Examining the Effect of Economic Shocks on the Schooling Choices of Southern Farmers

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April 2018

Abstract

Black men born in the Cotton South during the turn of the twentieth century attended school for three and half fewer years relative to their white counterparts. In this paper, I examine whether economic fluctuations contributed to blacks receiving fifty percent less schooling than whites. Using US Census data, I find a positive correlation between black school attendance and cotton production. The attendance rates of white children are unaffected by changes in cotton production. Using features of the Southern agricultural economy, I show credit constraints drives the positive correlation between school attendance and cotton production for black households.

Introduction

Blacks from the [2] US Cotton South born in 1910[3] attended school for three and half fewer years than their white peers. The black white schooling gap contributed to financial inequalities between the households. Black men earned fifty percent less than white men. The lower earnings translated into black households accumulating assets at a slower pace. The pervasive consequences of the black white schooling gap cause researchers to focus on the determinates of black schooling choices.

The unequal allocation of schooling resources between the races contributed to the schooling gap. Observable characteristics show Southern blacks attended inferior schools relative to whites. School boards spent more on white pupils. Whites attended schools with higher quality facilities and instructors. The academic year was longer in white schools. By analyzing various school quality measures, researchers find the supply of schooling contributed to the black white schooling gap. However, the supply side covers just part of the schooling market. The labor market played a critical role in determining the demand for schooling.

Racial differences in household responses to labor market fluctuations contributed to the observed schooling gap between blacks and whites. Previous research observes labor demand increases led to a reduction in black school attendance and had no effect on whites. Rising wages and opportunity costs pulled blacks out of school. The explanation suggests a negative relationship between incomes and black schooling outcomes. Unlike previous research, the

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[2] Throughout the paper the Cotton South (unless specified otherwise) refers to the ten U.S. states that produced around 95% of cotton during the late 19th and early 20th century: Arkansas, Alabama, Georgia, Florida, Louisiana, Mississippi, North and South Carolina, Tennessee, and Texas.

[3] The averages are based on the school obtainment values of individuals born in the Cotton South in 1910. The school obtainment values come from the 1940 Census. 1910 is used because blacks born in this year should be educated in graded schools. Earlier cohorts were potentially taught in ungraded school houses. (Margo 1990).

current paper examines the connection between the supply of labor and the demand for schooling. Research on modern developing economies suggests households, under conditions similar to southern blacks', may exhibit a positive relationship between household incomes and schooling outcomes. As incomes increase, the household can afford to send the children to school instead of work (i.e., labor supply decreases and demand for schooling increases). The explanation predicts a positive correlation between household incomes and schooling outcomes. Education as a normal good and consumption smoothing under credit constraints are two mechanisms capable of producing a positive relationship between schooling outcomes and incomes. The normal good mechanism says as incomes rise, households spend more on schooling. For the consumption smoothing mechanism, a household experiences a negative income shock and no longer can afford their typical consumption bundle. The household is unable to borrow against future earnings to make up for the current income decline. Therefore, the household uses their assets to make up for the income decline (i.e., the children enter the labor market to earn a wage at the expense of schooling). The mechanism fits with the credit conditions black farming households faced in the period of analysis.

My results consistently show a positive correlation between schooling choices by black farming households and household incomes. In black farming households, I find school attendance rates increase as my proxy for income increases (i.e. as cotton yields increase). I find the same income fluctuations have no effect on the schooling choices of white households. To address the potential endogeneity of my results, I use weather variables to predict cotton yields. My instrumental variable strategy leads to identical results—a positive correlation between household incomes and black school attendance. Through my extensions, I show my results are robust to several different estimation approaches—racial subsamples and individual level

estimates; and the positive correlation between household incomes and schooling outcomes I find in my main results is driven by a constrained credit access mechanism—not schooling as a normal good.

The consequences of a positive correlation between incomes and school attendance go beyond human capital investments. In theory, black households simply need to shift schooling from bad to good income years to achieve the same total years of schooling as white households with no correlation between schooling and incomes. In practice, however, schooling outcomes show Southern blacks fail to keep pace with white households. The lower education levels translate into black households earning less and acquiring few assets. The positive correlation between children's schooling and both household assets[4] and paternal education levels[5] results in the next generation of blacks having less schooling relative to whites. The pattern repeats and contributes to the persistent inequality between blacks and whites (i.e., the correlated and noncorrelated groups) observed by economic historians. While the current paper's analysis is limited to a historical context, the implications for inequality and development are not. Researchers observe similar conditions and a positive correlation between incomes and schooling in modern developing economies. Unlike the current paper, limited time horizons prevent researchers from observing the long-term consequences on schooling attainment and economic inequality.

Literature Review

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[4] Margo 1985 & 87
[5] Barnhouse Walters and Briggs 1993

Researchers document a gap between white and black households in the US Cotton South along major economic measures of household welfare. Southern black men born in 1910 receive fifty percent less schooling relative to white men. The gap corresponds to three and half fewer years of schooling. The schooling gap contributes to a household earnings gap of fifty percent (Carruthers et al.). With lower earnings, black households accumulate assets at a comparatively slower pace than white households. The pattern is true across asset classes including financial assets (i.e., bank deposits and bonds) (Higgs 1982) and farm ownership (Ransom and Sutch 2001). A predominant explanation for the economic gap between whites and blacks during the late 19th and early 20th century reverts back to the determinates of the low human capital investments made by black households—the supply and demand of schooling.

On the supply side, the low-quality schooling provided to Southern blacks led to lower school attendance rates. Southern black schools received less funding and lower skilled teachers relative to whites (Margo1990).[6] The school year was longer in white schools. Margo consistently finds a positive relationship between school quality and black schooling outcomes (Margo 1985 & 87).   School quality discrepancies led to lower attendance and literacy rates among Southern blacks versus whites (Margo 1985 & 87).

On the demand side, researchers observe fluctuations in the labor market help determine black households' demand for schooling. Baker (2015) uses the boll weevil's arrival and resultant persistent decline in labor force demand to examine the correlation between wages in the local agricultural labor market and black school attendance. Using cotton ginning as a proxy

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[6] A separate literature examines the reasons for the underfunding of black schools in the Cotton South. Researchers tend to focus on the role of disenfranchisement and school boards decisions (Collins and Margo 2006 and Naidu 2012).

for labor demand, the author finds a negative correlation between the amount of cotton ginned and black school attendance. The attendance rates of white households are not correlated with cotton production. The estimates use county level datasets on cotton ginning and school attendance from Georgia. To address endogeneity concerns, the author uses the arrival of the boll weevil as an instrument to predict the amount of cotton ginned.

The economic literature on modern developing economies shows the correlation between the economy and school attendance can be positive.[7] Ranjan (2001) uses a two period Overlapping Generations model to illustrate the theoretical basis for a positive correlation. The model sensibly assumes the returns to schooling are higher than the market rate of return. When households are not credit constrained, they always invest in schooling. However, if households are constrained and experience a negative shock, they use child labor to increase household income and consumption. Empirical evidence supports the theoretical prediction that credit constrained households increase child labor usage following a negative external shock. In Indonesia, poorer households increased child labor usage by more than wealthier ones following the decline of GDP (Thomas et al. 2004). Credit constrained farming households in India (Jacoby and Skoufias 1997) and Tanzania (Beegle et al. 2006) increased child labor usage following crop shocks. The increase in child labor supply reduces the demand for schooling— Beegle et al. (2009), Cavalieri (2002), and Jacoby and Skoufias (1997).

The current paper extends the Cotton South literature by being the first to analyze how decreases in the labor supply affect the demand for schooling. Using cotton yields as a proxy for household incomes, I find a positive correlation between school attendance and cotton yields for

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[7] Similar to Baker (2015), a branch of the development literature observes the negative correlation between schooling outcomes and the local economy—Duryea and Arends-Kuenning (2003), Kruger (2007), Beegle et al. (2009), and Edmonds and Pavcnik (2004).

black households. In response to rising incomes, black households reduce their labor supply and send their children to school (i.e., increasing the demand for schooling). I find no correlation between incomes and schooling for white households. To address concerns regarding the direction of causality, I use weather fluctuations to predict cotton yields. For black households, I find a positive correlation between predicted cotton yields and school attendance rates.

To understand my results, I consider several potential mechanisms that lead to a positive correlation between black school attendance rates and incomes. I eliminate education as an inferior good and rising opportunity costs as potential mechanisms, because both lead to a negative correlation between household incomes and schooling. Schooling as a normal good generates a positive correlation. Declines in cotton yields reduces household incomes. The decline in incomes cause reductions in expenditures on all normal goods, including schooling. Credit constraints can also generate a positive correlation between cotton yields and school attendance. Households desire to smooth consumption following negative income shocks. If households have credit access, households maintain consumption levels by borrowing against future earnings. Constrained households are forced to use assets to maintain consumption. Households lacking financial assets turn to child labor at the expense of schooling. The mechanism holds even if every household has credit access, but the cost varies. High cost households pull children from school earlier than low cost households. Therefore, schooling as a normal good and credit constraints can explain black households' behavior.

When examining black white differences in the Cotton South, authors must consider the influence of racism. Racism is unlikely to directly cause a positive correlation between incomes and schooling. However, I go through two potential ways racism can contribute to or is the underlying cause of the normal good and credit constrained mechanisms. Racism could cause

blacks to receive lower paying jobs or wages. The lower earnings lead to lower expenditures on schooling—normal good explanation. The local merchant has a fixed level of capital to lend to customers and prefers to lend to whites over blacks—constrained credit access. Therefore, racism is compatible with the normal good and credit constrained mechanisms.

