Counties

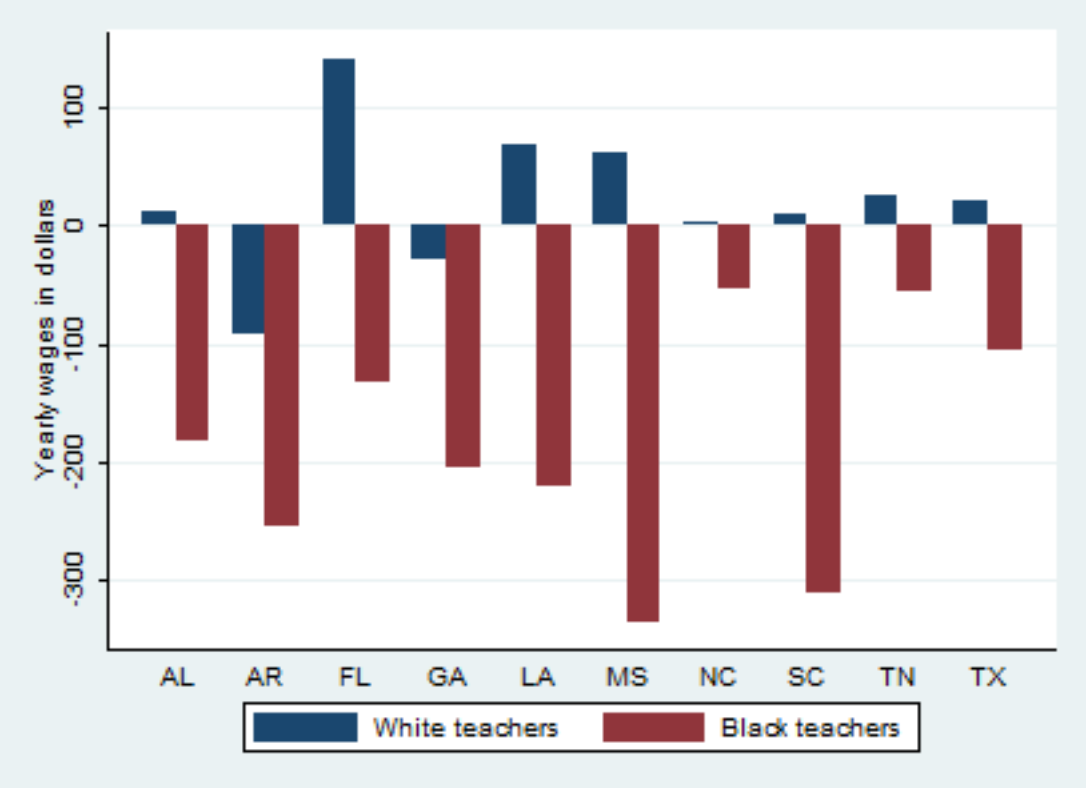


Figure 14. Mandated Teacher Minimum Wages for AL, GA, MS (blacks), NC, and TN; 10th Percentile Wages for AR, FL, LA, MS(whites),SC, and TX

