Three Essays on Higher Education and Inequality

by

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REQUIRED DISCLAIMER

CHAPTER ONE: INTRODUCTION

Economic inequality has grown in the United States over the past fifty years, reaching a level not seen in a century (Saez and Zucman 2020), though it has plateaued in the last decade due to wage growth at the bottom of the distribution (Aeppli and Wilmers 2022). At the same time, institutions of higher education have both grown and diversified, incorporating formerly excluded populations in new ways. These two trends are intimately entwined: industrial decline and the rise of computerized and knowledge-based work have polarized the rewards to work, dramatically increasing higher education's importance for socioeconomic attainment (Goldin and Katz 2008; Liu and Grusky 2013). The economic rewards to earning a college degree grew rapidly over the 1980s and 1990s amidst falling then stagnating compensation among the less educated (Acemoglu and Autor 2012; Binder and Bound 2019). Additionally, the advantages of educational attainment in the new economy have continued to shift outward: the returns to postgraduate degrees account for much of the recent the wage growth among the highly educated (Acemoglu and Autor 2012; Lindley and Machin 2016).

Children and their families have responded to the growing importance of educational attainment for economic success in adulthood, and college has become a typical experience for youth adults in the United States. A majority of high school students have long reported that they aspire to complete a baccalaureate degree, and most do enroll in a higher education institution of some kind, even as more students take nontraditional pathways through education, failing to complete or taking longer to do so (Goyette 2008; Zarifa et al. 2018). Competition has also dramatically increased for slots in the nation's most selective colleges (Hoxby 2009). The perception among parents and their children that elite degrees are particularly secure investments in a middle-class future has prompted fervent efforts among high school students and their parents to appeal to admissions officers (Bound, Hershbein, and Long 2009; Stevens 2009).

These developments in the role of higher education for the transmission of advantages across generations and for the maintenance of racial inequality have implications that are only just emerging. Once considered the ‘great equalizer’ (Hout 1988; Torche 2011), more recent evidence has begun to question the extent to which college degrees reduce inequality (Fiel 2020; Witteveen and Attewell 2017a; Zhou 2019). On the other hand, while socioeconomic disparities in baccalaureate degree attainment have grown and the returns to college have increased, we have little evidence that intergenerational correlations in income have grown as a result (Bailey and Dynarski 2011; Bloome, Dyer, and Zhou 2018; Chetty et al. 2014). Even as racial disparities in educational attainment have shrunk, labor market outcomes have not much equalized (Bayer and Charles 2018). Slowly converging rates of college attainment by race conceal stark racial segregation in the types of institutions that individuals attend, resulting in racial disparities in the quantity and quality of educational resources college students can access (Baker, Klasik, and Reardon 2018). Horizontal stratification among institutions of higher education may be increasingly important for both race and socioeconomic inequality in life chances. And as graduate and professional degree attainment rates have grown, sociologists have increasingly examined whether and how that sector of higher education abets social reproduction or counters it (In and Breen 2022; Oh and Kim 2019; Posselt and Grodsky 2017; Torche 2011).

This dissertation consists of three studies that seek to shed light on the consequences of these ongoing transformations of higher education’s role in social stratification. In each study, I seek to illuminate how higher education has altered inequality and the transmission of advantages across generations in the United States. The first chapter examines the most educated

Americans: graduate and professional degree holders. The subsequent two chapters, by contrast, shift focus to young adults' transition into higher education, examining how schools and local labor markets shape racial inequality in the transition from high school to college.

Chapter Two sheds new light on educational attainment and earnings at the top of the educational distribution. Elite colleges and universities have long been a subject of sociological inquiry, and have received increasing attention in recent years (e.g., Chetty, Friedman, Saez, Turner, & Yagan, 2017). However, far less attention has been focused on distinctions among graduate and professional degree programs, and how they relate to labor market inequality. In this chapter, I add to this emerging literature with a new data source drawn from a large, nationally representative survey of the most educated. I link individual responses to the National Survey of College Graduates with Census Bureau records to take an unprecedented look at the educational histories and labor market experiences of the most highly educated Americans. Using these novel data collected over the last 30 years, I track recent historical changes in who attains top graduate and professional degrees in research doctorate, MBA, law, and medical programs. I find a marked increase in the influence of parental education on elite degree attainment, such that top graduate and professional programs are increasingly training the children of parents who themselves earned graduate degrees. This novel evidence suggests the solidifying of an intergenerational class of highly educated professionals in the United States. Second, I explore the earnings returns to program rank across different degree types, and by gender and parents' education. Unlike at the baccalaureate level, the earnings returns to prestige vary significantly across fields, such that they are much higher in MBA and JD programs than research doctorates or medical programs. I also find that the earnings returns to prestige are higher for children from less-educated families, suggesting a potential equalizing effect of elite institutions.

Chapter Three examines how local labor markets shape college attendance differently by race and gender among low-income students. A long-standing sociological literature has established the empirical regularity that white students are substantially less likely to attend four-year colleges than are Black students with similar socioeconomic resources and academic performance. Drawing on accounts of racial labor market segregation among workers without bachelor's degrees, I hypothesize that racialized access to good, sub-baccalaureate jobs—for instance, jobs in the trades—account for some of the differences in the motivation to pursue a bachelor's degree, and thus may account for the differences in college attendance. I test this hypothesis empirically by examining variation in the net-Black advantage across places with differing degrees of racial occupational segregation, separately for Black and white boys and girls. Using administrative data on all public-school students in Wisconsin and Bayesian hierarchical models, I do not find clear support for my hypothesis. Labor market segregation is unrelated to four-year college attendance differences between similarly performing, low-income white and Black students. However, I do find novel evidence that white boys are more likely than Black boys to attend two-year colleges in places with more racially segregated labor markets. This finding suggests that a net-White advantage in vocational higher education pathways parallels the net-Black advantage in four-year college attendance, and provides some support for the hypothesized labor market pathway.

Chapter Four, co-authored with Christian Michael Smith, examines high school tracking on the path to college. Prior work in sociology has produced conflicting evidence on whether and to what extent school officials' decision-making contributes to racialized tracking. We advance this literature by examining the effects of schools' enrollment policies for Advanced Placement (AP) courses. Using a unique combination of school survey data and administrative data from Wisconsin, we examine what happens to racial inequality in AP participation when school officials enforce performance-based selection criteria, which we call "course gatekeeping." We find that course gatekeeping has racially disproportionate effects. Although racialized differences in prior achievement partially explain the especially large negative effects among students of color, course gatekeeping produces Black-white and Hispanic-white disparities in participation even among students with similar, relatively low prior achievement. We further find that course gatekeeping has longer-run effects, particularly discouraging Black and Asian or Pacific Islander students from attending highly selective four-year colleges.

CHAPTER TWO: HORIZONTAL STRATIFICATION AMONG GRADUATE AND PROFESSIONAL DEGREES

Introduction

Growing income inequality is driven in part by changes in the demand for and distribution of skills (Song, Lachanski, and Coleman 2021). Among scholars and the public, there has been particular interest in rising inequality at the very top of the income distribution (Saez and Zucman 2020). The role of educational institutions and educational attainment in US economic inequality is critical to our understanding of the causes and consequences of social inequality broadly. Two hallmarks of the economic elite are the attainment of graduate and professional degrees and employment in top management and the professions; perhaps increasingly so (Keister 2014). But rather than the stereotypical image of the top percentile earner as a corporate manager or chief executive, the typical top earner works in professional services like law or medicine, often owning a small business in that field (Guvenen, Kaplan, and Song 2020; Kopczuk and Zwick 2020). The rising returns to graduate education and the increasing importance of abstract knowledge and professional expertise to economic rewards in the modern economy are thus key areas for social science inquiry aimed at understanding contemporary economic elites.

Sociologists have long held that colleges and universities are key institutions in the production and maintenance of elite status (Khan 2012; Mills 1956). However, much of the recent scholarly literature in this area has focused on the role of elite undergraduate institutions in the production of economic inequality and reproduction of advantage across generations (e.g. Chetty, Friedman, Saez, Turner, & Yagan, 2020). There has been relatively scant recent evidence on the role of graduate and professional degrees, despite their apparently increasing importance to understanding contemporary educational stratification (Posselt and Grodsky 2017).

This chapter aims to add to our understanding of the importance of postbaccalaureate education to social stratification by investigating horizontal stratification among those earning graduate and professional degrees. In particular, I examine recent historical changes in who earns degrees in medicine, law, business, and research doctoral programs from top-ranked programs. I also examine the association between graduate program prestige and personal earnings, paying particular attention to top earners given their meteoric gains in the past few decades. To accomplish these aims, I analyze a unique and rich data source on the educational careers and economic circumstances of a large sample of highly educated Americans in the National Survey of College Graduates (1993-2019).

Given the growth in graduate and professional degrees in the United States and their potential link to rising inequality, this chapter aims to add to our understanding of the importance of horizontal stratification among graduate and professional degrees in producing inequality in labor market outcomes. My inquiry has two components, informed by two broad research questions:

1. How does the attainment of prestigious graduate and professional degrees differ by race, gender, and social origins, and how have these patterns changed in recent history?
2. What are the earnings returns to graduate and professional degree prestige, and how do they vary by field, gender, parents' education, and over the recent past?

The analysis will focus on four degrees with widely circulated institutional rankings: business (MBAs), law (JDs), medicine (MDs), and research doctorates across fields of study (PhDs). Given the importance of the top of the earnings distribution to recent trends in inequality, I will also focus much of my analysis of earnings on the top percentile of the distribution.

Background

Attainment of top degrees

Elite colleges and graduate programs have long been important in the production and maintenance of the elite, but this function has coexisted with the imperative to promote social mobility and inclusion. For roughly the first half of the twentieth century, elite baccalaureate programs—along with boarding schools and exclusive clubs—were a common experience for the white, male heirs of fortunes made during the Gilded Age (Baltzell 1976; Karabel 2005; Mills 1956). MBA and law programs at Harvard or Yale capped off the educational sequence for many men of this elite class (Mills 1956).

However, during the postwar period and Civil Rights Era, elite educational institutions shifted their approach to elite reproduction (Khan 2011, 2012). Seeking to partially remedy historical injustices and to maintain legitimacy amidst forceful student protest movements in the 1960s and the broader context of the Civil Rights Movement, elite colleges began actively recruiting and preferentially admitting students from some racial minority and other formerly excluded groups (Karabel 2005; Skrentny 2002). Building on earlier efforts to use standardized measures of academic skills to bring more talented students from non-elite families into to elite institutions (Chauncey 1971; Khan 2011), these colleges also increasingly began to rely on academic criteria such as entrance exams to inform their admissions and financial aid decisions (Alon and Tienda 2007; Grodsky 2007; Karabel 2005; Stevens 2009). Graduate and professional programs at elite colleges followed suit, sometimes even preceding undergraduate programs in admitting Black and Hispanic students (Karabel 2005). Black students who were among the first beneficiaries of affirmative action at selective colleges went on to top-ranked MBA and professional programs at high rates (Bowen and Bok 1998).

Since mid-century, women have come to account for the majority of students in higher education, although the most selective universities have been slower to reach gender equality (Bielby et al. 2014; DiPrete and Buchmann 2013). Although women are approaching parity with men in overall enrollment in graduate and professional programs such as law and medicine, studies of gender disparities in prestige at the graduate level are scant. One study of all research doctorate earners found that women were less likely to earn degrees from top programs (Weeden, Thébaud, and Gelbgiser 2017). One objective of this study will be to investigate recent trends in gender disparities in graduate and professional prestige.

Elite undergraduate institutions have had less success—or perhaps less interest—in improving socioeconomic diversity in their student bodies. For decades, very few students at highly selective colleges have come from low-income or low-SES families (Bastedo and Jaquette 2011; Chetty, Friedman, et al. 2020; Grodsky 2007). However, these disparities are driven mostly by disparities in academic achievement and socioeconomic differences in application behavior. Even among similarly high achieving students, low-income students are significantly less likely to apply to highly selective colleges (Hoxby and Avery 2012; Radford 2013).

Due to the strong connection between selective undergraduate and top graduate programs, socioeconomic segregation at the baccalaureate level may well translate into similarly low socioeconomic diversity at the most selective graduate and professional programs, although there is little direct evidence on this question. Studies have found that high-income students with highly educated parents are more likely to earn the most lucrative *types* of graduate and professional degrees (Mullen, Goyette, and Soares 2003; Posselt and Grodsky 2017; Schultz and

Stansbury 2022; Torche 2011). But we lack evidence on the extent to which privileged students seek and gain advantages *within* graduate fields. One prominent sociological theory suggests that such students may be increasingly seeking admission to top programs within graduate fields. Effectively Maintained Inequality (EMI) predicts that socioeconomically advantaged groups seek quantitative educational advantages (i.e., years of schooling) where they are available, but that as a given level of schooling becomes more common, those groups will seek *qualitative* educational advantages (Lucas 2001). This suggests that as graduate and professional education becomes more common—as it has been over recent decades—that the socioeconomically advantaged will seek qualitative advantages such as institutional prestige. On the other hand, these degrees remain relatively uncommon—with only about one in seven individuals over age 25 holding a graduate degree (Census Bureau 2022). This may not be common enough to produce EMI's predicted pattern. A key objective of this study will be to examine whether this has occurred over recent decades.

The socioeconomic returns to institutional prestige

The second major component to this chapter is an examination of which institutional differences lead to substantial inequality in later life outcomes for graduates. Compared to the literature on the returns to baccalaureate degrees, there are relatively few empirical investigations of how horizontal stratification among graduate and professional degrees affects socioeconomic inequality among degree holders. In what follows, I first review the literature on the returns to elite baccalaureate degrees and consider the likely parallels to the postbaccalaureate level. Second, I argue that an important theoretical distinction between these levels of education is the role of the professions in determining the returns to graduate degrees. Because many graduate and professional degree programs are oriented toward specific professions—even if not all graduates end up in them—the characteristics of the professions will affect how the academic status hierarchy produces variation in socioeconomic outcomes. I approach degree fields (and therefore, professions) as a meso-level unit of analysis in the production of horizontal stratification. I will draw on Andrew Abbott's (1988) theoretical work to support this argument.

<u>The economic returns to baccalaureate prestige</u>

Much of the empirical work that investigates the importance of institutional prestige for labor markets focuses on the undergraduate level. This work finds that graduates from prestigious baccalaureate colleges earn far more than graduates from less- and non-selective colleges and children of elites are much more likely than their peers to attend elite colleges. Nearly 13 percent of students who attend 12 Ivy League and comparable colleges earn in the top one percent of their cohort by their early 30s, and about six percent of students in 62 other 'elite' colleges do the same (Chetty et al. 2017). Similarly, past studies of economic elites have found that top baccalaureate degrees are well-represented at the very top of corporate structures (Useem and Karabel 1986). At first blush, these descriptive findings support the contention that elite undergraduate programs are central to the (re)production of economic advantage.

However, there has been spirited scholarly debate over whether attending a prestigious and highly selective undergraduate institution *causally* increases individuals' earnings. Much of the association between college selectivity and earnings is due to elite colleges' proficiency at selecting students who are already well-connected, highly motivated, and skilled, and thus are likely to enter the economic elite regardless of where they attend college. Many studies that use covariate adjustment find that the association between college selectivity and socioeconomic outcomes gets smaller, but remains, when accounting for academic and other background factors (Black and Smith 2004; Bowen and Bok 1998; Brand and Halaby 2006; Conwell and Quadlin

2021; Witteveen and Attewell 2017b). Yet studies that employ stronger causal study designs find null effects on average (Chetty, Friedman, et al. 2020; Dale and Krueger 2002, 2014; Ge, Isaac, and Miller 2022). More broadly, while colleges do differ in the extent to which they causally influence later economic outcomes, it seems that selectivity or prestige is weakly correlated—if at all—with the dimensions of colleges that matter for earnings (Chetty, Friedman, et al. 2020; Mountjoy and Hickman 2020). An important and consistent exception to this finding is that elite college attendance is particularly influential for the economic outcomes of Black and Hispanic students and students from low-income families (Bleemer 2022; Chetty, Friedman, et al. 2020; Dale and Krueger 2014; Zhou 2019).

This accumulated evidence supports the hypothesis that elite colleges offer a set of resources and advantages that are largely redundant for their more privileged students' economic outcomes, but that do boost the earnings of students who come from less socioeconomically privileged contexts. This conclusion is surprising in light of the lengths to which high-SES parents go to get their students admitted to selective colleges (Stevens 2009). It is also surprising in light of the quantitative and qualitative studies that emphasize how top colleges' institutional structures and social life appear oriented toward fostering academic success and social connections among the children of the socioeconomic elite in particular (Armstrong and Hamilton 2013; Jack 2019; Michelman, Price, and Zimmerman 2020), and because elite college students appear to come to value, seek out, and are given preference for post-college jobs in the most lucrative sectors such as consulting and investment banking (Binder, Davis, and Bloom 2016; Rivera 2016).

One way to understand the contrast between the apparently low causal economic returns to prestige and the intense competition over access to top degrees is to consider other outcomes sought by advantaged students—and potentially influenced by institutional prestige—beyond income alone. It may be that elite colleges are particularly adept at selecting for and fostering young people's skills for cultural and symbolic production. These skills may not lead to exceptionally high earning careers relative to those pursued by graduates of less-selective colleges, but rather they may be particularly high-status ones (Brint et al. 2020; Brint and Yoshikawa 2017). It may also be that students see elite colleges as offering more options for varied pathways to high-earning jobs, or because they facilitate access fields that are appealing on other non-pecuniary dimensions like autonomy and flexibility.

The economic returns to graduate and professional degree prestige

There are two ways that the research findings on the returns to baccalaureate prestige may be relevant to the post-baccalaureate level. The first is the direct linkage between baccalaureate and postbaccalaureate prestige in the careers of students: as discussed above, top graduate and professional programs disproportionally select students from top colleges. Second, studies of baccalaureate colleges may be empirically relevant because of the parallels between the application and admissions processes at the baccalaureate and post-baccalaureate levels. Admissions rates are very low at top research doctorate, medicine, law, and business programs, and many of the same criteria are directly selected on in the admissions process: academic preparation, motivation, and skill. Thus, students who enroll and graduate from these programs may well have been financially successful regardless of where they attained their degree. Furthermore, just as at the baccalaureate level, the institutional knowledge about the process of application is likely unequally distributed according to students' social backgrounds. Both of these possibilities suggest that at least some part of the association between graduate and professional degree prestige and economic outcomes may be spurious. On the other hand, elite graduate programs may be more likely to causally improve earnings than undergraduate programs, whether by more directly enhancing graduates' marketable skills or because graduate degrees may have more cache than undergraduate degrees as credentials in the labor market. The existing evidence from MBA and JD programs suggests a substantial causal component to the returns to top programs in those fields (Arcidiacono, Cooley, and Hussey 2008; Chen, Grove, and Hussey 2012; Oyer and Schaefer 2019).

<u>The role of the professions in the returns to prestige</u>

However, despite these similarities, a key difference that emerges at the graduate and professional degree level is the closer linkage between degrees and particular positions in the labor market. While most baccalaureate majors have no specific occupational destination, many graduate programs are tied to specific professions. It is therefore likely that the advantages students secure by attending more prestigious and selective graduate programs will vary considerably by field of study. In this study, I examine degree fields separately, an analytic choice which is likely more relevant at the graduate compared to the undergraduate level. Indeed, the existing evidence suggests that the variation in selectivity returns across different college majors is relatively modest (Quadlin, Cohen, and VanHeuvelen 2021).

Given the importance of professions, I draw from sociological theory that characterizes the system of professions to make sense of the role of institutional prestige at the graduate and professional level. Andrew Abbott (1988) conceptualizes professions as occupational groups that generate and apply abstract knowledge to solving social problems. Professions participate in a system of competition by making claims for what Abbott calls 'jurisdiction'—control over the work that addresses a particular social problem. A profession is successful to the extent that its jurisdiction expands to the deficit of other professions.

The extent to which field-level institutional prestige maps to socioeconomic rewards among graduate and professional degrees will depend mostly on two factors. The first is the degree of inequality in institutional prestige in a given field. As the primary centers of abstract knowledge production for many professions, academic training programs derive their status from characteristics that promote that knowledge production: size, grant funding, and research productivity (Sweitzer and Volkwein 2009). As a result, top programs are able to attract the most exceptional students, and elite faculty and alumni act as gatekeepers to high-status professional networks. However, fields differ in the steepness of their hierarchy across institutions: if prestige and resources are concentrated in a small number of institutions versus diffused across many, this will affect the amount of status variation among graduates of those programs.

The second factor is the extent to which intra-professional variation in status is related to socioeconomic rewards. This will depend mainly on two aspects of professions' jurisdictions: the internal division of labor and client differentiation (Abbott 1988:117). The extent to which high-status labor and/or clients are served by high-status professionals will affect the degree of inequality in both pecuniary and nonpecuniary rewards. Some professions have relatively little client differentiation—for instance, social work mostly serves low-status individuals, and so social workers are unlikely to experience much variation in professional rewards. Other professions—lawyers, for instance—serve a wide variety of clients (e.g., individual criminal and civil defendants versus large corporate clients in mergers and acquisitions cases). Relatedly, professional jurisdictions typically cover many job tasks, with some higher status than others. For example, routine work is typically lower status than non-routine work (Abbott 1988:125). The degree to which those tasks are performed by high- versus low-status members of a profession, as opposed to either distributed over individual careers or delegated to adjacent professions or paraprofessionals, will further affect the distribution of rewards among professionals.

I hypothesize that those two factors will be responsible for much of the variation across fields in the returns to prestige. However, there are other possibilities that emerge from this theoretical approach. For instance, the extent to which the profession is adaptable to changes in the demand for its services, which Abbott calls "demographic rigidity", may affect the returns to prestige (Abbott 1988:128). The primary factor in demographic rigidity is training time: it is difficult to adjust graduate production rates to changes in demand when training periods are long, as they are in law, medicine, and PhD fields. Therefore, if demand for the services of a demographically rigid field contracts, the resulting overproduction of graduates will lead to individuals being forced out of the profession, potentially into less lucrative or lower-status occupations. The rising rate of PhD employment as adjunct faculty is one example of this phenomenon. Conversely, if demand grows and educational opportunities are slow to expand, professional rewards may be more widely shared. Thus, graduates of lower-status institutions will likely be most affected by changes in the supply of and demand for professionals in a given field.

Finally, the literature from the baccalaureate level suggests that there may be an equalizing causal effect of attending prestigious educational institutions. It remains an open question whether this equalization will extend to the graduate and professional level. Although this study will not estimate causal effects, the field still lacks even a description of the gradient of returns to graduate and professional degree prestige.

Similarly, it remains to be seen whether top graduate or professional programs tend to equalize earnings outcomes among their graduates, as top undergraduate programs apparently do

(Chetty, Friedman, et al. 2020). This may be a product of differential selection (e.g., Zhou, 2019) or, as discussed above, a compensatory effects of selective colleges. However, prior work suggests that socioeconomic disparities in income may grow among graduate and professional degree holders compared to those with bachelor's degrees only (Torche, 2011; but see Fiel, 2020), and horizontal stratification may be a mechanism for that inequality. The analyses below will test this proposition.

Data and Measures

There are few existing data sources with both sufficient samples of graduate and professional degree holders and information on the institutions they attended. In this chapter, I draw on data from the National Survey of College Graduates (NSCG), a large, nationally representative survey of bachelor's degree holders in the United States, linked to responses to the Decennial Census and American Community Survey (ACS). I use data from six waves of the NSCG: 1993, 2010, 2013, 2015, 2017, and 2019. Most NSCG respondents were originally sampled from the Decennial Census or ACS, though some 2010 respondents came into the survey through the National Survey of Recent College Graduates. Using a combination of direct identifiers and exact matching on covariates present across both data sets, I match upwards of 99% of NSCG respondents who were drawn from the Census or ACS to their sampling frames. The match between the NSCG and census surveys allows me to include an additional measurement of individual earnings for many respondents. Between 2010-2019, a subset of respondents was selected in each wave to be re-surveyed for the subsequent three waves. For NSCG respondents in the 1993 survey, I have a single observation of earnings reported in the 1990 Census (the 1993 NSCG collected annual salary and not earnings), and for respondents in the 2010-2019 NSCG, I observed earnings on up to five occasions for each individual. In all analyses, I employ the provided survey weights to make inferences on the cross-sectional population of college graduates (or sub-samples) in each survey wave. In the earnings analysis, I also cluster all standard errors by person to account for the within-person correlation among respondents with multiple earnings observations.