To further differentiate the current paper from the previous literature, I quantitatively test for the mechanism behind the observed correlation between cotton output and black school attendance. I evaluate the two potential mechanisms, normal good and credit constrained, by examining how black schooling behavior varies with demand for credit access. Despite lacking a direct measure of individual credit access, I take advantage of features of the rural southern agricultural economy to observe households with different levels of credit demand. Due to similar household characteristics, the level of credit access for black tenant farmers is fairly uniform. However, the demand for credit access varies. Tenant farmers can be grouped into two types—share tenants and fixed rent tenants.[8] Share tenants pay a predetermined share of their output to the landlord at the end of crop cycle. The share tenant can use available cash at the merchant shop to purchase goods at significantly lower prices relative to credit prices (i.e., 50%). The share tenant requires no cash to initiate the next year's share agreement. At the beginning of the crop cycle, fixed rent tenants pay the landlord an agreed upon cash amount[9] to gain access to a piece of land. Following a down year, fixed rent tenants had to conserve household cash or face

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[8] The category of share tenants includes different shares (1/3, 2/3,…) and share croppers. Farmers were ranked by their category (i.e., tenant and cropper) and by the share paid to the landlord. Once a farm laborer earned a positive reputation, landlords were willing to enter into cropper agreements with the laborer. As the laborer established a stronger reputation and acquired physical capital (i.e., mulls, tools, and plows) laborers switched from being croppers to share tenants and paid smaller and smaller shares of their output to the landlord. Above share tenants were fixed rent tenants—the last step before land ownership. The orderly progress and rankings from farm laborer to tenant farmer to landowning farmer is frequently referred to as the agricultural ladder.

[9] Rent payments occasionally came in the form of cotton. However, the payment form does not change the relationship between credit access and tenant type.

the possibility of not being able to pay rent in the next period. Therefore, the average fixed rent tenant relied more on credit access than the average share tenant. If credit access is causing the positive correlation between cotton yields and black school attendance rates, the relationship will be stronger in areas with more fixed rent tenants and be weaker in areas with fewer fixed rent tenants. I repeat my main analysis after splitting my sample into areas with above and below average shares of fixed rent tenants and find the results fit with the credit access mechanism (i.e., the coefficient on cotton yields is still significant in areas with more fixed rent tenants and insignificant in areas with fewer fixed rent tenants).

The current paper extends the modern development literature by providing insights on the long-term consequences of a positive correlation between incomes and schooling outcomes. Modern development studies can observe the positive correlation, but the shorter time horizon prevents the authors from knowing the behavior's long-term consequences. If households perfectly shift schooling from low to high income years, then the total number of years of schooling will be the same across household types (i.e., correlated and noncorrelated). If not, then the total years of schooling will be lower in income correlated households than those with no correlation. By analyzing a historical context, the current paper overcomes the time horizon limitation and I find the positive correlation does lead to fewer years of schooling—blacks did receive fewer years of schooling relative to whites.

Data

The weather data used to measure crop shocks comes from the nClimDiv dataset from the National Oceanic and Atmospheric Administration. The dataset is based at the Climate Division level. Each state is composed of half dozen or more divisions. The divisions themselves are

composed of several counties. Figure one shows a map of the United States broken down into Climate Divisions. From the map, we can see the nClimDiv database provides weather data across the entire contiguous United States at a level in-between the state and county levels.

From the nClimDiv dataset, I use measures of rainfall and temperature. The one month Standardized Precipitation Index is normalized using the division's historical rainfall patterns over the period 1901 to 2001. A measure of zero represents the median value. Negative values are associated with dry periods and positives with wet periods. The greater the magnitude of the measure the more severe the weather conditions are. Figures two and three provide the reader with a visual representation of the variation in division's rainfall. From the average monthly temperature measures, I generate a variable for division's average temperature across the crop cycle. The variation within a climate division's two weather measures is critical to my instrumental variable strategy.

Cotton output and acreage comes from the U.S. Agricultural Census. I collect the 1920 Agricultural Censuses data from the Inter-University Consortium for Political and Social Research's Historical, Demographic, Economic, and Social Data: The United States, 1790-2002 series. For 1930, I transcribed the values from digital copies of the U.S. Agricultural Census (Ruggles). The output and acreage variables are measured at the county level. Using these values, I calculate the cotton yield per acre by dividing the county's total cotton output by the total acres of cotton.

I gather data on the local farming community from the U.S. Agricultural Census. The census provides information on the population of tenant farmers, farm laborers, and landowning farmers. The census breaks the populations down further by race, black and white, and type of

tenant farmer—share or fixed rent. In my main specifications, I include the farmer population

data as part of the controls for county characteristics. In my extensions, I use the detailed

breakdown of tenant types to breakup my sample into areas with high and low shares of fixed

rent tenant farmers. To calculate the shares, I divide the total number of fixed rent tenants by the

total number of tenants (i.e., fixed rent plus share) in a county.

Individual level data come from the Integrated Public Use Microdata Series' one percent

sample from the 1920 and the five percent sample from the 1930 U.S. Census. The key variable

of interest is school attendance by individuals. The Census asked individuals if they attended

school during the school year leading up to the census (i.e. the 1919-1920 and 1929-1930 school

years). From this variable, I generate a dummy variable equal to one if an individual attended

school during the academic year beginning in 1919 or 1929 and zero otherwise. Table one

provides the reader with descriptive statistics on workforce participation, school attendance, and

idleness by race, age, and gender.[10]

By combining Census information on whether individuals live in urban or rural areas

with farm status, I restrict my sample to rural farming households. I further restrict my sample to

individuals from the Cotton South[11]. These restrictions reduce my sample to two hundred-forty

thousand individuals (I also restrict the sample to individuals between the ages five and

eighteen.).

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[10] Per the Instructions to Enumerators, children on farms who helped their parent's farm or worked off the farm were identified as "Farm Laborer." Children who performed chores or general household work were not given an occupation. Without an occupation, children were not considered a labor force participant (Haines). Idle identifies children who are neither enrolled in school nor participating in the workforce.

[11] I use the same group of states as Davis et al. (2009): Arkansas, Alabama, Georgia, Florida, Louisiana, Mississippi, North and South Carolina, Tennessee, and Texas. These states produced around 95% of cotton during the late 19th and early 20th century

The Censuses also provides demographic controls: age, race, gender, and number of siblings. Previous research into child labor shows that children's age, gender, and number of siblings are all important factors in the household's decision to use child labor. I control for gender by including a dummy variable equal to one for females and zero for males. Individuals' values for age and number of siblings are included directly in the estimation equations. Unlike previous studies, controlling for individuals' race is critical for my results. I find that blacks and whites responded differently to the same shocks.

The final set of individual level variables I gather from the Censuses are those for parental controls and household assets. The education level of parents is strongly correlated with their children's levels. The 1920 and 30 Censuses do not have a direct measure of individual's educational obtainment. Instead, I use literacy as a measure of individual's educational level. The Census defines literacy as the ability to read and write. Based on this definition, seventy percent of my sample is literate. From the literacy variable, I generate a variable equal to one when at least one of a child's parents is literate. (In households where only grandparents are present, I use their literacy in place of the parents'.) I control for household assets by including information on if the household owns or rents their dwelling. I create a dummy variable equal to one whether the household owns their dwelling and zero otherwise.[12] I combine information on ownership status and parent occupation to create a dummy variable for tenant farmers. If the household head is a farmer and the farm is rented, the tenant farmer dummy variable equals one. The variable equals zero if households own their dwelling or are headed by farm laborers.

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[12] In addition to the dummy for owning the household dwelling, I tried to include a dummy variable for owning the dwelling out right, but the variable is dropped due to multicollinearity.

Table two provides the reader with the differences in means of child school attendance rates based on several household characteristics. My sample of rural farming households from the Cotton South matches patterns previously observed by researchers. Children from black households attend school at lower rates than their white counterparts. The attendance rates of children with a literate parent are almost twenty percentage points higher than households with illiterate parents. This difference is even larger than the gap between landowners and renters—12.8. Female children attend school at slightly higher rates than males. Children from tenant farming households attend school in lower rates than other groups.[13]

The key assumption of the current paper is fluctuations in cotton yields (a proxy for households incomes) affect household schooling choices. Tables three and four provide support for this belief. Table three looks at how weather shocks influence attendance rates. Table four directly examines the effect of cotton yields on the attendance rates of children from rural farming households from the Cotton South.

Table three gives the differences in means of school attendance rates of household types conditioned on severe dry and wet Mays. The level of observation is the individual level. Therefore, I interrupt the value 73.7 in the Black row and Yes column as 73.7% of black children living in a division experiencing an extremely dry May in 1919 attend school during the next school year (i.e., fall 1919). Depending on the year and household type, the number of observations vary from 16,000 to 114,000. For weather extremes, I use National Oceanic and Atmospheric Administration (NOAA) definitions to generate the two extremes—dry and wet.[14]

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[13] The difference between tenant farming and non-tenant farming households is misleading. The non-tenant farming category is composed of landowners and farm laborers.

[14] Based on the Standardized Precipitation Index, NOAA defines an extreme dry period as values less than or equal to negative one and extreme wet as values equal to one or higher. The measure is normalized across a division's rainfall patterns for a hundred years. The measure is similar to a one standard deviation from a division's mean

Dry Mays tend to raise cotton yields while wet ones reduce yields. Therefore, the local economy in rural Southern communities are likely declining following wet periods and improving after dry periods. From the table, the reader can observe school attendance rates are higher following a dry May for children from black, white, and tenant farming household.[15] Only landowning households were unaffected. Following a wet May, the school attendance rates are statistically significantly lower for all households except land owners. The pattern is robust to the year used—1920 or 1930.

Table four compares the attendance rates of households in counties with high and low cotton yields. Counties in the high sample have yields in the top ten percent and counties in the low sample have yields in the bottom ten percent. Like table three, the level of observation is the individual level. Therefore, I interpret the value 72.0 in the Black row and High column as 72.0% of black children living in a county with a cotton yield in the highest decile (i.e., 90-100 percentiles) attend school during the next school year (i.e., fall 1919). Similar to the dry period portion of table three, the reader observes that children from black, white, and tenant farming households attend school with higher rates in high yield counties versus low yield counties. However, the differences are smaller than those based on dry periods. The difference is likely due to weather shocks capturing the fluctuations in incomes while the yields correspond more to income levels. I fail to find a statistical difference between the attendance rates of children from land owning households from counties with high and low cotton yields.

rainfall. The measure allows me to compare divisions on the same scale (i.e., a value of one in division A has the same interpretation as a value of one in division B). However, the calculation is based a given division's history, so three inches of May rain in division A maybe lead to a zero and to a value of one in division B. Therefore, I am unable to make broad statements of the form: "Any region that receives X inches of rain will see attendance drop by…"

[15] In 1930, no regions in my sample experience an extremely dry May. Therefore, I only report the Dry results for 1920.