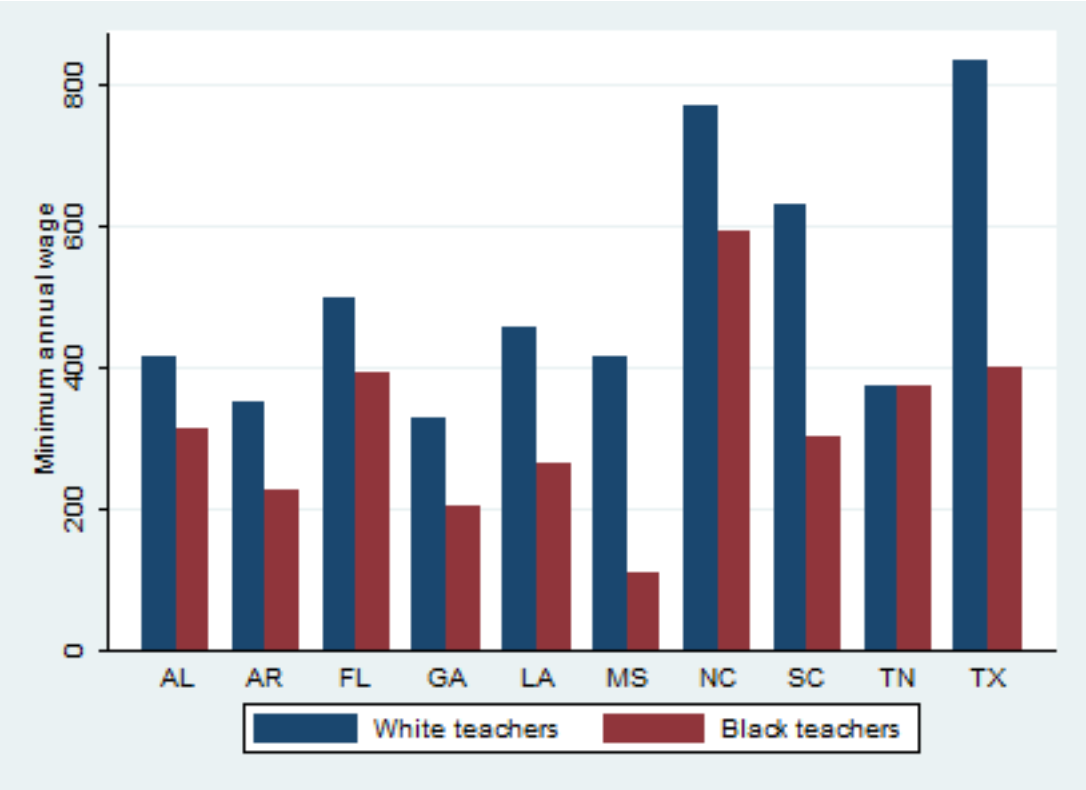


Figure 15. Distribution of Black Teacher Wages, Border Counties

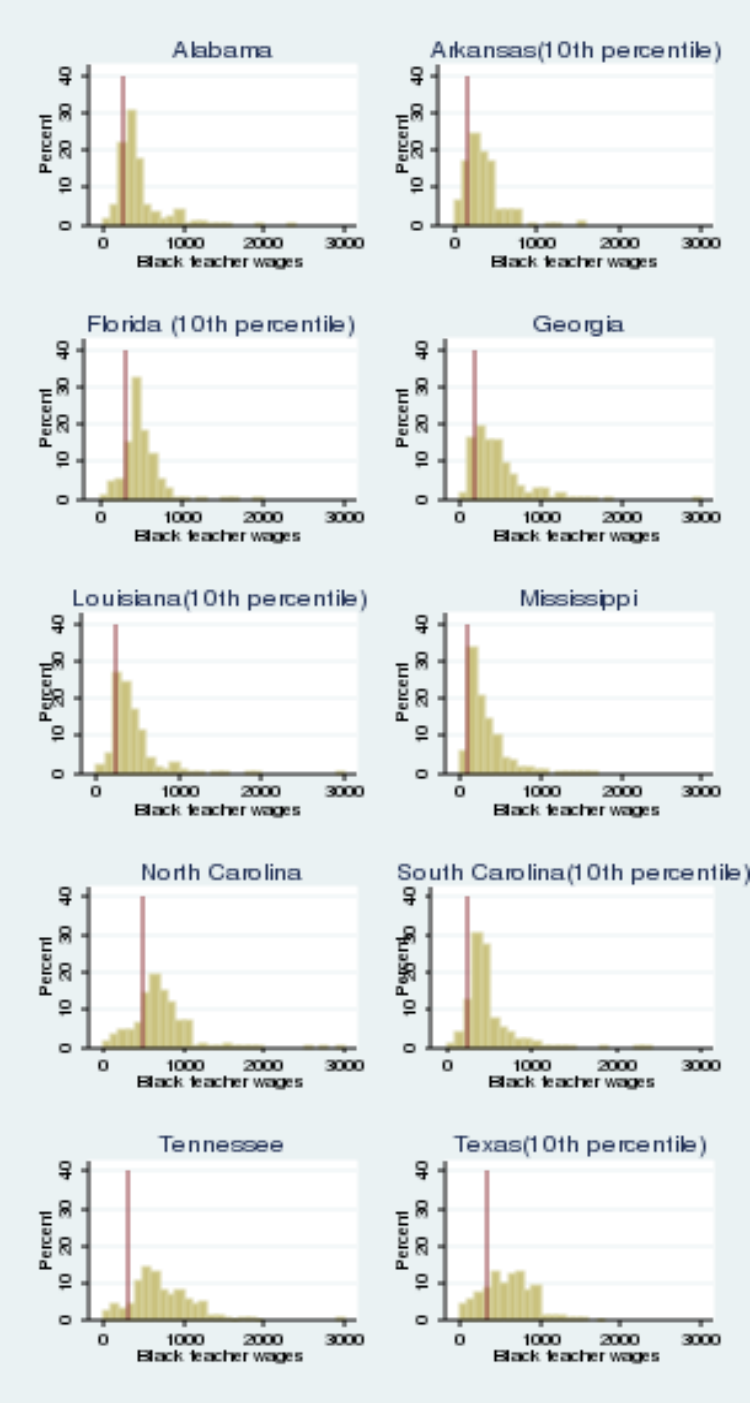
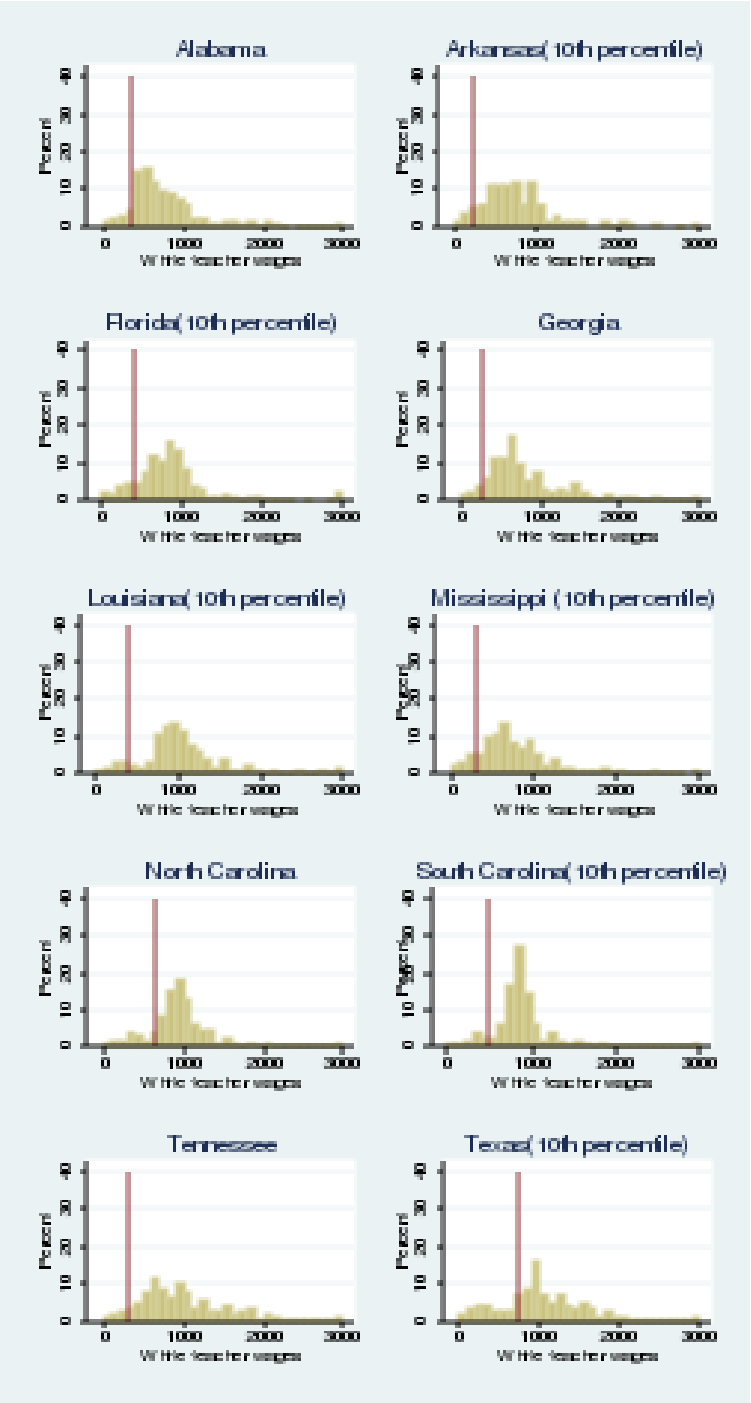


Figure 15. Distribution of White Teacher Wages, Border Counties



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Appendix 1. Historical Background: Educational Opportunities in the U.S. for the "Parent Generation"

Our paper describes upward mobility in education for two generations—a children generation, born in the 1920s, and a parent generation, most of whom were born between 1880 and 1910. These parents were educated during a period of rapid evolution in American education.