The analyses in this chapter focuses mainly on individuals who earned one of four degree types: a research doctorate, Masters of Business Administration (MBA), Juris Doctorate (JD), or Doctor of Medicine (MD). To define each population, I use slightly different methods based on the limitations of the NSCG and the ranking data available to me. Since not all doctorates are research-oriented (e.g., Ed.D.), I use information on degree major to define the set of research doctorate subjects I include. I also am only able to include individuals in the sample who earned doctorates from majors for which doctoral rankings are available, which I describe below. MBAs are defined as any master’s degree in a business subject, and JDs as any professional degree in law.

The NSCG does not include a narrowly defined major for MD earners. Instead, it includes a single category for medicine, which includes other medical professional degrees such as veterinary medicine or dentistry. Because the USNWR program rankings apply specifically to MD programs, I use individuals’ reported occupation in their Census survey response to better isolate MD holders. I only include individuals in the sample if they reported working in one of five occupations: physicians and surgeons, medical scientists, postsecondary teachers, chief executives, and medical and health services managers. Physicians and surgeons comprise the great majority of these workers. The possible bias from excluding MDs employed outside those professions is preferrable to the alternative of including many non-MD degrees in this category. However, the number of US medical school graduates who are not employed in one of those professions is likely small. Although I have found no data source that tracks medical graduates' employment outcomes into their mid-career, a proxy for the rate at which medical school graduates transition into actual medical practice is the residency match rate. In the last five years, the match rate has been around 94% for graduates of US medical schools (NRMP 2021).

Institutional prestige

I use widely available rankings released by third-party organizations as my measures of institutional prestige. Each of these ranking systems are generated using survey data, administrative data. They each use a statistical procedure for weighting professionals' opinions of program reputation and other factors like program size and research productivity. These rankings systems represent relatively time-stable proxies for the common understanding of the ranking of prestige in academic fields. Over recent decades, ranking systems have gained increasing significance for institutions' status maintenance, and are therefore subject to gaming behavior (Clarke 2002; Sauder and Espeland 2009; Sweitzer and Volkwein 2009). I consider these rankings as measures of prestige, not necessarily of institutional quality, though they may well be related. For MDs, JDs, and MBAs I digitized the printed 1995, 2000, and 2005 U.S. News and World Reports (USNWR) Graduate Program Rankings. There are no widely available, broad-coverage rankings for these subjects prior to the mid-1990s, and so although I analyze individuals who earned their bachelor's degrees as far back as 1936 (the sample mean graduation year is 1985), I must assume that these rankings are largely stable into the past. For doctoral programs, I use the rankings from the National Research Council (NRC). These rankings have better historical coverage, with releases in 1982, 1996, and 2011. I attach the ranking for an individual's institution using year closest to that person's graduation date. Although the methodology for the NRC rankings was similar between the 1982 and 1996 releases, the 2011 release included additional methodological complexity, releasing a “survey-based” and a “regression-based” set of rankings, where the latter is built from a composite of survey and other data. I use the regression-based rather than the survey-based quality rankings from that year because they exhibited the highest correlation with the rankings from past NRC releases. However, the results are qualitatively similar regardless of which system I use.

Finally, in many models I control for the selectivity of individuals’ undergraduate degree using the Barron’s selectivity rankings. The Barron’s ranking system splits the nations’ undergraduate programs into nine categories based on incoming students’ SAT scores, class rank, GPA, and acceptance rate: most competitive, highly competitive, (and separate “plus” category), very competitive (and separate “plus” category), competitive, less competitive, noncompetitive, and special. I combine each category with its “plus” equivalent and combine the lowest three categories. Given the focus on elite graduate degree programs and the importance of graduating from an elite undergraduate program for entry into elite graduate programs, I follow Chetty et al. (2020) and add an additional top category for “Ivy+” colleges: the Ivy League plus Stanford, University of Chicago, and Duke. I measure the Barron’s rankings from 1972, 1982, 1992, and 2004, assigning the category to individuals that is closest to the year they completed their baccalaureate degree. In some models I also include a control for the individuals’ undergraduate major in six categories: computer and mathematical sciences, biological sciences, physical sciences, social sciences, engineering, and other majors.

Earnings and the top one percent

I measure earnings as the sum of all wages, salaries, and business income reported by individuals from the prior year in the Census products. I also use the earnings measure in the NSCG surveys, which asked individuals to report their earned income from all jobs in the prior year, and directed them to include “all wages, salaries, bonuses, overtime, commissions, consulting fees, net income from businesses, summertime teaching or research, or other work associated with scholarships.” In the 1990 Decennial Census and ACS, respondents may report up to $1,000,000 dollars in each earnings category. This creates a top code on earnings, but it is a very high one and affects very few respondents[1]. There is no top coding in the NSCG earnings responses. I inflate all earnings reports to 2019 dollars using the CPI-U, log-transform, and average earnings across multiple observations when present. I measure two outcomes: log earnings and top one percent status. I define the top one percent as those earning more than 99% of same-age individuals in the national distribution of earnings in a given year. I use all respondents to the decennial census or ACS in the corresponding year with non-zero earnings as the reference distribution to define this group.

Survey earnings measures may not always be accurate for high earners, particularly for individuals who work in professional services. Recent scholarship on top-one percent earners in general (Kopczuk and Zwick 2020; Smith et al. 2019) and physicians in particular (Gottlieb et al. 2020) has found that a portion of the income of top earners—as much as one third—is received via pass-through business income from an ownership share in an S-corporation, rather than as wages[2]. Gottlieb et al. (2020) use administrative data compared to the ACS to show that at mid-career, doctors underestimate their true earnings by about one-third in survey earnings measures on average because they tend to report only their wages and not the pass-through income from

[1] I have applied the same top code to all earnings observations in my analysis and found the results were virtually identical to those presented here.

[2] It is debatable whether business income should be considered equivalent to labor market earnings. Smith et al. (2019) argue that around 75% of pass-through income should be considered human-capital driven earnings rather than passive income, because company profits decline by a commensurate amount when the earner exits the business either though retirement or death.

their business, even in response to survey questions that explicitly ask about business income. Thus, to the extent that respondents fail to report this type of income on the survey measures I employ, I will underestimate the overall earnings premiums in these professions. If this type of underreporting varies across institutional prestige, it will also bias those findings, although I am not aware of any evidence that this type of bias will be significant.

Demographics and social origins

I measure self-identified gender and racial identity in the NSCG and treat them as both covariates and moderators in my analysis. To meet disclosure guidelines, I operationalize race/ethnicity as non-Hispanic white, non-Hispanic Black, Hispanic, and non-Hispanic Asian or Pacific Islander. I must exclude other groups and multiracial individuals because of insufficient sample sizes. Finally, I measure respondents' parental education using their self-reports in the NSCG. The exact categories collected varies across survey waves. I combine both parents' education by using the attainment of the more-educated parent. I divide parental attainment into three categories: high school or less, some college or bachelor's degree, and graduate or professional degree. I have tested the robustness of key results below to different operationalizations of parental education, including the average continuous years of education of both parents. The results remain substantively unchanged using these alternatives.

Inequality in Top Graduate/Professional Degree Attainment over Time

Methods

The first set of analyses examines historical trends in how gender, race, parents' education, and baccalaureate pedigree influence who has attained top graduate and professional degrees. To do so, I estimate logit models predicting whether graduate degree holders earned a top degree in their field. I define a top degree by a program being ranked in the top 20. I chose this cutoff to balance an interest in measuring entry into elite graduate programs against minimum cell size restrictions for disclosure. However, the results are substantively similar using other cutoffs, such as a top-25 or top-10 degree. All coefficients in the model are freed to vary across three cohorts of bachelor's degree earners: those who earned their degree prior to 1980, between 1980 and 1999, and in 2000 or after. These cohorts roughly divide the sample of degree holders into thirds, ensuring that I have enough statistical power to detect important trends.

This analysis raises the question of whom to consider 'at risk' of attaining a top graduate or professional degree and therefore whom to include in the analytic sample. Different sample restrictions target different behavioral processes. As is common in the literature on the attainment of baccalaureate prestige (e.g. Chetty et al. 2020), in one model I restrict the population to earners of the four degree types only. This model implicitly assumes that individuals decide to attain a graduate degree of a given type before subsequently entering the choice and assignment process for a specific program. The results from this model therefore summarize the outcomes of those individuals' application decisions, institutions' admissions decisions, attendance, and graduation. In a second model, however, I include *all* bachelor's degree holders in the sample because those individuals represent the full population at risk of attaining a top graduate or professional degree. The results from this model therefore incorporate individuals' decision to pursue one of these degrees in the first place.

I present the coefficient estimates as average marginal effects in the probability metric. I avoid logit coefficients and odds ratios for comparing coefficients across cohorts because they depend on the conditional probability of the outcome and the effects of other variables in the model, which can be interpreted as unwanted contamination by unobserved heterogeneity in the underlying latent scale across groups (Breen, Karlson, and Holm 2018). Average marginal effects do not present the same problem in that they are directly comparable across groups and models, which facilitates the main comparisons of interest: coefficient differences across cohorts. The probability metric is also more intuitive than logits or odds ratios.

While the absolute probability metric is intuitive and substantively meaningful, I also interpret the effect sizes relative to changes in the overall probability of the outcome between cohorts. In this case, attention to relative effect sizes is warranted because of the sharply falling proportion of the sample that attains a top degree over time. In Table 1, I present the probability of top-20 degree attainment for each degree type over time, and separately for the two different risk groups. Three processes create mechanical reductions in the percentage of the sample who get top-20 degrees in these fields over time. First, when examining the overall population of bachelor's degree holders, educational expansion has meant that the number of bachelor's degree holders has grown faster than the number of JD, MD, MBA, or research doctorate recipients. This means that the percentage of top degree holders will fall across cohorts. Second and relatedly, the last cohort in my analysis of all bachelor's degree holders—people who graduate from college in or after the year 2000—have had less time to attain a graduate degree than the earlier cohorts. I limit the sample to individuals who are at least 5 years out from their bachelor's degree to ensure equal comparisons across cohorts.

The third factor applies only to my analysis of graduate and professional degree holders. Top degree programs have tended keep enrollment steady over time even as the total number of graduate and professional degree holders has increased. In other words, the selectivity of top graduate and professional degree programs has tended to increase over time. The second panel in Table 1 makes this clear, though the extent to which it has occurred varies across degree types. The percentage of all research doctorates earned from top-20 programs declined by about onesixth between the first and last cohort groups in my data, by about one third among JDs, and by nearly one half among MBAs and MDs. These substantial historical changes are therefore important context for the results presented below.

Results and discussion

Table 2 presents the full results from the models predicting top-20 graduate and professional degree attainment by sample and by bachelor's degree cohort. The most significant change across cohorts in these models can be summarized simply: parental education has become dramatically stronger as a predictor of degree attainment over the last six decades, while the influence of gender and race/ethnicity have no obvious trend.

Even among college graduate cohorts before 1980, those with highly educated parents enjoyed a significant advantage in attaining an elite graduate or professional degree. Compared to college graduates without a parent who attended college, those with a parent who attended some college or earned a bachelor's degree had 0.4 percentage points higher probability of attaining a degree from a top-20 program, and among graduate degree holders, a 1.2 percentage point higher probability (though not statistically significant), net of undergraduate selectivity, undergraduate major, and demographics. College graduates with a parent who preceded them in attaining a graduate degree had a 1.2 percentage point probability higher probability, on average, of getting a top-20 degree before 1980 compared to the group with the least educated parents. This differential is 3.5 percentage points among degree holders. However, by the 2000s the parental education advantage had grown considerably. Degree holders in the 2000s with parent with some college or a bachelor's degree had a (nonsignificant) 3.3 percentage point advantage over the high school or less group, while those with a graduate degree holder parent held a 12 percentage point advantage, net of the covariates. The absolute advantage enjoyed by the children of graduate degree parents after 2000 was nearly four times the size of the advantage before 1980. The corresponding probability advantages were 0.5 and 2 percentage points among all college graduates after 2000, respectively, which represent smaller yet still significant increases from the first cohort.

As highlighted above, the increasing contribution of parental education to the probability of attaining a top degree has occurred in the context of these degrees becoming increasingly rare, both among all college graduates and the narrower population of these degree holders. Therefore, the *relative* effect of parents' education has increased even more than the absolute effect displayed in Table 2. As a useful comparison, the effect of college pedigree on top degree attainment has declined somewhat over the same time period. Among degree holders, attaining a degree from an Ivy+ institution yielded a 12.7 percentage point advantage over the least selective colleges and universities, net of the other covariates, prior to 1980. After 2000, that advantage had declined slightly to 8.2 percentage points. Since the overall probability of attaining a top-20 degree among degree holders declined from roughly 0.21 to 0.13, the *relative* effect of that college pedigree has remained strong—even increasing slightly—as the absolute effect declined. This comparison highlights just how dramatic the increase in the effect of parental education—particularly children whose parents themselves attained a graduate degree—has been.

This evidence suggests top graduate degrees in medicine, law, business, and doctoral research are increasingly earned by the children of highly educated parents, particularly to parents who themselves earned graduate degrees. These findings support the proposition that Effectively Maintained Inequality has expanded into the qualitative dimension of education at the graduate and professional level (Lucas 2001; Posselt and Grodsky 2017). It also supports accounts of strengthening social reproduction at the top of the distribution among the professional class in particular (Mitnik, Cumberworth, and Grusky 2016). Although I cannot test this with the data available to me, it is likely that the growing advantage of the children of highly educated parents occurs through many channels, including higher academic performance in college and access to resources for competing in increasingly selective admissions processes at top programs.

I find no clear pattern of advantage or disadvantage in elite graduate degree attainment by race/ethnicity net of undergraduate characteristics and other demographics in any time period. However, the samples of each racial/ethnic group are small, and the standard errors are large, so I cannot rule out potentially substantial effects in either direction. There is some evidence that Asian/Pacific Islander graduate degree holders are more likely to have earned their degree from a top institution than are white degree holders, but that advantage appears to decline over time, though the effect contrasts between cohorts are not statistically significant at conventional levels. There is some weak evidence that Black college graduates and degree holders held a small advantage over their white counterparts in the first two cohorts, net of the covariates. The direction of these coefficients suggests that the combination of racial disparities in the attainment of higher education and racial segregation at the baccalaureate level are the predominant explanations for the relatively few Black or Hispanic individuals earning degrees from top law, medical, business, or research doctorate programs. The vast majority of the individuals in this study graduated college after the Civil Rights Movement of the 1960s, and so would have been applying to graduate and professional programs after many elite programs had begun actively recruiting and admitting racial minority students to both undergraduate and graduate programs (Grodsky 2007; Karabel 2005; Stulberg and Chen 2014). These finding are further consonant with prior research on the post-baccalaureate outcomes of Black graduates of highly selective colleges, which finds that Black graduates are more likely than white graduates to aspire to and earn graduate degrees, and particularly so from highly ranked business, law, and medical programs, despite on-average lower grades and test scores (Bowen & Bok, 1998:102). However, I also find some evidence—albeit uncertain—that this net advantage in top degree attainment among Black relative to white college graduates has eroded and reversed in the most recent cohorts, from a 0.8 percentage point advantage before 1980 to a 0.7 percentage point disadvantage among college graduates after 2000. Neither coefficient is significant at the conventional level. Future research should examine the possibility that the historically high transition rate from top colleges to top graduate schools for Black students may have slowed.

I do find that men have held a modest advantage in attaining top graduate and professional degrees, and there is evidence that this gender inequality persists into the most recent cohorts in these data. Men's advantage among all college graduates appears to have declined somewhat (in both absolute and relative terms) over time, reflecting the broader trend of more women entering the professions (DiPrete and Buchmann 2013). However, in the most recent cohort group of graduate degree holders, men still retain a 3.7 percentage point advantage in top-20 degree attainment relative to women net of the covariates. This remaining gender inequality in top graduate and professional degree attainment is a novel finding that echoes the slower move to gender equality among the most selective colleges, despite women's increasing advantage in academic performance (Bielby et al. 2014).

The Economic Returns to Graduate and Professional Degree Prestige

Methods

The next section pursues the second major research question by measuring the returns to elite graduate and professional degrees. I estimate two types of models for two outcomes: linear models for log individual earnings and logit models for top one percent earnings attainment. In estimating the returns to rank, I must overcome one inherent limitation in these data: the range of institutional rankings varies considerably depending on the field. The MD and MBA rankings are only available for ranks 1-50, and the JD and research doctorate rankings often have a much larger range depending on the year and field. As will be evident below, however, the majority of the gradient in earnings outcomes occurs in the top 50-ranked programs. I therefore choose to characterize the gradient in earnings across rank using two different approaches: one comparing the average difference in earnings outcomes between the top 50 and all other programs, and one examining the continuous association between rank and earnings among only the top 50 programs. The models for the returns to the top 50 versus the below-50 take the form:

$$y = \beta_0 + \beta_1 I\{rank \leq 50\} + \sum \beta_k X_k + \varepsilon, \qquad (1)$$

where $I\{\}$ is the indicator function. I estimate these models using the full sample of degree earners of each type.

Then, based on visual inspection of the data and fit statistics among the top 50 programs, I estimate models that allow earnings to take a quadratic function in rank among the top 50 programs[3]. These models take the form:

$$y = \beta_0 + \beta_1 rank + \beta_2 rank^2 + \sum \beta_k X_k + \varepsilon \qquad (2)$$

among top-50 degree holders in their field. In both cases, the X_k are a set of k covariates that always includes age and its quadratic, the year of the earnings observation, the number of years since graduate degree receipt, gender, race, parental education, and nativity. In a second set of

[3] The separate models from equation (1) and (2) yield nearly identical results to a single, composite model where the effect of rank is interacted with a dummy for being in the top 50, and rank is re-coded such that zero is the sample average rank. However, in this case, the coefficients on the covariates are estimated separately among the whole sample in equation (1) and the top 50 programs in equation (2).

models, I also include controls for undergraduate selectivity categories from the Barron's rankings and undergraduate major categories. Because I estimate a nonlinear association between earnings and program rank among the top 50 programs, I characterize that association by estimating the marginal effect of rank at three points in the distribution: rank 5, 25, and 45.

I estimate these two simple models for different subgroups in the data, examining variation by degree type, year, parental education, and gender. When I aim to compare coefficients across subgroups, I estimate the models using Seemingly Unrelated Regression (SUR) to estimate the full variance-covariance matrix of the coefficients. Since I measure earnings multiple times for some respondents, I cluster the standard errors by person to account for the within-person correlation in earnings.

Finally, I estimate a set of supplemental models that examine the associations between background characteristics and earnings among graduate degree holders, with and without controls for graduate degree rank. These models describe the extent to which group differences in earnings can be attributed to differences in program rank.

Compared to the analysis of top degree attainment in the prior section, I restrict the sample for these analyses in three ways. First, I include only individuals' earnings observations from at least two years after they earned their graduate or professional degree, ensuring that I measure labor market outcomes sufficiently long after degree receipt. Second, I exclude a small number of observations with very low or zero earnings reports (below $5,000 dollars) because of the undue influence of those observations in the log scale. This means that these results apply only to individuals who are earners and treat entry into this population as ignorable. However, this is a relatively minor caveat due to the very high employment rate in this population. Finally, I also only include earnings observations between the ages of 30 and 64. I focus on this age range because of life-cycle bias in earnings outside these prime earning years (e.g. Haider & Solon, 2006). This concern is likely particularly important for graduate and professional degree holders, whose earnings typically peak much later in life than among less-educated workers. The availability of earnings observations from roughly mid-career is a major strength of these data when compared to similar data sources, which typically follow graduates only through their early career. These restrictions result in a sample of roughly 91,000 earnings observations of 46,000 individuals.

The returns to graduate and professional prestige by degree type

Figure 1 presents predicted exponentiated mean log earnings—roughly equivalent to medians—and the predicted probability of earning in the top one percent of the distribution by program rank for each degree area. These predictions are adjusted, such that they hold age at 45, years since degree receipt at 15, and time period at 2009-2019 to account for any age-structure, work experience, or period differences between holders of the different degree types.

The returns to rank differ substantially across degree type. For research doctorate earners and MDs, there are relatively weak (though still significant) returns to prestige in log earnings. Graduates of the top-10 doctoral programs earn about $21,700 more than graduates of programs ranked above 50 or unranked, representing a 21% increase. The relative difference between top-10 and 50-and-below ranked MD programs is similar at 28%, though the much higher earnings enjoyed by medical doctors means there is an absolute difference of about $57,600. On the other hand, JD and MBA programs exhibit sharper gradients to program rank. Graduates of the top-10 JD programs earning 58% ($60,600) more, and graduates of top-10 MBA 88% ($92,000) more, compared to graduates of below-50 ranked programs.

The differences in the rank association with earning in the top one percent for these degrees is perhaps even more striking. Relative to the other degree types, fewer doctorate recipients reach the top one percent—only about 5.5% of top-10 program graduates do—and the gradient across rank is relatively weak. The rank gradient across MD programs is similar in magnitude to research doctorates, though it is far more common for those graduates to be one-percenters. Roughly one quarter of all MDs reach the top percentile in any given year. Top-10 JD graduates, on the other hand, are over three times more likely than below-50 graduates to earn in the top percentile of the distribution (0.18 versus 0.056) Similarly, top-10 MBA graduates have more than a five-fold probability advantage over graduates of the bottom ranked programs.

In further analyses in Table 4, I estimate the returns to rank by graduate degree type using the full model specifications described in Equations 1 and 2. Net of the full set of covariates including demographics and baccalaureate selectivity and major, the results are broadly consistent with the depictions in Figure 1. The returns to rank are steeper at virtually every point in the distribution among MBAs and JDs compared to research doctorates or MDs. The differences across degree types are particularly stark among the most elite programs. For instance, among MBAs at around program rank 5, the estimated returns to an increase of 1 in rank are 2.8% higher earnings and an additional 0.7 percentage point increase in the likelihood of earning in the top one percent. There is a near-zero association between rank and earnings among MDs at rank 5: an increase of 1 rank is associated with only a 0.1 percentage point increase in top one percent probability.

Why these two distinct patterns of association across different types of degrees? I hypothesize that this is partially due to the wide variation in the types of work conducted and the clientele served by high-status versus low-status professionals across these fields (Abbott, 1988).

In particular, it is likely that the very high earnings of top MBA and JD graduates reflect the tight linkage between top programs and elite firms in the financial and corporate sectors. The highest paying law firms, management consulting firms, and investment banks hire entry-level employees almost exclusively from elite postsecondary institutions, including MBA and JD programs (Rivera 2016; Rivera and Tilcsik 2016). These early positions catapult many of these graduates to top incomes later in life, as apparent in the results described above. Some of this association is certainly due to selection: the reputation of the top programs inspires intense competition among applicants, allowing admissions officers to select the most skilled, motivated, culturally equipped, and thus likely highest future earners for their incoming classes. On the other hand, much of the association may reflect a true causal effect of the relationships between elite programs and firms, although I am not aware of plausibly causal studies of elite graduate degree attainment that test this directly.

In contrast, neither medical doctors nor postsecondary education and research provide significant professional services to the financial or corporate world. Internal status among research doctorate holders is determined largely by scientific communities without substantial financial resources, albeit with some exceptions, such as outside consulting practices among elite academic economists. The top rungs of the academic profession—tenure-track positions at elite research-oriented universities—pay a relatively modest wage premium over lower-status postsecondary teaching positions.

However, unlike postsecondary teaching and research, medical doctors do have a division of labor that is strongly tied to earnings: specialty (Gottlieb et al. 2020). Some types of surgeons earn up to three times more than primary care physicians, on average. While graduates of highly ranked institutions are more likely to enter the higher earning specialties, the differences appear to be relatively small. For instance, about 23% of top-ranked Harvard's medical graduates enter primary care, which is one of the lowest earning medical specialties, compared to 34% of University of Utah, ranked 50th (Mullan et al. 2010).

Finally, the weak gradients in medicine and among doctorates may reflect the influence of state intervention in those markets, either through direct provision in public hospitals and colleges or through policymaking, such as through Medicaid reimbursement rates or college funding and financial aid policy. These interventions shape the market for medical and educational services, which may further limit earnings inequality by status in these fields as compared to business management or law.

