Online Appendix A: Robustness of Main Results

The main results illustrate large negative effects of Rosenwald exposure on incarceration. This section shows results with alternative specifications, different matching procedures, different definitions of incarceration, and different weighting schemes. Next, I show that results are similar in unmatched data, although that data has many drawbacks. Finally, I conduct a permutation exercise which reshuffles Rosenwald exposure randomly throughout eligible counties, and show that the main coefficient is larger in magnitude than almost any other assignment of Rosenwald schools.

A. Robustness to Specification, Matching, Measure of Incarceration, and Weighting

In Table A.1, I include different specifications in the main regressions. I start by reproducing the main result. One main worry with this specification is that it might not be fully controlling for different urban and rural age trends which are correlated with exposure to Rosenwald schools. While controlling for rural birthplace times black fixed effects is likely over-controlling because the outcomes of the exposed cohorts will be partially absorbed, I do this in Column (2) in order to see if the coefficient remains negative. While it becomes significant only at the 10% significance level for both measures of exposure, it remains negative and large. In the next columns, I control for rural birthplace times birth year race-specific trends, and then rural birth state times birth year times race fixed effects. Finally, I remove the previous controls but use county times rural times childhood census year fixed effects in the regression. The coefficients all stay negative and large, though lose significance sometimes. I view the smallest of these, -0.81 (“Likely Seats”) or -0.17 (“School in County”) as the lower bound of the true effects of Rosenwald exposure on incarceration.

Table A.2 presents results with different matching procedures. The first column replicates the original results. Column (2) requires individuals to be unique within a five year age band (plus or minus two years) to reduce the chance of false positive matches. The match rate is much lower in this sample at 18.6 percent relative to 27.7 percent in the main sample, but the results are almost identical in magnitude. The third column returns to the iterative method but allows individuals to only match with only up to one year discrepancy in age; again, the larger two year discrepancies in age are more likely to be incorrect matches. The results are almost identical with this sample as well. Columns (4) and (5) follow Columns (1) and (2) but match on exact names instead of standardized names and also find similar results, if slightly smaller at 1.4 percentage points and 1.77 percentage points when requiring uniqueness within a five year age band. Note that the samples in these are over 50 percent smaller than with standardized names, likely because of spelling differences of names that sound phonetically the same. Finally, in Column (6), I show that introducing *more* false positive matches by allowing individuals to match up to five years off in age reduces the coefficient by introducing measurement error. The coefficient falls to an insignificant 1.18 percentage points.

Table A.3 shows that results are insensitive to the choice of incarceration measure described in Section III. While the preferred method uses the group quarters and relationship variables from IPUMS, it also adds individuals in prison who had blank group quarters and relationship strings but who were coded by hand. Using a more hands off method, the second column uses only the group quarters variables in IPUMS to assign incarceration status. Column (3) fixes obvious mistakes in the IPUMS coding by coding individuals as non-incarcerated if they are household heads or children, and adding individuals to the incarcerated category if they have relationship strings of “Prisoner” or “Convict”. Results are consistent across the three

categorizations, with the effect of full exposure between -1.74 and -1.96 percentage points using the "Likely Seats" measure and between -0.409 and -0.618 using the "School in County" measure.

I showed in Table 4 that the matched sample was not representative of the population but that the two are indistinguishable after using inverse probability weights. My main results reweight by prisoner, race, and year, but do not correct for the differences in covariates described in Table 4. Therefore, in Table A.5, I show that results with different weighting schemes. In the second column, I start by removing all weights. Results become smaller in magnitude because the mean incarceration rate falls. The effect of full exposure using the "Likely Seats" measure falls in magnitude to 1.45 percentage points. Column (3) uses the inverse probability weights estimated based on the childhood census year covariates from Table 4, while Column (4) uses weights calculated based on the adult census year characteristics from Table 4. Results using both of these are almost identical in magnitude to the original results, suggesting that observable differences between the matched sample and population do not explain the results.

B. Replicating the results in unmatched data

While there are no meaningful differences between the matched sample and population, and reweighting the results does not meaningfully affect the results, one might still worry that the matched sample differs from the population along unmeasurable characteristics. To alleviate this concern, I use the 1940 Full Count census from IPUMS which has prisoner status, birth state, county of residence in 1935, race, and age.