In 1880 the availability of public primary schooling was widespread in the U.S., but secondary schooling, public or private, was rare. In 1880 the number of high school graduates equaled only 2.5 percent of the population aged 17, and the majority of these students attended private academies.[43] Individuals born around 1880 were then the beneficiaries the "first great transformation" of American secondary education (Trow, 1961), which resulted in the widespread establishment of public secondary schools across the country. By 1910 there were 10,000 public high schools in the U.S., educating more than 900,000 students.[44] As Goldin and Katz (1999) discuss, a "second great transformation" in secondary education then swept the country, and by 1950 the U.S. had widespread provision of public secondary schools. The growth of public high schools, also known as the "high school movement," resulted in a rapid increase in graduation rates—from 8.6 percent in 1910 to 16.3 percent in 1920 and 28.8 percent in 1930.

Many individuals in the 1880–1910 birth cohorts worked as children. Child labor was common in the U.S. during the first half of the 19th century; the first law limiting child labor in the U.S. did not appear until 1842.[45] Laws limiting child labor were strengthened and became widespread during late 19th century; by 1914 all states had regulations limiting child labor (Lleras-Muney, 2002). Thus, "gainful employment" of children aged 10 to 15 peaked at 1.75 million in 1900 and declined to 667,000 by 1930 (Bureau of

[43] All statistics are from Bureau of the Census (1975).

[44] In additional, approximately 100,000 students attended private school.

[45] The Massachusetts Act of 1842, chapter 60, limited children under age 12 to ten-hour work days, though it appears that the law was not actively enforced. A memorandum book from a 19th century firm provides evidence about the productivity of children for one family—a father who worked alongside his children at a Massachusetts cotton mill. His weekly wage was $5.00; his 16 year old son Michael earned $2.00; 13 year old son William, $1.50; 12 year old daughter Mary, $1.25; and 10 year old son, Robert Rier, $0.83. An 8 year old niece Sally had a weekly wage of $0.75 (Abbott, 1908).

the Census, 1975). Our analysis below indicates that reported employment of children aged 13 and younger was rare in 1940 Census records.

More broadly, by 1940 the stage was set for post World War II American educational norms—the emerging middle-class expectation of high school graduation and the real possibility of advancement to higher education.

Educational Opportunities for Minority Groups in the U.S.

While the U.S. was the first nation to provide widespread access to public primary and secondary education, this broad access did not initially extend to all communities, a point vividly illustrated by the experiences of black, Chinese, and Japanese Americans born 1880–1910.

Black Americans

In 1900 literacy among native-born white Americans (aged 10 and above) was more than 95 percent, a result, no doubt, of the widespread accessibility of public primary schooling in the 19th century. The corresponding literacy rate among black Americans was less than 55 percent. Of course, in 1900 black individuals over age 35 had been born prior to the 13th Amendment, which abolished slavery in the U.S., and the vast majority of black Americans lived in Southern states, where segregation was enforced as a matter of public policy.

After the Civil War, a series of federal actions granted and then strengthened the rights of black Americans—most notably the 1868 ratification of the 14th Amendment, which granted citizenship to all persons born in the U.S., and the Civil Rights Act of 1875. Nonetheless, in 1881 Southern states began to issues laws that scaled back civil rights for black Americans—initiating a period of increasingly rigid state-sponsored segregation. The first of these Jim Crow laws was a 1881 Tennessee law that segregated railroad cars. The flood of similar laws that followed was made possible by the 1883 *Civil Rights Cases,* an 8-1 ruling by the Supreme Court overturning key provisions of the Civil Rights Act of 1875.[46] As for educational institutions, the *Plessy*

[46]The court ruled that while the state could not discriminate on the basis of race, individual citizens could. As Justice Joseph P. Bradley argued, " ... it would be running the slavery argument into the ground to make it apply to every act of discrimination which a person may see fit to make as to guests he will entertain, or as to the people he will

v. Feguson decision of 1896 declared racial segregation in schools to be constitutional, and the 1899 Supreme Court's ruling in *Cumming v. Richmond County Board of Education* clarified that the resulting "separate but equal" doctrine did not necessitate equality of resources devoted to racially segregated schools. Segregation in education thus became a permanent feature in the South for generations; it was not declared unconstitutional until 1954, with *Brown v. Board of Education*. Moreover, as we document below, during this period black and white public schools were indeed far from "separate but equal."