In addition to individual controls, the U.S. Decennial Census provides county level controls. The county level controls come from the Inter-University Consortium for Political and Social Research's Historical, Demographic, Economic, and Social Data: The United States, 1790-2002 series. The controls include information on the county's area, population, and farms. The county's area is given in terms of square miles. Population variables include the county's totals for the following groups: total, rural, white males, black males, individuals over the age of nine, illiterate individuals over the age of nine, and individuals between six and twenty enrolled in school. For farms, I include the total number of farms, farms owned by native whites, and tenant farms. Within the category of tenant farms, I include the total acreage and value of farmland and implements.

The final set of controls measures school accessibility. I use the school quality dataset from Carruthers and Wanamaker 2015. The authors use annual education reports from southern states between 1910 and 1940 to generate a county level dataset. I include the total number of teachers at black and white schools, total number of black and white schools, and total expenditure per student.

Empirical Methods

To examine school attendance rates' relationship with the local economic conditions and incomes, I make several adjustments to accommodate the structure of my data. Lacking a direct measure of incomes, I focus my analysis to farmers in the Cotton South. Given the farmers' reliance on cotton production, [16] I use cotton yields as a proxy for household incomes. However, cotton yields are at the county level while the school attendance variable is at the individual

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[16] For details, see the section on the historical background on the Cotton South.

level. Therefore, I aggregate the individual variables to the county level, so the dependent and treatment variables are at the same level—county. The use of cotton yields allows me to implement a weather based instrumental variable strategy to control the direction of causality. The weather instruments are at the climate division level (i.e., above the county level), and again require the second stage variables to be aggregated upward. Given the importance of the aggregation of individual variables for my estimates, the next paragraph explains the process in detail and goes through an example.

By going from the individual to county level, I aggregate the individual dummy variables into county shares. I collapse the individual dataset by county, race, and year. The process results in two observations per county per year—black and white. Therefore, $Black$ is still a dummy variable, but represents the response of all black households in the county. The collapsing process causes the other individuals variables to convert into shares within a given race and year. I will go through the intuition with the generation of the dependent variable—county school attendance rate. At the individual level, I have a dummy variable equal to one if a school aged child attended school in the past year and zero if not. I sum up the school attendance dummy variables (i.e., the ones and zeros) for all of the individuals within the county by year and race. I divide the attendance sum by the total number of individual observations in the county for the year and race. If a county has 100 black children and 50 of them attended school in the last year, then the black county school attendance rate equals .5—50/100. I repeat the process for white households. Therefore, it's as if each county-year pair has two "individuals," one black and one

white, whose attendance variable is a share (i.e., not a one or zero).[17] Figure four shows the distribution of county attendance rates by race.

After adjusting for the data structure and incorporating the proxy variable for household incomes, I estimate the following linear model:

$$County\ School\ Attendance\ Rate_{rtc}$$
$$= \alpha + \beta_{1c}Cotton\ Yield_{ct} + \beta_{2c}(Black * Cotton\ Yield_{ct}) + \boldsymbol{\beta_{mrc}X_{rtc}}$$
$$+ \phi_r + \delta_t + \gamma_c$$

The dependent variable is the share of school age children in a county attending school. $\boldsymbol{X_{rtc}}$ is a matrix of county controls by race and year. $Black$ is a dummy variable representing all black households in a county. $Cotton\ Yield$ is a continuous variable equal to a county's cotton yield in a given year. The unit is five hundred pound cotton bales per acre. The model's errors are clustered at the county level. The model includes race ϕ_r, year, δ_t, and county, γ_c, fixed effects. Previous papers[18] find county fixed effects are critical for controlling for black population distributions and other economic institutions due to the legacy of slavery. County fixed effects control for time invariant determinates of cotton yields—geography, soil quality, and long-term

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[17] The aggregation process adds an extra step going from the data to estimation, but provides several econometric advantages. The treatment variable, cotton yield, is at the county level. Therefore, the individual observations within a county do not truly provide additional information about the relationship between the dependent and treatment variable. The aggregation takes the analysis from a binary outcome to a rate between zero and one. The change in outcome variables allows me to use linear estimation approaches, OLS and 2SLS, in place of nonlinear ones—Probit and IV Probit. Relative to nonlinear models, linear models have better asymptotic traits and standardized practices. Probit panel models provide potentially biased estimates if the number of sample periods is too small (Wooldridge 2010). For IV Probit, researchers have not established a standard practice to test for weak instruments. Wooldridge (2010) recommends the same tests used for 2SLS. For completeness, I provide the results from the nonlinear estimation approaches in the Extension section. I find similar results under both approaches—linear and nonlinear estimation.

[18] Barnhouse Walters and Briggs (1993), Baker (2015) and Margo (1985, 1987, and 1990)

weather patterns. Therefore, cotton yields capture the effect of changes in incomes and not income levels.

The model's key variable of interest is the interaction term between cotton yield and $Black$. If black households respond to cotton yields differently relative to whites, the coefficient on the interaction term, β_{2c}, will be significant. A significant β_{2c} means the blacks households' reaction to economic fluctuations differ relative to the reference group—whites.

To control for household characteristics, I add household controls that are aggregate to the county level by race and year. The controls include parental literacy, age, number of sibling, and dummy variables for tenant status, dwelling ownership and female. After aggregation, the parental literacy variable represents the percentage of households with a literate parent in a county by race and year. Previous child labor research shows that all of these characteristics are significant factors in household's education decisions. The household's assets affect their access to credit markets. To control for this access, I include the county's shares of tenant farmers and households that own their farm.[19]

County controls include two other categories of variables researchers commonly have in child labor models:[20] measures of school accessibility and local characteristics. County fixed effects control for time invariant determinates of school accessibility within a county. Year fixed effects control for schooling trends common to all counties in a given year. To address short-run

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[19] The reference category is white farm wage workers as the regression includes dummies for black, tenant farmer, and landowning farmers.

[20] In the development literature, papers analyzing the relationship between schooling and the economy control for three factors: school access, household characteristics, and local economic and community characteristics. The controls are important as researchers find all three factors influence schooling choices. A limited list of papers that follow this approach are Beegle et al. (2009), Cavalieri (2002), and Jacoby and Skoufias (1997).

changes in school accessibility, I include county level measures of the supply of schooling. The variables include the total number of black and white schools, total number of teachers at black and white schools, and total expenditures per student. For local characteristics, I add information on the county's population and farming community.

To address the possibility of cotton yields being endogenous, I implement an instrumental variable strategy. I use May values of the one month Standardized Precipitation Index and average temperature across the crop cycle as instruments. The instruments allow me to extract the exogenous portion of cotton yields. May rain and average temperature are correlated with cotton yields and unlikely to affect school attendance.

My instrumental variable strategy must address the issue that by interacting cotton yields with $Black$, I generate a second potentially endogenous variable. I use an approach discussed by Wooldridge (2010) to handle the concern. I interact my two instrumental variables with $Black$ to generate two additional instruments. Therefore, my two first stage equations take the form:

$$Cotton\ Yield_{dt}$$
$$= \alpha + \beta_1 May\ Rain_{dt} + \beta_2 May\ Rain\ X\ Black_{dt} + \beta_3 Avg\ Temperature_{dt}$$
$$+ \beta_4 Avg\ Temperature\ X\ Black_{dt} + \boldsymbol{\beta X}_{dt} + \phi_r + \delta_t + \gamma_d$$

$$Cotton\ Yield\ X\ Black_{dt}$$
$$= \alpha + \beta_1 May\ Rain_{dt} + \beta_2 May\ Rain\ X\ Black_{dt} + \beta_3 Avg\ Temperature_{dt}$$
$$+ \beta_4 Avg\ Temperature\ X\ Black_{dt} + \boldsymbol{\beta X}_{rtd} + \phi_r + \delta_t + \gamma_d$$

where $May\ Rain_{dt}$ is the May value of one month Standardized Precipitation Index and $Avg\ Temperature_{dt}$ is average temperature across the crop cycle at the climate division level—

d. The model includes race, year, and division fixed effects. The other portion of the equation is variables from the second stage. My second stage equation now has the following form:

$$Division\ School\ Attendance\ Rate_{rtd} = \alpha + \beta_1 \widehat{Cotton\ Yield}_{dt} + \beta_2 \widehat{Cotton\ Yield\ X\ Black}_{dt} + \boldsymbol{\beta X}_{rtd} + \phi_r + \delta_t + \gamma_d$$

The dependent variable is the share of school age children in a climate division attending school. The estimated cotton yield and interaction term replace the true values. I make several adjustments due to the instruments being measured at the climate division level. I cluster the errors and include fixed effects at the climate division level. I aggregate all of the variables to the climate division level.[21]

Two potential threats to the excludability of the instrumental variable involve the weather directly affecting school attendance. Rainy weather could physically prevent children from attending school due to unpassable roads and water damage. This could explain a correlation between wet periods and declines in school attendance. However, the timing does not fit my model. Farmers begin to plant their cotton crop in April. The crops experience the weather shocks in May. Attendance data come from the school year that begins around September, which is just before the time cotton crops are picked—October. The four month gap between the occurrence of the weather shock and the start of school makes it unlikely that the weather directly causes changes in attendance rates. May storms could be severe enough that schools are damaged and unable to reopen in time for the new school year several months later. To address

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[21] When aggregating to the division level, variables fall into two categories—share and count. For share variables, aggregation to the division level follows the same process used to aggregate to the county level (i.e., divide the individual dummy variable totals by the division's total population). For count variables, I simply add up the values for each of the counties within a given climate division. Cotton yields is an example of a count variable. I add up the number of cotton acres and bales across the counties to generate the division totals for both variables. To generate the division's cotton yield, I divide the division's total number of cotton bales by the total number of cotton acres.

this threat, I add school access variables from the previous school year to my model (i.e. for 1930 I include the school access variables from the school years 1928-1929 and 1929-30). If the weather is closing schools, the closures will show up as decreases in the number of schools between the two school years.

I estimate a falsification test to eliminate other potential threats to my results. Given cotton yields directly affect farmers, I except to see a stronger response in the attendance rates of children from farming households relative to nonfarming household. Therefore, I estimate my main model with populations outside of farming—rural nonfarming and urban households. Similar results for farming and nonfarming households would suggest a third factor is generating my results. A wet May could lead to a decline in cotton yields and an increase in malaria. Therefore, the drop in attendance rates is drive by illness and not changes in the local economy.

Results

To examine how changes in household incomes affect school attendance rates, I use cotton yields as a proxy for farm household incomes in the U.S. Cotton South. For economic conditions to contribute to the black white schooling gap, we need to see blacks and whites react differently to changes in cotton yields. Therefore, I regress school attendance rates on cotton yields and cotton yields interacted with a dummy variable for black. A significant coefficient on the interaction term, Cotton Yield X Black, would show blacks did response differently than whites to changes in the local economy.

