Research in Higher Education
https://doi.org/10.1007/s11162-020-09599-4

Well-Placed: The Geography of Opportunity and High School Effects on College Attendance

Noah Hirschl[1] · **Christian Michael Smith**[1]

Received: 23 July 2019

Abstract
Recent work has broadened the scope of school effectiveness research to consider not only academic achievement but also other outcomes, especially college attendance. This literature has argued that high schools are an important determinant of college attendance, with some contending that high schools matter more for college attendance than for academic achievement. A separate branch of research has illustrated how place-based opportunities facilitate college attendance. We merge these two literatures by asking if schools' geographic context can explain apparent variation in effectiveness among Wisconsin high schools. We find that geographic context explains more than a quarter of the variance in traditional estimates of school effectiveness on college attendance, because factors like proximity to colleges are strongly associated with college attendance. Accounting for geography is therefore important in order not to overstate high schools' role in higher education outcomes. Results are based on multilevel models applied to rich administrative data on every Wisconsin public high school entrant between 2006 and 2011.

Keywords College attendance · Geography of opportunity · School effects · College proximity · Local labor markets

Introduction

While canonical research on school effectiveness emphasizes academic achievement as the outcome of interest (Coleman et al. 1966), research in the last decade has illustrated how high schools also differentially impact other outcomes, especially college attendance. Without contradicting the long-standing consensus that social background is the most powerful factor, researchers have found that high schools still have large effects on college attendance, while having relatively meager effects on students' academic achievement

Noah Hirsch and Christian Michael Smith contributed equally and are listed alphabetically.

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s11162-020-09599-4) contains supplementary material, which is available to authorized users.

✉ Christian Michael Smith
csmith59@wisc.edu

[1] University of Wisconsin –Madison, Madison, WI, USA

as measured by standardized achievement tests. Although much of the recent research in this area emerges from urban school districts (Cullen et al. 2006; Deming 2011; Deming et al. 2014), other research uses data from national samples or multiple states and finds between-school variation of similar magnitude (Altonji and Mansfield 2011, 2018; Jennings et al. 2015; Rumberger and Palardy 2005), and some argue that variance in school effectiveness is larger for 4-year college[01] attendance than for academic achievement (Jennings et al. 2015). If schools play a crucial role in the college attendance process, more crucial than their role in the process of improving academic achievement, then differences in school effectiveness may matter more than previously thought. This recent wave of studies on how high schools impact college attendance has coincided with the proliferation of a separate literature that finds college attendance depends on the characteristics of youths' spatial locations, a set of characteristics that we call *geographic context*. This research has demonstrated how, for example, individuals are more likely to attend college if they live near one (Klasik et al. 2018; Turley 2009), implying that the unequal geographic distribution of postsecondary institutions is relevant for policy and inequality (Hillman 2016). Others have emphasized the relevance of local labor markets, noting that youths are less likely to attend college if they live in an area with high unemployment rates (Hillman and Orians 2013) and many jobs that do not require a college degree (Bozick 2009).

We build on both young literatures described above. Merging these two literatures can contribute to both by assessing whether apparent variation in schools' effects on college attendance are actually due to differences in schools' geographic contexts, rather than being due to policies and practices that vary across schools. We ask how much schools' geographic context can explain apparent variation in Wisconsin high schools' effectiveness with respect to students' 4-year college attendance. We find that geographic context explains about 30% of the variance in traditional estimates of school effectiveness on college attendance. Two geographic features are especially important in explaining this variance: the proximity of local colleges and the occupational mix of the local labor market. We also demonstrate that variation in effectiveness across high schools is even less influential, in an absolute sense, for college attendance among lower-income versus higher-income students. Therefore, we build on the recent, postsecondary outcome-focused body of research on school effectiveness by presenting a more modest appraisal of high schools' role in producing college attendance, particularly for society's most economically disadvantaged youth. Our study uses a unique merger of aggregated American Community Survey and U.S. Bureau of Labor Statistics data with individual-level data on every Wisconsin public school student from the Wisconsin Statewide Longitudinal Data System and the National Student Clearinghouse. We use multilevel modeling techniques that allow us to estimate the contribution of high schools to students' success while controlling for a rich set of academic, demographic, and behavioral covariates.

It is important to assess whether schools' variation in effectiveness has been overstated because policymakers should have a realistic picture of the power schools do or do not have to influence youths' life chances, relative to interventions not directly related to school. Education has become policymakers' preferred engine to solve problems of poverty and inequality (Kantor and Lowe 2013). Child poverty in the U.S. is remarkably high relative to other developed nations, in large part because its public policy does less to support low-income families (Smeeding and Thévenot 2016). Rather than focus on

[1] In this paper, we use *4-year college* to denote any institution of postsecondary education that grants bachelor's degrees, including those that also grant other types of degrees.

improving poor children's material circumstances while they are young, the federal government focuses on improving poor children's schools, so that the children can dodge adult poverty using the human capital they acquire in school (Katz 2010). This focus is evident in federal initiatives like the Race to the Top grant and the Every Student Succeeds Act, each of which includes school accountability efforts specially related to the outcomes of low-income students. These initiatives rely on a notion that schools can readily improve their practices and policies to such a degree that students make substantially greater gains than before. Meanwhile, quasi-experiments show that government money directly provided to families is conducive to both academic achievement (Whitehurst 2016) and college attendance (Manoli and Turner 2018) and may have greater per-dollar impacts than common education-based government interventions. By bounding the extent to which schools vary in their effectiveness for important youth outcomes like college attendance, our study helps determine whether educational interventions should take precedence over equally-priced, potentially more effective economic redistribution policies.

Literature Review

High School Effects on College Attendance

How much can high schools influence youths' long-run outcomes? Beginning with Coleman et al. (1966), scholars have looked to the empirical distribution of student outcomes between schools to estimate the possible influence school resources and practices can have on students' life chances (Jencks et al. 1972; Borman and Dowling 2010, Morgan and Jung 2016). Although most early studies measured school effectiveness using standardized test scores, school effects on other outcomes like educational attainment are potentially more important to later life success because they reflect students' development of crucial non-cognitive skills in addition to cognitive skills (Heckman et al. 2006; Jennings et al. 2015, Jackson 2018). Indeed, students who have similar pre-high school characteristics but who attend different high schools can have widely varying outcomes. Recently, researchers have leveraged value-added-type methods and newly available administrative data to show that moving from a 10th percentile to the 90th percentile high school increases that student's probability to attend college by between 10 and 20 percentage points (Jennings et al. 2015; Altonji and Mansfield 2011, 2018). Findings from these studies have led some scholars to consider whether, because of high schools' apparent importance for college attendance, differences in school quality matter more than researchers previously thought (Jennings et al. 2015).

However, these findings do not shed light on the mechanisms that produce this wide variation of high school effects. The broader education literature points to schools' college counseling structure and college culture (McDonough 1997; Hill 2008; Woods and Domina 2014; Engberg and Gilbert 2014), and rigorous, college preparatory coursework (Adelman 2006; Klugman 2012) as key resources that facilitate college-going. But the extent to which these resources can explain all or most of the variation across schools has not been directly confronted to our knowledge, and such a question poses substantial challenges for data availability and measurement. Instead, we approach this question from a different angle. We draw on the geography of opportunity tradition to examine the extent to which contextual features of places can explain the apparent variation in school effects.