Recent changes in the returns to graduate and professional degree prestige

I next test whether there have been increasing returns to graduate and professional degree prestige over the recent past. Due to the surveys' timing, I am only able to precisely estimate the change across two periods: 1990 and an average across the survey waves from 2009 to 2019. First, consistent with evidence showing increasing returns to graduate degrees (Lindley and Machin 2016), in Table 3 I find that the overall earnings of graduate and professional degree holders have increased over the past 3 decades. Net of demographics and undergraduate pedigree/major, these types of graduate and professional degree holders earned roughly 9% more in 2009-2019 compared to those in 1990. The increase in top one percent probability is smaller at a (nonsignificant) increase of about half a percentage point. The contrast between the earnings results and the top percentile results are likely due to the threshold for reaching the top one percent increasing substantially over the last thirty years. Net of program rank, these time period changes are slightly larger, reflecting the increasing number of relatively low-ranked (and lower-earning) professional and graduate degree holders shown in Table 1.

Table 5 examines changes in the returns to program rank over time. If elite graduate and professional education is becoming increasingly predictive of top earnings over time, this would suggest the increasing importance of these institutions for the formation of the economic elite. I find mixed evidence that this is occurring. Net of demographics alone, there has been a significant increase in the earnings returns to a degree from a top-50 program relative to a program ranked below the top 50 from between 1990 and 2009-2019, growing from a roughly 18% to a 29% advantage. However, top-50 degree holders have just maintained their 3.7 percentage point advantage in top-one percent status over under-50 degree holders since 1990. Furthermore, among top-50 programs, I find no statistically significant evidence that the returns to rank have changed over time at any point in the rank distribution. If anything, the point estimates suggest that the returns to rank among these institutions have declined slightly over the last 30 years. Conditioning on baccalaureate pedigree and major does little to change these comparisons, albeit shrinking the point estimates toward zero.

Differences in the returns to graduate and professional degree prestige by gender

I next examine differences in the returns to highly ranked graduate and professional degree programs by gender and socioeconomic origins. First, I find that women who attain a top-50 MD, MBA, JD, or doctoral degree earn considerably less, on average, than men who earn the same degrees (Table 3). Net of demographics and baccalaureate measures, men with these types of degrees earn about 35% more than women on average and are 5.9 percentage points more likely to earn in the top one percent each year. Controlling for program rank does little to alter these disparities because, as established in the prior section, there are only modest gender inequalities in the graduate degree prestige net of the covariates. Furthermore, women's returns to program rank among the top-50 programs are roughly half as large across the distribution of rank (Table 6). The finding that there are large gender earnings disparities among professionals at the top of the wage distribution is not new (e.g. England, Levine, & Mishel, 2020; Guvenen, Kaplan, & Song, 2020), but the finding that the returns to rank are much higher for men establish that these disparities are especially large among graduates of top degree programs. Combined with the modest disparity in top-20 degree attainment among female graduate and professional degree holders, this finding indicates that horizontal stratification in these degree types tends to increase gender disparities in personal earnings. However, it may be that assortative mating—perhaps particularly matching between individuals in the same graduate degree program—offsets these disparities in personal earnings at the household level for women. Future research can investigate this possibility.

Differences in the returns to graduate and professional degree prestige by parents' education

First, returning to Table 3, I find minimal differences in average earnings outcomes by parents' education among these graduate and professional degree holders. I find that net of demographics and baccalaureate controls, the children of some college or bachelor's degree parents earn roughly 2% more than the children of parents who never attended college, and the children of graduate degree holders roughly 6% more, though only the graduate degree/high school or less contrast is statistically significant. Both earnings differences shrink by almost half once graduate degree program rank is controlled and become statistically insignificant, reflecting the substantially unequal distribution of degree prestige across parental education identified in the prior section. There are no statistically or substantively significant differences by parental education in the propensity of graduate/professional degree holders to earn in the top one percent, net of the covariates. These estimates contrast with accounts from the UK finding large earnings differences by social origins among high-earning professionals (Laurison and Friedman

2019), and showing a re-emergence of the influence of social origins among graduate degree holders net of field or occupation (Oh and Kim 2019). This discrepancy may be due to the relatively narrow set of degrees employed in the analysis here—perhaps an investigation of a wider range of graduate and professional degrees would uncover persistent social origins differences in earnings. Alternatively, it may be that a different measure of social origins like parental earnings might present a different picture.

However, the average similarities in earnings by parents' education mask substantial differences in the returns to program rank (Table 7). Graduate degree holders with parents who attained a bachelor's degree or less education gain more from the most highly ranked degrees than do the children whose parents earned graduate degrees. These differences in returns are large and statistically significant at conventional levels. Conditional on demographics, the marginal effect of one rank on log earnings at rank 5 are 36% higher for the children of high school graduates or less, and 59% higher for the children of parents who attended college, compared to the children of graduate degree holders. These differences are similar for top one-percent earnings attainment. Furthermore, rather than attenuate when undergraduate selectivity and major are controlled, the differences in returns between groups expand. This is because conditioning on undergraduate pedigree reduces the estimated returns to prestige most for the children of graduate degree holders. In combination with the finding of negligible average earnings differences in this population, these findings imply that graduates from elite graduate and professional programs with less-educated parents in fact *out-earn* their classmates from families with higher-educated parents.

There are several possible explanations for these substantial differences. One is that the process of selection that children from less-educated families undergo to reach the upper echelons of graduate degrees means those that make it are more likely to earning large sums: in other words, a differential selection story (Cameron and Heckman 1998; Fiel 2020; Zhou 2019). Another possibility is that the elite graduates from low-SES origins are more motivated by the pecuniary returns to their profession, either out of necessity (perhaps to pay off higher levels of educational debt or to support family members in need) or because of taste. Future research can investigate these possible explanations for this surprising finding.

Conclusion

This study has produced novel evidence on the degree of horizontal stratification among graduate and professional degrees with respect to institutional prestige. In particular, the findings make four main contributions to the literature on graduate and professional degrees and social stratification.

First, I find that children from less-educated families have become increasingly unlikely in recent decades to earn degrees from the top business, medical, law, and research doctorate programs in the country relative to the children of the most educated parents, even net of baccalaureate pedigree. In contrast, both gender and race/ethnicity are independent of or only modestly related to top degree attainment, suggesting that even as the new academic and professional elite has become increasingly integrated by race and gender, it has become less diverse in terms of early life socioeconomic experiences. These findings accord with the recent research on the reformulation of elite educational institutions' missions with respect to diversity (Khan 2012). These patterns also support the continued relevance of Effectively Maintained Inequality theory as educational attainment continues to expand in US society (Lucas 2001). However, as noted above, this pattern has emerged despite the rate of graduate degree attainment being relatively low in the US population. Another possible interpretation is that rising inequality, particularly at the top of the distribution, has intensified competition for these coveted credentials, leading elite families and their children to expend more resources and effort on gaining them. Given the evidence in the remainder of the chapter that top degrees have large earnings returns, expanding social origins associations with elite graduate and professional degree attainment may be an important mechanism for strong reproduction at the top of the earnings distributions and among top professionals (Mitnik et al. 2016; Mitnik and Grusky 2020). These patterns also have implications beyond earnings inequality. When top professionals and scholars are disproportionately drawn from particular social origins, as recent evidence suggests they are, it may well shape the focus of scientific fields and the value of particular kinds of knowledge or expertise at the expense of others (Morgan et al., 2022).

Second, I find that the returns to prestige at the graduate and professional degree level depend strongly on degree field. These findings support the importance of professions in shaping the returns to institutional prestige, and call attention to theoretical work describing internal stratification in the professions (Abbott 1988). They also contrast with findings from the baccalaureate level, where degree field is less important in determining the earnings returns to prestige.

Third, I find mixed evidence that the academic elite have become more likely to enter the increasingly high-earning economic elite in US society. I do find that the earnings of graduate and professional degree holders overall have certainly risen, and that graduates of top-50 programs have increasingly out-earned lower-ranked graduates. However, these earnings gains have not much translated into an increasing likelihood of entering the top percentile of the earnings distribution since 1990. These patterns might be interpreted as the educational elite riding the rising tide of US earnings inequality, yet without gaining position.

Fourth and finally, I find that the returns to graduate and professional degree prestige are substantially weaker for the children of highly educated parents compared to the upwardly educationally mobile. These findings echo the emerging consensus at the baccalaureate level, where the returns to elite colleges appear concentrated among the least advantaged (Chetty et al., 2017; Dale & Krueger, 2014) and raise similar questions around the relative importance of selection bias, the effects of educational institutions, and differences in preferences for pecuniary versus non-pecuniary dimensions of job rewards.

This chapter suggests multiple fruitful avenues for future research. First, future research should investigate the impacts of institutional prestige on a fuller range of socioeconomic outcomes at midlife, including household income, occupational prestige, or other markers of career status like scientific contributions or professional influence. It is likely that these are strong motivators for professionals in these fields and earnings may be a weak proxy for many of these outcomes. Future research should also more fully investigate racial differences in the process of elite graduate and professional degree attainment, particularly as it intersects with gender, social origins, and nativity. I do find clear evidence that Black and Hispanic professionals earn far less than their white counterparts who graduate with the same degrees from the same institutions, and that Asian/Pacific Islander graduate and professional degree holders have more difficulty entering the top earnings percentile. However, sample size and disclosure risk limited my ability to continue that line of inquiry. Finally and perhaps most critically, the degree types investigated here are only a subset of the broader postbaccalaureate landscape. Future work should include more graduate and professional degree fields, and therefore professions, in a full investigation of the variation in the returns to institutional prestige.

Tables and Figures

Table 1. Proportion earning top-20 MBA, JD, MD, or research doctorate degrees by BA cohort

	Before 1980	1980s-1990s	2000 and after
Among same-degree holders			
Research doctorates	0.2841	0.2208	0.2134
JDs	0.2020	0.1783	0.1489
MBAs	0.1621	0.1423	0.0828
MDs	0.1724	0.1394	0.0847
Any	0.2052	0.1702	0.1325
Among all bachelor's degree holders			
Research doctorates	0.0104	0.0050	0.0047
MBAs	0.0076	0.0054	0.0036
JDs	0.0076	0.0081	0.0046
MDs	0.0032	0.0018	0.0006
Any	0.0288	0.0203	0.0135

Source: This research was performed at a Federal Statistical Research Data Center under FSRDC Project Number 2239. (CBDRB-FY23-P2239-R10625)

Table 2. Associations between parents' education, gender, race, and undergraduate selectivity and top-20 graduate and professional degree attainment by bachelor's degree cohort

Outcome:	Earned a top-20 MBA, JD, PhD, or MD					
Population at risk:	All BA holders			Degree earners only		
Bachelor's degree year:	Before 1980	1980s-1990s	2000 and after	Before 1980	1980s-1990s	2000 and after
	(1)	(2)	(3)	(4)	(5)	(6)
Highest parent's education (ref: high school or less)						
Some college or bachelor's degree	0.0038*	0.0075***	0.0050*	0.0122	0.0439***	0.0325+
	(0.0016)	(0.0020)	(0.0023)	(0.0091)	(0.0133)	(0.0174)
Graduate degree	0.0124***	0.0176***	0.0196***	0.0348***	0.0851***	0.1202***
	(0.0020)	(0.0024)	(0.0028)	(0.0102)	(0.0148)	(0.0194)
Gender (ref: woman)						
Man	0.0181***	0.0062***	0.0073**	0.0387***	0.0161	0.0369*
	(0.0015)	(0.0018)	(0.0025)	(0.0092)	(0.0109)	(0.0165)
Race (ref: White, not Hispanic)						
Black, not Hispanic	0.0079+	0.0098+	-0.0072+	0.0414+	0.0512	-0.0406
	(0.0044)	(0.0058)	(0.0042)	(0.0228)	(0.0338)	(0.0295)
Hispanic	0.0093	0.0002	0.0066	0.0166	0.0015	0.0453
	(0.0063)	(0.0029)	(0.0052)	(0.0277)	(0.0189)	(0.0332)
Asian/Pacific Islander, not Hispanic	0.0053	0.0042	-0.0026	0.0232	0.0378*	-0.0068
	(0.0039)	(0.0029)	(0.0028)	(0.0157)	(0.0186)	(0.0188)

Undergraduate selectivity (Ref: Barron's less competitive, noncompetitive, special, or unranked)						
Ivy+	0.1274***	0.1324***	0.0817***	0.4618***	0.5312***	0.4337***
	(0.0083)	(0.0109)	(0.0112)	(0.0237)	(0.0315)	(0.0458)
Barron's most competitive (excl. Ivy+)	0.0839***	0.0756***	0.0519***	0.3521***	0.3252***	0.2851***
	(0.0097)	(0.0093)	(0.0133)	(0.0371)	(0.0344)	(0.0864)
Barron's highly competitive	0.0520***	0.0474***	0.0304***	0.2377***	0.2338***	0.1983***
	(0.0032)	(0.0045)	(0.0052)	(0.0151)	(0.0237)	(0.0349)
Barron's very competitive	0.0325***	0.0209***	0.0198***	0.1548***	0.1148***	0.1148***
	(0.0024)	(0.0033)	(0.0037)	(0.0120)	(0.0208)	(0.0267)
Barron's competitive	0.0069***	0.0042*	0.0080*	0.0408***	0.0282*	0.0569*
	(0.0015)	(0.0019)	(0.0032)	(0.0091)	(0.0133)	(0.0240)
Rounded sample size		368,000			57,000	

Notes: * p < 0.05, ** p < 0.01, *** p < 0.001. Heteroskedasticity-robust standard errors in parentheses. All models additionally control for age, years since bachelor's degree receipt, degree type, baccalaureate degree major, and US- versus foreign-born.

Source: This research was performed at a Federal Statistical Research Data Center under FSRDC Project Number 2239. (CBDRB-FY23-P2239-R10625)

Table 3. Associations between earnings outcomes and parents' education, gender, and race among MBA, JD, PhD, and MD holders

Outcome:	Log earnings		Top 1 percent earnings	
Controls:	Without rank	With rank	Without rank	With rank
	(1)	(2)	(3)	(4)
Highest parent's education (ref: high school or less)				
Some college or bachelor's degree	0.0218	0.0126	0.0012	-0.0010
	(0.0251)	(0.0249)	(0.0061)	(0.0061)
Graduate degree	0.0582*	0.0334	0.0059	0.0005
	(0.0256)	(0.0256)	(0.0064)	(0.0064)
Gender (ref: woman)				
Man	0.3495***	0.3399***	0.0588***	0.0574***
	(0.0202)	(0.0201)	(0.0042)	(0.0042)
Race (ref: White, not Hispanic)				
Black, not Hispanic	-0.1771***	-0.1802***	-0.0499***	-0.0521***
	(0.0421)	(0.0432)	(0.0080)	(0.0078)
Hispanic	-0.1771***	-0.1793***	-0.0248**	-0.0262**
	(0.0363)	(0.0347)	(0.0091)	(0.0085)
Asian/Pacific Islander, not Hispanic	-0.0251	-0.0323	-0.0242**	-0.0248**
	0.0323	0.0320	0.0082	0.0080
Time period (ref: 1990)				
2009-2019	0.0894***	0.1066***	0.0045	0.0083*
	0.0152	0.0151	0.0039	0.0039
Total earnings observations	91,000	91,000	91,000	91,000
Total individuals	46,000	46,000	46,000	46,000

Notes: * p < 0.05, ** p < 0.01, *** p < 0.001. Cluster-robust standard errors in parentheses. All models additionally control for age, years since bachelor’s degree receipt, degree type, baccalaureate degree major, and US- versus foreign-born.

Source: This research was performed at a Federal Statistical Research Data Center under FSRDC Project Number 2239. (CBDRB-FY23-P2239-R10625)

Table 4. Associations between graduate and professional program rank and earnings by degree field

Outcome:	Log earnings	Log earnings	Top one percent	Top one percent
	(1)	(2)	(3)	(4)
	Research doctorates			
I{rank <= 50}	0.1146***	0.0718***	0.0105*	0.0039
	(0.0188)	(0.0188)	(0.0045)	(0.0048)
Rank effect among top 50				
At rank = 5	-0.0033***	-0.0025***	-0.0009*	-0.0006+
	(0.0007)	(0.0007)	(0.0004)	(0.0003)
At rank = 25	-0.0028***	-0.0021***	-0.0005**	-0.0003*
	(0.0006)	(0.0006)	(0.0002)	(0.0002)
At rank = 45	-0.0022***	-0.0017***	-0.0003***	-0.0002*
	(0.0004)	(0.0004)	(0.0001)	(0.0001)
	MBAs			
I{rank <= 50}	0.3469***	0.2939***	0.0731***	0.0612***
	(0.0428)	(0.0413)	(0.0116)	(0.0124)
Rank effect among top 50				
At rank = 5	-0.0276***	-0.0278***	-0.0073*	-0.0071*
	(0.0074)	(0.0076)	(0.0033)	(0.0036)
At rank = 25	-0.0068**	-0.0070**	-0.0019**	-0.0018**
	(0.0023)	(0.0022)	(0.0006)	(0.0007)
At rank = 45	0.0140+	0.0139+	0.0007	0.0006
	(0.0073)	(0.0074)	(0.0018)	(0.0017)
	JDs			
I{rank <= 50}	0.2695***	0.2211***	0.0794***	0.0675***
	(0.0428)	(0.0431)	(0.0143)	(0.0143)
Rank effect among top 50				
At rank = 5	-0.0064***	-0.0057***	-0.0026**	-0.0022*
	(0.0016)	(0.0016)	(0.0010)	(0.0009)
At rank = 25	-0.0054***	-0.0049***	-0.0019***	-0.0017***
	(0.0012)	(0.0012)	(0.0005)	(0.0005)
At rank = 45	-0.0045***	-0.0041***	-0.0014***	-0.0013***

	(0.0008)	(0.0008)	(0.0003)	(0.0003)
	MDs			
I{rank <= 50}	0.1345***	0.1095**	0.0272	0.0202
	(0.0403)	(0.0412)	(0.0241)	(0.0244)
Rank effect among top 50				
At rank = 5	0.0001	-0.0004	-0.0007	-0.0004
	(0.0064)	(0.0062)	(0.0044)	(0.0042)
At rank = 25	-0.0040*	-0.0032+	-0.0016	-0.0010
	(0.0018)	(0.0018)	(0.0011)	(0.0011)
At rank = 45	-0.0082	-0.0060	-0.0023	-0.0015
	(0.0066)	(0.0062)	(0.0033)	(0.0033)
Controls for demographics and degree type	Yes	Yes	Yes	Yes
Controls for BA major and selectivity		Yes		Yes

Notes: * p < 0.05, ** p < 0.01, *** p < 0.001. Cluster-robust standard errors in parentheses. All models additionally control for age, years since bachelor's degree receipt, degree type, baccalaureate degree major, and US- versus foreign-born.

Source: This research was performed at a Federal Statistical Research Data Center under FSRDC Project Number 2239. (CBDRB-FY23-P2239-R10625)

Table 5. Associations between graduate and professional program rank and earnings by year

Outcome:	Log earnings	Log earnings	Top one percent	Top one percent
	(1)	(2)	(3)	(4)
	1990			
I{rank <= 50}	0.1621***	0.1261***	0.0432***	0.0375***
	(0.0159)	(0.0166)	(0.0069)	(0.0072)
Rank effect among top 50				
At rank = 5	-0.0058***	-0.0046***	-0.0023***	-0.0020***
	(0.0007)	(0.0008)	(0.0005)	(0.0005)
At rank = 25	-0.0048***	-0.0038***	-0.0016***	-0.0014***
	(0.0005)	(0.0006)	(0.0003)	(0.0003)
At rank = 45	-0.0037***	-0.0030***	-0.0011***	-0.0010***
	(0.0004)	(0.0004)	(0.0001)	(0.0001)
	2009-2019			
I{rank <= 50}	0.2550***	0.2097***	0.0452***	0.0374***
	(0.0245)	(0.0241)	(0.0061)	(0.0063)
Rank effect among top 50				
At rank = 5	-0.0049***	-0.0045***	-0.0017**	-0.0014**
	(0.0011)	(0.0011)	(0.0005)	(0.0005)
At rank = 25	-0.0043***	-0.0040***	-0.0012***	-0.0011***
	(0.0008)	(0.0008)	(0.0003)	(0.0003)
At rank = 45	-0.0036***	-0.0034***	-0.0009***	-0.0008***
	(0.0006)	(0.0006)	(0.0001)	(0.0001)
Controls for demographics	Yes	Yes	Yes	Yes
Controls for BA major and selectivity		Yes		Yes

Notes: * p < 0.05, ** p < 0.01, *** p < 0.001. Cluster-robust standard errors in parentheses. All models additionally control for age, years since bachelor's degree receipt, degree type, baccalaureate degree major, and US- versus foreign-born.

Source: This research was performed at a Federal Statistical Research Data Center under FSRDC Project Number 2239. (CBDRB-FY23-P2239-R10625)

Table 6. Associations between graduate and professional program rank and earnings by gender

Outcome:	Log earnings	Log earnings	Top one percent	Top one percent
	(1)	(2)	(3)	(4)
		Women		
I{rank <= 50}	0.2036***	0.1620***	0.0330***	0.0291**
	(0.0369)	(0.0366)	(0.0081)	(0.0090)
Rank effect among top 50				
At rank = 5	-0.0032*	-0.0031*	-0.0011+	-0.0010
	(0.0015)	(0.0015)	(0.0007)	(0.0007)
At rank = 25	-0.0028*	-0.0028*	-0.0008*	-0.0007*
	(0.0011)	(0.0011)	(0.0003)	(0.0003)
At rank = 45	-0.0025**	-0.0025**	-0.0005***	-0.0005**
	(0.0008)	(0.0008)	(0.0001)	(0.0002)
		Men		
I{rank <= 50}	0.2577***	0.2131***	0.0526***	0.0438***
	(0.0230)	(0.0227)	(0.0072)	(0.0073)
Rank effect among top 50				
At rank = 5	-0.0062***	-0.0055***	-0.0022***	-0.0019**
	(0.0010)	(0.0010)	(0.0006)	(0.0006)
At rank = 25	-0.0053***	-0.0047***	-0.0016***	-0.0014***
	(0.0008)	(0.0008)	(0.0003)	(0.0003)
At rank = 45	-0.0044***	-0.0039***	-0.0011***	-0.0010***
	(0.0005)	(0.0005)	(0.0001)	(0.0001)
Controls for demographics	Yes	Yes	Yes	Yes
Controls for BA major and selectivity		Yes		Yes

Notes: * p < 0.05, ** p < 0.01, *** p < 0.001. Cluster-robust standard errors in parentheses. All models additionally control for age, years since bachelor's degree receipt, degree type, baccalaureate degree major, and US- versus foreign-born.