Table five presents my baseline estimates based on Ordinary Least Squares.[22] The statistically significant result that black children attended school less frequently than white children matches previous research into the schooling choices of rural farming households in the Cotton South. We see the parameter on the interaction term, Cotton Yield X Black, is positive and significant at five percent level in all four specifications. The result matches the predictions generated from my theoretical model. The schooling choices of the credit constrained group (black households) are positively correlated with income fluctuations (cotton yield). The model also predicts the less credit constrained group (white households) will not change their schooling choices with income fluctuations. The reader can observe the empirical results confirm this theoretical prediction as the coefficient on Cotton Yield is insignificant after the inclusion of controls beyond fixed effects. (The coefficient on Cotton Yield represents the response of white households to income fluctuations as they are the reference group.)

The margins plot in figure five provides the reader with a more intuitive representation of my results in column four of table five (i.e., Ordinary Least Squares with the full set of controls). The inclusion of county fixed effects causes Cotton Yield to represent changes in yields and not levels (i.e., changes in household incomes and not income levels). The negative coefficient on *Black* in table five is represented by the black predicted school attendance rates being below the white values—specifically at the fiftieth percentile. The independence between white school attendances rates and cotton yields explains why the white margins plot is flat. The positive slope captures the positive correlation between cotton yields and black school attendance. Figure five

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[22] Table ten tests the robustness of my OLS results to using individual outcomes and a nonlinear model—Probit. The results match those in table five. Figure six shows the margins plot for the estimates in the fourth column of table eight—the Probit estimates with the full set of controls. The results match the margin plots based on the OLS estimates with full controls in figure five.

provides clearer evidence of cotton yields influence on the black white schooling gap. Comparing the fiftieth to one hundredth percentile, positive income shocks cause the schooling gap to decrease from five percent to one and half percent—a seventy percent decrease. At the hundredth percentile, the predicted school attendance rates for blacks is not statically different than whites. Comparing the fiftieth to zeroth percentile, negative incomes shocks cause the schooling gap to increase from five to eight percent—a sixty percent increase.

I provide the Two Stage Least Squares estimates in table six.[23] The data is now aggregated to the climate division to match the level of observation for my instrumental variables. I provide the first stage F-Statistic at the bottom of table six. The combined Kleibergen Paap F-statistic ranges from 7.29 to 12.49. Using the critical values for models with two endogenous variables and four instruments (Stock and Yogo 2005), the second stage estimates in the first two columns have a potential bias of less than 10% and 20% in the last two.[24] The second stage estimates are similar to the results based on OLS. Children from black farming households attend school at lower levels than their white counterparts. After adding controls for local characteristics, the coefficient on Cotton Yield X Black is positive and significant at the five percent level or higher. However, the magnitudes are four to five times larger than the OLS estimates. The difference could be due to the OLS estimates capturing the average effect of changes in cotton yields across the population. The 2SLS estimates capture the effect of households responding to short run fluctuations in yields due to weather conditions. There is marginal evidence that white households reduce school attendance as cotton yields increase. We

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[23] Table eleven tests the robustness of my 2SLS results to using individual outcomes and a nonlinear model—IV Probit. The results match those in table six.

[24] I repeat the estimation using Limited Information Maximum Likelihood in place of 2SLS. The second stage estimates are nearly identical to those presented in table eight. While LIML requires more assumptions, the estimates are no longer biased based on the critical values from Stock and Yogo (2005).

see the coefficient is negative and close to being statistically significant in columns 2 through 4. The result suggests some white households are responding to increasing wages by pulling children from school. The pattern is consistent with a rising opportunity cost of attending school.

The results in tables five and six show that economic fluctuations due to changes in cotton yields were a significant factor in the schooling choices made by black farming households in the Cotton South. Using cotton yield as a proxy for local economic conditions, I find children from black households attend school more frequently when the local economy is booming and less during down periods. While black school attendance rates show a positive significant correlation with economic conditions, white attendance rates are unaffected.

Extensions

To further examine my results, I estimate a decomposition of my main estimates and calculate several additional specifications. I estimate a Blinder-Oaxaca Decomposition of the black white schooling based on the major determinants of schooling. I run a less restrictive model with no interaction term on different subpopulations: white and black farmers, urban blacks, and rural non-farming blacks. I estimate a model testing if credit constraints are behind the positive correlation between black school attendance and cotton yields.

Table seven provides the estimates from a Blinder-Oaxaca Decomposition based on my main Two Stage Least Squares model. To estimate the decomposition, I make two adjustments to the model—I dropped the fixed effects and replace the predicted cotton yields with the instrumental variables (i.e., rainfall and average temperature). The estimates break the nine percent (i.e., 74-65%) school attendance gap between whites and blacks down along several dimensions. The first break splits the gap into Explained (i.e., Endowments) and Unexplained

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portions. The overall effect of the Endowments and Unexplained factors is represented by the coefficients in the Constant row of table seven. Endowments account for .033 or thirty six percent of the .09 attendance gap between whites and blacks. If black households had the same endowments or characteristics as white households, black school attendance rates would be 3.3% higher (i.e., .033). The remaining gap, .055, is due to differences in the estimated coefficients for black and white households—Unexplained.

The second dimension of the decomposition breaks the Endowments and Unexplained categories down by key determinants of schooling—county characteristics, measures of school access, household characteristics, and exogeneous variation in household incomes (i.e., weather fluctuations). Looking at the first column, the reader sees household characteristics is the only significant part of the Endowment differences between blacks and whites. Observable differences between black households and their white counterparts, including lower levels of home ownership and parental literacy rates, explains 42% of the schooling gap. The insignificant coefficients for county characteristics and weather fluctuations show the races lived in area with similar observable characteristics. Moving to the second column, the reader sees weather fluctuations is the only significant portion of the Unexplained difference. We interpret the 0.017 coefficient as the following: If blacks had the same response (i.e., coefficient) to weather fluctuations as whites, the school attendance rate gap would be 1.7% smaller. If we relate the estimate to the paper's main results, the 0.017 shows 19% of the black white schooling gap is due to the positive correlation between household incomes (i.e., cotton yields) and black school attendance rates.

In table eight, I estimate a less restrictive 2SLS with no interaction term—Cotton X Black. I restrict the sample to just white or black farmers. Therefore, the coefficients are not

jointly determined like the baseline model. Before, the coefficient on the number of black schools represented the effect of black schools on the attendance rates of both white and black farmers. Now, I allow the coefficients to vary by race. I obverse a similar pattern as baseline estimates. The schooling choices of white farming households are unaffected by changes in incomes as the coefficient on Cotton Yield is insignificant. However, we see the coefficient is positive and significant for black farmers. Therefore, the attendance rates of children from black farming households are increasing in response to increasing incomes. A negative consequence of restricting my sample to subpopulations is the weak instrument issue is exacerbated. Therefore, I only present estimates with not weak instruments.

As a falsification test, I replace my sample of rural black farming households from the Cotton South with two groups whose attendance rates should be unaffected by cotton yields. A significant result would suggest my main empirical results are capturing a different mechanism. To show my results are specific to black farming households, I show the estimates of regressing the attendance rates of children from urban black and rural non-farming black households on cotton yields in table ten. The results are insignificant in both cases. For the rural non-farming black households, the children likely attend the same schools as the children in my main sample. Therefore, my main results cannot be caused by changes in the supply of schools.

To test if constraints on credit access is driving my results, I separate my sample into regions with high and low shares of fixed rent tenants in table nine. Due to the nature of rental agreements, fixed rent tenants had higher demand for credit access. If credit access is driving the positive correlation between incomes and school attendance rates for black households, we expect to see the correlation to be weaker in areas with lower shares of fixed rent tenants. In columns one and two, we observe cotton yields are an insignificant determinant of black school

attendance rates in areas with below average shares of fixed rent tenants. In columns three and four, we observe cotton yields are a significant determinant of black school attendance rates in areas with above average shares of fixed rent tenants. If a normal good mechanism drove the positive correlation between schooling and incomes, the coefficient on cotton yields should be significant in all four columns, but is not. Therefore, table nine's estimates show credit constraints is the mechanism behind the positive correlation I obverse in my Results section.

Conclusion

Previous research into schooling choices during the early twentieth century show school quality and labor demand contribute to white children receiving more schooling than black children. I extend the literature by being the first to examine how fluctuations in the labor supply affect schooling choices in rural farming communities in the U.S. Cotton South.

Using cotton yields as a proxy for household incomes, I find a positive correlation between the share of black children attending school and exogenous shocks to incomes. After restricting my sample to rural farming households in the U.S. Cotton South, I regress school attendance rates on cotton yields and controls for county, household, and school access characteristics. The model includes year and county fixed effects. To control for the endogeneity of cotton yields, I use May value of the one-month Standardized Precipitation Index and average temperature as instrumental variables. Based on the first stage estimates, I regress the climate division school attendance rates on predicted cotton yields. I consistently find a positive correlation between cotton yields and the school attendance rates of black child and no correlation for white child.

Finding a correlation between incomes and black school attendance rates provides insights on Southern racial inequality. The predicted margins figures show incomes play a critical role in potentially alleviating the black white schooling gap. Following a positive income shock, the schooling gap nearly disappears. However, negative incomes shocks double the size of the gap. The income correlation requires black households to shift schooling from low to high income years to attain the same level of schooling as whites—the non-income correlated group. The three and half year schooling gap between blacks and whites demonstrates black households fail to perfectly shift schooling across years. However, the pattern does not end with one generation. The fewer years of schooling contributes to lower wages and household assets. The positive correlation between parental education and household assets and incomes with children's schooling contributes to the next generation of blacks receiving less schooling. The lack of an income correlation results in white households avoiding the lower schooling cycle experienced by blacks. Therefore, racial differences in household responses to income fluctuations contribute to the persistence of black white inequality.