The Geography of Opportunity

Prior studies investigating how much high schools vary in their effects on college attendance have provided estimates that include variation due to geographic context in addition to variation due to school practices and policies, which administrators can more readily manipulate. While such estimates are useful, for example, to parents concerned with how much it matters where they send their child to school, the estimates are less useful to policymakers concerned with whether some schools' practices and policies are substantially more effective than those of others. To address the latter concerns with more precision, studies should compare the outcomes of students who are in different schools and are similar in terms of not only individual characteristics, but also geographic features that determine college attendance. Below, we elaborate the theoretical framework of our study and review the theory and evidence validating the geographic features we include in our analyses.

Theoretical Framework

Our study draws on the geography of opportunity framework, most commonly associated with Galster and Killen (1995). The framework posits that space influences the decisions youths make because persons situated in different spaces have access to different local opportunity structures (Galster and Killen 1995; Sharkey and Galster 2017). In this way, even if youths act with bounded rationality, their decisions are products of not solely individual-level attributes but also broader-scale, spatially-determined forces. In particular, two identical, utility-maximizing individuals situated in different spaces may make different decisions—for example when deciding whether to attend college—because the nearby opportunities available to them impact costs and benefits and shape the information and beliefs they have about their choices. Despite the importance of these local opportunities to students' decisions, research on the high school-to-college transition often emphasizes academic factors but does not situate decisions in the geographic context in which they occur (Turley 2009). Of particular interest in this study are students' local labor markets and distance to colleges.

Local Labor Markets

Local labor markets can directly constrain the employment opportunities available to new high school graduates and, in turn, influence their college attendance decisions. In places where many jobs do not require a college degree, high school students are much less likely to attend 4-year colleges. Duncan (1965) was among the first to suggest that youth are more likely to continue their education when the blue-collar work around them is limited, and empirical research has validated this claim. High school graduates are more likely to enter college during recessions and periods of high unemployment (Betts and Mcfarland 1995; Bozick 2009; Rivkin 1995; Hillman and Orians 2013). Moreover, the percentage of blue-collar occupations in high school students' counties has a strong influence on whether students go on to attend college (Sutton et al. 2016). Among men, the tendency to take local blue-collar jobs upon exiting high school explains much of this relationship (Sutton et al. 2016). High school graduates with available blue-collar work in their communities likely see greater opportunity costs to college attendance given the comfortable earnings they would have to forgo to attend.

The local labor market composition and unemployment rates may be mutually reinforcing. The positive influence of the unemployment rate on college attendance decisions is strongest in places with more blue-collar occupations (Bozick 2009). Moreover, nearly one in five students who do not attend college report that they forwent college because they were satisfied with their current employment (Bozick and DeLuca 2011). These results suggest that local labor markets shape students' postsecondary decisions, and that students graduating from high schools in places where there are many available blue-collar jobs may be less likely to transition into a 4-year college.

Distance to Local Colleges

Institutions of higher education are unevenly distributed geographically, and areas of postsecondary scarcity or abundance often coincide with broader contours of inequality by race, ethnicity, and social background (Hillman 2016). The distribution of postsecondary institutions matters because students and their families are highly sensitive to the distance between their home and their prospective colleges, and tend not to travel far for school (Leppel 1993; Alm and Winters 2009; Turley 2006). Nationally, 57 percent of college students attend a nearby college, defined as within 24 miles for non-urban and 12 miles for urban students (Turley 2009). Furthermore, students who grow up with many institutions of higher education nearby attend college at higher rates overall (Turley 2009), with both 2-year and 4-year colleges drawing students depending on their relative distance (Alm and Winters 2009; Rouse 1995). Although these associations may reflect residential sorting, two studies exploiting new university openings in Canada (Frenette 2009) and California (Lapid 2016) present convincing evidence that the relationship is causal.

Scholars hypothesize that this spatial relationship may stem from students and their families preferring local colleges to ease the financial or emotional burden of the transition to college (Lapid 2016; Turley 2006, 2009). Alternatively, the relationship may arise because local postsecondary institutions cultivate college-going cultures or knowledge of how to get to college (Turley 2009). Evidence that local university openings immediately induce college attendance supports the former hypothesis, but there has been little systematic research on the latter. Overall, the weight of the evidence suggests that local institutions of postsecondary education influence students' college behavior independently of their high school experience.

Methods

Estimating School Effects

The main objective of this study is to improve on prior work by disentangling the effects of schools' practices from the effects of the contexts in which the schools are located. This task is fraught with methodological difficulties because all relevant features of 'context,' and certainly of 'practice,' are never directly measured. According to Raudenbush and Willms (1995), estimating the effects of high schools without separating contextual and practice elements is relatively simple because the analyst need only condition on the individual-level characteristics that determine sorting across schools. This estimation strategy yields what we call *total effects* of high schools. In contrast to the total effect of a school, what we call the *school practice effect* captures only how schools' practices, policies, and all other manipulable organizational features contribute to the outcome of interest.[2] This study focuses on school practice effects. Since no known dataset, least of all an administrative one, captures all the relevant policies and practices that shape students' propensities to attend college, the typical approach is to estimate school practice effects by measuring and controlling for as many aspects of context as possible, and then attribute any residual school differences to practice. For this purpose, many researchers include school- or cohort-level averages of student level characteristics (e.g. subsidized lunch eligibility, race, and test scores) as measures of context (e.g. Jennings et al. 2015, Altonji and Mansfield 2011). Adjusting for these compositional measures is important because they are associated with many educational outcomes, including postsecondary attendance behavior (Engberg and Wolniak 2010; Klugman and Lee 2019), and arguably vary primarily due to forces outside the control of schools themselves. However, as suggested by Raudenbush and Willms (1995) and the literature reviewed above, we hypothesize that context is more multi-dimensional than what is captured by the compositional measures used in prior studies. In particular, the key innovation in this study is to approximate more credible school practice effects by netting out geographic factors like the local labor market and proximity to colleges. Because these factors constitute contextual factors that schools cannot manipulate in any way, it is appropriate to adjust for them when estimating school practice effects. Any observed association between geographic factors and educational outcomes may be causal or may reflect the sorting of students with educationally favorable attributes in certain geographic areas. However, this distinction is immaterial for our purposes because, in either case, including geographic factors in models improves school practice effect estimates by adjusting for factors outside of schools' control.

Data Sources

Urban school districts have received disproportionate attention in research on school effectiveness for college attendance. Our data come from Wisconsin, which is a valuable case for study because the state has many students in both rural areas and high-density metropolitan areas. Wisconsin is not only a typical state in terms of urban and rural population rates, but also in terms of median household income (Guzman 2017) and average academic achievement (National Center for Education Statistics 2018).

Student-level data on the K-12 years come from Wisconsin's Statewide Longitudinal Data System, which registers all Wisconsin students in traditional public schools and charter schools. We track Wisconsin high school graduates into college using data from the National Student Clearinghouse. Every semester, the Clearinghouse records the postsecondary institution where students enroll and whether they enroll full- or part-time. These data cover upwards of 96% of all national postsecondary enrollment in higher education institutions over the period we study (Dynarski et al. 2015). We access the National Center for Education Statistics school district population estimates from the American Community

[2] We use Willms and Raudenbush's (1989) taxonomy of Type A (total) effects and Type B (school practice) effects but use a different name for each type, for conceptual clarity.

