

The road to better education: The effect of Interwar highways on education in the U.S. South

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In 1920, Southern states lagged far behind the rest of the country in education spending and educational attainment. The school system was “separate but *not* equal”. In the next twenty years, funding for public schools and educational attainment both improved dramatically in the South. Previous studies explained these improvements in education through improvement in public health¹, passing laws on compulsory attendance and abolishing child labor², and capital investment via private philanthropic programs such as the Rosenwald Fund³ and the Jeanes Fund⁴. I suggest in this paper that internal improvements, the construction of Federal-Aid Highways in particular, may help explain the increase in education funding as well.

The Federal-Aid Highways built in the interwar years represent a forgotten transportation revolution. As a response to the exponential growth of automobile ownership and an ever-increasing demand for road transportation, the nation spent an average of 0.3 percent of GDP on highway building in the 1920s and 30s and built a system of highways spanning more than 90,000 miles. This system of highways eventually became known as the U.S. Numbered Highways. Recognizing that “good schools and good roads [were] forerunners of a general betterment of the conditions and opportunities”⁵, southern states devoted a higher share of state government revenue to highway construction compared to other states. A concerted, large-scale infrastructure build-up such as the Federal-Aid Highways network would have larger impacts in the regions with the lowest level of initial infrastructure and market access such as the Deep South.⁶

Contemporary observers seemed to notice the impacts highway building had on education. They stated that “the development of consolidated schools, *aided by improved highways*, permitting children to come from an area of 25 to 50 square miles, [was] tending to

¹ Bleakley, Hoyt. “Disease and Development: Evidence from hookworm Eradication in the American South.” *Quarterly Journal of Economics* 122 (2007): 73-117.

² Lingwall, Jeff. “An Economic History of Compulsory Attendance and Child Labor Laws in the United States, 1810-1926.” PhD dissertation, Carnegie Mellon University, 2014.

³ Donohue, John T. III, James J. Heckman, and Petra E. Todd. “The Roles of Legal Activism and Private Philanthropy.” *Quarterly Journal of Economics* 117 (2002): 225-268.

Aaronson, Daniel, and Bhashkar Mazumder. “The Impact of Rosenwald Schools on Black Achievement.” *Journal of Political Economy* 119 (2011): 821-888.

⁴ Kreisman, Daniel. “The Next Needed Thing: The Impact of the Jeanes Fund on Black Schooling in the South, 1900—1930.” *Journal of Human Resources*, 52 (2016), 573-620.

⁵ Hager, J. Manfred. “Commercial Survey of the Southwest.” Washington: US Government Printing Office (1927). The quotes in the next paragraph also came from the Commercial Survey.

⁶ Mu, Ren, and Dominique van de Walle. “Rural Roads and Local Market Development in Vietnam.” *Journal of Development Studies*, 47 (2011), 709-734.

equalize the opportunities for rural children. ... [A more connected economy] allowed for [better maintenance of] facilities, [permitted] the employment of well-qualified teachers, the extension of school terms, the purchase of better equipment, the widening of curricula, and [insured] larger enrollments and better attendance.”

I utilize newly digitized county-level data on Federal-Aid Highways as well as public schools for the time period 1920 to 1930 from the states of Alabama and Georgia. Highway data are drawn from reports by each state’s Highway Departments. Reports from Alabama and Georgia provided data on mileage, type of surface, total expenditure, and amount of federal aid on an annual basis. Education data are from annual reports issued by state Departments of Education, which provided county-level enumerations of expenditure, enrollment, teachers, teacher salary, enrollment, local tax revenue, among other things. This dataset was used in Carruthers and Wanamaker (2013, 2017a, 2017b).⁷ To control for other observable characteristics of counties, I merge highway and education data with banking data collected by the Federal Deposit Insurance Corporation (FDIC) as well as socio-demographic data from decennial population censuses, population censuses, as well as censuses of religious bodies.