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Appendix Discussion of F-Statistics

My nonstandard instrumental variable strategy leads to questions about the appropriate F-Statistic to use: Cragg-Donald (CD) or Kleinbergen-Paap (KP). In models with one endogenous variable and one excluded instrument, the CD F-Statistic is preferred. However, the current paper's estimation equations include two endogenous variables (i.e., Cotton Yields and Cotton Yields X Black) and four excluded instruments (i.e., May Rain, May Rain X Black, Average Temperature, and Average Temperature X Black). Stock and Yogo (2005) recommend using the KP F-Statistic in models with multiple endogenous variables and excluded instruments. KP is a more conservative estimate of the F-Statistic and is robust to violations of the independent and identically distributed assumption. The conservative nature of the KP F-Statistic explains why the values are a tenth of size of the CD F-Statistic for my estimates. Based on the CD measure, my instruments are strong as the F-Statistic is over one thousand. Based on the KP measure, my instruments are borderline weak instruments in some first stages.

The known nature of weathers variables as instruments for predicting cotton yields strengths the argument for my instruments and results. To evaluate borderline instruments, Angrist and Pischke (2009) suggest checking the coefficients match the author's predictions. A negative coefficient on May rain and a positive coefficient on average temperature matches patterns observed in previous studies. Several articles and books by different authors use May rainfall and average temperature weather variables to predict cotton yields during the early twentieth century.[25] The number sample periods reduces the effectiveness of my weather variables. If I add a third period, 1910, to panel, the KP F-Statistic increases to over thirty. The combination of these factors suggest weather variables are valid instruments for predicting cotton yields.

Appendix Discussion of Southern Labor and Capital Markets

The conclusion of the Civil War marked the end of slavery in the United States. However, the legacy of slavery was clearly visible in Southern states for decades to come. Rural black[26] farmers had limited access to credit markets in part due to a lack of assets. The combination of the lack of credit market access and federal insurance programs left the farmers susceptible to income fluctuations due to weather shocks to their primary crop—cotton.

Small rural black farmers had few assets following the end of slavery. At the conclusion of the Civil War, there was no general pattern of land redistribution. Most land remained in the hands of the white elite. In Georgia, only one percent of the land was owned by blacks in 1874 and one point six percent by 1880. Across the Cotton Belt, less than ten percent of the farm land was owned by blacks (Ransom and Sutch 2001). Farm land was not the only asset blacks lacked. Within rural counties of Georgia, blacks owned less than three percent of the total taxable assets[27] (Ransom and Sutch 2001). Beyond a lack of assets, black households also accumulated

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[25] Lange et al. (2009), Moore (1917), and Hanes and Rhode (2012)

[26] Poor farmers faced similar credit constraints regardless of their race (Wright 1986 and Ransom and Sutch 2001). Tenant farmers and farm laborers did not own land and had few assets to secure a loan besides crop liens. Credit could be secured only through the local merchant. Government laws on child labor and social programs were the same for all farmers.

[27] Taxable assets includes land, city and town property, money and liquid assets, kitchen and household furniture, mules, horses, hogs, and etc., planation and mechanical tools, and all other property.

assets at a slower pace than whites (Higgs 1982). However, one physical asset the rural farmer owned that could be used as collateral was his future crop production. From the perspective of a lender, a farmer "'… could give virtually no security for his loans except the forthcoming crop (Anderson 2013).'" While crop liens gave farmers access to the credit market, they severely limited the sources of credit available to them.

The lack of assets besides crop liens limited the credit market for rural black farmers to the local merchant. Following the defeat of the Confederate Army, much of the South's formal banking system collapsed. In 1860, there were forty-nine state charter banks in Georgia and South Carolina. Only three of these banks survived the Civil War (Ransom and Sutch 2001). Even following the Reconstruction Era, the South's banking system lagged relative to other parts of the country. Of the nearly three thousand national banks in the United States in 1890, less than four hundred of them were located in the twelve southern states[28] (Ransom and Sutch 2001). Beyond this general tightness of credit markets in the South, the lack of land ownership ensured most rural black farmers were cut off from traditional sources of credit. To fill this void, local merchants offered credit to rural farmers by taking crop liens as collateral. Merchants' reliance on personal knowledge of individuals to judge their credit worthiness limited the threat of competition from outsiders. While landowners' wealth and familiarity with locals represented a potential threat, merchants and landowners often worked together or simply were the same individual. Therefore, merchants were able to exercise a "territorial monopoly" (Ransom and Sutch 2001). The strength of the merchant's monopoly can be seen in the level of interest charged for credit. Based on data from 1880s Georgian merchants, Ransom and Sutch (2001) estimate that the average markup for corn purchased on credit was thirty-five percentage points higher than cash purchases. From the differences in price markups, they estimate an implicit annual interest rate of 59.4%. Merchants' monopoly power can also be observed in how the crop liens were written.

Merchants' control of the credit market led to crop liens requiring farmers to grow just cotton. From the perspective of the merchant, cotton had several benefits over other crops. The market for cotton was large and well established. Cotton can be easily stored without fear of spoilage. By forcing the farmers to grow just cotton, the merchant reinforced the farmer's dependence as the farmer had to buy food and animal feed on credit. Indebted farmers knew the importance of growing cotton: "…cotton is the only crop that will bring money… cotton brings the money, and money pays debts…" (Wright 1986). Besides cementing the farmer's reliance on the merchant, cotton yields declined due to this practice. Southern farmers were not able to apply scientific farming techniques used by northern farmers to increases yields--crop rotation and fallow fields. While the local merchant's monopoly over credit developed organically, other features of the southern farming economy grew from the white elites' desire to limit the economic advancement of former slaves.

Credit access for rural Southern farmers remained a struggle into the early twentieth century despite the Federal government's efforts. While credit access in Southern urban areas appears to have improved by the 1900s (Olney 1998), rural areas continued to lag. To improve rural credit access, the Federal Reserve Act of 1913 reduced the reserve ratio for country national banks and allowed the rediscounting of certain types of agricultural papers (Ransom and Odell

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[28] The South in this case refers to Arkansas, Alabama, Georgia, Florida, Louisiana, Mississippi, North and South Carolina, Tennessee, Texas, Virginia, and West Virginia.

1986). However, the policies had little effect in the South due to the small number of Federal Reserve member banks and low capital levels. The Federal Farm Loan Act of 1916 created twelve Federal Land Banks for the purpose of making loans to farming associations at rates less than 6 percent. The act also established private joint stock banks that could loan directly to farmers. The act did not benefit landless tenant farmers and land owner credit access only improved marginally. A report on farmer credit access in U.S. Department of Agriculture's 1924 *Yearbook* concluded: "[The land banks] … have not met the needs of the landless farmer. The amount of credit allowed on the valuation of the land is conservatively appraised is relatively small… [The farmer] must obtain additional credit through other sources." USDA's assessment matches the results of a survey conducted by the North Carolina Agricultural Department in 1923. The survey found that only 15.6% of farm credit was provided by land banks. The local merchant still provided the majority of credit to rural farmers—50.3%. The survey also found the interest rates paid by black farmers were fifty percent higher than whites (i.e. 30 versus 20 percent) (Ransom and Odell 1986). Researchers (Whatley 1983 and Wiener 1979) argue the Southern agricultural system did not change significantly until the Great Depression and the passage of the Agricultural Adjustment Act.[29] While federal policies failed to achieve the stated goal of improving credit access for rural farmers, Southern Congressman outright blocked federal policies meant to protect individuals from the risks associated with farming.

During the first half of the twentieth century, Southern congressmen voted to eliminate or limit federal programs meant to insure individuals against idiosyncratic shocks. Research by Alston and Ferrie (1999) details the strategies used by southern congressmen to exclude farmers from federal welfare programs. When the U.S. Congress passed the Social Security Act, farmers were excluded from both the unemployment and old age provisions. Southern congressman also succeeded in having farmers excluded from the Fair Labor Standards Act. By eliminating coverage of farmers, children were still able to work on farms. In the case of the Farm Security Administration, the southern congressmen were initially able to defund the program and later have the act that established it abolished. The act would have provided grants to farmers following natural disasters. (The administration also threatened merchant control by establishing co-operatives of farmers) (Alston and Ferrie 1999). While the motivation of Southern congressmen is not critical for the current paper, their success in affecting policy is. Farmers were not insured against weather shocks. And farming was one sector of the labor market in which children could still participate.

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[29] Whatley (1983) argues the Great Depression and AAA allowed large Southern land owners to switch from a tenancy to a wage based system.

Figure 1: Map of the United States broken down into Climate Divisions

U.S. Climatological Divisions
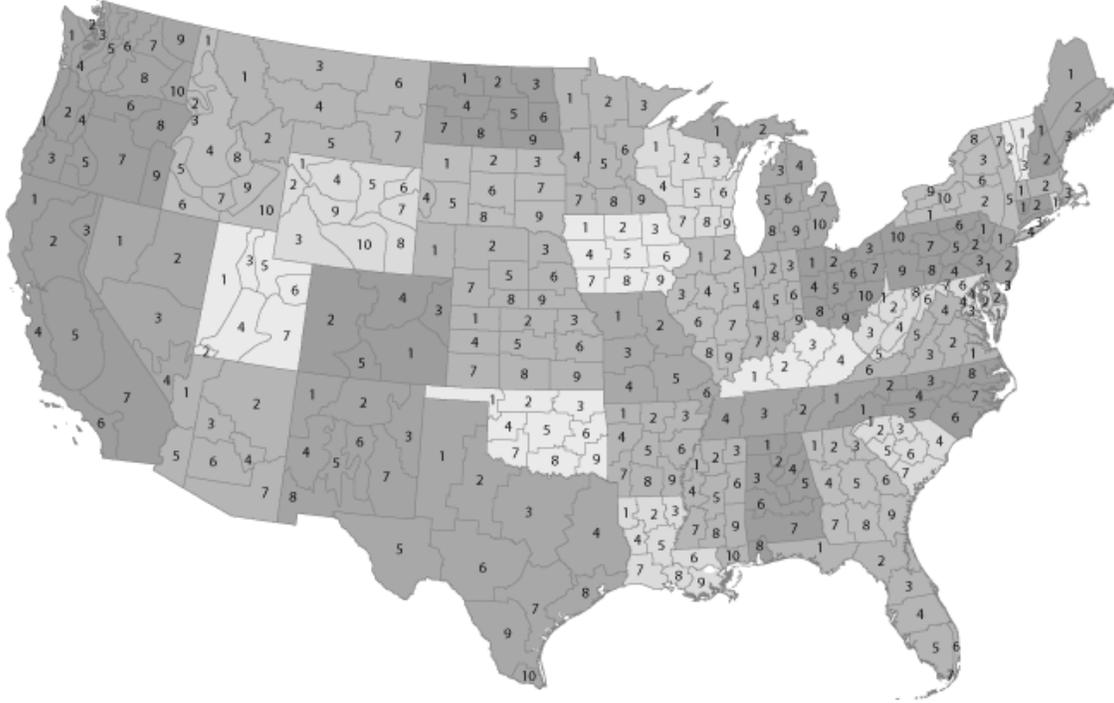
Source: National Oceanic and Atmospheric Administration/ National Weather Service Prediction Center