Survey and aggregate these data from years 2011–2015. These data describe the socioeconomic and labor market conditions of school districts. We use data from the U.S. Bureau of Labor Statistics for estimates of county-level unemployment rates for each year in the study. Finally, we use data from the College Scorecard for the geographic coordinates of Wisconsin colleges.

We analyze all Wisconsin public school students who entered ninth grade for the first time between the 2006–2007 and 2011–2012 school years, and were enrolled in a Wisconsin public school in eighth grade. We therefore exclude students who were at private schools, at schools outside Wisconsin, or practicing homeschooling. Our results therefore apply to the population of students who were enrolled in public school in middle as well as high school. Three and a half percent of remaining students are missing either their math or English 8th grade test score. An additional 1% attended a high school that was one of the 67 schools with missing school-level data, often because the school closed or opened during the study period. We drop these students using listwise deletion. Although listwise deletion rests on the assumption that values are missing completely at random, an assumption we cannot assess, the choice of missing data procedure does not tend to influence the substantive results when the proportion of missing data is very low, as in our case (Cox et al. 2014). In total, our analytic sample contains 352,324 students from 514 high schools. These schools are spread across 382 school districts, 329 of which have only one high school. Below, we list all of the characteristics of students and schools used in this study.

Outcome Measure

The main outcome of interest in this study is 4-year college attendance. We dummy code 4-year college attendance equal to 1 if a student enrolled in a 4-year college at least half time within two years of completing high school and had not enrolled in a 2-year college previously. We restrict the window to two years after finishing high school because postsecondary enrollments too long after the student has been exposed to her high school are less likely to be the result of her school's practices. However, the results of this study are practically the same when we include later enrollments, as well as when we include the 4-year enrollments of students who transfer in from a 2-year school. We include enrollment in all public, private not-for-profit, and private for-profit 4-year institutions covered by the National Student Clearinghouse. In additional analyses not presented, we examine schools' impacts on attendance at any college, 2-year or 4-year, and the results (available upon request) are nearly identical to those for 4-year colleges alone.

Student-Level Characteristics

Our analysis adjusts for student characteristics in order to account for students' nonrandom allocation to high schools across the state. We include race and ethnicity (indicators for being non-Hispanic white, non-Hispanic black, Hispanic, and other/multiple race), sex,[3] eighth-grade math and English language arts (ELA) scores, the proportion of observed years a student was designated an English language learner, whether a student was ever recorded as having a disability, a student's total absences in 8th grade, whether the student

[3] Both race and sex are very slightly time-variant in these data. We use each student's modal race and sex over the observed years.

was suspended in eighth grade, indicators for the year the student entered high school, and the proportion of observed years a student received free- or reduced-price lunch (FRPL). Students are eligible for reduced-price lunch if their family income is at or below 185% of the federal poverty line, which in the 2015–2016 school year was $44,863 of annual income for a family of four (U.S. Department of Agriculture 2015). We operationalize economic disadvantage using longitudinal information about FRPL receipt because FRPL receipt at a single point in time yields a coarser view of the material resources students enjoy.[4] Demographic and test score variables analogous to the foregoing control variables are commonly included in models of 4-year college attendance and have arisen as important predictors of this outcome (e.g., Altonji and Mansfield 2018, Jennings et al. 2015). We similarly control for measures of school attendance and discipline because these predict 4-year college attendance (Bacher-Hicks et al. 2019), a theoretically sensical relationship given that students' attendance and discipline at school can represent how students affectively experience the schooling system.

School-by-Cohort Level Characteristics: School Composition

Students' peer groups can have a significant influence on their postsecondary choices (Engberg and Wolniak 2010; Alvarado and Turley 2012). Since these influences are not directly malleable by school policy, we adjust for peer composition in our school practice effects models. Students are most likely to interact, both within classes and other contexts, with students in their own grade. Furthermore, our study uses data from six cohorts of students, and there are sometimes significant time trends in student composition within schools. We therefore measure school-by-cohort student composition by taking the average of each of the above student-level measures at the school-by-cohort level.

School-Level Characteristics: Geographic context

Motivated by the geography of opportunity literature, we adjust for four aspects of the local areas surrounding schools. First, we measure characteristics of the local labor market: the percentage of adults who work in blue-collar industries[5] and the unemployment rate. The latter measure is derived from the Bureau of Labor Statistics and is, by the confines of the data, bounded by county. The former measure is derived from ACS estimates and bounded by school districts, which are the smallest available geographic areas for this characteristic and therefore measure geographic context more precisely than county or commuting zone measures would.[6] The unemployment rate is also the only geographic characteristic that

[4] Among those receiving FRPL, those who receive it for more years tend to have lower family incomes (Michelmore and Dynarski 2017). Michelmore and Dynarski also find a negative correlation between test scores and years of FRPL receipt. In our own data, we observe a large gradient in both test scores and college attendance across students' years on FRPL. One cannot account for these gradients when measuring FRPL receipt at a single point in time.

[5] We define blue-collar occupations in line with recent work (Sutton et al. 2016; Sutton 2017) as the Census-defined categories natural resources, construction, maintenance, production, transportation, and material moving occupations.

[6] A considerable literature in sociology and economics has demonstrated the importance of the immediate neighborhood environment (e.g. within Census tracts) in producing educational attainment and achievement. We are limited to using measures of larger areas defined by school districts and counties because we do not have access to students' addresses. However, this limitation is not a threat to our conclusions in that

we measure time variantly, since the coefficient is sensitive to the inclusion of cohort-level variation in the case of this characteristic. Second, we include three measures of the availability of local institutions of higher education: the distance to the nearest public 2-year college, the distance to the nearest University of Wisconsin 4-year college (hereafter, UW campus), and the distance to the nearest private or out-of-state college. We measure distance to UW campuses separately from other colleges because over 65% of Wisconsin high school graduates who attend a 4-year college attend a UW campus. Hence, we do not suspect that proximity to private or out-of-state colleges fosters college attendance as strongly as proximity to UW campuses. Finally, we measure whether a district is in a rural area. We use the National Center for Education Statistics locale classification scheme, which is based on Census designations of rural areas. The Census defines as rural any area outside urban areas of at least 50,000 people or urban clusters of between 2,500 and 50,000 people.

Analytic Strategy

Our research questions are inherently hierarchical because we are interested in high school-level effects but need to account for differences across high schools in the backgrounds of students they serve. To estimate school practice effects, we therefore use hierarchical linear models to account for the nesting of students within schools and cohorts.[7] We estimate a three-level model with randomly varying intercepts at the school-level (level 3) and the cohort-by-school-level (level 2). The three-level structure allows us to partition the variation in college attendance into the portions between individuals, across time within schools, and stable variation between schools. The model is of the form

$$(Level\ 1): \ Y_{ijk} = \beta_{0jk} + \beta_{100}X_{ijk} + \varepsilon_{ijk}$$

$$(Level\ 2): \ \beta_{0jk} = \gamma_{00k} + \gamma_{010}W_{jk} + \zeta_{0jk}$$

$$(Level\ 3): \ \gamma_{00k} = \delta_{000} + \delta_{001}V_k + \eta_{00k}$$

where Y_{ijk} is a binary indicator of 4-year college attendance for student i in cohort-school j and school k; X_{ijk}, W_{jk}, and V_k are vectors of student-level, cohort-school-level, and school-level predictors, respectively; β_{100}, γ_{010}, and δ_{001} are vectors of slopes between their respective predictors and 4-year college attendance; δ_{000} is the overall intercept; ζ_{0jk} is the cohort-school-level random intercept; η_{00k} is the school-level random intercept; and ε_{ijk} is the student-level error term.