Source: This research was performed at a Federal Statistical Research Data Center under FSRDC Project Number 2239. (CBDRB-FY23-P2239-R10625)

Table 7. Associations between graduate and professional program rank and earnings by highest parents' education

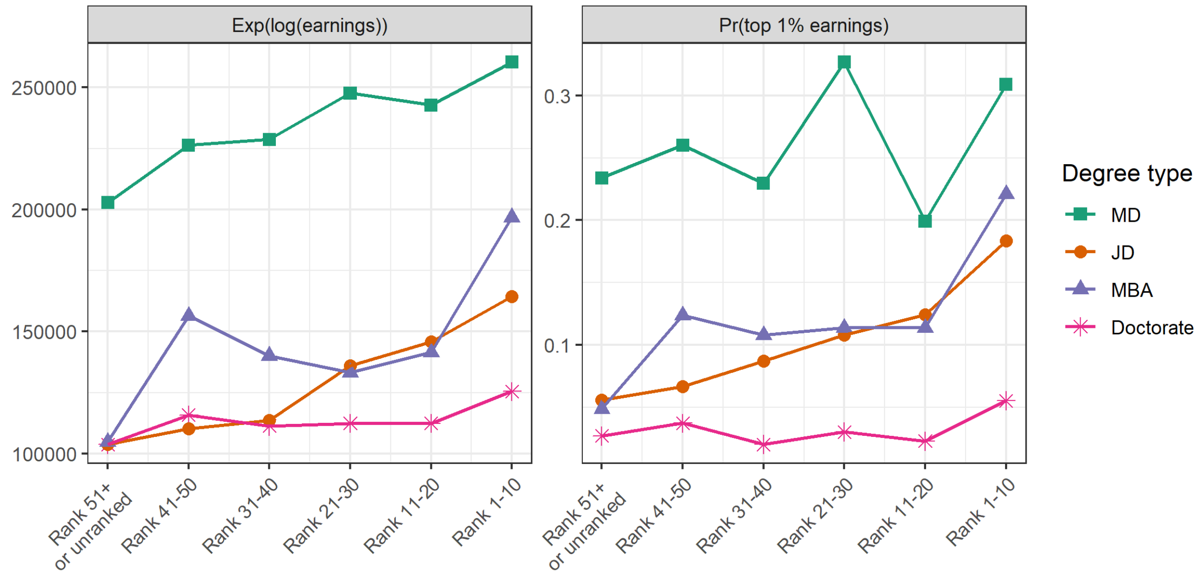
Outcome:	Log earnings	Log earnings	Top one percent	Top one percent
	(1)	(2)	(3)	(4)
		High school or less		
I{rank <= 50}	0.2005***	0.1593***	0.0293**	0.0207*
	(0.0487)	(0.0444)	(0.0094)	(0.0091)
Rank effect among top 50				
At rank = 5	-0.0053+	-0.0052*	-0.0011	-0.0007
	0.0019	0.0018	0.0008	0.0007
At rank = 25	-0.0044**	-0.0043**	-0.0008+	-0.0006
	0.0014	0.0014	0.0004	0.0004
At rank = 45	-0.0035***	-0.0034***	-0.0005*	-0.0004+
	0.0009	0.0009	0.0002	0.0002
		Some college or bachelor's degree		
I{rank <= 50}	0.2722***	0.2287***	0.0543***	0.0473***
	(0.0331)	(0.0329)	(0.0089)	(0.0094)
Rank effect among top 50				
At rank = 5	-0.0062***	-0.0060***	-0.0026**	-0.0023**
	0.0014	0.0014	0.0008	0.0008
At rank = 25	-0.0052***	-0.0050***	-0.0017***	-0.0016***
	0.0011	0.0011	0.0004	0.0004
At rank = 45	-0.0041***	-0.0040***	-0.0011***	-0.0010***
	0.0008	0.0008	0.0002	0.0002
		Graduate degree		
I{rank <= 50}	0.2193***	0.1761***	0.0449***	0.0377***
	(0.0276)	(0.0285)	(0.0085)	(0.0088)
Rank effect among top 50				
At rank = 5	-0.0039**	-0.0029*	-0.0014*	-0.0012+
	0.0012	0.0013	0.0006	0.0006
At rank = 25	-0.0036***	-0.0028***	-0.0011**	-0.0010**
	0.0009	0.0009	0.0003	0.0004
At rank = 45	-0.0033***	-0.0027***	-0.0009***	-0.0008***
	0.0006	0.0006	0.0002	0.0002

Controls for demographics	Yes	Yes	Yes	Yes
Controls for BA major and selectivity		Yes		Yes

Notes: * p < 0.05, ** p < 0.01, *** p < 0.001. Cluster-robust standard errors in parentheses. All models additionally control for age, years since bachelor's degree receipt, degree type, baccalaureate degree major, and US- versus foreign-born.

Source: This research was performed at a Federal Statistical Research Data Center under FSRDC Project Number 2239. (CBDRB-FY23-P2239-R10625)

Figure 1. Returns to program rank by degree field, adjusting for age and time since degree



Source: This research was performed at a Federal Statistical Research Data Center under FSRDC Project Number 2239. (CBDRB-FY23-P2239-R10625)

CHAPTER THREE: LOCAL LABOR MARKET SEGREGATION AND THE NET-BLACK ADVANTAGE IN COLLEGE ATTENDANCE

Introduction

Sociological research on educational transitions has revealed complex patterns at the intersection of race and class. White students are on average less likely to transition to four-year colleges than are Black students from similar socioeconomic backgrounds (Alexander, Holupka, and Pallas 1987; Bennett and Xie 2003; Charles, Roscigno, and Torres 2007; Ciocca Eller and DiPrete 2018; Michelmore and Rich 2022; Rivkin 1995). Bennet and Xie (2003) termed this phenomenon the "net-Black advantage." Scholars have interpreted this pattern as reflecting a broader orientation toward education as a means of racial uplift in Black communities (Harris 2008). However, as college dropout rates remain high among Black youth and the costs of college increase (Ciocca Eller and DiPrete 2018), the net-Black advantage may expose more Black young adults to an increased risk of holding student loan debt and no credential, which in turn may negatively affect life courses in a variety of ways (Addo, Houle, and Simon 2016; Ciocca Eller and DiPrete 2018; Jackson and Reynolds 2013).

Social scientists have accumulated considerable evidence on these patterns and have proposed a set of theoretical explanations for them. However, few empirical efforts have attempted to disentangle these explanations. In this chapter, I examine the possibility that racial segregation in local labor markets differently shapes educational continuation decisions among Black and white youth. As the availability of middle-class jobs for high school graduates has declined and earnings and employment among less-educated adults have fallen, college degrees have become increasingly associated with earnings in adulthood (Autor, Goldin, and Katz 2020; Lemieux 2006). Increasing work precarity and a polarizing job market since the 1970s has meant that workers without college degrees are disproportionately exposed to employment in 'bad' jobs—that is, with low pay, few benefits, uncertain work schedules, and high turnover—often concentrated in the service sector (Kalleberg 2009; Labriola and Schneider 2020). On the other hand, there remain pathways to good jobs—that is, positions with good pay, job security, regular hours, and fringe benefits—for sub-baccalaureate workers, particularly in some sectors like healthcare and the trades (Dill and Hodges 2019). In addition to being educationally stratified, access to these jobs is also racially stratified in the United States—that is, white workers are more likely to work in those sectors as well as hold higher quality jobs within sectors (Royster, 2003; Storer, Schneider, & Harknett, 2020, Stainback and Tomaskovic-Devey, 2012).

These racialized labor market patterns may shape the patterns of college attendance at the intersection of race and class. Although the prior literature on the net-Black advantage has referenced the potential importance of the labor market opportunities faced by young people, it has less commonly linked this type of labor market segregation to net racial differences in college attendance. I hypothesize that the historical domination of good, blue-collar jobs by white workers—and white men in particular—creates opportunities for white youth to land good jobs without a bachelor's degree that are less available to black youth in segregated labor markets (Royster 2003). These opportunities, in turn, may reduce the incentive for white youth to earn a baccalaureate credential, thus contributing to the net-Black advantage.

In this chapter, I test this hypothesis empirically by examining spatial heterogeneity in net-racial differences in college attendance. In particular, I examine how variation in the degree of local labor market segregation shapes differential patterns of college attendance among low-income Black and white adolescents.

Using a combination of administrative data from public schools in Wisconsin and the American Community Survey, I estimate multi-level models predicting college enrollment differences between Black and white boyss and girls in labor markets with differing degrees of gender-specific racial occupational segregation, which I argue proxies for racial differences in choices and opportunities among workers without bachelor's degrees. However, I do not find evidence consistent with the hypothesis above: the net-Black advantage in four-year college attendance among both boys and girls is unrelated to labor market segregation in Wisconsin. However, I do find some evidence that white boys in the most segregated labor markets are more likely than Black boys to choose to attend two-year colleges, potentially pursuing a vocational education pathway. Taken together, these findings shed light on the sources of racial differences in educational transitions in the United States and suggest new directions for future work.

Background

The net-Black advantage in college attendance

The net-Black advantage can be broadly characterized as a higher likelihood that Black youth attend baccalaureate colleges when compared to white youth with similar background characteristics. There have been three major theoretical explanations proposed for this empirical finding: institutional access, social-psychological and cultural motivation, and labor market access and discrimination.

Early work in this area proposed that differences in institutional pathways between Black and white students explains the net differences. For instance, Manski and Wise (1983) hypothesized that Historically Black Colleges and Universities' (HBCUs) role in promoting college attendance among Black youth accounted for the differences. However, Bennett and Xie (2003) found that explanation wanting: the net Black advantage emerges for attendance at baccalaureate institutions broadly. Indeed, conditional on background measures, Black and Hispanic students attend more selective colleges on average than their white counterparts (Conwell and Quadlin 2021). Others have proposed that the emergence of affirmative action policies at the college level have promoted greater attainment among Black as compared to white students since the 1960s (Bauman 1998). It is true that selective colleges evince a preference for Black applicants—and more recently Hispanic applicants—in their admissions competitions, conditional on students' academic characteristics (Grodsky 2007). However, most students now attend less- and non-selective colleges where affirmative action is irrelevant (Baker et al. 2018). Furthermore, Bauman (1998) found evidence of a net Black advantage in educational attainment beginning in the 1950s, before the Civil Rights era, calling into question the importance of affirmative action in explaining the phenomenon. The combined evidence suggests that institutional pathways are a weak explanation for net racial differences in college attendance.

Other scholars have noted that differences in educational transitions are partly explained by the earlier formation of particularly high aspirations and pro-school attitudes among Black youth and other students of color. Some of these differences in beliefs and attitudes are present at the margin, and they become larger conditional on family SES and academic achievement (Bennett and Xie 2003; Downey, Ainsworth, and Qian 2009; Merolla 2013; Morgan 1996). Among Black students, scholars have termed this phenomenon the "attitude-achievement paradox" because of the discrepancy between pro-school attitudes and comparatively low achievement (Downey et al. 2009; Mickelson 1990). Scholars have hypothesized that these attitudes and orientations have historical roots, such that Black Americans' struggle for access to educational institutions throughout U.S. history has fostered a particularly pro-education cultural orientation (Harris 2008). These findings further refute theories explaining Black students' underachievement in school as rooted in an oppositional culture established in response to structurally limited mobility chances (Fordham and Ogbu 1986; Ogbu 2003). Black children's and their parents' affection for school and value placed in educational attainment are associated with higher achievement and a higher likelihood of attending college (Harris 2008). White children, on the other hand, see less value in schooling for their social mobility (Harris 2008). The balance of evidence suggests that these processes are a partial but important explanation for net racial differences in college attendance.

The third explanation approaches racial differences in educational investment as a mobility strategy in the racialized labor market. This explanation is not independent of the cultural and social-psychological explanation above: perceptions are informed by the realities of structural or interpersonal racism in the opportunity structure. Black children are more likely than white children to believe they will be met with barriers in the labor market regardless of the education they attain (Harris 2008). From a rational actor perspective, if Black children must attain more education to achieve a similar level of socioeconomic success as their white counterparts, it may be that are compelled to invest more in educational attainment net of the resources available to them (Lang and Manove 2011; Mangino 2010, 2019). Educational credentials may be particularly important for subordinated racial groups to establish legitimacy and competence in the eyes of gatekeepers in racialized organizations (Ray 2019). This may be especially important for avoiding downward socioeconomic mobility, as predicted by Relative Risk Aversion (Breen and Goldthorpe 1997), and Black men and women are at particularly high risk of downward absolute economic mobility (Chetty, Hendren, et al. 2020; Mazumder 2011). Indeed, Black workers experience higher rates of unemployment and earn lower wages conditional on educational attainment and measures of cognitive skills than do white workers

(Lang and Manove 2011). However, few studies have considered the particular labor market conditions that link these unequal outcomes to different educational decisions. In the next section, I consider one potential mechanism: racial segregation in the sub-baccalaureate labor market.

Racialized labor markets and the net-Black advantage

As evident from the summary above, most of the extant literature has considered what it is about Black youth that leads them to have particularly pro-educational and/or pro-college orientations and behaviors. Surveying this literature, Pattillo (2021:27) pushes researchers ask the opposite question: why are white youth less likely to enroll in college, net of background characteristics? One possibility is that there are attractive opportunities in the sub-baccalaureate market available to young white people that are less likely to be available to Black youth. Although scholars have often referenced racial inequality in employment and wages as potential explanations of the net-Black advantage (e.g., Beattie, 2002; Bennett & Xie, 2003; Harris, 2008; Rivkin, 1995), there has been less empirical work examining the labor market conditions that underly that inequality.

While wages for workers without college degrees have generally stagnated in recent decades, there do remain ‘good’ jobs for workers without bachelor’s degrees: jobs with middle-class wages, fringe benefits, a regular schedule, and job security (Dill and Hodges 2019; Kalleberg 2011; Labriola and Schneider 2020; Schneider and Harknett 2019). If white youth are more likely to land these good jobs, perhaps through family and social connections or through explicitly discriminatory treatment, it may lower their incentive to pursue a bachelor’s degree after high school relative to Black youth. This hypothesis further suggests that the intersection of race and gender is critical to this process because the sub-baccalaureate labor market is gendered as well as racialized. In particular, the remaining ‘good’ jobs for sub-baccalaureate men are typically found in construction and manufacturing, while they are largely found in healthcare and other care work among women (Dill and Hodges 2019).

Social networks may create unique opportunities for good jobs in construction and the trades for young white men. In contrast, Black men have historically faced exclusion and discrimination in those industries (Stainback and Tomaskovic-Devey, 2012). Indeed, Black youth who complete vocational training programs see lower returns in the labor market than do white youth (Ainsworth and Roscigno 2005). In one study of young Black and white trade school graduates, Royster (2003) found that despite similar skills and aspirations to white graduates, Black graduates were far less likely to find long-term employment in the industries they were trained in, and often instead fell into low-paying and unstable service sector work. Due to the white majority among workers and managers in the sought-after industries, white graduates had access to opportunities, information, and referrals through their family and social networks that fostered career mobility, and which were inaccessible to the Black men in her study.

Although that study focused on youth who had already chosen not to pursue a bachelor’s degree, those same racialized social networks may well shape occupational aspirations, educational investments, and college-going decisions. White boys may experience more encouragement than Black boys from family, friends, and school officials to gain vocational skills and pursue employment in the trades, particularly when their own parents did not complete college. Children disproportionately enter the specific occupations held by their parents, perhaps because of the influence of socialization to occupation-specific values or culture, or due to the transmission of relevant social networks and skills (e.g., Jonsson, Grusky, Di Carlo, Pollak, & Brinton, 2009). To the extent that white children are more likely to be born to parents who work in the trades than are Black children, this could well shape their tastes for, and knowledge about, this type of work. There is also evidence that this mechanism functions at the community level. Bolstering this account, Sutton, Bosky, and Muller (2016), report suggestive evidence of larger racial disparities in blue-collar employment after high school in blue-collar communities in particular.

In addition to these structural barriers, a disproportionate focus on upward educational mobility inside schools can create an environment where students receive less information about, or encouragement to pursue, well-paying jobs that do not require a bachelor's degree. High schools in the US have increasingly promoted a "college-for-all" approach to educational attainment (Rosenbaum 2001). In a recent study, Hill (2022) found that high school officials serving a majority Black population almost exclusively promoted four-year college attendance despite the likelihood that many students would likely struggle to complete a bachelor's degree. This environment also corresponded to a racialized local labor market in the trades. In that context, Hispanic youth had family and social connections to the trades that Black youth lacked, and more often ended up in those jobs despite the focus on four-year colleges among school officials (Hill, 2022).

Among women, however, stratified employment in healthcare, education, and other services is the most prominent manifestation of Black-white inequality in the labor market (Dwyer 2013; Hodges 2020). Black women are disproportionately employed in the lowest-paying and least secure occupations such as home health aide and child care worker, while white women are overrepresented in the most lucrative professions in those fields (Hodges 2020). Access to good jobs in those fields, however, is more strongly structured by educational attainment and credentialing than it is in blue-collar industries. The credentialization of those fields may reduce the influence of racialized social networks, and thus racial segregation, on access to job opportunities among women (Redbird 2017). This, in turn, may reduce the influence of labor market segregation on the educational decisions of low-income Black and white girls, because both white and Black girls face equal incentives to earn a bachelor's degree relative to facing the sub-baccalaureate market.

The Present Study

The main objective of this chapter is to conduct a novel empirical investigation of the possibilities described above. I test for the importance of labor market segregation in explaining net differences in college attendance by race and gender. Empirically, I compare the college outcomes of same-gender, low-income Black and white youth across labor markets in Wisconsin. I measure gender-specific labor market segregation in the area where students reside as the key predictor in my analysis. This analysis provides novel evidence on the importance of racial inequality in labor market opportunities as an explanation for the net-Black advantage.

This study, like the other work in this area, is essentially descriptive—it examines conditional mean differences in college attendance between Black and white youth. However, prior work has conceptualized and empirically measured net racial differences in college attendance in multiple ways. Some studies have made comparisons conditional on measures of family socioeconomic status like income, neighborhood disadvantage, and parental educational attainment (e.g., Bauman, 1998; Michelmore & Rich, 2022). Others have additionally included measures of academic performance, attitudes, or educational aspirations (e.g., Ciocca Eller & DiPrete, 2018).

In this study, I estimate models that condition on measures of academic skills as well as a measure of family income. An important part of the theoretical interest in the net-Black advantage is a comparison of college-going behavior between students with similar resources that facilitate educational attainment, and here I consider academic skills to be one important resource for that end, and therefore an important part of the conditioning set in this literature. On the other hand, academic performance may be downstream of some of the proposed mechanisms of the net-Black advantage described above. For instance, if low-income white youth and/or their parents see less value in pursuing a bachelor's degree, they may invest less time, effort, or financial resources in promoting academic performance than do similarly socioeconomically situated Black parents. In this way, academic performance may be a mediator in the social process of interest. Conditioning on a mediator presents many non-intuitive problems for inference, including attenuation bias and endogenous selection bias (Elwert and Winship 2014). To minimize this possibility, I measure academic performance in 8th grade, before many students take concrete actions towards a particular career path or college destination.

Data and Methods

I analyze data on all public-school students enrolled in Wisconsin schools using the Wisconsin State Longitudinal Data System (SLDS). These data record students' demographic characteristics and track their enrollments and educational outcomes. I analyze Black and white students enrolling in 10th grade for the first time between 2009 and 2015. Students' records are linked to their postsecondary enrollments using the National Student Clearinghouse, which covers upwards of 95% of all postsecondary institutions in the United States (Dynarski, Hemelt, and Hyman 2015). I measure whether and where students enroll using their first college enrollment within four years after the fall of their 10th grade year. Students therefore have up to two years after expected high school graduation to be measured as enrolling in college. I focus on four-year college attendance as the main outcome of interest, following prior work in this area. Ideally, I would be able to measure the occupational destinations of students who do not attend college to provide more evidence on the hypotheses above. However, I also examine two-year college attendance because many students enroll in vocational programs in community and technical colleges, potentially providing evidence of a pathway into the trades or healthcare professions.

Prior work has consistently found that net racial differences in college attendance emerge mainly among relatively low-income or low-SES students (Bennett and Xie 2003; Bumpus, Umeh, and Harris 2020). Following this empirical finding and my theoretical interest in these net differences, I restrict the analytic sample to low-income students. I do this by proxy: I include in my analysis only students who received subsidized school lunch at some point in their public-school career. Longitudinal measures of school lunch receipt have proved strong proxies for family income (Michelmore and Dynarski 2016; Michelmore and Rich 2022). Since there remains substantial variation in income among students who ever receive subsidized lunch, I additionally control for the percentage of observed years students received it.

I draw on the American Community Survey (ACS) for small area estimates of occupational and educational distributions among adults over 25 by race. I use 5-year estimates from 2009-2013 to approximate the years these students attended high school. I measure the percentage of Black and white adults over 25 with at least a bachelor's degree to proxy for the educational attainment of students' parents and others in their same-race social networks[4].

I measure gender-specific occupational segregation using the Black-white dissimilarity index. I calculate the index using the five occupational categories available in ACS estimates at

[4] In supplementary models, I have included additional measures of the educational distribution of adults in each district, such as the percentage with less than a high school degree, and found that the results were essentially equivalent.

small geographies: Production, transportation, and material moving occupations; natural resources, construction, and maintenance occupations; sales and office occupations; service occupations; and management, business, science, and arts occupations.

These are the most detailed publicly available data at small geographies for measuring occupational segregation by race and gender. However, I note that the hypothesized mechanism described above links labor market segregation to differences in college attendance through a specific type of segregation: racialized access to more lucrative or otherwise higher quality positions in the sub-baccalaureate labor market. An ideal measure would use more detailed local race-by-gender job distributions, as well as workers' educational attainment to measure racial inequality in the distribution of workers across low-paying service work versus higher-paying jobs in blue-collar industries. However, the measure I create using the available data is likely a reasonable proxy for the ideal version. First, most workers have not earned bachelor's degrees: in Wisconsin, the rate of bachelor's degree attainment among working adults is about 32%. Therefore, a measure of segregation in the whole labor market will heavily weight workers without four-year degrees. Second, in the models below I condition on the rate of bachelor's degree attainment to remove as much of the variation in segregation driven by the distribution of that group across places.

I examine spatial heterogeneity at the level of Commuting Zones (CZs), reasoning that these geographic boundaries best approximate the local labor markets that define the context of young peoples' educational continuation decisions[5]. Commuting Zones are clusters of counties with a high degree of labor market integration, usually centered around a more urban core, or

[5] I have also examined the robustness of my results to the choice of geographic unit by conducting supplementary analyses using Core Based Statistical Areas (CBSAs) that students reside in, and have found that the results are broadly similar.

Core-Based Statistical Area. Given the time frame of my study, I use CZ boundaries developed by Fowler et al. using methods from prior years and data from 2010 (Fowler and Jensen 2020; Fowler, Rhubart, and Jensen 2016). Finally, given the importance of access to postsecondary institutions for college attendance (Hirschl and Smith 2020), I measure the distance between each school district centroid and the nearest two-year and four-year college.

I use the school district that students attend in 10^{th} grade to infer their residence in a given CZ. School district boundaries do not fit perfectly into CZ boundaries, and so I allocate each district to the CZ that contains the largest proportion of its area. I must exclude one commuting zone from my analysis because only one Black student attended high school there, precluding reasonable statistical inference. After these exclusions, the analytic sample contains 125,092 students residing in 376 districts located in 16 CZs.

Methods

To examine variation across labor markets in racial differences in college attendance, I use analytic methods that account for the nested geographical structure of the data and also adjust for measurement error in key predictors. I fit multi-level grouped[6] logistic regression models using Bayesian inference. The baseline model for racial differences in college attendance takes the form:

$$\text{college}_{ij} \sim \text{Binomial}(n_{ij}, p_{ij})$$

$$\text{logit}(p_{ij}) \sim \alpha_{cz} + \beta_{cz}\text{black}_{ij} + \sum \gamma_k \text{X}_{ijk}$$

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[6] I choose to estimate grouped models—that is, with observations aggregated at the district level—rather than individual-level models because individual-level models with tens of thousands of observations were not computationally feasible with full Bayesian estimation. Since the only individual-level predictor is the percentage of years students receive subsidized lunch, the only compromise is that I control for district-by-race-specific averages of that variable, rather than at the individual-level. This compromise likely has little effect on the results. I have fit individual-level models using maximum likelihood estimation, and found the results very closely comparable to the equivalent grouped models.

$$\begin{bmatrix}\alpha_{cz}\\ \beta_{cz}\end{bmatrix} \sim \text{MVNormal}\left(\begin{bmatrix}\alpha\\ \beta\end{bmatrix}, \begin{bmatrix}\sigma_{\alpha} & \sigma_{\alpha\beta}\\ \sigma_{\beta\alpha} & \sigma_{\beta}\end{bmatrix}\right) \ , \qquad (1)$$

where i indexes 376 public school districts, j indexes racial identity (Black or white), and cz indexes the 16 commuting zones in the analysis. The outcome of interest is p_{ij}, the probability that the average student of racial identity j in district i attends college. The random intercepts α_{cz} model differences in that probability across CZs, and the random slopes β_{cz} describe the difference between Black and white students in each CZ. The intercepts and slopes are jointly estimated as a correlated multivariate normal distribution. The γ_k are slope parameters on the k district-level covariates, which in the baseline model include the average percentage of years students receive subsidized lunch by race, the average reading and math test scores from students' 8^{th} grade administration, the percentage of same-race adults who have a bachelor's degree, whether the district is within 20 miles of a public four-year college, and within 10 miles of a public two-year college.