I use my preferred measure of incarceration and use county of residence in 1935 to assign Rosenwald exposure instead of relying on matched data. I note that this is imperfect because

25% of individuals from these birth cohorts had already left their state of birth by 1935 (11% had left the South entirely), suggesting that I may understate the main result due to measurement error in exposure. Furthermore, many prisoners were likely already incarcerated in 1935 which will also lead to incorrect assignment of exposure if they are incarcerated outside of their county of residence. Finally, residence five years ago is disproportionately missing for prisoners versus non-prisoners (13% versus 3%). I use the "migcity" variable in IPUMS to assign rural status to individuals in 1935. I also restrict to men living in one of the 14 Rosenwald states in 1935 to compare results between the unmatched and matched data.

I show the results in Table A.5. The first two columns use unmatched data, the next two columns used matched data but assign Rosenwald exposure using residence five years ago, and the final two columns use matched data and exposure based on childhood residence. The difference between the first and second sets of results is entirely due to selection differences between unmatched and matched data; the variable for residence in 1935 is reported in the census in 1940 so there is no information being used from the pre-1940 census. There are two differences between the samples used in the second and third set of results. First, I assign Rosenwald exposure based on childhood location instead of location in 1935. This requires matching so measurement error could be introduced here due to false matches. Second, I am able to use the full matched sample because I have residence in childhood for the full sample. This is key because the incarceration rates are much lower in data which restricts to living in the south in 1935 (the first two sets of results). Therefore, the difference between the second and third results is ambiguous in terms of having more or less measurement error in the measurement of actual Rosenwald exposure during childhood.

The main coefficients of interest for each outcome are not statistically distinguishable from each other. However, I do find that full Rosenwald exposure increases years of education by between 0.73 and 1.28 years. Full exposure reduces the probability of incarceration by between 1.34 and 1.88 percentage points. This suggest that using matched data is not driving the primary results.

C. Permutation Tests

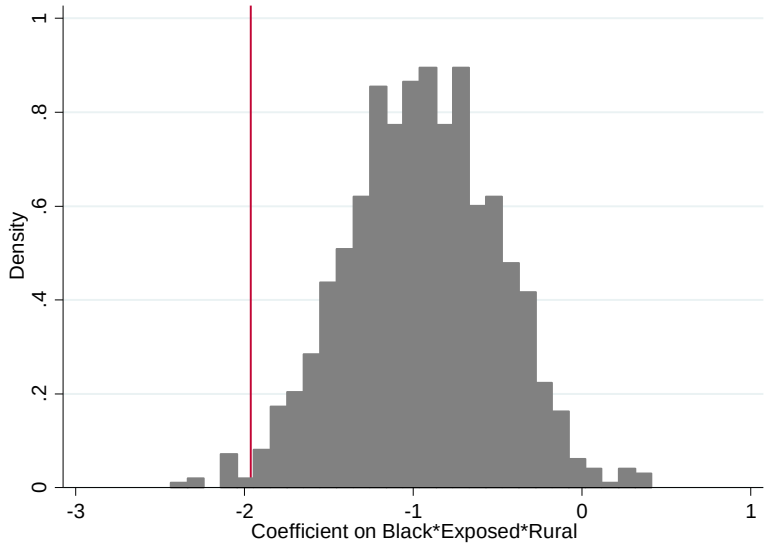
Finally, I use a permutation test to reshuffle Rosenwald exposure among eligible Southern counties. By doing this, I argue that the effects found in this paper are not just due to random chance. I randomize across counties in two ways: first, among only those who did get a school, and second among all southern counties. I keep the distribution of school opening dates fixed to match the actual opening dates of the schools. I use the "Likely Seats" measure of exposure and proceed as follows:

Because the relative populations of counties differs widely across the south, I do not redistribute schools and then recalculate my measure of exposure. Instead, I assume that the "Likely Seats" measure would be the same when reshuffling the schools but reshuffle the counties in terms of the order they receive schools. For example, if County A received its first school in 1920 which could seat 20% of students and received another county in 1925 which increased the county's capacity to 40% of students, I hold these numbers fixed. When reshuffling, I move County A's exposure by birth year to a random County B. This happens for all counties which were exposed. Then, I recreate Exposure, Black*Exposure, Rural*Exposure, and Black*Rural*Exposure for each iteration.