Our research questions center around the dispersion of the school-level random intercepts η_{00k}, which approximates the between-school distribution of the stable effects of school practices and policies. Each intercept η_{00k} captures the deviation of school k's typical college attendance outcome from the overall typical college attendance outcome,

Footnote 6 (continued)

the omission of neighborhood-level factors necessarily leads to us *underestimating* the importance of geographic context in our analyses.

[7] We use a linear probability model for our models of college attendance following similar recent work (Jennings et al. 2015). However, all results presented in this paper are substantively the same when using hierarchical logistic regression models (results available upon request). For ease of interpretation, we show results from linear models only.

conditional on student-level and contextual covariates outside the control of the school. Therefore, we calculate the school practice effect of school k using η_{00k}, which estimates how efficaciously school k begets 4-year college attendance among its students while accounting for factors that place schools on unequal playing fields. Accordingly, the dispersion of these random intercepts measures how much schools vary in their effectiveness. As Willms and Raudenbush (1989) explain, this approach has the advantage of generating the cumulative impact of each school's policies and practices, since each η_{00k} is essentially a school-level residual that sums over all policies and practices, observed or unobserved. While regression coefficients can estimate the effects of the policies and practices observed by the researcher, they cannot capture cumulative impact in the same way as the approach advocated by Willms and Raudenbush.

We control for the full set of individual-level covariates described above in all models, including a cubic transformation of 8th grade math and ELA test scores.[8] We estimate a model using each of two sets of school-level controls. The first set includes school-by-cohort composition measures only and is most similar to the set used for prior school practice effect estimates. The second set, which we consider more appropriate for estimating school practice effects, includes both the school composition and measures of schools' geographic context. The geographic context measures are those listed above, with quadratic transformations of the high school's distance to a UW campus and to the nearest private or out-of-state campus.[9]

Of chief interest is the extent to which geographic context matters above and beyond school composition. If the observed dispersion of school practice effects on 4-year college attendance attenuates when conditioning on geographic context, then previous claims about the importance of school practice may be overstatements. In supplementary analyses presented in Online Appendix B, we also examine whether the dispersion of school practice effect estimates is more sensitive to geography when 4-year college attendance, rather than academic achievement, is the outcome. If geographic context matters more for college attendance than for academic achievement, the *relative* importance of school practice for life chances after high school, compared to the importance of school practice for high school academic achievement, is overstated when not considering geographic context. Such a result would qualify Jennings et al. (2015) result that high school effects on 4-year college attendance vary more than school effects on academic achievement. It also would indicate that school geographic context is uniquely important for the college attendance decision.

We also examine if the variability in school effectiveness differs based on students' family incomes. In order to test this possibility, we divide the student population into three groups: students who received free- or reduced-lunch in all observed years (15% of the sample), students who sometimes but not always received it (27%), and students who never

[8] The cubic specification reduces the Bayesian Information Criterion of our full model by 4434 relative to the quadratic specification and by 9122 relative to the linear specification. Therefore, including cubic transformations of test scores improves model fit to a dramatic extent that far outweighs the loss in parsimony.

[9] This nonlinearity is theoretically compelling: we expect that a unit increase in distance to the nearest college will matter less the farther a student is from a college, since the student will probably have to move away from home whether she is, for example, 70 or 100 miles away from a college, but the same is not true in the case of 5 versus 35 miles. We also find that including the squared term significantly improves model fit: it reduces the Bayesian Information Criterion of the college attendance model by 38 compared to the model with a linear term alone. Most students are much closer to a 2-year college and so including a squared term for the distance to a 2-year college does not improve the model.

received it (57%). We term the first group *persistently low-income,* the second group *sometimes low-income*, and the third group *never low-income*. Persistently low-income students have the lowest family incomes and a student in this group is more likely to be in poverty than a sometimes low-income student, even during years that both students are eligible for FRPL (Michelmore and Dynarski 2017). We estimate the same three-level hierarchical model separately for each income group, and compare the magnitude of the variation in school effects. This income-stratified analysis is particularly relevant to school accountability policies that enact special incentives related to low-income students' outcomes, policies that implicitly assume schools vary widely in their effectiveness for low-income students in particular.

Results

Descriptive Statistics

Table 1 provides a descriptive portrait of the analytic sample. Overall, 38% of students in the analytic sample attend a 4-year college. The average student spends 31% of observed years eligible for FRPL. The high standard deviation of this measure, 0.4, illustrates how students in the sample occupy many positions on the spectrum of economic advantage. About 79% of the students are non-Hispanic white, 9% non-Hispanic black, 7% Hispanic, and 5% either of another race or of multiple races. The means of school composition measures, of course, mirror the means of the corresponding individual student characteristics. Reflecting Wisconsin's marked school segregation, though, school composition measures are highly dispersed; for example, while students receive FRPL for 31% of observed years at the average school, they receive FRPL for 50% of observed years at a school only one standard deviation above the mean in terms of economic composition. The socioeconomic characteristics of the adults also vary widely across school districts; for example, 26% of adults in the average district work in blue-collar industries, versus 34% in districts one standard deviation above the mean. One quarter of students in Wisconsin attend rural school districts. Finally, public 4-year colleges in Wisconsin are far from equally spread across the state—a student living one standard deviation above the mean in terms of distance to a UW campus is nearly twice as far from the nearest UW campus as is the average student (36 versus 20 miles).

School Effects with and without Adjustment for Geographic Context

We find that accounting for geographic context significantly attenuates the dispersion of school effects on 4-year college attendance. The first column of Table 2 displays the dispersion in school effects using different sets of school-level controls. Table A1 in Online Appendix A presents the full sets of coefficients from these models. The last two columns of Table 2 compare the variation of each model with the variation in effects controlling for only student-level and school composition measures. We use this model as a reference because this is the set of controls researchers have typically used to estimate school practice effects. We make the comparisons in two metrics—standard deviation and variance—because while standard deviations are more intuitive, many prior studies describe variation across schools in terms of variance. When we adjust for the geographic context of schools in addition to school composition, the standard deviation of school effects on

Table 1 Means and standard deviations of each measure analyzed in study

Variable	Mean	Standard deviation
Student-level characteristics		
4-year college attendance	0.38	
10th grade math	50.21	28.85
10th grade ELA	50.07	28.84
White	0.79	
Black	0.09	
Hispanic	0.07	
Other/multiple race	0.05	
Female	0.49	
Has ever had disability	0.16	
Proportion of years FRL	0.31	0.40
Proportion of years ELL	0.04	0.17
Number of absences in 8th grade	9.06	12.13
Was suspended in 8th grade	0.07	
8th grade math	0.00	1.00
8th grade ELA	0.00	1.00
School composition characteristics		
% Black	0.09 (before z-scoring)	0.18 (before z-scoring)
% Hispanic	0.07 (before z-scoring)	0.09 (before z-scoring)
% Other/multiple race	0.05 (before z-scoring)	0.06 (before z-scoring)
% Disabled	0.16 (before z-scoring)	0.37 (before z-scoring)
Avg. proportion of years FRL	0.31 (before z-scoring)	0.19 (before z-scoring)
Avg. proportion of years ELL	0.04 (before z-scoring)	0.05 (before z-scoring)
Avg. absences in 8th grade	9.06 (before z-scoring)	7.02 (before z-scoring)
% suspended in 8th grade	0.07 (before z-scoring)	0.11 (before z-scoring)
Avg. 8th grade math	50.19 (pct. points, before z-scoring)	10.99 (pct. points, before z-scoring)
Avg. 8th grade ELA	50.03 (pct. points, before z-scoring)	9.10 (pct. points, before z-scoring)
Geographic context characteristics		
% Unemployed in county	0.07 (before z-scoring)	0.02 (before z-scoring)
% in blue collar jobs in district	0.26 (before z-scoring)	0.08 (before z-scoring)
Rural	0.25	
Distance to UW campus	19.56 mi (before z-scoring)	16.23 mi (before z-scoring)
Distance to 2-year college	7.95 mi (before z-scoring)	7.58 mi (before z-scoring)
Distance to other 4 year college	20.85 (before z-scoring)	23.64 (before z-scoring)