One benefit of the Bayesian approach is that it facilitates the regularized estimation of theoretically compelling models with many parameters but without excessive efficiency loss. In particular, the effects of other variables in the model likely vary across commuting zone. In particular, places vary in the extent to which low-income students are likely to attend college (Hirschl & Smith 2021). They may well also vary in the extent to which test scores predict college attendance, depending on the opportunities available to high- versus low-achieving students. These place-varying effects would contaminate the Black-white contrast of interest if those coefficients are fixed to be the same in every place. I therefore allow the coefficients on subsidized lunch and average test scores to vary across CZs as random slopes, which are modelled as drawn from a common multivariate normal distribution and thus regularized. I estimate the full variance-covariance matrix of the varying slopes and intercepts.

In the full model, I include the key predictor of interest: Black-white occupational segregation at the CZ level:

$$\text{logit}\left(p_{ij}\right) \sim \text{Baseline model} + \delta_1 \text{occ\_seg}_{cz} + \delta_2 \text{occ\_seg}_{cz} \times \text{black}_{ij} \ , \quad (2)$$

where δ_1 is the association between occupational segregation and college attendance for white students, and δ_2 is the difference in the association for Black students compared to white students. The interaction term can also be interpreted as the extent to which Black-white differences in college attendance differ by occupational segregation. I estimate these models separately for 10^{th} grade boys and girls, using gender-specific occupational segregation in each. I fit all models with uninformative and weakly regularizing priors on the parameters.

I estimate models predicting both four-year and two-year college attendance. This choice is an additional expansion compared to the existing literature, since studies of the net-Black advantage rarely consider two-year attendance. Two-year degrees are often oriented toward careers in the trades or healthcare, and therefore students' attendance could indicate an intention to work in those sectors.

Correcting for measurement error

Two predictors in the models above are calculated from an often small random sample of adults within geographic areas: CZ occupational segregation and the educational attainment of same-race adults in each school district. As a consequence, they are both laden with measurement error, and the magnitude of that error differs across observations depending on the size of the sample drawn from the corresponding geographic area. In particular, because the Black population is geographically concentrated in Wisconsin, there are large errors in some districts and CZs where relatively few Black adults reside. If left unaccounted for, this measurement error will bias the estimated associations, as well as potentially understate the uncertainty in the relationships of interest. Since there are multiple variables with measurement error, the direction of the bias could be in either direction.

One advantage of the Bayesian estimation framework is that it facilitates accounting for measurement error. In particular, the models treat each observed value of local educational attainment and local occupational segregation as draws from an unobserved latent distribution (see Fiel, 2020 for another application of this method). The model estimates latent distributions of the predictors for each observation and draws from them on each chain iteration, thereby accounting for uncertainty in the measures and the error-driven bias in the coefficients estimated on them. In a process analogous to a multi-level model, the model shares information across observations, shrinking less certain ones toward the overall average[7].

I define the standard error of measurement of the latent distributions using the margins of error released with the ACS count estimates. I follow the procedure recommended by the Census Bureau for converting the standard errors for counts into standard errors for proportions. However, the uncertainty in dissimilarity index estimates is not directly calculable from released standard errors because of its relative complexity. Furthermore, analysts have long recognized that sampling error in segregation indices tends to bias them upward. Therefore, the naïve segregation estimates for the CZs with fewer Black adults are likely inflated. I both correct for this upward bias and calculate the standard errors of each dissimilarity index using the numerical method established by Napierala and Denton (2017).

Finally, I note that there is very likely aggregation bias in the estimates of labor market segregation I use. The ACS only releases occupational distributions across five categories at

[7] In the case of the percentage of adults with a bachelor's degree by race in each district, I gain further precision by modeling the nested structure of districts within CZs. I shrink the district-level estimates of toward the same-race mean of adults in the larger CZ.

small geographies; a measure of segregation with a more detailed set of occupational categories would capture more racial differences and therefore measure more labor market segregation. Since my aim is to compare across geographies, the extent to which this bias affects my results depends on how that aggregation bias varies across CZs in Wisconsin. I am unaware of any data or prior research that uses more detailed, local occupational distributions that could shed light on the importance of this aggregation bias.

Results

The top panel of Table 1 presents the average characteristics of students in the analytic sample. As is true nationally, low-income girls in Wisconsin are substantially more likely to attend college of any kind than are low-income boys: more than a quarter of low-income white girls attended college, compared to just 17% of low-income white boys. Twenty percent of Black girls in this sample attend four-year colleges compared to 12% of Black boys. Even among this population of students who ever received free or reduced-price lunch, the longitudinal measure of receipt reveals further disparities by racial identity. On average, Black children were eligible for subsidized lunch in about three quarters of observed years, compared to 60% among white children. Furthermore, the average percentage of Black adults with a bachelor’s degree in the districts where these students reside was 13%, compared to 28% among white students.

Gendered occupational segregation in Wisconsin

Labor markets are strongly racially segregated in Wisconsin. The average dissimilarity index among both men and women is nearly 0.3, meaning that 30% of workers would have to move among the five broad occupational categories I construct to equalize those distributions. The bottom panel of Table 1 paints a more detailed picture of occupational segregation in Wisconsin. Compared to white men, Black men are less likely to work in natural resources, construction, and maintenance occupations, reflecting the historical racial exclusion from the trades. Black men are also less likely to hold managerial positions, or work in business, science, and arts occupations. Instead, Black men are more than twice as likely to hold jobs in service occupations. Although similar in its degree, the form of occupational segregation between Black and white women is markedly different: the main contrast is between service occupations and management, business, science, and arts occupation. This contrast is consistent with national evidence of strong racial segregation across different occupations in the healthcare, education, and other service sectors (Hodges 2020).

Importantly for this study, there is considerable variation in segregation across labor markets in Wisconsin: the standard deviation in the dissimilarity index across them is between 0.10 and 0.13. To get a sense of how the occupational distributions differ between more- and less-segregated labor markets, Figure 1 presents selected occupational distributions in the most and least segregated CZs by gender. In the Appleton-Fond du Lac-Oshkosh labor market (Panel A), where the dissimilarity among men is 0.2, the state average pattern is evident, though somewhat muted: an overrepresentation of Black men in service occupations and production, transportation, and material moving occupations, and a modest underrepresentation in the trades. In highly the segregated Manitowoc-Sheboygan labor market, on the other hand, Black men are heavily concentrated in service occupations, and are virtually absent from the trades and management, business, science, and arts occupations. These distributions also suggest that the overall measure of labor market segregation I construct proxies reasonably well for the unequal distribution of Black versus white men in the sub-baccalaureate labor market, especially in service versus natural resources, construction, and maintenance occupations.

Occupational segregation among women takes a somewhat different form in Wisconsin given women's very low participation in blue-collar work. Black women in the relatively integrated Madison-Baraboo labor market are nearly equally likely as white women to be employed in sales, office, or management, business, science and arts occupations. In the most segregated labor market for women, however, Black women are disproportionately concentrated in service occupations.

Variation in net racial differences across labor markets

The next task of this study is to compare net differences in college attendance between commuting zones with differing degrees of gendered labor market segregation, where variation in labor market segregation may create starkly different job opportunities for Black and white youth emerging from high school. As a preliminary step, I establish that there is a reasonable degree of variation across Wisconsin's labor markets in the outcome of interest: net racial differences in four-year college attendance. To do so, I estimate the baseline model described above, and calculate the marginal effect at the mean for each β_{cz}—the random slopes for Black-white differences in four-year attendance. These models condition on differences by race in subsidized lunch receipt, test scores, educational attainment among adults, and distance to the nearest colleges.

Figure 2 displays those estimates and their credible intervals, separately for boys and girls. The variation across CZs is substantially wider for girls (Panel B) than boys (Panel A). The difference between the CZ with the largest difference in four-year college attendance and the one with the lowest is about 10 percentage points of probability among boys, whereas for girls, it is about 20 percentage points. However, when taken as a percentage of the base rate of college attendance for each group (Table 1), this degree of variation is more comparable. Together, these distributions show modest net differences across places in college attendance by race.

Panel A in Figure 2 also shows that on average the net-Black advantage is substantially larger for boys than girls. In fact, there is no average net advantage for Black girls relative to white girls: in some places like Racine, there is a small net-Black disadvantage, and in others—particularly the Milwaukee area—there is a substantial net-Black advantage. Among boys, on the other hand, there is at least a small net-Black advantage in most CZs. The finding that there is substantial gender variation in the net-Black advantage is to my knowledge new in this literature, and provides prima facie evidence supporting the gendered role of blue-collar jobs.

The association between occupational segregation and net racial differences in college attendance

I next estimate the main models described above to examine the association between CZ occupational segregation and the net-Black advantage in four-year college attendance. These estimates are presented in Table 2 separately for boys and girls. These estimates reveal a modest Black advantage among boys net of FRL receipt, test scores, local educational attainment, and distance to local colleges. Black boys have 32% higher odds of attending four-year colleges than do white boys, though the 95% credible interval on this estimate contains zero. However, as was evident in Figure 2, there is no evidence of a net advantage among girls; the logit coefficient is zero, albeit with a wide confidence interval around it.

Contrary to the hypothesis described above, I find little evidence that occupational segregation is associated with four-year college attendance for any group. To better visualize both these relationships and their uncertainty, and to avoid problems interpreting logit coefficients between groups, I display marginal predictions from these models with all other covariates held at their means in Figure 3. In sum, there is some evidence—albeit highly uncertain—that the net-Black advantage in four-year college attendance is similar across labor markets with varying degrees of racial segregation in Wisconsin. These findings are not consistent with the notion that racial differences in the pursuit of, or access to, sub-baccalaureate, blue-collar job opportunities play a role in producing the net-Black advantage in four-year college attendance more broadly. However, there is considerable uncertainty around these estimates, reflecting the relatively few labor markets in Wisconsin and the relatively small and concentrated population of Black students; I cannot rule out relatively large effects in either direction.

Finally, I estimate parallel models for two-year college attendance in Table 3. Conditional on the covariates, I find small within-gender racial differences in two-year college attendance on average, to the advantage of Black students. However, here there is evidence that net racial differences in two-year college attendance are associated with occupational segregation for boys. Occupational segregation is positively associated with two-year college attendance among white boys: an increase of 0.10 in segregation is associated with 45% higher odds of two-year college attendance. In contrast, the same association is weakly negative for Black boys. The interaction coefficient is -0.54 in the logit scale, and the credible interval excludes zero. Figure 4 displays these associations in the probability metric with all other covariates held at their mean. In the least segregated CZs, Black boys are predicted to attend two-year colleges at higher rates than are white boys; in the most segregated ones, the inequality is reversed. If these differences reflect differences in the pursuit of vocational credentials, this finding represents limited evidence for the hypothesis connecting labor market segregation to college attendance behavior.

However, this remains speculative without additional data on the majors that students enroll in or the jobs they hold after completing their degrees.

Conclusion

In this chapter, I produced novel evidence on the role of local labor markets in shaping a common empirical finding in the literature on race and educational stratification: the net-Black advantage. I put the literature on the net-Black advantage in conversation with the literature on racial differences in the sub-baccalaureate labor market, hypothesizing that places where white workers dominate relatively high-paying jobs in the trades would also be places with the largest net-Black advantages in four-year college attendance, particularly among boys. Using multi-level Bayesian regression models, I tested this hypothesis across labor markets in Wisconsin.

I found no evidence that labor market segregation is associated with the net-Black advantage in four-year college attendance for either boys or girls. These findings suggest that other mechanisms may be more important in producing this empirical regularity, including the social-psychological and historical-cultural explanations emphasized by past work (e.g., Harris, 2008). However, I did find some evidence that conditional racial differences in two-year college attendance vary across labor markets, such that white boys are more likely than Black boys to attend sub-baccalaureate colleges in the most segregated labor markets. This finding complicates the typical picture of the net-Black advantage in college attendance by introducing sectoral differences. Future work examining mechanisms for racial differences in college attendance should continue to disaggregate two- versus four-year outcomes, and ideally measure the subjects students pursue in college.

Although there was no association between the measure of occupational segregation I construct and the net-Black advantage, I do find substantial variation in net racial differences in four-year college attendance across geographic areas in Wisconsin. This finding suggests that other geographically bound mechanisms may be important to understanding this empirical pattern.

The findings in this chapter exhibit substantial statistical uncertainty because they are drawn from labor markets in a single state. Future work should re-examine this hypothesis using a national sample of high school students, and therefore capture more variation across different kinds of labor markets. Extensions of this work should also consider a wider range of racial and ethnic identities beyond the Black-white binary to shed light on the racialized mechanisms driving college attendance behavior.

Tables and Figures

Table 1. Means (standard deviations) or proportions of key measures by race and gender

	Black boys	White boys	Black girls	White girls
Student, district, and CZ measures				
Attended a four-year college	0.12	0.17	0.21	0.27
Attended a two-year college	0.15	0.20	0.17	0.24
Gender-specific occupational dissimilarity in CZ	0.27 (0.09)	0.28 (0.09)	0.25 (0.12)	0.27 (0.13)
% of years FRL	0.77	0.60	0.73	0.60
District avg. 8th grade WKCE math scores	-0.44 (0.77)	0.19 (0.21)	-0.35 (0.70)	0.16 (0.20)
District avg. 8th grade WKCE ELA scores	-0.45 (0.65)	-0.04 (0.20)	-0.01 (0.65)	0.31 (0.19)
% same-race adults with bachelor's degree in district	0.13 (0.09)	0.28 (0.09)	0.13 (0.09)	0.28 (0.09)
Distance to nearest public four-year	20.7 (11.9)	22.3 (13.2)	20.5 (12.3)	22.4 (13.3)
Distance to nearest public two-year	10.5 (7.2)	11.7 (8.1)	10.4 (7.3)	11.7 (8.1)
	Black men	**White men**	**Black women**	**White women**
Adult occupational distributions				
Production, transportation, and material moving occupations	0.25	0.18	0.07	0.05
Natural resources, construction, and maintenance occupations	0.08	0.14	0.00	0.01
Sales and office occupations	0.19	0.19	0.33	0.32
Service occupations	0.23	0.11	0.27	0.18
Management, business, science, and arts occupations	0.24	0.38	0.33	0.44

Table 2. Estimates from multi-level logistic regression models for four-year college attendance

	Boys		Girls	
	Logit (1)	Odds ratio (2)	Logit (3)	Odds ratio (4)
Black (ref: white)	0.28 [-0.02, 0.58]	1.32 [0.98, 1.78]	0.00 [-0.32, 0.30]	1.00 [-0.72, 1.34]
District-by-race variables				
% years FRL receipt	0.01 [-0.07, 0.08]	1.01 [0.93, 1.08]	0.01 [-0.05, 0.05]	1.01 [0.95, 1.05]
Avg. 8th gr. WKCE Math score	0.64 [0.41, 0.84]	1.89 [1.51, 2.33]	0.41 [0.22, 0.60]	1.50 [1.25, 1.83]
Avg. 8th gr. WKCE ELA score	0.33 [0.09, 0.57]	1.39 [1.09, 1.76]	0.56 [0.24, 0.88]	1.76 [1.27, 2.41]
% adults with bachelor's degree	0.15 [0.12, 0.19]	1.16 [1.12, 1.20]	0.11 [0.09, 0.14]	1.12 [1.09, 1.15]
<= 20 miles to public four-year	0.02 [-0.04, 0.08]	1.02 [0.96, 1.09]	0.07 [0.02, 0.12]	1.07 [1.02, 1.13]
<= 10 miles to public two-year	-0.13 [-0.19, -0.08]	0.87 [0.82, 0.92	-0.22 [-0.26, -0.17]	0.80 [0.77, 0.84]
CBSA variables				
Occupational segregation	-0.28 [-1.02, 0.35]		-0.04 [-0.23, 0.09]	
Occupational segregation × white	*(ref.)*	0.76 [0.36, 1.42]	*(ref.)*	0.96 [0.79, 1.09]
Occupational segregation × Black	0.17 [-0.63, 1.21]	0.89 [0.43, 2.04]	-0.11 [-0.50, 0.26]	0.87 [0.56, 1.24]
sd($Intercept_{cbsa}$)	0.11 (0.06)		0.22 (0.06)	
sd($Black_{cbsa}$)	0.28 (0.09)		0.42 (0.12)	
corr($Intercept_{cbsa}$, $Black_{cbsa}$)	-0.17 (0.35)		-0.18 (0.31)	
Students	63,697		61,395	
School districts	376		376	
Commuting zones	16		16	

Notes: Posterior medians with 95% credible interval in brackets. The variables % years FRL receipt, % adults with bachelor's degree, and occupational segregation are all scaled such that an increment of 1 is equal to a change of 0.10, and test scores are scaled so that an increment is one standard deviation. All continuous variables are centered on their means

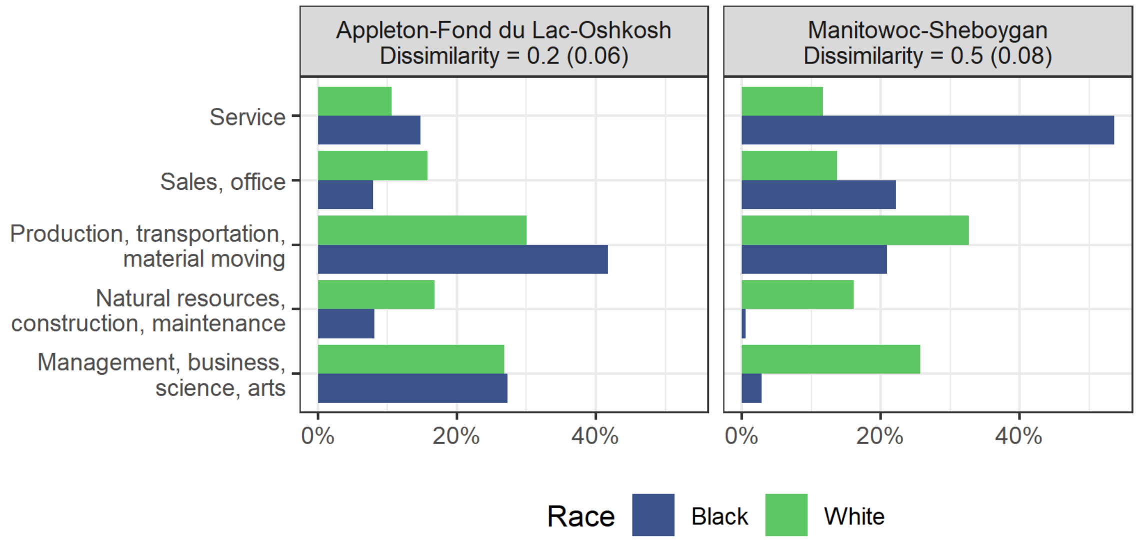
Table 3. Estimates from multi-level logistic regression models for two-year college attendance

	Boys		Girls	
	Logit (1)	Odds ratio (2)	Logit (3)	Odds ratio (4)
Black (ref: white)	0.21 [-0.07, 0.42]	1.24 [0.92, 1.52]	0.12 [-0.10, 0.35]	1.13 [0.90, 1.41]
District-by-race variables				
% years FRL receipt	-0.07 [-0.12, -0.01]	0.93 [0.89, 0.99]	-0.08 [-0.15, -0.01]	0.92 [0.87, 0.99]
Avg. 8th gr. WKCE Math score	0.29 [0.03, 0.50]	1.33 [1.03, 1.65]	0.30 [0.03. 0.53]	1.35 [1.03, 1.70]
Avg. 8th gr. WKCE ELA score	0.21 [-0.06, 0.43]	1.23 [0.95, 1.54]	0.07 [-0.22, 0.34]	1.07 [0.80, 1.41]
% adults with bachelor's degree	-0.06 [-0.09, -0.03]	0.94 [0.91, 0.97]	-0.14 [-0.18, -0.11]	0.87 [0.84, 0.90]
<= 20 miles to public four-year	0.04 [-0.01, 0.10]	1.05 [0.99, 1.10]	-0.05 [-0.11, 0.01]	0.95 [0.90, 1.01]
<= 10 miles to public two-year	0.03 [-0.02, 0.08]	1.03 [0.98, 1.09]	0.10 [0.05, 0.15]	1.11 [1.05, 1.16]
CBSA variables				
Occupational segregation	0.37 [0.02, 0.99]		0.17 [0.05, 0.31]	
Occupational segregation × white	*(ref.)*	1.45 [1.02, 2.70]	*(ref.)*	1.18 [1.05, 1.36]
Occupational segregation × Black	-0.54 [-1.31, -0.03]	0.84 [0.48, 1.56]	-0.11 [-0.39, 0.14]	1.06 [0.81, 1.37]
$sd(Intercept_{cbsa})$	0.15 (0.07)		0.10 (0.06)	
$sd(Black_{cbsa})$	0.17 (0.13)		0.22 (0.11)	
$corr(Intercept_{cbsa}, Black_{cbsa})$	-0.04 (0.39)		0.14 (0.38)	
Students	63,697		61,395	
School districts	376		376	
Commuting zones	16		16	

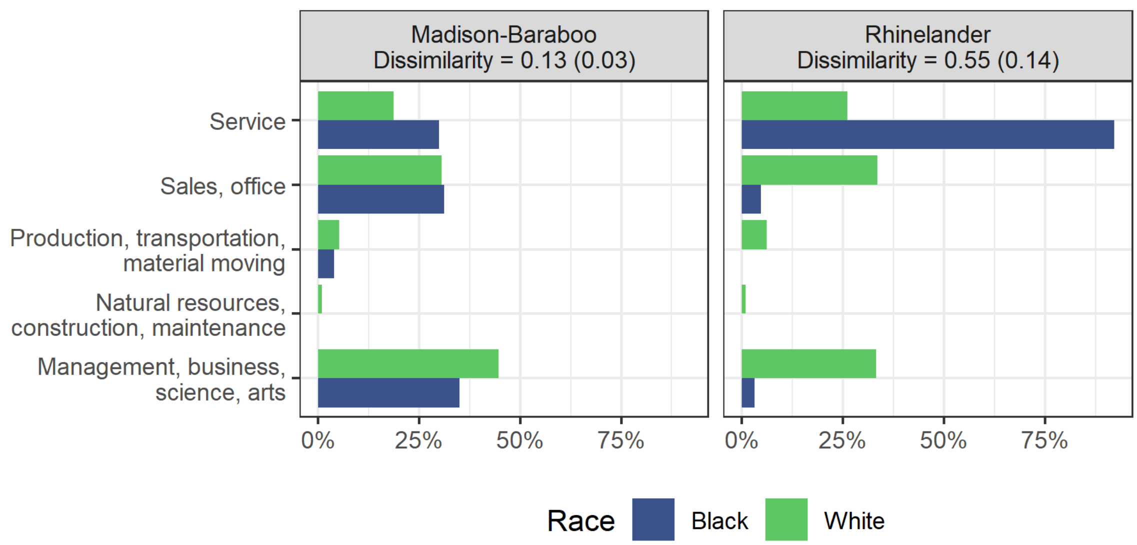
Notes: Posterior medians with 95% credible interval in brackets. Standard errors on variance-covariance parameters in parentheses. The variables % years FRL receipt, % adults with bachelor's degree, and occupational segregation are all scaled such that an increment of 1 is equal to a change of 0.10, and test scores are scaled so that an increment is one standard deviation. All continuous variables are centered on their means.