A large majority of black Americans lived in the South at the turn of the century, but millions were then part of the Great Migration—the flow of migrants leaving the South in hopes of building a better life elsewhere. Among those born 1900–1909 in the Deep South States of Louisiana, Mississippi, Alabama, Georgia, and South Carolina, for example, fully one third lived outside the South as adults (Black, et al., 2015). A large literature documents the daunting circumstances these migrants faced in their destination locations, in terms our employment and housing (Smith and Welch, 1989; Margo, 1995; Maloney, 1995; and Eichenlaub, et al., 2010). In the Northern, Midwestern, and Western urban areas to which these black Americans largely migrated, most public school districts were not segregated as a matter of official policy, but *de facto* segregation in schooling was common.

Given the historical context, it is not surprising that levels of educational attainment of these parents was much lower than their white counterparts, as we document in table at the end of this Appendix.

Chinese Americans

The first sizable flow of immigrants from China was in 1854, a year in which 13,100 Chinese immigrants arrived in the U.S. By 1882 approximately 275,000 immigrants had come from China to the U.S.[47] The Chinese Exclusion Act of 1882 reduced this flow substantially;[48] from 1882 through 1943, the annual number of immigrants from China was often less than 1000, and

take into his coach or cab or car; or admit to his concert or theater, or deal with in other matters of intercourse or business."

[47]Statistics on immigration are from Bureau of Census (1975).

[48]The Act was signed by the President Chester Arthur over the objections of only a few statesmen, including Senator George Frisbie Hoar of Massachusetts, who characterized the Act as "the legalization of racial discrimination." The Act was not repealed until 1943.

never greater than 6,992 (in 1924). Thus the Chinese American children we study in 1940 were mostly native born, and indeed many were third or fourth generation Americans. Most lived in California, but there were significant Chinese populations in other states.

As Kuo (1998) documents, in 1880 discrimination targeting Chinese Americans and Chinese immigrants was enshrined in the California constitution.[49] State laws passed in the late 19th century imposed restrictions for Chinese in land ownership, interracial marriage, and naturalization. Chinese American children faced barriers in access to public education. In 1885 the parents of an eight-year-old Chinese American girl, Mamie Tape, challenged her exclusion from San Francisco's public schools, and the ruling in *Tape v. Hurley* favored the Tape family. In response, state legislation was passed allowing school districts to offer segregated schools under the "separate but equal" doctrine, and in 1885 the San Francisco School Board thus opened the Chinese Primary School. Segregation in schooling remained a feature in the city for the next 40 years. Kou (1998) indicates that elsewhere in California the experience of Chinese Americans students varied. In some communities student were admitted to white public schools, while in others students were educated in segregated schools or in missionary schools set up for Chinese American students. Strict segregation policies waned by the 1920s and in 1940 local school policies no longer segregated Chinese students, though legislation establishing *de jure* segregation was not repealed until 1947.

Chinese students living in the U.S. South also experienced exclusion from white public schools in many cases, as was highlighted by the 1927 Supreme Court case, *Lum v. Rice.* The issue involved a nine-year-old girl, Martha Lum, who had been excluded from an all-white public school in Mississippi. The Court ruled that the exclusion was permissible on the grounds that Martha could instead attend the school intended for black children. In general in the South, there were Chinese American students in both white and black schools, and also some in missionary schools.

Japanese Americans

The annual level of immigration to the U.S. from Japan first exceeded 1000 in 1891, and from that year through 1924, approximately 270,000 Japanese immigrants arrived in the U.S. There was then a cessation in immigration

[49]The 1879 California Constitution denied voting rights to "idiots, insane persons, and 'natives of China'."

as President Calvin Coolidge signed the Immigration Act of 1924, which included the Asian Exclusion Act; from 1925 through 1940 only a few hundred immigrants per year arrived in the U.S. from Japan. Thus, like Chinese Americans students, in 1940 nearly all Japanese American primary and secondary students were native born.