college attendance falls from 6.3 to 5.3 percentage points. This decline accounts for more than a quarter (28%) of the variance in traditional school effect estimates.[10]

[10] In Online Appendix B, we show that the variance in school practice effect estimates with respect to test scores drops by only 5% after accounting for geographic context. Thus, if high schools seem to matter more for college attendance than for academic achievement under traditional estimates (Jennings et al. 2015), schools' apparent importance for the two outcomes converge upon adjusting for differences in geographic context. In Online Appendix B, we also show that geographic context coefficients all have low magnitude when academic achievement is the outcome, in contrast to many of the geographic context coefficients observed when 4-year college attendance is the outcome.

Table 2 Standard deviations of school effect estimates from random-intercept hierarchical linear models of 4-year college attendance with different sets of controls

School-level controls	SD of school effects	SD of school effects as fraction of composition specification	Variance of school effects as fraction of composition specification
School composition	0.063	1.00	1.00
Geographic + school composition	0.053	0.85	0.72

Both models include student-level controls

Table 3 Standard deviations of school effect estimates from random-intercept hierarchical linear models for 4-year college attendance for different income groups

	SD of school effects	SD of school effects as fraction of SD for never low-income	Variance of school effects as fraction of SD for never low-income
Persistently low-income	0.039	0.66	0.44
Sometimes low-income	0.042	0.70	0.49
Never low-income	0.060	1.00	1.00

All models include student-level, school composition, and geographic context controls

School Effect Heterogeneity by Family Income

We next examine heterogeneity in school effects on college attendance by students' level of economic disadvantage. In order to do this, we divide students into three groups according to how frequently they receive subsidized lunch (persistently, sometimes, and never eligible) and estimate separate versions of our preferred school effects model with geographic context controls. Stratifying the sample allows all model parameters to vary across income categories. The resulting standard deviations of school effects are presented in column 1 of Table 3 for each income group. In absolute terms, the distribution of school effects becomes tighter as the level of economic disadvantage increases; there is far more variation in schools' contributions to college attendance among never low-income students (standard deviation = 6.0 percentage points) than among persistently low-income students (standard deviation = 3.9 percentage points), with sometimes low-income students falling in the middle (standard deviation = 4.2 percentage points). The next two columns in Table 3 present each group's distribution of school effects as a percentage of the distribution for higher income students, first as standard deviations then as variances. These differences are large. A never disadvantaged student who attends the 95th percentile high school instead of the 5th percentile high school is about 20 percentage points more likely to attend a 4-year college as a result, all else equal. For persistently disadvantaged students this difference is 66% as large, or about 13 percentage points.

The income-based differences in dispersion may arise in part because persistently low-income students are furthest from the margin of college attendance—on average, only 17% of persistently low-income students attend a 4-year college compared to 21% and 52% of sometimes and never low-income students, respectively. This makes higher-income students more sensitive to changes in their environment and school in an absolute sense.

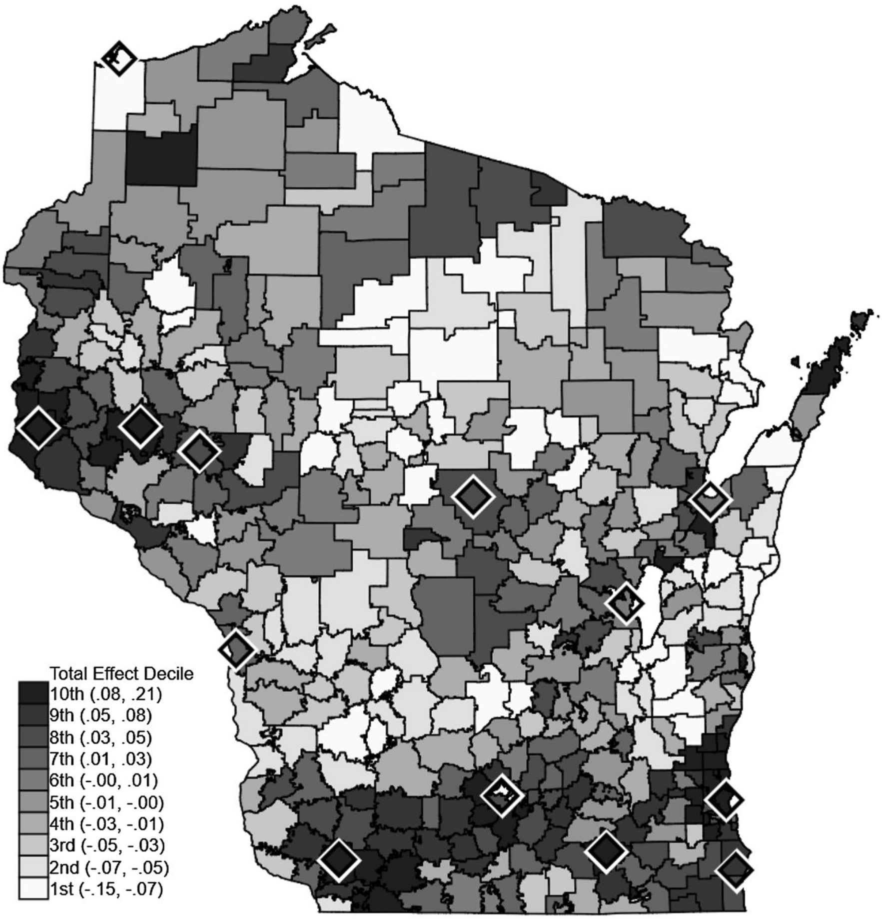

Fig. 1 Wisconsin school districts shaded according to each district's total effect on 4-year college attendance. Diamond markers represent University of Wisconsin bachelor's-granting campuses

However, since this comparison remains substantively the same when using hierarchical logistic regression models (results not shown, available upon request), which assume a continuous latent variable, there is reason to believe that proximity to the margin of attendance cannot fully explain differences in school effects across income groups. It is possible that existing school policies simply hold more sway over higher-income versus lower-income students' transition to college.

What Aspects of Geography Are Associated with College Attendance?