Figure 2: Map of the southern United States with Climate Divisional Precipitation Anomalies in May 1919
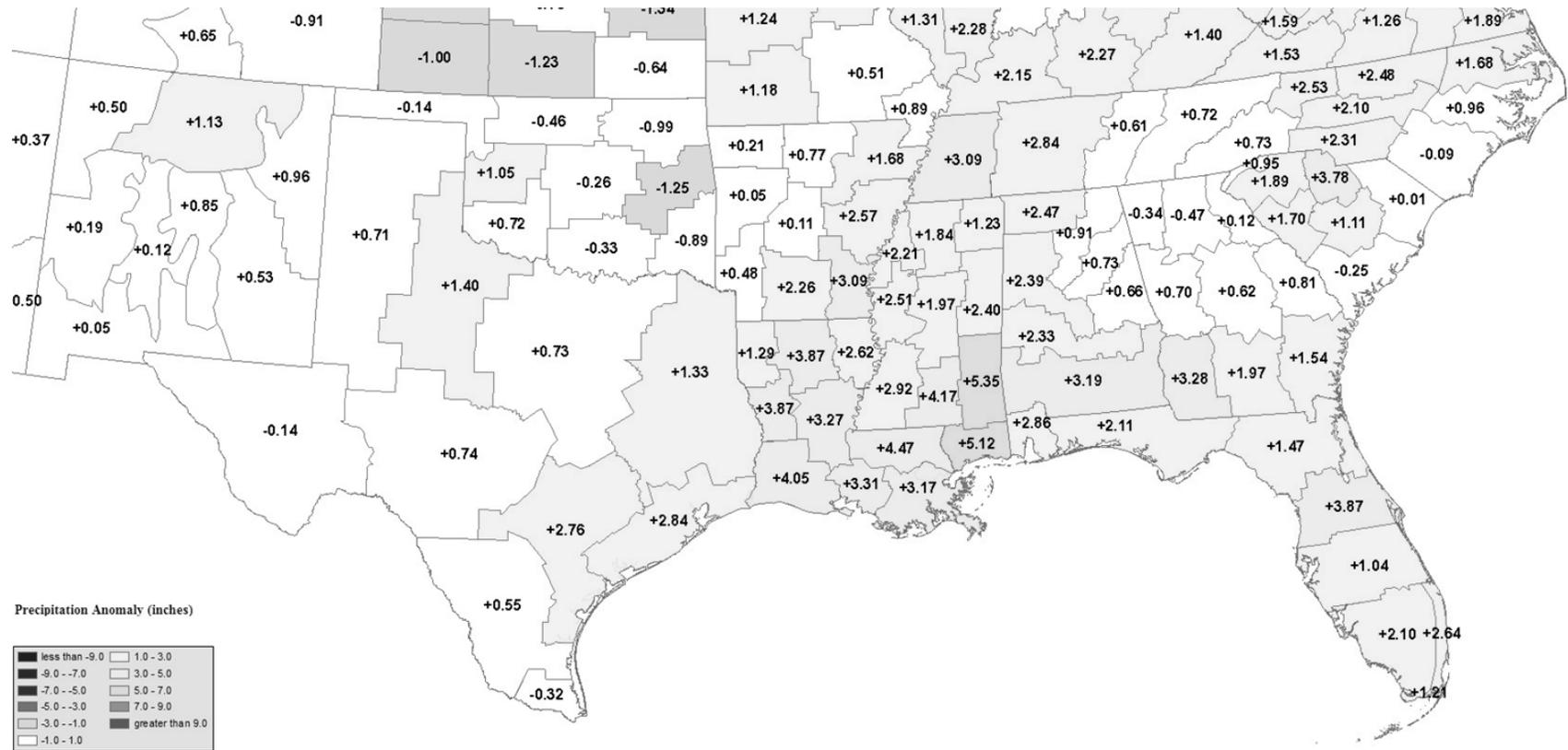
Source: National Oceanic and Atmospheric Administration/ National Weather Service Prediction Center
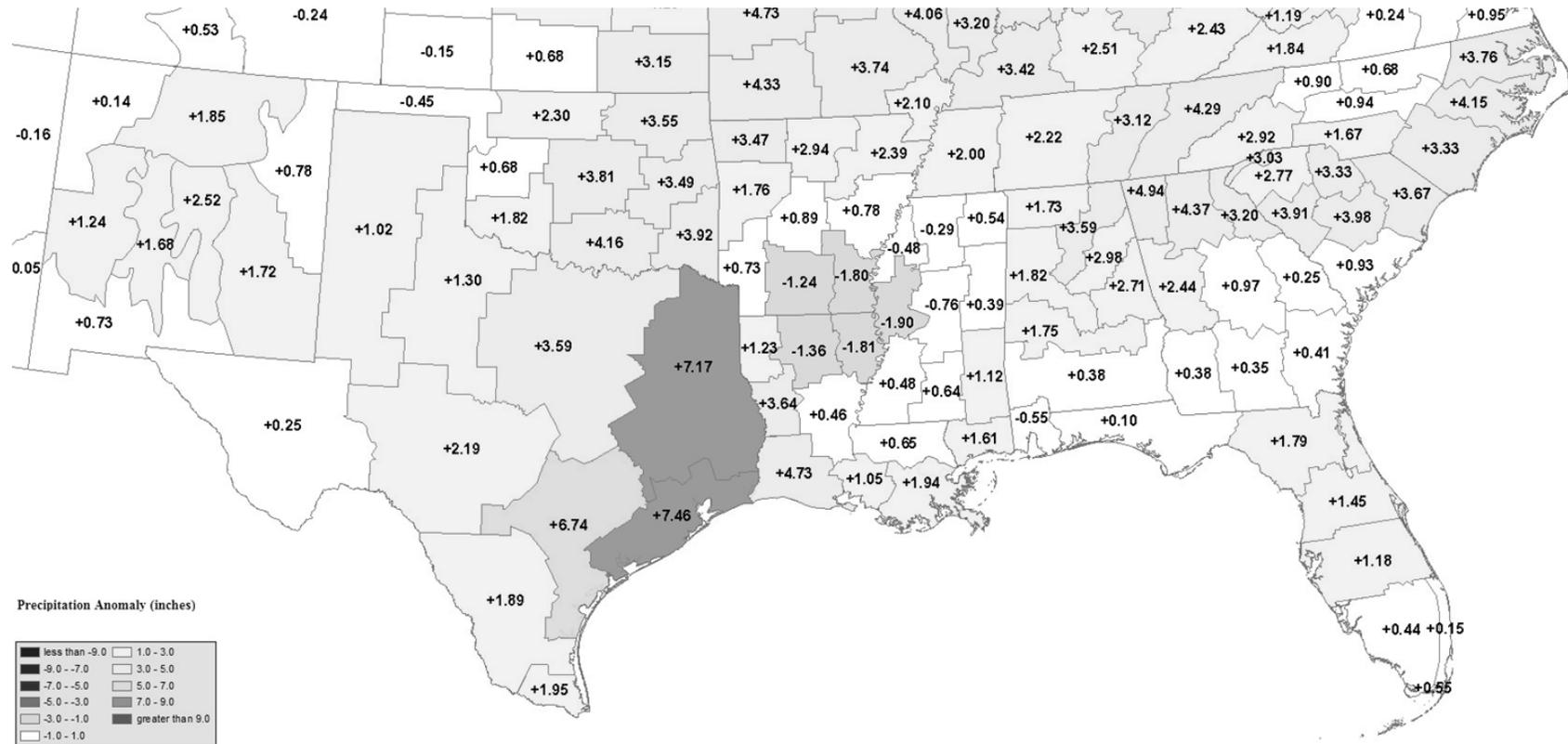
Figure 3: Map of the southern United States with Climate Divisional Precipitation Anomalies in May 1929

Source: National Oceanic and Atmospheric Administration/ National Weather Service Prediction Center