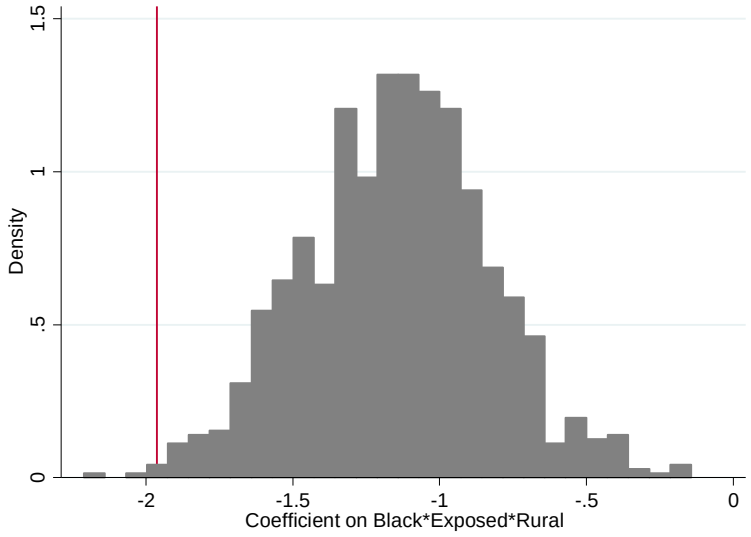
I do the previous procedure 1,000 times and plot the coefficients in Figure A.1. The coefficient in the main sample is plotted as a vertical line in the histograms. While there is large variation in the estimated coefficients in the placebo regressions, my coefficient is larger in magnitude than all by 1.1% of coefficients when using only receiving counties, and 0.3% of coefficients when randomizing across the entire South. This suggests that the results found were not due to random chance but the actual placement of the schools.

Figure A.1: Permutation Test

Panel A: Assign Rosenwald Exposure among eventually treated counties only



Panel B: Assign Rosenwald Exposure among all Southern Counties



Notes: Figures plot estimated coefficients from 1000 placebo regressions after reshuffling Rosenwald school timing across eligible Southern counties. In Panel A, procedure only assigns Rosenwald exposure to those counties which will eventually be treated. In Panel B, procedure reassigns Rosenwald exposure to all Southern counties in the 14 Rosenwald states. Regressions use the "Likely Seats" measure of exposure where the share of students exposed to a school by birth year is held constant but the county with the schools is changed.

Table A.1: Alternative Specifications

	(1)	(2)	(3)	(4)	(5)
Weights:	Year FE Only	Preferred Specification	Rural*Birthyear Trends	Rural*Birthyear FE	County*Rural* Year FE
Black*Exposure*Rural	-1.963***	-1.227*	-0.971	-0.812	-1.145*
	(0.609)	(0.693)	(0.704)	(0.718)	(0.689)
Exposure Measure	"Likely Seats"	"Likely Seats"	"Likely Seats"	"Likely Seats"	"Likely Seats"
Mean Exposure	0.059	0.059	0.059	0.059	0.059
Sample Mean, black	2.105	2.105	2.105	2.105	2.105
Black*Exposure*Rural	-0.618***	-0.416*	-0.224	-0.174	-0.394
	(0.168)	(0.243)	(0.265)	(0.296)	(0.248)
Exposure Measure	"School in County"	"School in County"	"School in County"	"School in County"	"School in County"
Mean Exposure	0.232	0.232	0.232	0.232	0.232
Sample Mean, black	2.105	2.105	2.105	2.105	2.105

Notes: N = 4,373,395. Outcome = 100 if in prison in the adult year. The coefficients in column are interpreted as percentage points rather than proportions. Black means of the outcome variable are given in the row labelled "Sample Mean, black". Regressions include age, black*age, year, black*year, and county-year fixed effects, where year refers to the childhood census year, and county refers to the childhood census county. I restrict to ages 18-35. Standard errors are clustered by childhood census county. Sample includes prisoners and non-prisoners in 1920, 1930, and 1940, linked to childhood census locations to assign Rosenwald exposure. Rural is defined as living in a place with less than 2500 inhabitants in the childhood census year. ***p<0.01, **p<0.05, *p<0.10.