Figure 1. Most and least segregated commuting zone occupational distributions and dissimilarity indices by gender

Panel A: Men



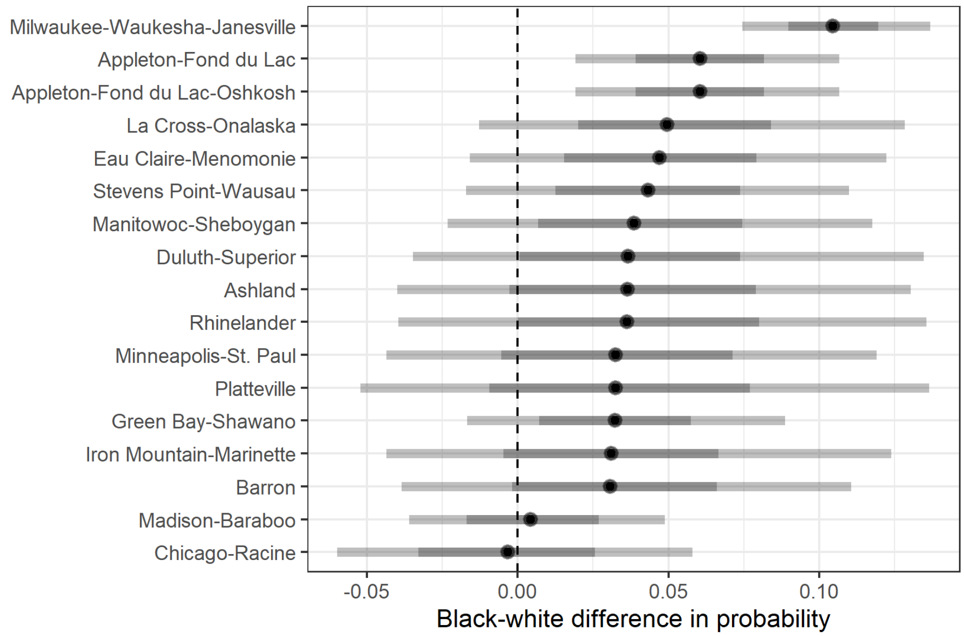
Panel B: Women



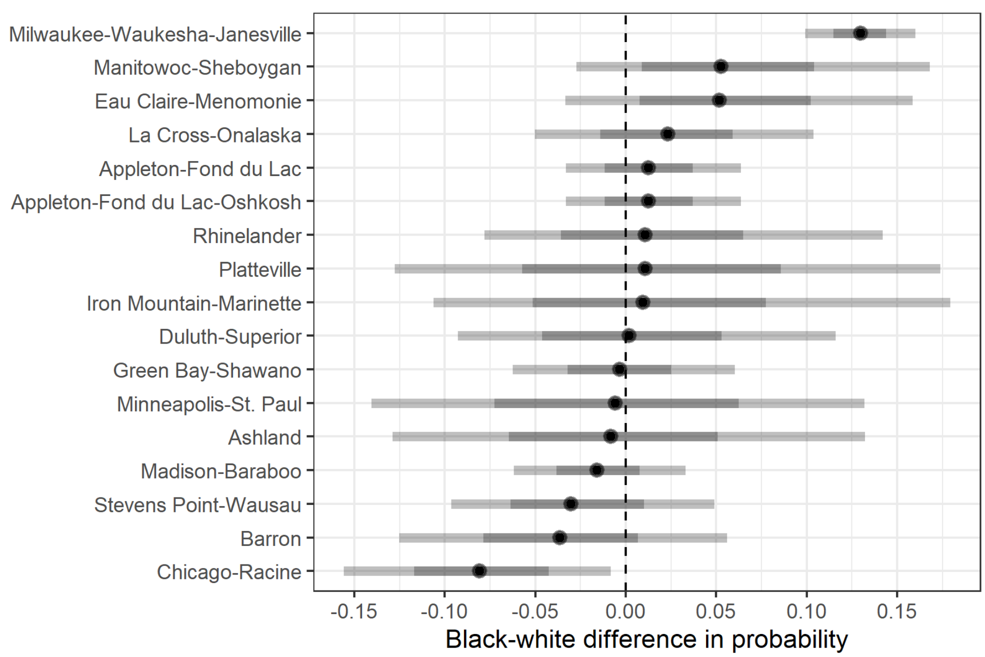
Notes: Data from the 2009-2013 American Community Survey. Dissimilarity indices estimated using the method from Napierala & Denton (2017), standard errors in parentheses.

Figure 2. Net Black-white differences in the probability of four-year college attendance among low-income students by Wisconsin CBSA

Panel A: Boys



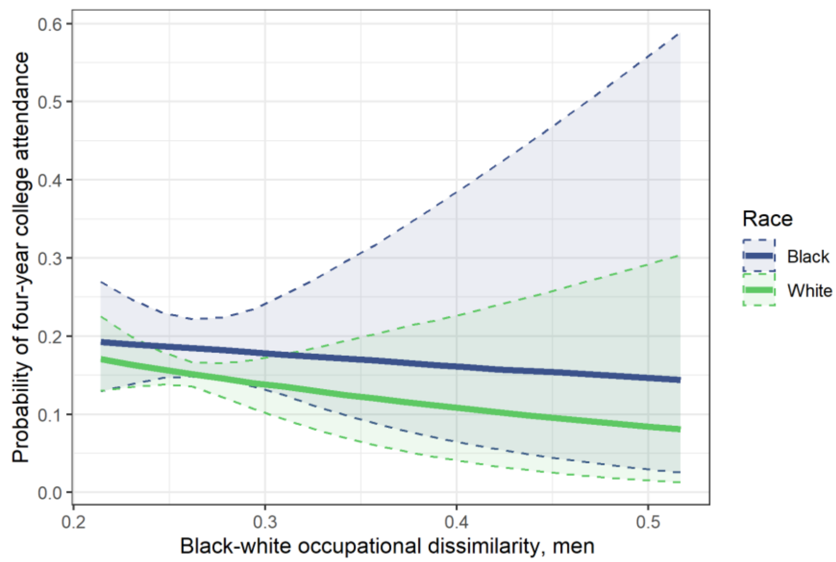
Panel B: Girls



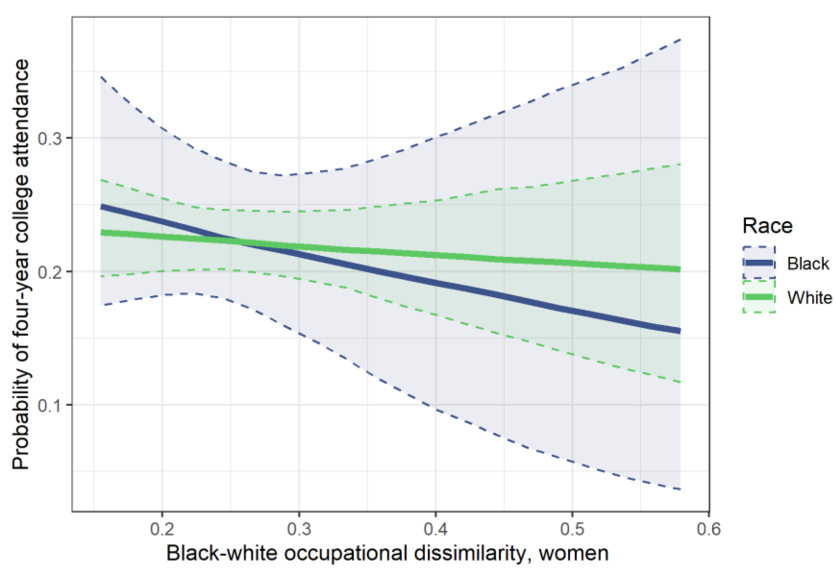
Notes: Data from Wisconsin's State Longitudinal Data Systems. Posterior medians with 66% and 95% credible intervals estimated from the baseline model, conditional on % years FRL, % adults with a bachelor's degree by race and school district, and distances to the nearest public four-year and two-year colleges. All covariates are held at their means.

Figure 3. Predicted probability of four-year college attendance at the mean by labor market segregation, race, and gender

Panel A: Boys



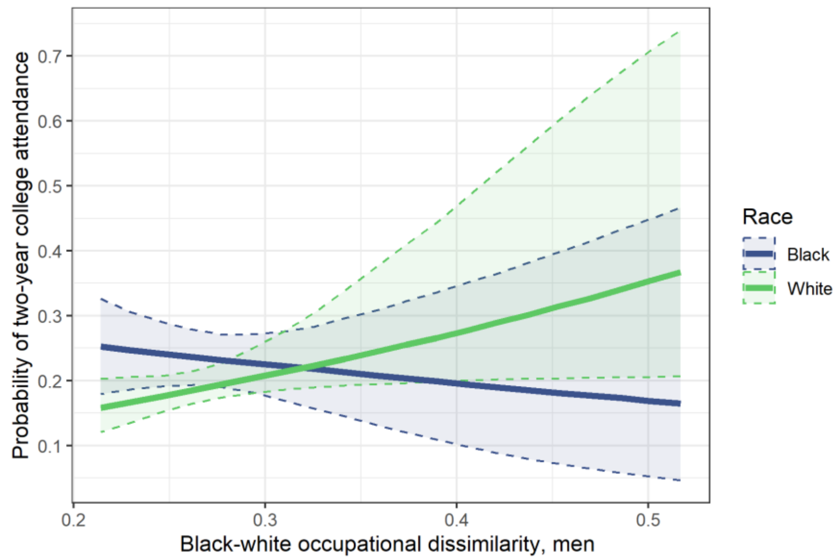
Panel B: Girls



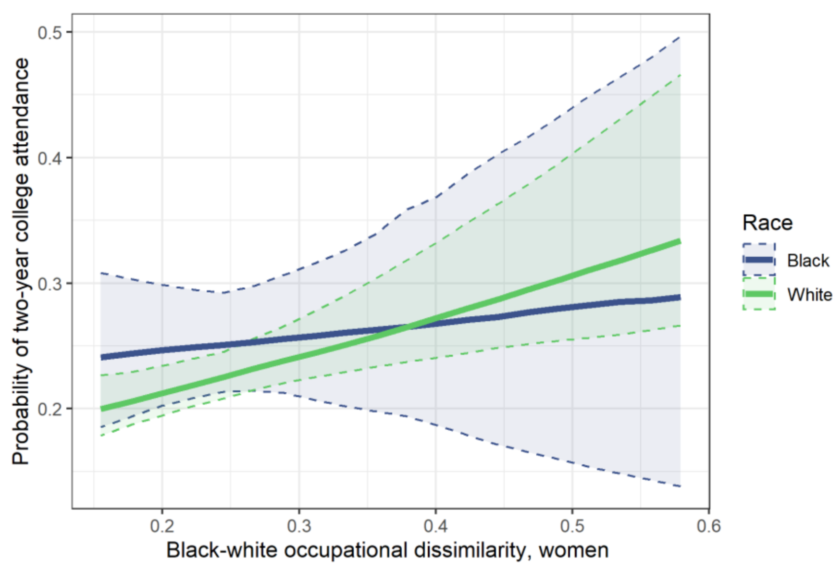
Notes: Data from Wisconsin's State Longitudinal Data Systems and American Community Survey 2009-2013. Conditional predictions at the mean from the models presented in Table 2.

Figure 4. Predicted probability of two-year college attendance at the mean by labor market segregation, race, and gender

Panel A: Boys



Panel B: Girls



Notes: Data from Wisconsin's State Longitudinal Data Systems and American Community Survey 2009-2013. Conditional predictions at the mean from the models presented in Table 3.

CHAPTER FOUR: ADVANCED PLACEMENT GATEKEEPING AND RACIALIZED TRACKING[8]

With Christian Michael Smith as co-author

Introduction

A salient feature of the U.S. secondary-school system has been de facto racial segregation across curricular levels within schools, a phenomenon commonly referred to as racialized tracking (Clotfelter, Ladd, and Vigdor 2003; Mickelson 2001; Tyson 2011). Although students are no longer sorted into a strictly linked set of courses through formal tracks, course enrollment remains highly racially segregated (Lucas 1999; Lucas and Berends 2007). Scholars of education and race have identified racialized tracking as one of the key mechanisms that contributes to the ongoing production of racial inequality in educational outcomes (Conwell 2020; Diamond 2006).

We join other scholars by investigating the mechanisms that lead to racialized tracking and their consequences for students (Lewis and Diamond 2015; Lewis-McCoy 2014; Tyson 2011). In particular, we test whether high schools exacerbate racial inequality when they impose performance-based eligibility criteria for advanced coursework. Existing literature points to different predictions regarding whether and why these eligibility criteria exacerbate racial inequality. With a longitudinal research design that capitalizes on a combination of administrative and survey data from the state of Wisconsin, we weigh the evidence supporting each prediction.

We focus on Advanced Placement (AP) courses, a curricular program that has come to dominate the upper strata of coursework in public high schools in the United States. The AP

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[8] This paper is now forthcoming in *Sociology of Education*. It was not at the time I began this dissertation. Hirschl, Noah and Christian Michael Smith. Forthcoming. "Advanced Placement Gatekeeping and Racialized Tracking." *Sociology of Education* 0(0):00380407231161334.

program is a set of more than 30 subject exams that the College Board constructs to reflect the rigor of college-level courses. Nearly three million high school students sat for over five million AP exams in 2019, a remarkable expansion since the program's inception as a curriculum for students bound for the most elite colleges (College Board 2019; Schneider 2009). AP aims to give students experience with college-level coursework, and if they attain a score of at least a 3 out of 5 on the standardized end-of-year exam, they may earn college credit, often allowing them to skip certain classes, expand their coursework breadth and depth, and graduate in less time (Avery et al. 2018; Evans 2019; Gurantz 2019; Smith, Hurwitz, and Avery 2017). Although opportunities to take AP courses have become more widespread across schools, the AP program has largely replicated earlier patterns of curricular segregation by race within schools (Kolluri 2018; Malkus 2016; Price 2021).

We study what happens to racial inequality in AP participation when schools change their policies regarding which students are permitted to participate. We also study what happens to racial inequality in college attendance and selective college attendance when schools make these changes; these postsecondary outcomes may be downstream consequences of AP policies, as the rigor of a student's high school curriculum plays a key role in college admissions, especially at the most selective colleges (Bastedo, Howard, and Flaster 2016; Bowman and Bastedo 2018). We use a unique linkage between school survey data and administrative data from Wisconsin as our empirical case. By focusing on the effects of changes in schools' policies over time, our study circumvents many forms of statistical bias that other observational studies cannot.

In addition to advancing theory on the links between race, education, and stratification, our study informs policy and practice meant to reduce racialized tracking in high schools. This practical contribution is important because racial inequality in AP participation may have larger implications. First, AP courses may foster enrollment in baccalaureate colleges generally and selective colleges particularly, which may be important for the educational trajectories and later life outcomes of racially minoritized students (Cortes 2010; Melguizo 2010; Small and Winship 2007). Second, we emphasize, along with other scholars, that racialized AP tracking may have other, harder to measure costs. Many argue that racialized tracking is a form of organizational racism that materializes racial hierarchy in the everyday structure of schools, in turn heightening students' perception of the link between racial identity and academic success (Lewis and Diamond 2015; Ray 2019; Tyson 2011) and subjecting some Black students to accusations that they "act white" (O'Connor et al. 2011).

Background

Organizational decisions about who is in class with whom reflect deeper tensions between schools' ability to exacerbate or alleviate social inequalities. The consensus view of tracking and inequality can be summarized simply: stronger tracking systems tend to increase the variance in learning, thus potentially reinforcing racial inequality in educational outcomes (Gamoran and Mare 1989; Hout and DiPrete 2006). Tracking practices have been used as a method of racial exclusion in educational institutions in the United States. For example, racialized tracking systems were one way that schools reinstituted racial segregation in response to court-mandated school integration (Tyson 2011). Thus, tracking practices have been a focus of scholars and policymakers seeking to identify and reduce racial inequality in educational outcomes.

Contemporary school tracking systems vary widely. Sørensen (1970) defined a set of theoretical dimensions that characterize diversity across tracking systems, and his theoretical model has been further expanded in later empirical applications (Domina et al. 2019; Gamoran

1992; Kelly 2007; Rosenbaum 1976). In this article, we define and study the effects of a particular aspect of high schools' tracking systems on racial inequality in course-taking: school officials' use of performance-based selection criteria to control enrollment, which we call "course gatekeeping," or "gatekeeping" for short.[9]

In practice, schools use a variety of mechanisms that fall under this definition of course gatekeeping. Typical gatekeeping measures include "objective" enrollment benchmarks such as minimum grades or test scores, and "subjective" enrollment criteria like teacher recommendations or vague behavioral requirements (Kelly 2007; Kelly and Price 2011). Prerequisite or co-requisite courses are also common entry criteria for upper-level coursework. In the case of these policies, we draw a distinction between requirements that are intended to ensure minimum prior content knowledge (e.g., requiring that students have taken two years of high school English before enrolling in AP English), which we would not call course gatekeeping, and those requiring a particular level of a prior course that covers similar content to another course (e.g., requiring that students take "honors" instead of "standard" English before enrolling in AP English), which we would call gatekeeping, because those policies more clearly use performance-based criteria. Throughout this article, we term the absence of any gatekeeping measures "open enrollment."

In Figure 1, we build on Sørensen's and others' dimensions of organizational differentiation to locate course gatekeeping in a conceptual model of tracking outcomes. Course

[9] Our definition of course gatekeeping applies to earlier stages of educational stratification, including entry into Gifted and Talented programs. The concept also relates to academic criteria in later-stage transitions, such as the use of standardized test scores in selective college or graduate school admissions, although those decisions often involve many non-academic criteria as well. In each of these cases, the type and stringency of performance-based admission criteria often have implications for racial equity. We thank an anonymous reviewer for making these connections.

gatekeeping depends on what Sørensen calls the assignment mechanism: the types of assignment criteria and their stringency. Teachers may gatekeep or not, and conditional on gatekeeping, they may do so to varying degrees depending on the exclusivity of the criterion (e.g., by specifying a specific minimum grade in a prior class).

The conceptual model in Figure 1 also clarifies the object of our inquiry by distinguishing between the policies and practices that schools use to produce differentiation ("course gatekeeping" and "course structure" on the left side of Figure 1), and the actual degree of differentiation ("tracking outcomes" on the right side of Figure 1). Course gatekeeping and structure are the two primary policy means by which schools affect organizational differentiation. This distinction avoids conflating the effects of policies with other factors producing tracking outcomes, such as the size and composition of the student body, students' own enrollment choices, or scheduling conflicts (see Domina et al. 2019; Kelly 2007). Thus, course structure and course gatekeeping are logically prior to, and have imperfect relationships with, tracking outcomes.

In making this conceptual distinction between policies and outcomes, we cleanly separate gatekeeping from two closely related, canonical dimensions of tracking systems: electivity and selectivity. Sørensen (1970:361, emphasis added) originally defined electivity as "the degree to which students' own decisions *are allowed* to be a determining factor in the assignment to groups," which seems to define the concept as a school policy or practice. In contrast, we define electivity as it is typically used in subsequent empirical work: the realized "contribution" of student choice to course placements given the set of constraints imposed by school policies (Kelly 2007:18; see also Gamoran 1992). We generally expect course gatekeeping to limit electivity. However, course gatekeeping may have little effect on electivity if students strictly self-sort into courses according to their prior performance. In that case, student enrollment patterns would be mostly unaffected by a performance-based barrier.

Similarly, Sørensen's (1970:362) original definition of selectivity is "the amount of homogeneity that school authorities intend," which again evokes school policies instead of outcomes. However, most empirical work operationalizes selectivity as the *observed* degree of homogeneity across course or track levels (e.g., Domina et al. 2019; Gamoran 1992). We follow these authors to define selectivity as an observed outcome rather than an intended outcome, or policy. Thus—as with electivity—course gatekeeping will only affect selectivity to the extent that it changes students' enrollment behavior.

Course Gatekeeping and Racialized Tracking

How and to what extent should we expect course gatekeeping to affect racialized tracking? Empirically, there are three possibilities: gatekeeping may have very little or no effect, it may exacerbate racialized tracking, or it may ameliorate racialized tracking. Our main objective in this article is to provide novel evidence to assess which of these predictions sees support.

First Prediction: Minimal Effect of Gatekeeping. To support the prediction that school officials' gatekeeping has little or no effect, scholars have suggested that other racialized, interlocking forces keep students racially segregated. In this scenario, even if teachers remove or enact a stringent requirement for access to upper-level courses, it has no effect on students' enrollment because students tend to self-segregate anyway (Yonezawa, Wells, and Serna 2002). Prior work suggests these interlocking forces include students' academic self-concept, social networks, informational barriers, hostile experiences in advanced courses, and parental lobbying efforts.

As a strategy to “protect their sense of competence,” many students choose classes in which they expect to succeed (Tyson 2011:139). By the time they reach high school, students’ sense of their academic competence has inflated or deflated according to accumulated, racialized academic experiences, such as earlier placement in gifted and talented programs; reinforcement from parents, teachers, and peers; and a long track record of academic success (Tyson 2011; Yonezawa et al. 2002). Thus, students may have already restricted their course choices regardless of how teachers admit students into advanced classes.

Furthermore, students tend to prefer taking classes with their friends, and friendship networks in high schools are typically highly racially segregated (Moody 2001). Black and other racially minoritized students may be reluctant to enroll in classes where few of their friends are present (Francis and Darity 2020).

Relatedly, when very few Black or Hispanic students are enrolled in a given advanced class, such as an AP course, those few report feeling uncomfortably visible in a white-dominated space and sensing that their peers devalue their perspective (Lewis and Diamond 2015; Taliaferro and DeCuir-Gunby 2008; Tyson 2011; Yonezawa et al. 2002). Similarly, O’Connor and colleagues (2011:1232) argue that a “racially stratified academic hierarchy” within a high school makes high-achieving Black students more vulnerable to accusations of “acting white.” Thus, one can imagine AP courses being undesirable to racially minoritized students in such schools regardless of the gatekeeping structures in place.

Moreover, some parents may help make gatekeeping policies moot by working around whatever policies are in place. White parents—especially those of high socioeconomic status—are apt to challenge school policies (Lewis-McCoy 2014), and schools are apt to capitulate, including when it comes to course-placement challenges (Calarco 2020). Even if these parents do not challenge the school policies, they may work hard to adapt to the policies (Alon 2009) (e.g., by investing in resources that help their children reach the eligibility criteria).

A study by Yonezawa and colleagues (2002) is perhaps most germane to the prediction that gatekeeping will have minimal effects. They argue that a combination of the above factors prevented any change in racialized tracking when the set of middle and high schools in their qualitative study allowed students complete freedom to choose their courses.

Second Prediction: Gatekeeping Exacerbates Racialized Tracking. The existing evidence for this prediction suggests three potential mechanisms. These mechanisms are not, in general, mutually exclusive, and components of each are likely relevant in different contexts.

First, a set of quantitative studies suggest that gatekeeping in advanced courses excludes minoritized students chiefly because they exclude students with lower prior academic achievement. These studies find that prior academic achievement accounts for most, if not all, of the racial differences in high school course-taking, particularly in the past few decades (Conger, Long, and Iatarola 2009; Gamoran and Mare 1989; Kelly 2009; Lucas, Molina, and Towey 2020). This finding may not hold in all contexts: schools with a high degree of socioeconomic or racial/ethnic heterogeneity tend to have more pronounced inequalities net of achievement (Lucas and Berends 2002, 2007; Oakes 1994). But the broader finding that earlier achievement disparities can account for racial disparities in advanced course placement suggests that schools strictly assign students to courses based on their prior achievement, regardless of racial identity. This further suggests that tightening entry criteria for advanced courses will affect racialized tracking if some racialized groups are more concentrated in the academic strata that are excluded under the new criteria.

Second, gatekeeping will reinforce racialized tracking if teachers and counselors hold systematically lower academic expectations for Black and Hispanic students, leading to default enrollment in lower-track classes, racial bias in faculty recommendations for AP courses, or higher resistance to students' or parents' attempts to appeal course placements (Lewis and Diamond 2015; Yonezawa et al. 2002). Some studies support the potential role of racialized teacher expectations, particularly with respect to Black students. Evidence from studies of twentieth-century teachers shows they expected worse academic performance from Black students than they expected from white students with identical records (for a review, see Ferguson 2003). More recently, Grissom and Redding (2016) found that elementary school teachers are less likely to refer Black students to gifted programs than they are to refer observationally equivalent white students. In high schools, teachers' educational expectations for Black students are dramatically lower when the teacher is non-Black rather than Black (Fox 2016; Gershenson, Holt, and Papageorge 2016). This bodes poorly for Black students given that the majority of teachers are non-Black (Schaeffer 2021), even at schools with majority-Black student bodies (Spiegelman 2020). Fox, Gershenson and colleagues, and Grissom and Redding all highlight the importance of student-teacher racial match for Black students, but none of the studies find similar patterns for students in other racial groups.

Similarly, Francis, De Oliveira, and Dimmitt (2019) found that, compared to fictional students with transcripts that had no name or a name coded demographically differently, fictional students with an otherwise identical transcript that had a Black female-coded name were far less likely to receive school counselors' recommendation to take AP Calculus. However, Francis and colleagues did not find that Black male-coded transcripts were similarly disadvantaged. In a study investigating teachers' recommendations for AP courses, Fox (2016) found that student-teacher racial match did not matter for the likelihood of AP recommendation, even though it mattered significantly for educational expectations (among Black students but not among students in other racial groups). However, Fox's study concerns the effect of student-teacher racial match rather than the effect of student race per se, and thus it does not directly indicate whether teachers are more inclined to recommend AP courses to white students than comparable Black students. In summary, the existing literature shows that school counselors tend to discriminate against Black female students in AP course recommendations, and it gives some suggestive clues that teachers might expect less achievement and attainment from Black students than from comparable white students. However, the field lacks clear evidence on whether AP course recommendations are applied racially unequally on a broad level.