Figure 4: The Distribution of County School Attendance Rates by Race
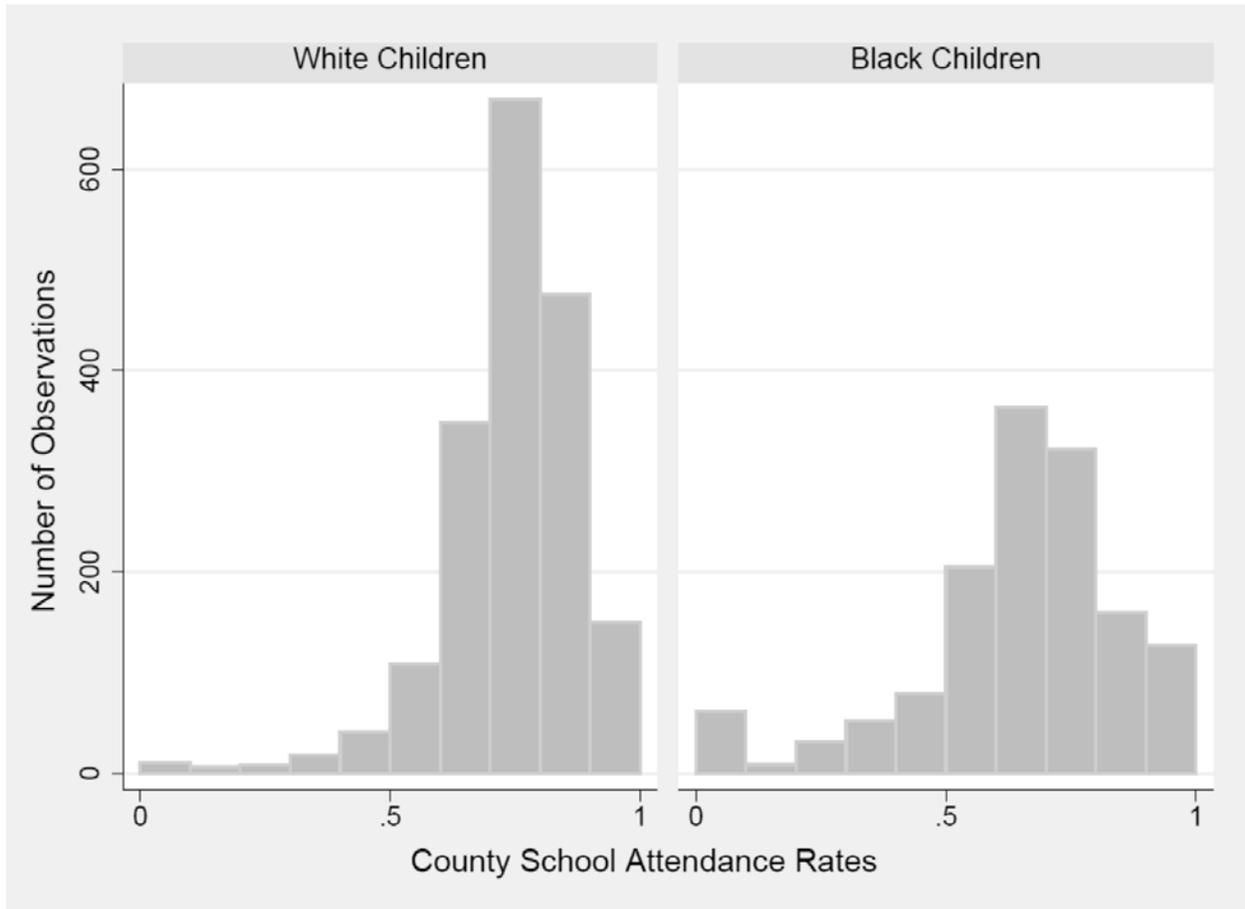
Notes: For whites, the distribution is based on 1,836 observations. The mean is .742 and standard deviation is .144. Five percent of the observations at the extremes—0 or 1. For blacks, the distribution is based on 1,410 observations. The mean is .645 and standard deviation is .218. Eleven percent of the observations are at the extremes—0 or 1. The distribution of division school attendance rates include about 140 observations per race, similar means, and smaller standard deviations. Only two percent of black divisions attendance rates are at an extreme and none for whites.

Figure 5: Predicted Marginal Effects of Cotton Yields on the County School Attendance Rate by Race Based on the Ordinary Least Squares Estimates with the Full Set of Controls

Figure 6: Predicted Marginal Effects of Cotton Yields on the Individual Probability of Attending School by Race Based on the Probit Estimates with the Full Set of Controls
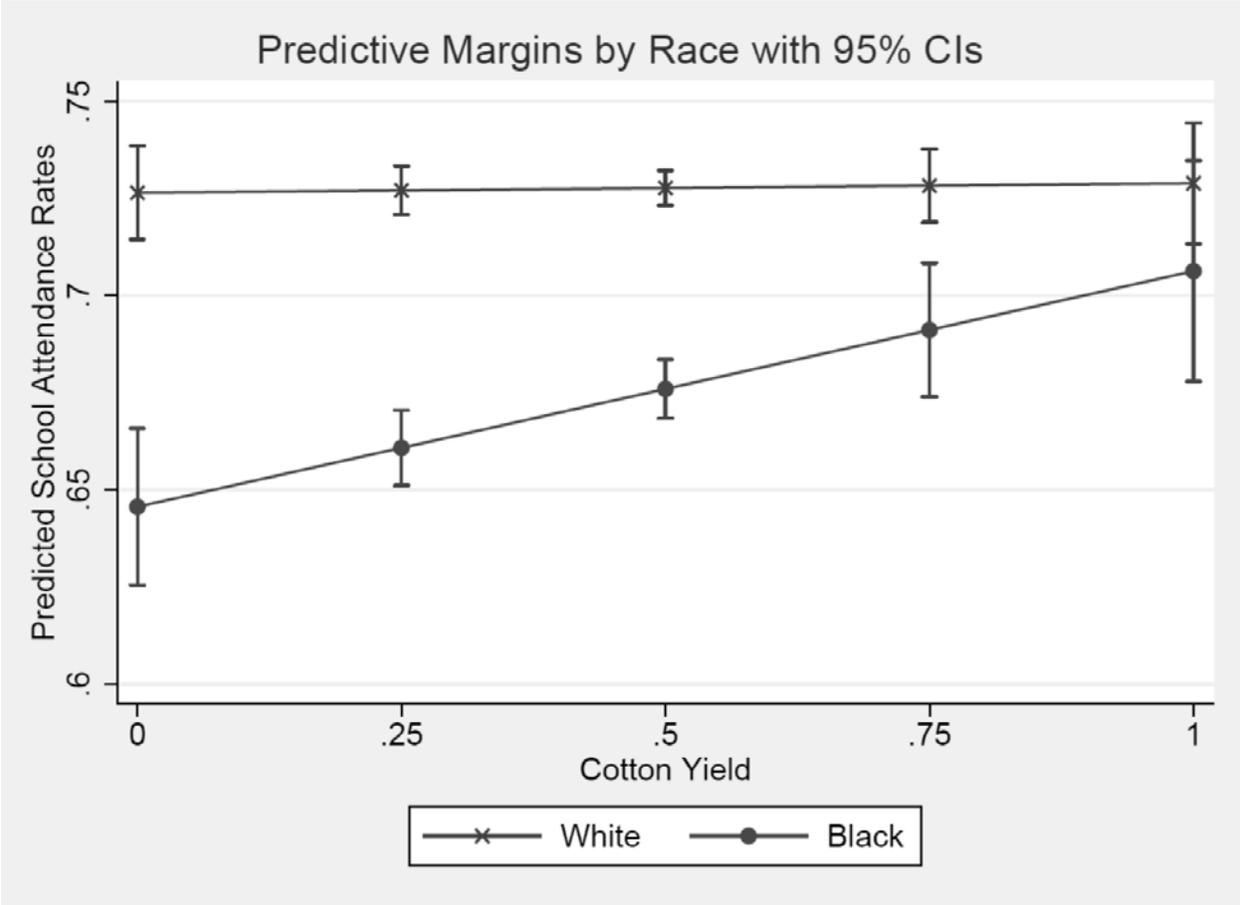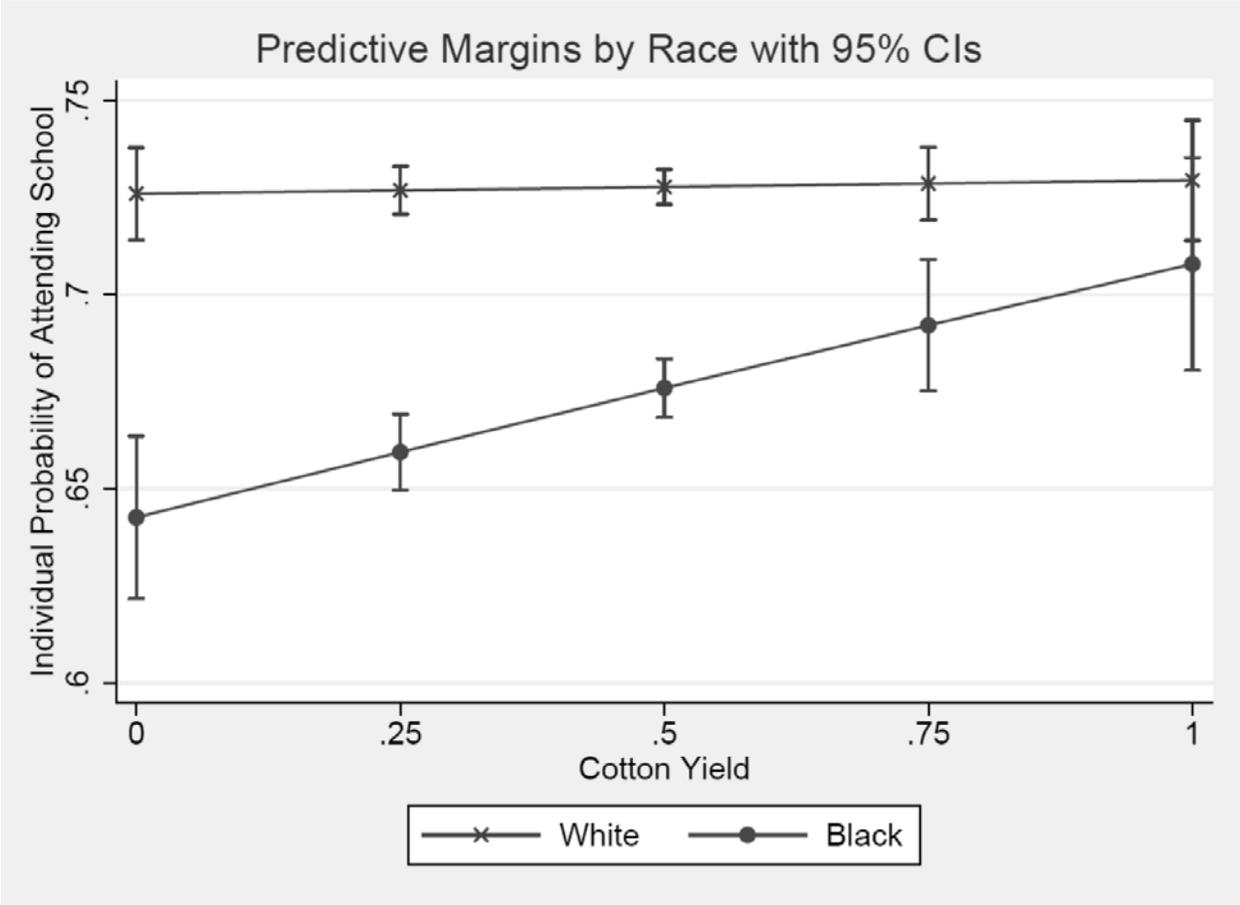
Table 1: Percentage of Farm Household Children Enrolled in School, Participating in the Workforce, and Idle by Race, Sex, and Age

	Male			Female		
	Ages 5-9	Ages 10-14	Ages 15-19	Ages 5-9	Ages 10-14	Ages 15-19
Black Children:						
In School	45.6	67.1	45.3	48.2	75.4	59.0
In Workforce	8.3	61.1	80.9	7.1	50.2	65.7
Idle	51.0	11.6	9.1	49.5	11.3	13.5
Observations	3,425	3,263	1,542	3,573	3,173	1,549
White Children:						
In School	59.1	87.3	72.4	60.7	88.3	73.6
In Workforce	8.3	52.8	73.4	4.2	24.8	28.6
Idle	39.5	5.4	5.6	38.5	8.0	17.3
Observations	5,121	4,790	2,605	5,132	4,349	2,294

Notes: Idle identifies children that are neither in school or the workforce. Observations come from the IPUMS 1% sample of the 1920 US Decennial Census.