Geography is conspicuously relevant when we map all Wisconsin school districts and shade them according to their effects on college attendance net of individual student characteristics only (Fig. 1). We do not map high schools themselves because so many students attend school outside of their attendance area, especially in Milwaukee's school district,

Table 4 Geographic context coefficients from hierarchical linear model of 4-year college attendance

	4 years College attendance	
Distance to UW campus	– 0.023	(0.006)
Distance to UW campus (squared)	0.003	(0.002)
Distance to 2-year college	0.017	(0.003)
Distance to other 4 year college	0.000	(0.006)
Distance to other 4 year college (squared)	– 0.002	(0.003)
% in blue collar jobs in district	– 0.030	(0.004)
County-by-year Unemployment rate	– 0.004	(0.002)
Rural	0.012	(0.006)

All continuous independent variables are z-scored. Robust standard errors are in parentheses

which has a particularly marketized educational system. But as previously noted, most districts in Wisconsin have only one high school. Thus, we shade districts according to their total effect as measured by their random intercepts from a model analogous to that detailed in the Analytic Strategy section, but with random intercepts for districts instead of schools and without any school-level variables. Previous claims that space influences individuals' decisions to attend a 4-year college (Turley 2009) has face validity according to Fig. 1: districts with good outcomes cluster together spatially, often around UW campuses. Similar students far from a UW campus attend 4-year colleges less often.

We reconfirm previous findings about how proximity to postsecondary institutions correlates with 4-year college attendance. Proximity to a UW campus is associated with 4-year college attendance even net of all measured student-level, school composition, and geographic context characteristics. Coefficients of geographic context measures, estimated with our full model that predicts 4-year college attendance, are in Table 4. Going to high school 3 miles away from a UW campus (10th percentile of distance distribution) is associated with a 5-percentage point advantage in the probability of attending a 4-year college compared to going to high school 40 miles away from a UW campus (90th percentile). Students who go to high school close to a 2-year college are less likely to attend a 4-year college. In particular, a student one mile from the nearest 2-year college, the 10th percentile, is about 4 percentage points less likely to attend a 4-year college compared to a student 18 miles from the nearest 2-year college, the 90th percentile (Fig. 2). These results provide suggestive evidence that nearby postsecondary institutions pull students, whether these institutions are 4-year or 2-year colleges·

It is possible that the 4-year college attendance gradient with respect to UW campus proximity instead reflects the geographic distribution of school resources and counseling opportunity structures between high schools[11] (Engberg and Gilbert 2014). We test this proposition to the best of our ability, given data limitations, and do not find evidence for it. We estimate models that add four school resource measures: per-pupil expenditures, the number of AP or IB courses offered, the student:counselor ratio, and the student:teacher ratio. All college proximity coefficients are the same to two decimal places when we include these school resource measures compared to when we omit them (full results available upon request). Nevertheless, we cannot rule out the possibility that unobserved school

[11] We thank an anonymous reviewer for this astute observation.

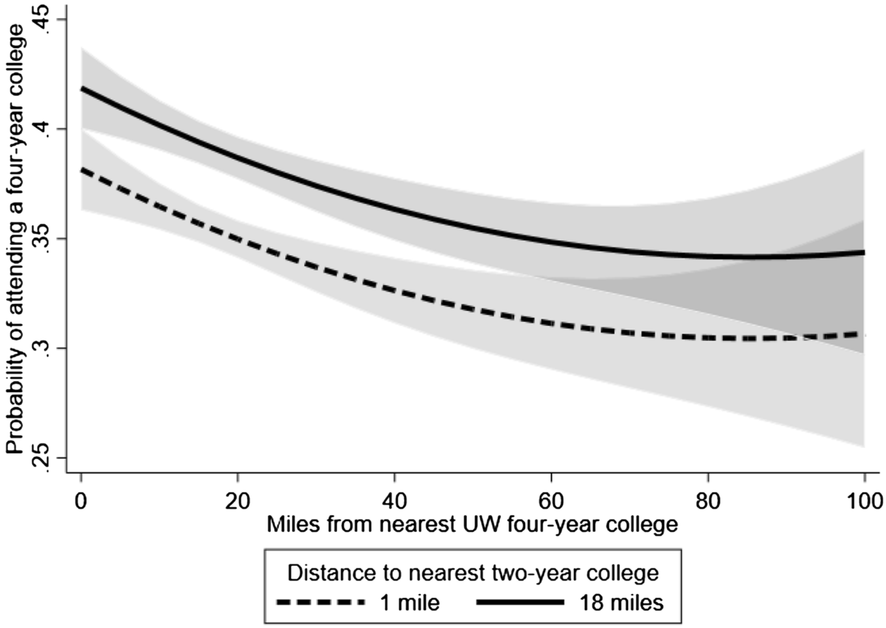

Fig. 2 Predicted probability of 4-year college attendance as a function of distance to a UW campus and distance to a public 2-year college, conditional on student-level, school composition, and geographic context characteristics. Shaded areas represent robust 95% confidence intervals

resource and counseling opportunity features explain the relationship between college proximity and 4-year college attendance.

We find that blue-collar work available in students' communities is associated with college attendance, which is consistent with claims that the labor markets available to students inform their postsecondary decisions (Bozick 2009). We treat the proportion of the local labor force that is in blue-collar occupations as a proxy for the availability of jobs that do not require a bachelor's degree. An 8-percentage point (one standard deviation) increase in the percentage of the labor force that is blue-collar is associated with a 3-percentage point decrease in the probability of attending a 4-year college (Table 4).

To our surprise, rurality is slightly positively associated with 4-year college attendance net of all other measured geographic, school composition, and student-level characteristics (Table 4). Findings from national data sources, in contrast, suggest that rurality is negatively associated with 4-year college attendance, in part because rural youth are disproportionately likely to attend 2-year colleges (Byun et al. 2012, 2017). In Wisconsin, disparities in school composition and geographic factors like distance to a UW campus explain the rurality disadvantage in 4-year college attendance. This is not to say that rural high school students fare better than comparable nonrural high school students. On the contrary, rural areas of Wisconsin send a relatively small fraction of their students to 4-year colleges, net of individual student characteristics. This relationship, though, is fully mediated by other school characteristics that we use to predict 4-year college attendance.[12]

Conclusion

This study merges literature on differential school effectiveness with literature on the geography of opportunity. This merger is timely given two recent waves of research: one arguing that high schools matter a good deal for whether students go on to attend college, and another illustrating how geographic context shapes youth's decisions to attend college. We ask how much of the apparent variation in school effectiveness on college attendance is attributable to geographic context. We find that differences in high school effectiveness for college attendance are overstated when not accounting for geographic context because factors like local labor market opportunities and proximity to colleges correlate strongly with college attendance. Prior studies have typically attributed variation in college attendance due to these factors to school practices and policies.

Our results accord with theories of how space influences youth's decisions to continue or terminate their education (Duncan 1965; Galster and Killen 1995; Turley 2009). While we have not attempted to prove causality, our evidence suggests that otherwise similar youth in different locations across Wisconsin are differentially inclined to pursue a college degree. These associations, which largely replicate results based on other samples, are important both to scholars theoretically interested in the geography of opportunity as well as to higher education professionals trying to target high school students who are otherwise least likely to attend college. Nearby UW campuses seem to pull youth to attend them, perhaps for reasons of convenience or socialization. Youth in areas with high unemployment rates and few jobs requiring a bachelor's degree are less likely to attend a 4-year college, potentially because the opportunity costs of attending are lower for these youth than the opportunity costs for youth in areas with ample blue-collar job openings. In short, our findings support Turley's (2009) position that research should situate the college decision process within the geographic context in which it occurs.