Third, gatekeeping might affect racialized tracking due to racial differences in students' propensity to choose to enroll in AP courses among relatively low-achieving students. Gatekeeping only excludes students who both want to enroll in AP courses and whose achievement falls below the assignment criterion's threshold. Thus, if any racial group is overrepresented in the subpopulation that meets those two conditions, the effects of gatekeeping will be more severe for that group. In particular, Black students (and perhaps other non-white racialized groups) express more pro-school attitudes and are more likely to aspire to and attend baccalaureate colleges than are white students with similar achievement levels (Bennett and Xie 2003; Charles et al. 2007; Downey et al. 2009; Mickelson 1990). If these phenomena lead relatively low-achieving minoritized students to be more inclined to enroll in AP courses than relatively low-achieving white students, on average, then gatekeeping may have racially disproportionate effects.[10]

Third Prediction: Gatekeeping Ameliorates Racialized Tracking. Although relatively little evidence supports this prediction, it is possible that a new or more stringent assignment mechanism could promote racial equality in AP enrollment. In one empirical example of a similar phenomenon, Card and Giuliano (2016) found that when universal screening for gifted education replaced a system based on parents' and teachers' referrals, Black and Hispanic students' representation in the program increased. This case suggests that when an existing system of allocation is very strongly biased against minoritized students, new performance-based criteria can reduce inequality.

Postsecondary Implications of Course Gatekeeping

Why might AP gatekeeping policies affect enrollment in baccalaureate colleges generally and selective colleges particularly? First, enrollment in AP courses may affect college plans, giving college-aspiring students a sense they can achieve in a rigorous college context, raising their expectations for the kind of institution they can attend (Karlson 2015). On the other hand, if students struggle academically in AP courses, it could erode their confidence in their ability to complete difficult coursework, thus reducing college enrollment (Conger et al. 2021). Second, AP courses improve students' chances of admission to highly selective colleges (Bastedo et al.

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[10] This relationship may have additional complexity. In particular, course gatekeeping may influence the degree to which educational attitudes are racialized within a school. For example, gatekeeping may make attitudes *more* racialized by heightening the awareness among students of color that they must struggle for access to educational institutions, in turn building a pro-education attitude among students of color. Alternatively, gatekeeping may make attitudes *less* racialized by obstructing the efforts of students of color to take AP courses, in turn discouraging students of color and bringing down their attitudes closer to the attitudes of their similarly achieving white peers.

2016). Almost half of admissions officers at selective colleges indicate that the rigor of high school coursework is the most important piece of information for determining applicants' academic merit, and at the very most selective colleges, over two-thirds of admissions officers say so (Bowman and Bastedo 2018). Therefore, expanding AP access could facilitate selective college admission particularly.

The Present Study

The main objective of the present study is to bring new evidence to clarify the role of gatekeeping in racialized tracking. We use data from public schools in Wisconsin to investigate the effects of changes in schools' AP enrollment policies on participation in those courses. We then examine whether these changes have downstream effects on college-going behavior. Our study adds to existing research by explicitly testing the strength of course gatekeeping as a mechanism of racialized tracking. While other scholars have thoroughly described the sources and consequences of racialized tracking, our study is the first to estimate the effects of course gatekeeping specifically, and we do so using a school fixed-effects design and unique, high-quality data. It is also the first to study this mechanism in the context of the growing AP program, and to follow students into college to examine downstream implications for postsecondary enrollment. Our contributions thus have relevance to sociological theory aiming to explain how schools produce racial inequality and to policy decisions that allocate access to advanced coursework.

Data and Methods

Data

This study uses data from two sources: Wisconsin's Statewide Longitudinal Data System (SLDS) and the Office of Civil Rights Data Collection (OCRDC) surveys. The SLDS is a census of Wisconsin public school students that tracks these students across their educational careers. It includes information on demographics, enrollments, test scores, grades, and other educational outcomes. We study students who attended the 327 public traditional and charter high schools in Wisconsin that offered at least some AP courses, and where at least some students took AP exams for the duration of the study, between the 2013–14 and 2017–18 school years. Our target population consists of three cohorts of first-time 10th-graders[11] at these schools in 2013–14, 2014–15, and 2015–16. These students had expected high school graduation dates in 2016, 2017, and 2018. Our analytic sample contains 144,669 students after the adjustments described in the remainder of this section.

Our first outcome of interest is students' participation in AP. We link our administrative data with College Board records to measure all the AP exams a student attempts. Our key outcome is simply a count of the total number of AP exams students took in grades 10 to 12. Unfortunately, the available data do not allow us to directly measure AP course *enrollment*, which is a more proximate outcome of AP gatekeeping. Not all students who take a course take the exam: nationally, about two-thirds to four-fifths of students who enroll in a given AP course ultimately take the exam (Malkus 2016; Price 2021). Under plausible assumptions, using exam counts as a proxy yields no bias in racial/ethnic interaction terms as well as no bias in, or even

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[11] We begin tracking students in 10th grade because it is exceedingly rare for students to take AP exams in 9th grade: 1.4 percent of students did so in 2014, the first year of our study. We start in 10th grade rather than 11th because it has become reasonably common for 10th-graders to take AP exams: 11 percent took at least one in 2016. We replicated our main models using only 11th- and 12th-grade AP exams as the outcome, and we found substantively similar, although slightly attenuated, results.

conversative estimation of, the group-specific gatekeeping effects we estimate. See Appendix B in the online supplement for a more thorough treatment of this issue.

Our secondary outcome of interest is students' college enrollment. We measure students' college enrollment in the fall after their senior year through a linkage between our administrative records and college enrollment from the National Student Clearinghouse (NSC).[12] We analyze students' enrollment in any four-year institution, and among four-year institutions, we also examine enrollment in "highly selective" schools, which we define as one of the 236 institutions that *Barron's Profiles of American Colleges* (2009) ranked as "very competitive plus" or higher.

Our main treatment variable is schools' AP gatekeeping policies. To measure gatekeeping policies in this period, we merge school-level SLDS data with OCRDC surveys from the 2013–14, 2015–16, and 2017–18 school years. This biennial survey is conducted by the federal Office of Civil Rights and has drawn responses from the universe of public education agencies in the country since 2012. Response rates are perfect because schools are required by law to fill out the survey.

In the latest three OCRDC surveys, schools were asked whether "a student is allowed to enroll in *all AP courses that the school offers* . . . without needing a recommendation or without meeting other criteria (except for any necessary course prerequisites) [emphasis added]." We use this measure as a proxy for schools' AP gatekeeping policies. However, this survey response might fall short of measuring all aspects of gatekeeping as we have conceptualized it in three ways. First, the question asks whether schools engage in gatekeeping in *any* of their AP courses.

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[12] The NSC data cover upward of 96 percent of all national postsecondary enrollment in higher-education institutions over the period we study (Dynarski et al. 2015). We limit our measurement of enrollment to the year following high school to maintain equal measurement timing across the cohorts in the study.

For instance, if a single teacher enforces a prior grade requirement for their class, the school is supposed to answer “no” on the survey. Thus, this measure may capture a narrower range of gatekeeping policies than exists across schools. Second, it excludes prerequisites, which we consider in certain cases to qualify as course gatekeeping measures (see above). However, the other requirements measured by this survey question, such as prior grades, test scores, and recommendations, are highly variable across schools: according to one 2002 survey of AP teachers, about 50 percent of teachers required a minimum grade, and nearly 60 percent required a recommendation (Milewski and Gillie 2002). Both in Wisconsin and in the national OCRDC survey data from 2017–18, about 30 percent of all high schools reported using AP gatekeeping of some kind. Thus, we measure an important aspect of between- and within-school variation in AP gatekeeping practice. Third, our measure does not record the type or stringency of the gatekeeping measure in place, so we cannot separate the effects of different types of gatekeeping measures in this study.

Because the exact same question was included across survey years, we use changes in schools’ responses to indicate a change in policy over time. We use the term “AP gatekeeping” to refer to the policy implied by answering “no” to the survey question, and “open enrollment” to refer to the policy implied by “yes.” We constructed our measure of gatekeeping by averaging the enrollment policy that each student experienced (1 = gatekeeping, 0 = open enrollment) in grades 10 to 12.[13] Thus, our measure varies across students from 0 (always open enrollment) to 1 (always gatekeeping). For example, if Student A attended grades 10 to 12 in a school when the

[13] The OCRCD survey is biennial, so we do not observe the policy measure in every school year. As a solution, we simply omitted the missing years when computing the average policy for each cohort of students (but not when computing each student’s total number of AP exams or any other variable). As an alternative method, we linearly imputed the missing interim years for each school before averaging, and we found essentially the same results (available upon request).

policy was always gatekeeping, the measure would equal 1 for Student A. If Student B attended grades 10 to 12 at the same school three later years, and the school allowed open enrollment in one of those three years, the measure would equal $0.\overline{66}$ for Student B.

There is enough variation in schools' policies over time to identify the effects of interest. Figure 2 displays trajectories of school policy change over the three waves of the OCRDC survey. Open enrollment policies are more common than gatekeeping policies across this entire period in Wisconsin. However, there is considerable flux over time. In the two gaps between OCRDC survey waves, 71 and 79 high schools changed their policy in either direction. This degree of variation is consistent with other work that shows considerable variation in tracking practices, both across and within schools across time (Domina et al. 2019). Our research design exploits these changes in schools' policies.

Research design and estimation

A simple comparison of AP participation between schools with different policies could be subject to confounding by unobserved school-level differences, because schools' course-placement policies differ in systematic ways (see Spade, Columba, and Vanfossen 1997). For instance, schools with open enrollment policies might also be more likely to provide other resources and programming intended to reduce disparities among racial groups, thus confounding naïve comparisons between schools. We mitigate this source of bias by measuring the effects of AP gatekeeping among cohorts of 10th-graders exposed to different policies within the same school using school fixed-effects models.

We chose to estimate Poisson models because our outcome of interest is a strictly non-negative count, so we expect the log-link functional form to be the most appropriate characterization of the relationship between the predictors and the conditional expectation of the outcome.[14] These models take the following general form:

$$\log(AP_{ijk}) = \alpha + \beta G_{ijk} + \sum_l \gamma_l X_{ijkl} + \theta_j + \tau_k + \varepsilon_{ijk} \qquad (1)$$

where AP_{ijk} is the number of AP exams taken by student i in school j in cohort k. The measure G_{ijk} is the averaged gatekeeping policy for each student described in the previous section, which varies between 0 and 1. The parameter β captures the effect of experiencing AP gatekeeping in all years, versus open enrollment in all years. In subsequent models, we include additional interaction terms that allow β to vary by race-ethnicity and by prior achievement to test the specific hypotheses described above. In models with race interactions, we omit the racial category "non-Hispanic white" from the interaction set. The γ_l parameters capture the effects of a set of covariates X, which are indexed by l and measured for each student i. The θ_j are school fixed effects, and the τ_k are cohort fixed effects. We cluster the standard errors at the school level. In the final section of the analysis, we estimate parallel models for college attendance outcomes. These models are the same in all respects except that we estimate them as logit models for binary outcomes: any four-year college attendance and highly selective four-year college attendance.

Covariates

Our main interest is whether the effects of AP gatekeeping differ by race and ethnicity. Our administrative measure of race/ethnicity categorizes students as non-Hispanic white, non-

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[14] Given that the log-link functional form is correct, Poisson fixed-effects models yield consistent estimates of the conditional expectation function regardless of whether or not the outcome was generated under a Poisson process (see Wooldridge 1999). Yet, analysts often model potential deviations from a Poisson process: overdispersion, often addressed with an overdispersion parameter, and excess zeros, often addressed with a zero-inflated or hurdle model. Our main results are substantively the same when estimated with an overdispersion parameter. And although our outcome data contain many zeros, we see no reason to assume that a separate process drives selection into taking zero AP courses, as would be assumed by a zero-inflated or hurdle model.

Hispanic Black, Hispanic, non-Hispanic Asian or Pacific Islander, non-Hispanic American Indian or Alaska Native, or two or more races. We do not aggregate this measure further in our analysis. The Hispanic and Asian populations in our sample are heterogeneous in terms of nativity and immigrant generation, with implications for the cultural, economic, and social capital students bring to school. In Wisconsin, three in four Hispanic individuals report Mexican descent, and most of the remainder report Puerto Rican descent. The predominant Asian immigrant group in Wisconsin is Hmong: about one in three individuals identifying as Asian are Hmong, 18 percent are Asian Indian, and 13 percent are Chinese (Curtis and Lessem 2014). These population characteristics bear on the social processes underlying our results, and on the extent to which our results generalize to other contexts.

We use measures of students' prior achievement as further control variables and moderators. We construct our key measure of prior achievement using students' GPAs when they were in 9th grade. Our secondary measure of prior achievement is students' test scores on their 8th-grade Wisconsin Knowledge and Concepts Examinations (WKCE) in math and language arts, the most recent standardized tests that students in our sample took. We standardize these scores to have mean zero and standard deviation one. We expect that in addition to GPA and test performance, students' prior track location is an important determinant of whether they take AP courses and is likely a factor in gatekeeping decisions (Kelly and Carbonaro 2012). Unfortunately, our coursework data do not reliably identify course subjects or levels. We therefore construct a proxy for track location in 9th grade using the average math and ELA test scores of students' 9th-grade classroom peers, which we expect strongly correlates with students' overall position in their schools' tracking system.[15] Test scores and GPA are the only sources of missingness in our data: 6 percent of students lack a 9th-grade GPA, 12.5 percent lack 8th-grade test scores, and 0.5 percent could not be matched to classmates with non-missing test scores to calculate our measure of track location. In total, 15.8 percent of student records lack one of these key achievement measures, and we drop these students from our sample.[16]

In addition to the race/ethnicity and achievement measures described above, all models include controls for binary sex, whether the student is an English-language learner, whether the student is classified as having a disability, and a measure of economic disadvantage. We measure economic disadvantage using receipt of free or reduced-price lunch. Following evidence that longitudinal measures capture more meaningful variation (Michelmore and Dynarski 2017), we use a measure of the proportion of years we observe students receiving free or reduced-price lunch in the years they were enrolled in Wisconsin public schools.

We also control for changes over time in students' opportunity to take AP exams by measuring the number of distinct AP exam subjects that schools offered while students were enrolled in them. We take the average over students' enrollment in grades 10 to 12 and log transform it. By controlling for course offerings, we neutralize the possibility that any expansions in course catalogs could mechanically increase AP participation for some groups and not others (Rodriguez and McGuire 2019). Finally, we control for school-by-cohort averages of

[15] To construct this measure, we first calculate leave-one-out test score averages for each course a student is enrolled in: $\frac{1}{J-1}\left(\sum_{j\neq i} Test\ score_j\right)$, where J is the number of students enrolled in the course, each student j's $Test\ score$ is measured in z-scores, and the focal student i's test score is left out of the mean calculation. We then take the average of these course-specific averages across all the courses the focal student is enrolled in to obtain the student's measure of track location.

[16] The predominant reason students lack either GPA or test scores is because they were not enrolled in a Wisconsin public school in the grade in question. These students often entered the public school system in high school from a private school or from out of state. Thus, our results may only generalize to the majority of students who remained in the public school system from middle to high school.

students' test scores and prior GPA. These measures account for the possibility that schools or teachers gatekeep based on the composition of students in each cohort. For instance, schools might be more likely to use course gatekeeping measures to allocate seats when a particularly high-achieving cohort of students overenroll in AP courses.

Results and Discussion

Racial Inequality in AP Participation

Patterns of AP exam participation reflect racialized tracking in Wisconsin's high schools. On average, white students take nearly one more AP exam than do Black or American Indian students, and about one half more exams than the average Hispanic student takes (see Table 1). On average, Asian/Pacific Islander students take more exams than white students, although the variability in the number taken is also highest in that group. Students from two or more racial groups fall near the middle in terms of the average number of exams taken.

We also see notable racial differences in the experience of gatekeeping policies. White, Asian/Pacific Islander, and American Indian students are most likely to experience gatekeeping, at 18 and 19 percent of their 10th- to 12th-grade years, on average, whereas Hispanic students and Black students experience gatekeeping 14 and 9 percent of the time, respectively. The particularly low rate of gatekeeping experienced by Black students reflects the disproportionate enrollment of Black students in Milwaukee and Madison, both urban districts with open enrollment policies throughout the study period. Table 2 shows the characteristics of schools with differing gatekeeping policy sequences across the study period. If schools that change their policies are very different from other schools, it may limit the external validity of our findings.[17]

[17] We have adequate samples of students identifying with each racial subgroup at the schools that changed their policies, thus providing adequate statistical power to detect the effects of interest. Our sample of students at those

We find that those schools are generally similar in terms of poverty rate, enrollment, and AP participation to other schools in Wisconsin, with the exception that "always gatekeeping schools" tend to offer fewer AP subjects and students take fewer exams.

Gatekeeping and Racial Inequality in AP Participation

Our findings suggest that AP gatekeeping policies make access to these advanced courses modestly more exclusive. The first column in Table 3 displays the main effect of gatekeeping from our specification of Model 1 above. The overall estimated effect of gatekeeping is to reduce AP exam-taking by 13 percent, on average ($1 - e^{-0.14} = 0.13$). This point estimate is statistically significant at the 1 percent level.

However, the average estimated effect conceals important heterogeneity. In Model 2, we find some evidence of racially disproportionate effects of gatekeeping: these policies seem to especially reduce AP exam-taking among Hispanic and perhaps among Black students and other students of color. While gatekeeping reduces exam counts by an estimated, statistically significant 11 percent, on average, among white students ($1 - e^{-0.12} = 0.11$), it reduces exam counts by 24 percent ($1 - e^{-0.12-0.16} = 0.24$) among Black students and 28 percent ($1 - e^{-0.12-0.21} = 0.28$) among Hispanic students. However, only the white-Hispanic effect difference is statistically significant at conventional levels; there is considerably more uncertainty in the white-Black contrast, in part due to the smaller number of Black students who experience gatekeeping regimes. The interaction terms are also somewhat negative among Asian or Pacific Islander students and multiracial students, and slightly positive among American Indian/Alaska Native students; none are statistically distinguishable from zero.

schools includes 2,497 students identifying as Black, 4,199 identifying as Hispanic, 1,602 identifying as Asian or Pacific Islander, 530 identifying as American Indian, and 1,029 identifying with two or more races.

Given the uncertainty in many of these interaction effects, the results in Model 2 of Table 3 provide some qualified support for the second prediction above: gatekeeping appears to exacerbate racialized tracking, particularly between Hispanic and white students. However, we identified multiple possible mechanisms for this pattern. It may be that the racial disproportionality in effects of gatekeeping is mainly explained by students' prior achievement; that is, gatekeeping only excludes racially minoritized students to the extent that those students have lower prior grades.

We partly test this proposition in columns 3 and 4 in Table 3. First, in column 3, we establish that gatekeeping mainly excludes students with relatively low prior grades by including an interaction term for below-median 9th-grade GPA students. Among at- or above-median GPA students, the estimated effect of gatekeeping is slightly negative and marginally statistically significant. However, the interaction is substantially negative and statistically significant, such that gatekeeping reduces AP exam-taking by an estimated 41 percent ($1 - e^{-0.10-0.37} = 0.41$) among students with lower than a B average. In column 4, we estimate a model with interactions between gatekeeping and race/ethnicity as well as a set of interactions between gatekeeping and prior achievement. If the main mechanism for the racially disproportionate effects of gatekeeping is racial disparities in prior achievement, these interactions should account for much, if not all, of the racially disproportionate effects of the policy changes.[18] We find that the effect of AP gatekeeping on lower-achieving students does account for much of the nonsignificant racially disproportionate effects: the interaction term capturing the nonsignificant white-Black contrast in effects declines by about 80 percent, from –0.16 to –0.03, and the interaction term capturing the

[18] This proposition rests on the assumption of minimal measurement error in the linear combination of the academic achievement measures we use.

significant white-Hispanic contrast declines by about half, from –0.21 to –0.11, and becomes nonsignificant. This evidence suggests that lower average achievement among Hispanic and Black students compared to white students leads those students to be more affected by AP gatekeeping measures.

We next examine differences in the effects of gatekeeping among students with similar prior achievement as a further test of the importance of achievement in explaining the racially disproportionate effects of gatekeeping. Table 4 splits the sample into the top and bottom half of the GPA distribution and estimates our model of racial differences in gatekeeping effects for each subpopulation. We find that gatekeeping excludes Black and Hispanic students with below-median GPAs much more than it does white students with similar GPAs. The estimated effect among Asian/Pacific Islander students is also large but not statistically significantly different from the effect among white students. In contrast, there are substantively smaller effects for all groups among students whose GPAs are above 3.0.[19] Because the magnitude of effects in percentage terms becomes more nonlinear as effects depart from zero, we visualize the differences by plotting the exponentiated coefficients and confidence intervals in Figure 3. Among white students and multiracial students, the estimated effect is to reduce exam-taking by near zero, compared to 56 percent among Black students, 45 percent among Hispanic students, 34 percent among Asian/PI students, and 20 percent among American Indian/Alaska Native students.

[19] Any residual differences in achievement between racial groups *within* these two GPA quantiles could still drive differences in effects between racial groups. To test this possibility, in supplemental models (available upon request), we replicated the model from Column 4 in Table 2 across our split sample by including three interaction terms between gatekeeping and prior GPA, 8th-grade math score, and 8th-grade reading score; the results were substantively the same. In Appendix C in the online supplement, we further test the possibility that the effects are driven by the clustering of some groups around the margin of AP participation.

In Appendices D and E in the online supplement, we conduct two additional analyses to probe these results. First, in Appendix D, we find that AP gatekeeping has similar effects on the number of AP exams students pass as the number they take. In Table E.1 in the online supplement, we explore the effects among below-median GPA students on exam-taking for specific AP subjects. We find similar overall effect sizes across subjects, albeit with somewhat smaller racial differences in English compared to math, STEM, and other non-STEM courses.

Effect of AP Enrollment Policies on the Transition to College

Finally, we examine whether gatekeeping policies ultimately affect racial inequality in postsecondary outcomes. If access to AP courses is important to students' propensity to attend selective colleges in particular, we expect to see racially disproportionate results in line with the effects on AP participation. Table 5 presents the results from separate logit models predicting two college outcomes: any four-year and highly selective four-year attendance, including interaction terms with race in the logit metric and group-specific average marginal effects (AMEs). We find suggestive evidence that overall college enrollment is slightly negatively affected by gatekeeping policies. However, there is clearer evidence that Black students are particularly less likely to attend four-year colleges in general, and highly selective four-year colleges in particular, under gatekeeping policies. The estimated effect of experiencing AP gatekeeping is to reduce Black students' odds of attending a four-year college by a factor of 0.48 ($e^{-0.13-0.60}$), and a highly selective college by a factor of 0.31 ($e^{-0.23-0.95}$). The corresponding AMEs are reductions in the probability of enrollment by 7 and 2 percentage points, respectively. These effects are substantively significant, and in all cases but the AME for elite college enrollment, statistically significant. We also find evidence of a large negative AME on Asian/Pacific Islander students' selective college enrollment of 5 percentage points. These findings suggest that when Black and Asian/Pacific Islander students gain access to AP courses through open enrollment policies, it facilitates their entry into baccalaureate colleges, highlighting the downstream consequences of policies that exacerbate racialized tracking.

<u>Limitations</u>

One limitation of this study is our survey-derived measure of schools' gatekeeping policies. There may be measurement error over time in schools' survey responses, perhaps driven by changes in the staff members filling out the OCRDC survey across years. If this is the case, the effects we estimate here are likely underestimates of the true effects of gatekeeping. However, we are encouraged by the results in column 3 of Table 2, which show that our gatekeeping measure is strongly associated with the exclusion of lower-achieving students, just as we would expect if it was a strong and valid measure of policy.