Table 2: Probability of Attending School Based on Household Characteristics Pooled Sample from the 1920 and 1930 Censuses

	Status		Difference	P-Value
	Yes	No		
Household Characteristic:				
Literate Household Head	72.4	54.0	18.4	0.00
Male	69.1	71.8	-2.7	0.00
Black	65.9	73.0	-7.1	0.00
Tenant Farmer	67.4	74.2	-6.8	0.00
Landowner	78.6	65.8	12.8	0.00

Note: The observations come from the IPUMS 1% sample of the 1920 and 5% sample of the 1930 US Decennial Census.

Table 3: Probability of Attending Schooling Following a Weather Shock in 1920 or 1930

Household Type:	Dry Period			
	Yes	No	Difference	P-Value
In 1920:				
Black	73.7	65.0	8.7	0.00
White	81.0	76.2	4.8	0.01
Tenant Farmer	77.7	67.7	10.0	0.00
Landowner	79.6	79.2	0.4	0.81

	Wet Period			
	Yes	No	Difference	P-Value
In 1920:				
Black	60.2	66.9	-6.7	0.00
White	78.3	75.8	2.5	0.00
Tenant Farmer	65.8	69.4	-3.6	0.00
Landowner	78.5	79.9	-1.4	0.06
In 1930:				
Black	64.1	69.6	-5.5	0.00
White	71.9	73.2	-1.3	0.00
Tenant Farmer	65.8	69.6	-3.8	0.00
Landowner	77.5	80.2	-2.7	0.00

Note: The observations come from the IPUMS 1% sample of the 1920 and 5% sample of the 1930 US Decennial Census. In 1920, the number individual of observations varies from 16,000 to 26,000. In 1930, the number of observations varies from 71,000 to 114,000.

Table 4: Probability of Attending School in 1920 or 1930 Conditioned on Cotton Yield

	Cotton Yield			
Household Type:	High	Low	Difference	P-Value
In 1920:				
Black	72.0	64.3	7.7	0.00
White	76.4	73.6	2.8	0.00
Tenant Farmer	73.1	64.6	8.5	0.00
Landowner	78.7	79.6	-0.9	0.31
In 1930:				
Black	69.4	64.6	4.8	0.00
White	72.1	65.5	6.6	0.00
Tenant Farmer	69.0	61.7	7.3	0.00
Landowner	77.0	75.9	1.1	.12

Notes: The observations come from the IPUMS 1% sample of the 1920 and 5% sample of the 1930 US Decennial Census. High corresponds to counties with yields in the highest decile and low to the lowest decile. For 1920, the number of individual observations varies from 6,000 to 10,000. For 1930, the number of observations varies from 10,000 to 35,000.

Table 5: County School Attendance Rate Regressed on Cotton Yield, Black, and Cotton Yield X Black Using OLS

	(1)	(2)	(3)	(4)
Black	-0.100***	-0.098***	-0.112***	-0.056***
	(0.008)	(0.007)	(0.011)	(0.014)
Cotton Yield X Black	0.035**	0.029**	0.046**	0.039**
	(0.016)	(0.013)	(0.020)	(0.017)
Cotton Yield	0.050*	0.015	0.009	0.011
	(0.028)	(0.023)	(0.034)	(0.030)
Controls:				
County	No	Yes	Yes	Yes
School Access	No	No	Yes	Yes
Individual	No	No	No	Yes
No. of Counties	930	930	451	451
Statistics:				
R^2	0.036	0.037	0.036	0.073
F-Test on Coefficients	0.00	0.00	0.00	0.00

Notes: Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Errors are clustered at the county level. All regressions include year and county fixed effects. The F-test on coefficients is testing the joint significance of Black, Cotton Yield X Black, and Cotton Yield and shows the probability of all three coefficients being insignificant.

Table 6: Climate Division School Attendance Rate Regressed on Cotton Yield, Black, and Cotton Yield X Black Using 2SLS

	(1)	(2)	(3)	(4)
Black	-0.249***	-0.257***	-0.263***	-0.182***
	(0.195)	(0.177)	(0.028)	(0.150)
Cotton Yield X Black	0.319	0.297**	0.330***	0.246**
	(0.200)	(0.117)	(0.123)	(0.123)
Cotton Yield	0.029	-0.182	-0.237*	-0.141
	(0.123)	(0.129)	(0.130)	(0.119)
Controls:				
County School	No	Yes	Yes	Yes
Access	No	No	Yes	Yes
Household	No	No	No	Yes
No. of Divisions	73	73	70	70
No. of Observations	269	269	248	248
First Stage Statistics:				
R^2	0.243	0.263	0.235	0.228
F-Statistic	12.49	10.48	7.29	9.70
F-Test on Instruments	0.00	0.00	0.00	0.00
Second Stage Statistics:				
Centered R^2	0.009	0.016	0.013	0.057
Uncentered R^2	0.711	0.713	0.704	0.721
F-Test on Coefficients	0.00	0.00	0.00	0.00

Notes: Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Errors are clustered at the climate division level. All regressions include year and division fixed effects. The F-test on instruments is testing the joint significance of the excluded instruments and shows the probability of all four coefficients being insignificant. The F-test on coefficients is testing the joint significance of Black, Cotton Yield X Black, and Cotton Yield and shows the probability of all three coefficients being insignificant.

Table 7: Climate Division School Attendance Rate Regressed on Cotton Yield Using 2SLS

	Black Farmers		White Farmers	
	(1)	(2)	(1)	(2)
Cotton Yield	0.403***	0.431**	-0.023	-0.169
	(0.146)	(0.207)	(0.069)	(0.107)
Controls:				
County	No	Yes	No	Yes
School Access	No	No	No	No
Individual	No	No	No	No
	Urban Blacks		Rural Non Farming Blacks	
	(1)	(2)	(1)	(2)
Cotton Yield	0.126	0.022	-0.023	-0.473
	(0.150)	(0.163)	(0.298)	(0.358)
Controls:				
County	No	Yes	No	Yes
School Access	No	No	No	No
Individual	No	No	No	No

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Errors are clustered at the climate division level. All regressions include year and division fixed effects.

Table 8: Blinder-Oaxaca Deposition of the Nine Percent School Attendance Rate Gap between Whites and Blacks (74-65%)

	Determinants of School Attendance Differentials			
			Percentage of Total Attendance Difference	
	Endowments	*Unexplained*	*Endowments*	*Unexplained*
Constant	0.033***	0.055***	36.6	61.1
	(0.010)	(0.009)		
County Characteristics	-0.015	0.028	-16.7	31.1
	(0.010)	(0.026)		
School Access Measures	0.007	0.012	7.8	13.3
	(0.005)	(0.020)		
Household Characteristics	0.038***	0.023	42.2	25.6
	(0.003)	(0.021)		
Weather Fluctuations	0.002	0.017*	2.2	18.9
	(0.002)	(0.010)		

Notes: Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Errors are clustered at the climate division level. All results in Percentage of Total Attendance Differences are coefficients in Endowments and Unexplained columns divided by .09 and multiplied by 100%.

Table 9: Climate Division Black School Attendance Rate Regressed on Cotton Yield Using 2SLS

	Areas with Below Average Number Fixed Rent Tenants		Areas with Above Average Number of Fixed Rent Tenants	
	(1)	(2)	(3)	(4)
Cotton Yield	0.147	0.116	0.438***	0.449**
	(0.213)	(0.236)	(0.168)	(0.198)
Controls:				
County	No	Yes	No	Yes
School Access	No	No	No	No
Individual	No	No	No	No

Notes: Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Errors are clustered at the climate division level. All regressions include year and division fixed effects.

Table 10: Probability of Individuals Attending School Regressed on Cotton Yield, Black, and Cotton Yield X Black Using Probit

	(1)	(2)	(3)	(4)
Black	-0.279***	-0.270***	-0.325***	-0.224***
	(0.024)	(0.023)	(0.033)	(0.032)
Cotton Yield X Black	0.073	0.051	0.148**	0.157**
	(0.045)	(0.042)	(0.067)	(0.064)
Cotton Yield	0.149**	0.076*	-0.033	-0.036
	(0.064)	(0.046)	(0.059)	(0.051)
Controls:				
County	No	Yes	Yes	Yes
School Access	No	No	Yes	Yes
Individual	No	No	No	Yes
No. of Counties	930	930	691	691
Statistics:				
Pseudo R^2	0.028	0.029	0.027	0.060
F-Test on Coefficients	0.00	0.00	0.00	0.00

Notes: Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Errors are clustered at the county level. All regressions include year and county fixed effects. The F-test on coefficients is testing the joint significance of Black, Cotton Yield X Black, and Cotton Yield and shows the probability of all three coefficients being insignificant.

Table 11: Probability of Individuals Attending School Regressed on Black, Cotton Yield, and Cotton Yield X Black Using IV Probit

	(1)	(2)	(3)	(4)
Black	-0.816***	-0.797***	-0.808***	-0.652***
	(0.101)	(0.086)	(0.182)	(0.170)
Cotton Yield X Black	1.29***	1.22***	1.26***	1.14***
	(0.261)	(0.217)	(0.456)	(0.426)
Cotton Yield	-0.102	-0.225	-0.008	0.098
	(0.297)	(0.294)	(0.485)	(0.497)
Controls:				
County	No	Yes	Yes	Yes
School Access	No	No	Yes	Yes
Individual	No	No	No	Yes
No. of Divisions	73	73	70	70
First Stage Statistics:				
R^2	.243	.263	.235	.228
F-Statistic	12.49	10.48	7.29	9.70
F-Test on Instruments	0.00	0.00	0.00	0.00
Second Stage Statistics:				
F-Test on Coefficients	0.00	0.00	0.00	0.00

Notes: Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Errors are clustered at the climate division level. All regressions include year and division fixed effects. The F-test on instruments is testing the joint significance of the excluded instruments and shows the probability of all four coefficients being insignificant. The F-test on coefficients is testing the joint significance of Black, Cotton Yield X Black, and Cotton Yield and shows the probability of all three coefficients being insignificant.