We argue that a view of school effectiveness as being more variable than it really is gives too much credit to the principle upon which recent education policy is founded: that an ineffective school can adjust its practices to match a more effective school and, in turn, cause students to see substantially greater outcomes than before. The narrower the difference between the most and least effective schools, the less this principle holds water. We acknowledge that schools vary in their effectiveness, and ourselves find nontrivial variability among Wisconsin public schools. Nevertheless, we advocate for a maximally accurate assessment of school variability so as not to rely too much on schools to foster positive student outcomes.

Similarly, an exaggerated picture of school variability can reinforce the U.S.'s education-driven social welfare strategy, which we consider insufficient to address inequality in students' life chances. Federal policy has pushed not only to have schools promote the success of their students overall, but also of specific subgroups, including low-income students. Our findings show that schools vary even less in their effectiveness for persistently

[12] Results (available upon request) from an otherwise identical model that omits all other school-level characteristics estimates that students in rural districts have a 3-percentage point 4-year college attendance disadvantage relative to non-rural districts.

low-income students than for higher-income students. When the importance of schools for low-income students' outcomes is overstated, too much burden is placed on schools to ameliorate social inequality (Kantor and Lowe 2013). Neoliberal regimes that make schools compete to cultivate human capital can then more easily take precedence over policies that directly impact disadvantaged individuals' material conditions. We echo recent calls to compare the cost-effectiveness of education-based reforms, such as government-provided pre-school, to that of reforms that reduce inequality in youth's conditions outside of school, such as health care expansion (Downey and Condron 2016; Morsy and Rothstein 2015; Whitehurst 2016).

Methodologically, we argue that models estimating school practice effects should control for geographic factors, especially when college attendance behavior is the outcome of interest. These factors likely influence educational outcomes, yet schools cannot manipulate them in any obvious way. Therefore, models that omit these variables attribute the influence of geographic context to school practice. Willms and Raudenbush (1989) were the first to recommend controlling for geographic context when estimating school practice effects, but most researchers control for school context using only school composition and not geographic context. Our results empirically point to the importance of the latter controls for youths' educational attainment, though not for their achievement growth.

Future research may investigate potential mechanisms that explain how geographic factors influence college attendance. Our finding that proximity to colleges is associated with college attendance is in harmony with findings from multiple decades of research (Klasik et al. 2018; Lapid 2016; Rouse 1995; Turley 2009), but there is relatively little knowledge of why this relationship exists. Perhaps the mechanism is that nearby colleges allow individuals to pursue a bachelor's degree without weakening existing familial and social ties and, in many cases, without forgoing the financial break of living with family. Alternatively, perhaps colleges instill the local area with a culture of higher education, exposing local youth to the tastes of college-educated people and quelling any hesitations about the college student lifestyle. In contrast, the association may not be causal at all and may merely reflect the sorting of high-achieving, college-inclined youth in areas with available colleges (Tinto 1973), although our finding that geographic factors have no net association with academic achievement growth in high school weakens—but does not entirely discredit—this proposition. Research that adjudicates between these and other explanations can inform interventions that attempt to raise college attendance rates.

Future research may also investigate the role of geographic context in explaining between-school differences in other student outcomes. For example, high schools appear to vary substantially in their effectiveness vis-à-vis students' long-term earnings after exiting high school (Altonji and Mansfield 2011), but it is possible that the observed variation is due to geographic factors, like local labor market opportunities, that affect earnings and differ across schools. If this were found to be the case, high schools would appear more responsible than they really are for youths' economic positions in adulthood.

Acknowledgements We are grateful for comments on previous drafts of this work that we received from Nick Hillman, Eric Grodsky, Jordan Conwell, Monica Grant, Leafia Ye, and participants of the 2018 Midwest Sociology of Education Conference. We are also grateful for the expertise of Carl Frederick and others at the Wisconsin Department of Public Instruction who assisted us with Wisconsin's Statewide Longitudinal Data System. The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Award #R305B150003 to the University of Wisconsin-Madison. The opinions expressed are those of the authors and do not represent views of the U.S. Department of Education. This work was also supported by a grant from the U.S. Department of Education, Institute for Education Sciences to the Wisconsin Department of Public Instruction (R372A 150031). Any views, opinions, findings, or conclusions expressed in this paper are those of the authors and do not necessarily reflect the views of the Institute for Education Sciences, the Department of Public Instruction, WCER, or cooperating institutions.

References

Adelman, C. (2006). *The toolbox revisited: Paths to degree completion from high school through college*. US Department of Education.

Alm, J., & Winters, J. V. (2009). Distance and intrastate college student migration. *Economics of Education Review, 28*(6), 728–738.

Altonji, J. G., & Mansfield, R. (2018). Estimating group effects using averages of observables to control for sorting on unobservables: School and neighborhood effects. *American Economic Review, 108*(10), 2902–2946.

Altonji, J. G., & Mansfield, R. (2011). The role of family, school, and community characteristics in inequality in education and labor-market outcomes. In G. Duncan & R. Murnane (Eds.), *Whither opportunity? Rising inequality, schools, and children's life chances* (pp. 339–358). New York: Russell Sage.

Alvarado, S. E., & Turley, R. N. L. (2012). College-bound friends and college application choices: Heterogeneous effects for Latino and White students. *Social Science Research, 41*(6), 1451–1468.

Bacher-Hicks, A., Billings, S. B., & Deming, D. J. (2019). *The school to prison pipeline: Long-run impacts of school suspensions on adult crime* (No. w26257). National Bureau of Economic Research.

Betts, J. R., & Mcfarland, L. L. (1995). Safe port in a storm: The impact of labor market conditions on community college enrollments. *The Journal of Human Resources, 30*(4), 741–765.

Borman, G., & Dowling, M. (2010). Schools and inequality: A multilevel analysis of Coleman's equality of educational opportunity data. *Teachers College Record, 112*(5), 1201–1246.

Bozick, R. (2009). Job opportunities, economic resources, and the postsecondary destinations of American Youth. *Demography, 46*(3), 493–512.

Bozick, R., & DeLuca, S. (2011). Not making the transition to college: School, work, and opportunities in the lives of American Youth. *Social Science Research, 40*(4), 1249–1262.

Byun, S., Meece, J. L., & Agger, C. A. (2017). Predictors of college attendance patterns of rural youth. *Research in Higher Education, 58*, 817–842.

Byun, S., Meece, J. L., Irvin, M. J., & Hutchins, B. C. (2012). Rural-nonrural disparities in postsecondary educational attainment revisited. *American Educational Research Journal, 49*(3), 412–437.

Coleman, J. S., Campbell, E. Q., Hobson, C. J., McPartland, P., Mood, A. M., Weinfeld, F. D., et al. (1966). *Equality of educational opportunity*. Washington, DC: Government Printing Office.

Cox, B. E., McIntosh, K., Reason, R. D., & Terenzini, P. T. (2014). Working with missing data in higher education research: A primer and real-world example. *The Review of Higher Education, 37*(3), 377–402.

Cullen, J. B., Jacob, B. A., & Levitt, S. (2006). The effect of school choice on participants: Evidence from randomized lotteries. *Econometrica, 74*(5), 1191–1230.

Deming, D. J. (2011). Better schools, less crime? *Quarterly Journal of Economics, 126*(4), 2063–2115.

Deming, D. J., Hastings, J. S., Kane, T. J., & Staiger, D. O. (2014). School choice, school quality, and postsecondary attainment. *American Economic Review, 104*(3), 991–1013.