As with Chinese American students, school segregation policies targeted Japanese American students in California, but the extent of this segregation was substantially less for Japanese American children.[50] The most prominent attempt at segregation, in the Fall of 1906, created an international crisis. When the School Board of San Francisco resolved to send Japanese American children to the Chinese School (which it renamed the Oriental School), nearly all Japanese parents refused, and the Japanese Consulate issued a strong letter of protest. The issue created a stir in the Japanese press, and American ambassador in Tokyo alerted President Theodore Roosevelt to the matter. In a December 1906 address to Congress, President Roosevelt condemned the exclusion of Japanese students from general public schools in San Francisco, and the School Board eventually backed down. Sacramento finally did enact legislation allowing school districts to place Japanese American students into segregated schools, in 1921, but by that point only a small number of districts elected to do so.[51]

Educational Attainment, 1880–1909 Birth Cohorts

Against this historical backdrop, the appendix table below provides statistics about educational attainment among white, black, Japanese, and Chinese Americans aged 30 to 60 in 1940, i.e., men and women in the typical age range to be parents heading the households we study below. We provides rates of 8th grade completion and 12th grade completion across three cohort groupings, 1880–1889, 1890–1899, and 1900–1909, for four Census regions.

Among these demographic groups, educational attainment was highest among whites; for these individuals 8th grade graduation was the norm, and rates of high school graduation were substantial, especially in more recent cohorts. Among whites, educational attainment was lowest in the South and

[50] This paragraph draws on the account of Wollenberg (1995).

[51] Wollenberg (1995) suggests that as of 1929 only 575 Japanese American students were in segregated schools (some of them with Chinese American classmates), compared with approximately 30,000 students who attended integrated schools.

highest in the West. Not surprisingly, educational attainment substantially higher for the more recent cohorts.

Within each region, black Americans had much lower levels of education than whites, and as with whites, educational attainment was lowest in the South and highest in the West. Japanese and Chinese Americans were concentrated in the in West, and in that region educational attainment among Japanese Americans was substantially lower than whites and slightly lower than blacks, but higher than Chinese American counterparts.

Table 11: Proportion graduating 8th and 12th grades—by cohort, region, and race/ethnicity

	White		Black		Japanese American		Chinese American	
	8th	12th	8th	12th	8th	12th	8th	12th
Northeast								
Born 1880–89	0.635	0.171	0.380	0.080				
Born 1890–99	0.692	0.212	0.440	0.098				
Born 1900–09	0.808	0.293	0.521	0.124				
Midwest								
Born 1880–89	0.678	0.162	0.376	0.085				
Born 1890–99	0.750	0.218	0.445	0.102				
Born 1900–09	0.852	0.323	0.552	0.135				
South								
Born 1880–89	0.502	0.191	0.136	0.039				
Born 1890–99	0.570	0.225	0.170	0.047				
Born 1900–09	0.633	0.273	0.220	0.061				
West								
Born 1880–89	0.746	0.267	0.487	0.140	0.428	0.147	0.215	0.056
Born 1890–99	0.800	0.320	0.581	0.179	0.508	0.167	0.325	0.100
Born 1900–09	0.864	0.412	0.684	0.240	0.615	0.235	0.515	0.219

Note: Authors' calculations, 1940 U.S. Census. Sample sizes are as follows.
White: $n_{NE} = 13,312,182$, $n_{MW} = 13,388,867$, $n_S = 10,332,791$, and $n_W = 5,220,229$.
Black: $n_{NE} = 532,354$, $n_{MW} = 569,100$, $n_S = 2,884,876$, and $n_W = 72,144$.
Japanese American: $n_W = 79,729$. Chinese American: $n_W = 26,392$. Only a small number of Japanese Americans live outside the West. We do not provide statistics on Chinese Americans because of concerns about measurement error in the 1940 Census in areas where there were few Chinese Americans.

Appendix 2

Residence of individuals aged 5–20.

Appendix 3

School quality data — sources and description.

Appendix 4

Estimates of coefficients in Tobit regressions.