It is useful to start by examining the cross-sectional evidence. First, I look at the impact of highway spending on educational expenditure using ten-year aggregates. After controlling for economic and demographical controls, a ten percent increase in highway spending in the 1920s is associated with a 5.9 percent increase in spending on white schools and 8.0 percent increase in spending on black schools. Cross-sectional regression results also strongly suggest that highway spending is positively correlated with education spending on a per pupil basis.

One concern with cross-sectional results like above is always that highway construction and education spending and/or outcomes are jointly determined by some unobservable county characteristics. One convenient way of accounting for these unobserved factors is to exploit the panel data structure and estimate fixed effect panel regressions. Specifically, I estimate the following specification

$$Y_{it} = \alpha + \sum_{s=-1}^3 \beta_s HwY_{i,t-s} + X\gamma + u_c + v_t + \varepsilon_{it}$$

where Y_{it} represents the outcome variable in county i and year t , HwY_{it} is the highway construction measure—log highway expenditures—in county i and year t , and X is a set of contemporaneous controls. X includes log bank deposits, shares of urban population and share of labor force working in manufacturing in the same year as the outcome variable was measured. u_c s are county fixed effects, v_t s are time fixed effects. Fixed effects regressions eliminate influences from time-invariant factors and time-specific events that may be correlated with the timing of highway construction and changes in education. Potential drawbacks in the

⁷ Carruthers, Celeste K., and Marianne H. Wanamaker. “Closing the Gap? The Effect of Private Philanthropy on the Provision of African-American Schooling in the U.S. South.” *Journal of Public Economics* 101 (2013): 53-67.

Carruthers, Celeste K., and Marianne H. Wanamaker. “Separate and Unequal in the Labor Market: Human Capital and the Jim Crow Wage Gap.” *Journal of Labor Economics* 35 (2017): 655-696.

Carruthers, Celeste K., and Marianne H. Wanamaker. “Returns to School Resources in the Jim Crow South.” *Explorations in Economic History* 64 (2017): 104-110.

model are the parsimonious set of controls due to data availability limitations as well as the noisy nature of the timing of highway and educational outcomes.

Using the most flexible panel regression model, evidence suggests that the cumulative effect of a ten percent increase in highway spending three years in a row adds up to a 1.9 percent increase in educational spending in white schools three years later, and the effect is statistically significant. The coefficients on black schools are similar in size and statistically significant as well. Moreover, the coefficients are also significant both statistically and economically when the dependent variables are per-pupil expenditures. Combining the panel evidence with the cross-sectional evidence, the pattern is clear and robust: counties that had a lot of federal highway expenditures also tend to increase their spending on education in the 1920s.

Now the question is: was highway activity also related to changes in educational outcome? Due to data limitations, I have not been able to directly link highway spending with high school graduate rates or better labor market outcomes. Enrollment improved across the board and did not seem to have any relationship with the geographical variation of highway activity. On the other hand, I do find robust and positive relationships between highway spending and number of teachers in black schools, average teacher salary as well as number of teachers in white schools.

What can be a possible mechanism linking highway spending and educational spending? I test several competing hypotheses. Preliminary evidence suggests that highway expenditure in the 1920s did not lead to more prosperity through more manufacturing activities, which was consistent with the macro historical narrative that the South was not industrialized until the mobilization for World War II. On the other hand, counties with more highways witnessed a larger increase in local tax revenue as well as in land value. This suggests that highway building might lead to an appreciation in land value, which gave local governments more tax revenues and that made increases in educational spending possible. This is however conjectural. My analysis does not rule out the endogeneity of highway placement and local preferences.

As such, this study calls for more research exploring the interesting connection between infrastructure building and public school financing. In the near future, I implement an instrumental variable design where I use the location of military forts built in the 1910s in the region (such as Fort Benning) as a source of exogenous variation in highway spending. Of course, more work can be done on expanding the geographic and/or longitudinal coverage and look at what happened in states such as the neighboring states such as Mississippi, Louisiana, and Tennessee and investigate the impacts of highway construction during the Great Depression.