Table A.2: Robustness to Matching

	(1)	(2)	(3)	(4)	(5)	(6)
Matching Method:	Original	Unique within 5 years	Restrict age to up to one year discrepancy	Match on exact names	Match on exact name + unique within 5 years	Allow to match within 10 year band
Black*Exposure*Rural	-1.963***	-2.085**	-2.153**	-1.405**	-1.773**	-1.179
	(0.702)	(0.865)	(0.763)	(0.708)	(0.770)	(0.913)
Exposure Measure	"Likely Seats"	"Likely Seats"	"Likely Seats"	"Likely Seats"	"Likely Seats"	"Likely Seats"
Mean Exposure	0.059	0.059	0.059	0.059	0.059	0.059
Sample Mean, black	2.105	2.105	2.105	2.105	2.105	2.105
Black*Exposure*Rural	-0.618***	-0.577**	-0.698***	-0.711***	-0.807**	-0.330
	(0.197)	(0.260)	(0.209)	(0.207)	(0.218)	(0.279)
Exposure Measure	"School in County"	"School in County"	"School in County"	"School in County"	"School in County"	"School in County"
Mean Exposure	0.232	0.232	0.232	0.232	0.232	0.232
Sample Mean, black	2.105	2.105	2.105	2.105	2.105	2.105
Match Rate	27.5	18.6	25.1	15.1	6.9	35.6
N	4,373,395	2,961,621	3,983,265	2,405,506	1,096,587	5,666,636

Notes: Sample sizes and match rates in last two rows apply to both panels. See Table 7 notes for sample and regression specification. Original matching procedure uses iterative match procedure of Abramitzky, Boustan, and Eriksson (2012); method requires exact match on (NYSIIS standardized) name, birth state, and race and iteratively allows up to two years of discrepancy in age. Column (2) requires individuals to be unique within a five year (plus or minus two years) age band in each year. Column (3) allows individuals to only match with up to one year discrepancy in age. Columns (4) and (5 replicate (1) and (2) but use raw name strings instead of the NYSIIS standardization. Column (6) allows individuals to match iteratively with up to five years discrepancy in age. ***p<0.01, **p<0.05, *p<0.10.

Table A.3: Robustness to Incarceration Measure

	(1)	(2)	(3)
Incarceration Measure:	Preferred	Group Quarters	Group Quarters + Relationship
Black*Exposure*Rural	-1.963***	-1.888*	-1.742***
	(0.700)	(0.659)	(0.667)
Exposure Measure	"Likely Seats"	"Likely Seats"	"Likely Seats"
Mean Exposure	0.059	0.059	0.059
Sample Mean 1940, black	2.105	1.655	1.769
Black*Exposure*Rural	-0.618***	-0.521***	-0.409**
	(0.197)	(0.187)	(0.209)
`Exposure Measure	"School in County"	"School in County"	"School in County"
Mean Exposure	0.232	0.232	0.232
Sample Mean, black	2.105	1.655	1.769

Notes: N=4,373,395. See Table 7 notes for sample and regression specification. Regressions are weighted to have correct incarceration rates within each year and race cell. Incarceration status refers to status in adult years of 1920, 1930, and 1940. "Preferred" incarceration measure uses all individuals with relationship string "Prisoner" and "Convict", as well as individuals with blank or "Inmate" relationships to household head that were determined by hand to be in a prison or jail. "Group Quarters" measure uses those identified by IPUMS to be in a correctional facility by the variable "gqtype". The "Group Quarters + Relationship" definition removes individuals from the previous definition who are household heads or other family members, and adds individuals with relationship strings of "Prisoner" and "Convict" who were not identified by the "gqtype" variable in IPUMS. See Section III for details. ***p<0.01, **p<0.05, *p<0.10.

Table A.4: Robustness to Weighting

	(1)	(2)	(3)	(4)
Weights:	Prison/Race only (Original)	No Weights	Childhood Census Year	Adult Census Year
Black*Exposure*Rural	-1.963***	-1.449***	-1.862**	-2.095***
	(0.700)	(0.548)	(0.620)	(0.697)
Exposure Measure	"Likely Seats"	"Likely Seats"	"Likely Seats"	"Likely Seats"
Mean Exposure	0.059	0.059	0.059	0.059
Sample Mean, black	2.105	2.105	2.105	2.105
Black*Exposure*Rural	-0.618***	-0.450***	-0.417***	-0.621***
	(0.197)	(0.157)	(0.153)	(0.204)
Exposure Measure	"School in County"	"School in County"	"School in County"	"School in County"
Mean Exposure	0.232	0.232	0.232	0.232
Sample Mean, black	2.105	2.105	2.105	2.105