Downey, D. B., & Condron, D. J. (2016). Fifty years since the Coleman Report: Rethinking the relationship between schools and inequality. *Sociology of Education, 89*(3), 207–220.

Duncan, B. (1965). Dropouts and the Unemployed. *Journal of Political Economy, 73*(2), 121–134.

Dynarski, S. M., Hemelt, S. W., & Hyman, J. M. (2015). The missing manual: Using National Student Clearinghouse data to track postsecondary outcomes. *Educational Evaluation and Policy Analysis, 37*, 53–79.

Engberg, M. E., & Gilbert, A. J. (2014). The counseling opportunity structure: Examining correlates of 4-year college-going rates. *Research in Higher Education, 55*(3), 219–244.

Engberg, M. E., & Wolniak, G. C. (2010). Examining the effects of high school contexts on postsecondary enrollment. *Research in Higher Education, 51*(2), 132–153.

Frenette, M. (2009). Do universities benefit local youth? Evidence from the creation of new universities. *Economics of Education Review, 28*(3), 318–328.

Galster, G. C., & Killen, S. P. (1995). The geography of opportunity: A reconnaissance and conceptual framework. *Housing Policy Debate, 6*(1), 7–43.

Galster, G., & Sharkey, P. (2017). Spatial foundations of inequality: A conceptual model and empirical overview. *RSF: The Russell Sage Foundation Journal of the Social Sciences, 3*(2), 1–33.

Guzman, G. G. (2017). *Household Income: 2016 American Community Survey Briefs*. Washington, DC: United States Census Bureau.
Heckman, J. J., Stixrud, J., & Urzua, S. (2006). The effects of cognitive and noncognitive abilities on labor market outcomes and social behavior. *Journal of Labor Economics, 24*(3), 411–482.
Hill, L. D. (2008). School strategies and the "college-linking" process: reconsidering the effects of high schools on college enrollment. *Sociology of Education, 81*(1), 53–76.
Hillman, N. W. (2016). Geography of college opportunity: The case of education deserts. *American Educational Research Journal, 53*(4), 987–1021.
Hillman, N. W., & Orians, E. L. (2013). Community Colleges And Labor Market Conditions: How does enrollment demand change relative to local unemployment rates? *Research in Higher Education, 54*(7), 765–780.
Jackson, C. K. (2018). What do test scores miss? The importance of teacher effects on non-test score outcomes. *Journal of Political Economy, 126*(5), 2072–2107.
Jencks, C., Smith, M., Acland, H., Bane, M. J., Cohen, D., Gintis, H., Heyns, B., & Michelson, S. (1972). *Inequality: A reassessment of the effect of family and schooling in America*. Basic Books.
Jennings, J. L., Deming, D., Jencks, C., Lopuch, M., & Schueler, B. E. (2015). Do Differences in school quality matter more than we thought? New evidence on educational opportunity in the twenty-first century. *Sociology of Education, 88*(1), 56–82.
Kantor, H., & Lowe, R. (2013). Educationalizing the welfare state and privatizing education: The evolution of social policy since the new deal. In P. L. Carter & K. G. Welner (Eds.), *Closing the opportunity gap: What America must do to give every child an even chance* (pp. 25–39). Oxford: Oxford University Press.
Katz, M. B. (2010). Public education as welfare. *Dissent, 57*(3), 52–56.
Klasik, D., Blagg, K., & Pekor, Z. (2018). Out of the education desert: How limited local college options are associated with inequity in postsecondary opportunities. *Social Sciences, 7*(9), 165–190.
Klugman, J. (2012). How resource inequalities Among high schools reproduce class advantages in college destinations. *Research in Higher Education, 53*(8), 803–830.
Klugman, J., & Lee, J. C. (2019). Social closure, school socioeconomic composition, and inequality in college enrollments. *Social Science Research, 80*, 156–185.
Lapid, P. A. (2016). Expanding college access: The impact of new universities on local enrollment. *Job Market Paper*.
Leppel, K. (1993). Logit estimation of a gravity model of the college enrollment decision. *Research in Higher Education, 34*(3), 387–398.
Manoli, D., & Turner, N. (2018). Cash-on-hand and college enrollment: Evidence from population tax data and the earned income tax credit. *American Economic Journal: Economic Policy, 10*(2), 242–271.
McDonough, P. M. (1997). *Choosing colleges: How social class and schools structure opportunity*. Albany, NY: State University of New York Press.
Morgan, S. L., & Jung, S. B. (2016). Still No Effect of Resources, Even in the New Gilded Age?. RSF: The Russell Sage Foundation. *Journal of the Social Sciences*, *2*(5), 83–116.
Michelmore, K., & Dynarski, S. (2017). The gap within the gap: Using longitudinal data to understand income differences in educational outcomes. *AERA Open*, *3*(1), 2332858417692958.
Morsy, L., & Rothstein, R. (2015). *Five social disadvantages that depress student performance: Why schools alone can't close achievement gaps. Report*. Washington, DC: Economic Policy Institute.
National Center for Education Statistics. (2018). '*Fast Facts: State-by-State Rankings*.' Retrieved December 4, 2018, from https://nces.ed.gov/fastfacts/display.asp?id=62.
Raudenbush, S. W., & Willms, J. (1995). The estimation of school effects. *Journal of Educational and Behavioral Statistics, 20*(4), 307–335.
Rivkin, S. G. (1995). Black/white differences in schooling and employment. *The Journal of Human Resources, 30*(4), 826–852.
Rouse, C. (1995). Democratization or diversion? The effects of community colleges on educational attainment. *Journal of Business and Economic Statistics, 13*(2), 217–224.
Rumberger, R., & Palardy, G. (2005). Test scores, dropout rates, and transfer rates as alternative indicators of high school performance. *American Educational Research Journal, 42*(1), 3–42.
Smeeding, T., & Thévenot, C. (2016). Addressing child poverty: How does the United States compare with other nations? *Academic Pediatrics, 16*(3 Suppl), S67–S75.
Sutton, A. (2017). Preparing for local labor: Curricular stratification across local economies in the United States. *Sociology of Education, 90*(2), 172–196.
Sutton, A., Bosky, A., & Muller, C. (2016). Manufacturing gender inequality in the new economy: High school training for work in blue-collar communities. *American Sociological Review, 81*(4), 720–748.

Tinto, V. (1973). College proximity and rates of college attendance. *American Educational Research Journal, 10*(4), 277–293.

Turley, R. N. L. (2009). College proximity: Mapping access to opportunity. *Sociology of Education, 82*(2), 126–146.

Turley, R. N. L. (2006). When parents want children to stay home for college. *Research in Higher Education, 47*(7), 823–846.

U.S. Department of Agriculture. (2015). Child nutrition programs—income eligibility guidelines. *Federal Register*, *80*(190), 9–10.

Whitehurst, G. J. (2016). Family Support or School Readiness? Contrasting Models of Public Spending on Children's Early Care and Learning. Evidence Speaks Reports, Vol 1, #16. *Center on Children and Families at Brookings*.

Willms, J. D., & Raudenbush, S. W. (1989). A longitudinal hierarchical linear model for estimating school effects and their stability. *Journal of Educational Measurement, 26*(3), 209–232.

Woods, C. S., & Domina, T. (2014). The school counselor caseload and the high school-to-college pipeline. *Teachers College Record, 116*(10), 1–30.