Notes: N = 4,373,395. See Table 7 notes for sample and regression specification. Regressions include county times childhood census year fixed effects. Original weights correct for differential match rates within prison/year/race cells to recover original population incarceration rates. Column (2) removes weights. Column (3) uses an inverse proportional weighting procedure to reweight the matched sample to the population based on childhood observable characteristics: Rosenwald exposure, birth state, race, age, household head literacy, school attendance, and household farm status. Column (4) uses an inverse probability weighting procedure to reweight the sample to the population based on adult observable characteristics: years of education, indicators for no education and less than eight years of education, state of residence, state of birth, race, prison status, and age. ***p<0.01, **p<0.05, *p<0.10.

Table A.5: Results with Unmatched 1940 Census

	(1)	(2)	(3)	(4)	(5)	(6)
	Unmatched Data		*Matched Data*			
	=100 if in Prison	Education	=100 if in Prison	Education	=100 if in Prison	Education
Black*Exposure*Rural	-1.884**	0.731**	-1.346	0.992***	-1.429*	1.277***
	(0.842)	(0.288)	(0.863)	(0.317)	(0.772)	(0.348)
Exposure*Rural	-0.402**	-0.249**	-0.479**	-0.190*	0.078	-0.095
	(0.189)	(0.112)	(0.215)	(0.107)	(0.158)	(0.110)
Black*Exposure	0.837	-0.093	0.659	-0.101	1.871*	-0.305
	(0.763)	(0.345)	(0.775)	(0.374)	(0.757)	(0.363)
Black*Rural	-0.154	-0.091	-0.269	-0.323***	-1.167***	-0.324***
	(0.213)	(0.098)	(0.235)	(0.108)	(0.148)	(0.118)
Rural	-0.129*	-1.602***	-0.128*	-1.585***	0.081*	-0.675***
	(0.077)	(0.045)	(0.073)	(0.044)	(0.045)	(0.039)
Exposure	0.322	0.176*	0.333	0.069	0.032	0.659***
	(0.200)	(0.107)	(0.217)	(0.098)	(0.166)	(0.110)
Black	1.117***	-2.726***	1.263***	-2.629***	2.781***	-2.074***
	(0.207)	(0.121)	(0.256)	(0.131)	(0.146)	(0.119)
Prison Measure	Preferred		Preferred		Preferred	
Exposure Measure	"Likely Seats"	"Likely Seats"	"Likely Seats"	"Likely Seats"	"Likely Seats"	"Likely Seats"
Exposure + Fixed Effects	County in 1935	County in 1935	County in 1935	County in 1935	County in Childhood	County in Childhood
Mean Exposure	0.127	0.127	0.129	0.129	0.131	0.131
Sample Mean, black	5.519	1.832	5.848	1.893	2.552	6.120
R^2	0.264	0.030	0.244	0.038	0.255	0.008
N	5,018,955	5,150,853	1,484,749	1,521,436	1,730,760	1,775,391

Notes: Table uses the previous matched data, restricted to outcome year 1940, for the first two columns and the full count unmatched 1940 census for the last two columns. The first two columns further restrict individuals to still be living in one of the Rosenwald states in 1935 to be consistent with the restriction in the unmatched data. The "Group Quarters" prison measure is used to be consistent with the unmatched data where information is not available to calculate the other two measures. The binary outcome variable for incarceration is multiplied by 100 so that the coefficients are expressed as percentages instead of proportions. Mean for blacks in 1940 are given in the row labeled "Sample Mean, black". Regressions use the "Likely Seats" measure of exposure. Regressions include age, black*age, and county fixed effects, where county is the county in 1935 (cols 1 - 2) or county in childhood (cols 5 and 6). For Columns (1)-(4), I restrict to those living in the South in 1935; in Columns (5) and (6), I restrict to those living in the South in 1935 and those aged 18 to 35 in 1940. Standard errors are clustered by county. Columns (1) – (4) use the "migcity" variable in IPUMS to assign rural status in 1935. "Rural" refers to living in a rural place in childhood in Columns (5) and (6). ***p<0.01, **p<0.05, *p<0.10.