Second, our analysis relies on the assumption that the timing of changes in a school's policies are random with respect to each new cohort's propensity to take AP courses, conditional on the covariates. We cannot be sure this assumption is met. Enrollment policy changes might coincide with other programs that encourage or discourage students, perhaps specifically students of color, from enrolling in AP courses. If this is the case, our estimates would instead identify the effect of the mix of policies that coincided. However, scholars have found that gatekeeping in AP courses is contentious among teachers and administrators (Rowland and Shircliffe 2016). We thus speculate that much of the variation we see in enrollment policies within schools over time reflects idiosyncratic turnover and decision-making processes among school staff.

Third, we do not directly observe what type of requirement—recommendations, grades, or another criterion—school officials enact. However, students' prior grades are probably central to any assignment process: even teachers' decisions about recommendations likely hinge mainly on prior performance. Furthermore, all types of requirements are similar in that they are unlikely to be applied strictly: school officials make exceptions to rules for certain students, for instance, when parents lobby for changes (Lewis and Diamond 2015). Relatedly, our measure of students' 9th-grade location in their school's tracking system—their classmates' test scores—is imperfect compared to a measure of specific prior coursework. Specific prior coursework levels are likely prerequisites for some AP courses, particularly in mathematics sequences, and students often face strong barriers to moving upward academically (Hanselman 2020; Kelly 2007; Kelly and Price 2011). However, our results are similar whether or not we include our measure of track location, suggesting our results would be robust to an even more precise measure.

Finally, we are limited to data from a single state. Wisconsin's unique qualities make it a compelling setting for answering these questions, but they may also limit the generalizability of our findings. Wisconsin is among the states with the most extreme racial inequality in both socioeconomic and academic outcomes (Smeeding and Thornton 2018; U.S. Department of Education 2022). And while the student population in the state has become more racially diverse, particularly as the Hispanic population has grown, public school teachers in Wisconsin remain 96 percent white (Goff, Carl, and Yang 2018). This situation may heighten the racialized effects of gatekeeping if white teachers in Wisconsin are particularly likely to be biased against non-white students.

Conclusion

In this study, we found evidence that when teachers or other school officials enact selection criteria for advanced courses, they modestly reinforce racialized tracking and increase racial disparities in college enrollment. This finding is relevant to school and district policy:

removing gatekeeping measures may increase racial equity. Our results further suggest a synthesis of the scholarly literature on the potential effects of course gatekeeping on racialized tracking. First, our results support the quantitative literature emphasizing the importance of prior achievement disparities: achievement criteria do disproportionately exclude any group with lower average achievement. However, we found this explanation alone wanting. AP gatekeeping disproportionately excludes Black and Hispanic students relative to white students among those with similarly low prior achievement. This finding is consistent with the notion that teachers' expectations of students depend on their racial or ethnic background, or that school officials are willing to override gatekeeping criteria for relatively low-achieving white students but unwilling to do so for relatively low-achieving Black and Hispanic students (Lewis and Diamond 2015). Alternatively, relatively low-achieving white students may be less likely than relatively low-achieving Black and Hispanic students to seek academic opportunities like AP courses. In practice, we cannot distinguish between these mechanisms with these data, but based on prior research, we suspect they both play a role in the results we report here.

Our results also partially accord with the First Prediction above in that they suggest course gatekeeping is but one, relatively minor mechanism through which racial dynamics and racism affect inequality in course enrollments. We found that gatekeeping largely affects racial inequality among a subset of lower-achieving students, suggesting a limited role for this dimension of organizational policies in the production of racialized tracking broadly. Supporting this conclusion, most schools in Wisconsin—and nationally (Farkas and Duffet 2009)—allow open enrollment in AP courses, yet there remain large racial disparities in participation. Other entrenched racialized and racist processes, including the formation of academic self-concept, segregated networks, and hostile academic environments also reinforce racialized tracking.

Furthermore, gatekeeping as we have conceptualized and measured it—formalized eligibility criteria—does not attend to teachers' or counselors' informal influence on students; for instance, by directly encouraging course enrollment based on their perception of students' academic performance.

Our findings suggest multiple avenues for future research. One fruitful avenue may be to continue examining the extent to which the effects of gatekeeping are due to student behavior as opposed to teacher or counselor bias, mechanisms we could not distinguish in our study (see Francis et al. 2019). The effects of gatekeeping may also vary depending on whether teachers use "subjective" or "objective" criteria (Grissom and Redding 2016). In the same vein, due to limited empirical variation in our context, we did not examine the role that teacher identity plays in these racialized processes, despite the evidence for its importance in similar educational situations (e.g., Gershenson et al. 2016). Future work on this subject could integrate teacher characteristics to test this possibility. Finally, our findings on the postsecondary consequences of gatekeeping raise mechanistic questions. When students of color are induced to take AP courses, why do they appear to attend baccalaureate colleges at higher rates and at higher levels of selectivity? Does the effect reflect the admissions benefit of a more rigorous transcript, the cost-benefit shift associated with a potentially quicker college graduation timeline, a psychological impact of succeeding in advanced coursework, or something else? Future research, quantitative and qualitative, can investigate these pathways.

Tables and Figures

Table 1. Means (standard deviations) of measures, by race/ethnicity

	Racial/ethnic identification					
	White	Black	Hispanic	Asian/PI	American Indian	Two+ races
Number of AP exams taken	1.23 (2.04)	0.38 (1.10)	0.62 (1.47)	1.85 (2.94)	0.34 (1.05)	1.00 (2.02)
Took ≥ 1 AP exam	0.40	0.16	0.24	0.45	0.15	0.31
Number of AP exams passed	0.84 (1.76)	0.11 (0.60)	0.31 (0.99)	1.25 (2.60)	0.18 (0.75)	0.70 (1.76)
Attended a four-year college	0.43	0.18	0.19	0.44	0.15	0.33
Attended a highly selective four-year college	0.10	0.02	0.04	0.18	0.03	0.11
AP subjects offered at school	13.7 (6.5)	13.6 (6.5)	14.7 (5.9)	16.4 (5.8)	11.7 (5.7)	15.6 (6.3)
Average AP gatekeeping policy	0.18 (0.30)	0.09 (0.22)	0.14 (0.28)	0.19 (0.32)	0.19 (0.30)	0.15 (0.28)
9th-grade GPA	2.97 (0.88)	2.01 (0.95)	2.35 (0.97)	3.15 (0.79)	2.20 (0.96)	2.64 (1.02)
8th-grade WKCE math score (standardized)	0.17 (0.91)	-0.89 (1.03)	-0.46 (0.94)	0.09 (1.06)	-0.47 (0.98)	-0.08 (1.01)
8th-grade WKCE ELA score (standardized)	0.12 (0.96)	-0.67 (0.92)	-0.40 (0.88)	-0.06 (0.98)	-0.41 (0.91)	-0.06 (1.02)
Mean 9th-grade classmates' standardized math scores	0.17 (0.39)	-0.51 (0.59)	-0.22 (0.49)	0.11 (0.52)	-0.17 (0.44)	0.06 (0.46)
Mean 9th-grade classmates' standardized ELA scores	0.08 (0.34)	-0.46 (0.48)	-0.24 (0.42)	0.03 (0.46)	-0.19 (0.38)	-0.01 (0.41)
Proportion years FRL	0.24 (0.35)	0.78 (0.33)	0.70 (0.37)	0.52 (0.43)	0.63 (0.39)	0.48 (0.43)
Female	0.49	0.49	0.49	0.51	0.50	0.50
Classified as disabled	0.11	0.22	0.13	0.07	0.21	0.16
English-language learner	0.00	0.01	0.17	0.13	0.01	0.01

Number of students	112,328	9,931	12,926	5,052	1,337	3,095

Source: Data are from the Wisconsin State Longitudinal Data Systems merged with survey data from the Office of Civil Rights Data Collection.

Table 2. Characteristics of schools with differing AP enrollment policy sequences

	Changes policy	Always gatekeeping	Always open enrollment
Student characteristics			
White	0.81	0.76	0.76
Black	0.05	0.04	0.08
Hispanic	0.08	0.10	0.09
Asian/PI	0.03	0.07	0.04
American Indian	0.01	0.01	0.01
Two+ races	0.02	0.02	0.02
Proportion years FRL	0.32	0.36	0.34
AP exams taken	1.06	0.75	1.18
School characteristics			
AP subjects offered	13.3	11.6	14.5
Annual enrollment	670	668	704
Number of students	52,244	4,936	87,489
Number of schools	122	11	194

Note: Cells contain proportions or means.
Source: Data are from the Wisconsin State Longitudinal Data Systems merged with survey data from the Office of Civil Rights Data Collection.

Table 3. Estimated effects of AP gatekeeping policy on AP exams taken from fixed-effects Poisson models, heterogeneous effects by race/ethnicity and prior achievement

Outcome:	Total number of AP exams taken			
	(1)	(2)	(3)	(4)
Main effect				
AP gatekeeping	-0.14** [-0.24, -0.03]	-0.12* [-0.22, -0.01]	-0.10+ [-0.20, 0.00]	-0.33** [-0.53, -0.13]
Race interactions				
AP gatekeeping × White		–		–
AP gatekeeping × Black		-0.16 [-0.49, 0.17]		-0.03 [-0.34, 0.29]
AP gatekeeping × Hispanic		-0.21** [-0.37, -0.05]		-0.11 [-0.28, 0.06]
AP gatekeeping × Asian/PI		-0.11 [-0.25, 0.04]		-0.11 [-0.26, 0.03]
AP gatekeeping × Amer. Ind.		0.04 [-0.25, 0.33]		0.11 [-0.17, 0.40]
AP gatekeeping × Two+ races		-0.07 [-0.22, 0.08]		-0.06 [-0.21, 0.09]
Prior achievement interactions				
AP gatekeeping × 9th-grade GPA at or above median (3.0)			–	
AP gatekeeping × 9th-grade GPA below median (3.0)			-0.37*** [-0.56, -0.17]	
AP gatekeeping × 9th-grade GPA (centered)				0.23 [-0.05, 0.51]
AP gatekeeping × 8th-grade Math score (standardized)				0.03 [-0.03, 0.08]
AP gatekeeping × 8th-grade ELA score (standardized)				0.07 [-0.02, 0.16]
Covariates	X	X	X	X
School and cohort FE	X	X	X	X
School observations	327	327	327	327
Student observations	144,669	144,669	144,669	144,669
Pseudo R^2	0.463	0.463	0.464	0.464

Note: Coefficients are from fixed-effects Poisson regressions. Complete model results are available in Table A.1 in the online supplement. 95 percent confidence intervals in brackets are clustered at the school level.
Source: Data are from the Wisconsin State Longitudinal Data Systems merged with survey data from the Office of Civil Rights Data Collection.
+p < 0.1; *p < 0.05; **p < 0.01; ***p < 0.001 (two-tailed t-test).

Table 4. Estimated effects of AP gatekeeping policy on number of AP exams taken from fixed-effects Poisson models, heterogeneous effects by race/ethnicity and 9th-grade GPA quantile

Outcome:	Total number of AP exams taken	
Subgroup:	Below median GPA (3.0)	At or above median GPA (3.0)
	(1)	(2)
Main effect		
AP gatekeeping	-0.01	-0.10*
	[-0.36, 0.34]	[-0.18, -0.01]
Race interactions		
AP gatekeeping × White	–	–
AP gatekeeping × Black	-0.80*	0.07
	[-1.57, -0.04]	[-0.18, 0.33]
AP gatekeeping × Hispanic	-0.60*	-0.07
	[-1.08, -0.12]	[-0.21, 0.07]
AP gatekeeping × Asian/PI	-0.42	-0.10
	[-1.14, 0.31]	[-0.23, 0.03]
AP gatekeeping × Amer. Ind.	-0.22	0.11
	[-1.09, 0.65]	[-0.21, 0.43]
AP gatekeeping × Two+ races	-0.01	-0.06
	[-0.68, 0.65]	[-0.21, 0.10]
Covariates	X	X
School and cohort FE	X	X
School observations	298[a]	326[a]
Student observations	70,979	72,358
Pseudo R^2	0.347	0.319

Note: Coefficients are from fixed-effects Poisson regressions. Complete model results are available in Table A.1 in the online supplement. 95 percent confidence intervals in brackets are robust to heteroskedasticity and clustered at the school level.
Source: Data are from the Wisconsin State Longitudinal Data Systems merged with survey data from the Office of Civil Rights Data Collection.
[a]The number of schools in these models is smaller than in the full sample because some schools have zero students taking AP courses within the subsamples split by median GPA. The fixed effects for those schools perfectly separate the outcome and must be dropped for estimation to be possible.
$+p < 0.1$; $*p < 0.05$; $**p < 0.01$; $***p < 0.001$ (two-tailed t-test).

Table 5. Estimated effects of AP gatekeeping policy on college attendance from fixed-effects logit models, heterogeneous effects by race/ethnicity

Outcome:	Four-year college		Highly selective four-year college	
Metric:	Logit	Group AME	Logit	Group AME
	(1)	(2)	(3)	(4)
Main effect				
AP gatekeeping	-0.13 [-0.44, 0.18]	–	-0.23 [-0.54, 0.07]	–
Race interactions				
AP gatekeeping × White	–	-0.02 [-0.07, 0.03]	–	-0.01 [-0.03, 0.01]
AP gatekeeping × Black	-0.60*** [-0.90, -0.30]	-0.07** [-0.11, -0.02]	-0.95** [-1.58, -0.32]	-0.02 [-0.05, 0.01]
AP gatekeeping × Hispanic	-0.01 [-0.23, 0.20]	-0.01 [-0.05, 0.02]	0.32 [-0.24, 0.88]	0.00 [-0.02, 0.02]
AP gatekeeping × Asian/PI	-0.01 [-0.31, 0.29]	-0.02 [-0.08, 0.04]	-0.41+ [-0.90, 0.07]	-0.05* [-0.10, 0.00]
AP gatekeeping × Amer. Ind.	-0.11 [-0.77, 0.55]	-0.02 [-0.08, 0.04]	-0.82 [-2.34, 0.71]	-0.02 [-0.06, 0.01]
AP gatekeeping × Two+ races	0.06 [-0.39, 0.52]	-0.01 [-0.06 0.05]	-0.30 [-0.79, 0.19]	-0.02+ [-0.06, 0.00]
Covariates	X		X	
School and cohort FE	X		X	
School observations	326[a]		314[a]	
Student observations	144,664		143,417	
Pseudo R^2	0.357		0.397	

Note: Coefficients are from fixed-effects logistic regressions, presented in both logit metric and group-specific average marginal effects (AME). Complete model results are available in Table A.1 in the online supplement. 95 percent confidence intervals in brackets are robust to heteroskedasticity and clustered at the school level.
Source: Data are from the Wisconsin State Longitudinal Data Systems merged with survey data from the Office of Civil Rights Data Collection.
[a]The number of schools in these models is smaller than in the full sample because a few schools have no students who attended a college of that type. The fixed effects for those schools perfectly separate the outcome and must be dropped for estimation to be possible.
+$p < 0.1$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$ (two-tailed t-test).

Figure 1. Conceptual model of the relationship between course gatekeeping and tracking outcomes

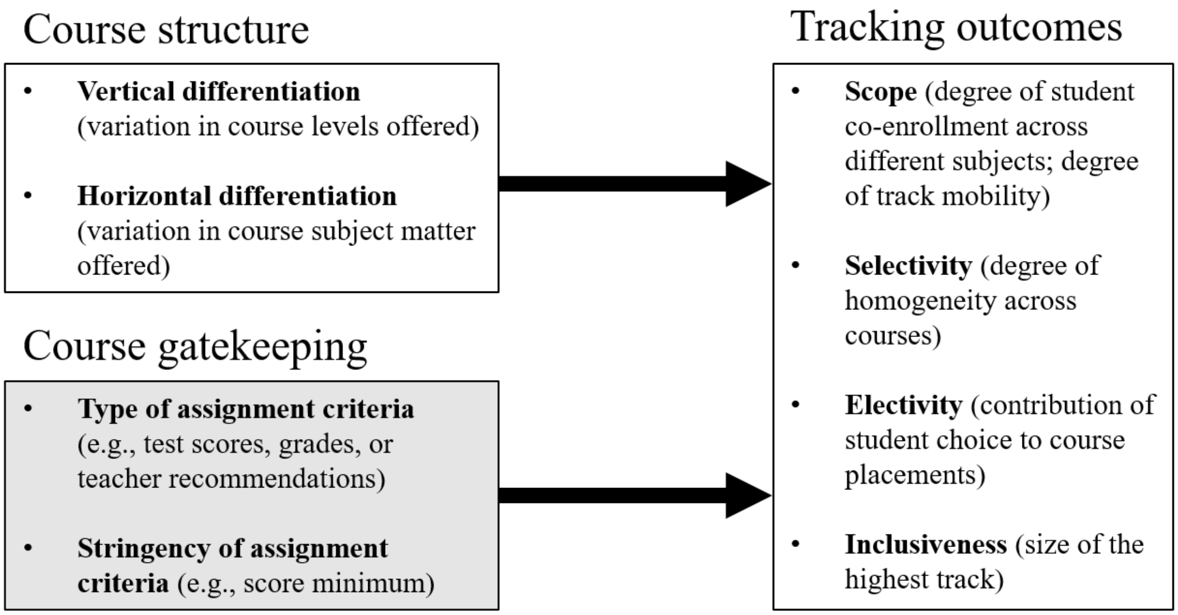
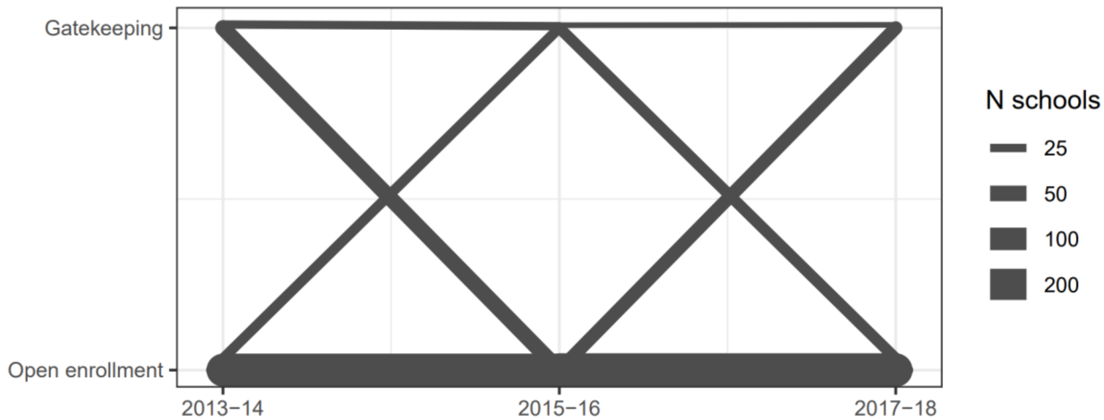
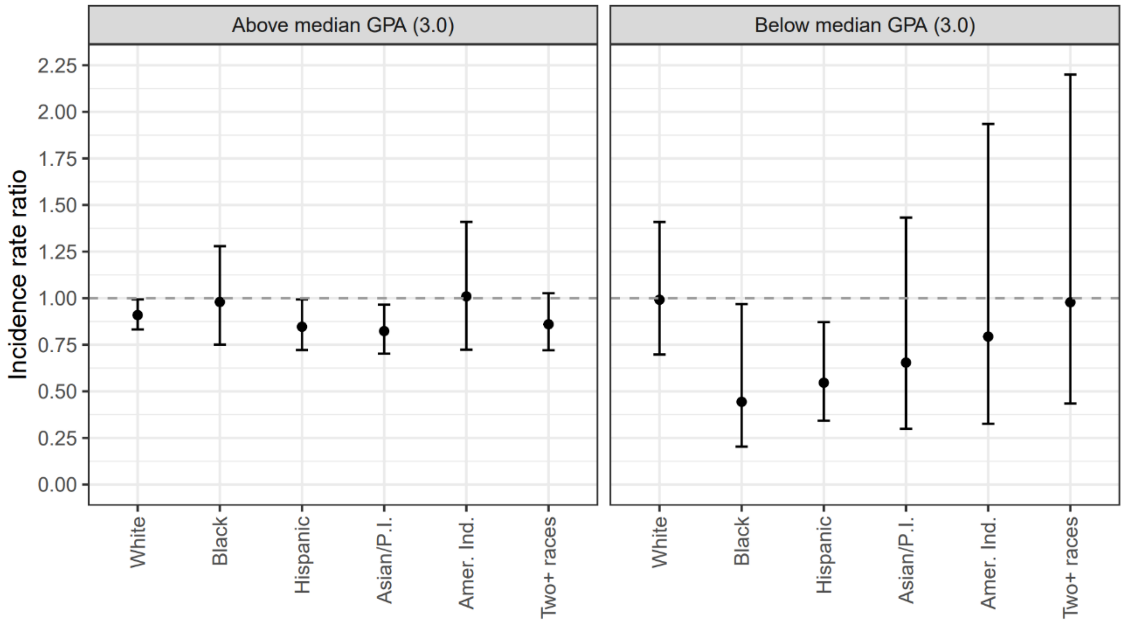


Figure 2. Change in high schools' AP enrollment policies by OCRDC survey school year



Note: Each line segment's width is proportional to the number of schools with that sequence of AP enrollment polices between the school years.
Source: Data are drawn from the Wisconsin State Longitudinal Data Systems and the Office of Civil Rights Data Collection.

Figure 3. Estimated effect of gatekeeping policy on number of APs taken by race/ethnicity and 9th-grade GPA quantile



Note: Estimates and 95 percent confidence intervals in incidence rate ratio metric for each racial/ethnic group computed from columns 1 and 2 in Table 4.
Source: Data are drawn from the Wisconsin State Longitudinal Data Systems and the Office of Civil Rights Data Collection.

Appendix A

Table A.1. Coefficients and standard errors from complete models displayed in Tables 3, 4, and 5

Outcome:	Total number of AP exams taken						Four-year college	Highly selective four-year college
Subgroup:	All students				Below median GPA (3.0)	Above median GPA (3.0)	All students	
Model family/link:	Poisson/log						Binomial/logit	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Gatekeeping	-0.14**	-0.12*	-0.10.	-0.33**	-0.008	-0.1*	-0.13	-0.14**
	(0.05)	(0.05)	(0.05)	(0.10)	(0.18)	(0.04)	(0.16)	(0.05)
Gatekeeping × Black		-0.16		-0.03	-0.8*	0.07	-0.60***	
		(0.17)		(0.16)	(0.39)	(0.13)	(0.16)	
Gatekeeping × Hispanic		-0.21**		-0.11	-0.6*	-0.07	-0.02	
		(0.08)		(0.09)	(0.25)	(0.07)	(0.11)	
Gatekeeping × Asian/PI		-0.11		-0.11	-0.42	-0.10	-0.01	
		(0.07)		(0.08)	(0.37)	(0.07)	(0.15)	
Gatekeeping × Amer. Ind.		0.04		0.11	-0.22	0.10	-0.11	
		(0.15)		(0.14)	(0.44)	(0.16)	(0.34)	
Gatekeeping × Two+ races		-0.07		-0.06	-0.01	-0.06	0.06	
		(0.08)		(0.08)	(0.34)	(0.08)	(0.24)	
Gatekeeping × GPA < 3.0			-0.37***					
			(0.10)					
Gatekeeping × GPA (centered)				0.23				
				(0.14)				
Gatekeeping × 8th-grade math score				0.02				
				(0.03)				
Gatekeeping × 8th-grade ELA score				0.07				
				(0.04)				
Student has a disability	-0.71***	-0.71***	-0.70***	-0.71***	-0.64***	-0.55***	-0.66***	-0.71***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)	(0.04)	(0.04)
Student is ELL	0.02	0.02	0.02	0.02	0.28	0.003	-0.23**	0.02
	(0.13)	(0.13)	(0.13)	(0.13)	(0.18)	(0.12)	(0.09)	(0.13)
Student is female (ref.: male)	-0.07***	-0.07***	-0.07***	-0.07***	0.06.	-0.09***	0.19***	-0.07***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.010)	(0.02)	(0.01)
% of years FRL receipt	-0.20***	-0.20***	-0.20***	-0.20***	-0.26***	-0.16***	-0.87***	-0.20***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.06)	(0.02)	(0.03)	(0.03)

Black. (ref.: white)	0.02	0.04	0.02	0.01	0.11	0.009	0.68***	0.02
	(0.06)	(0.07)	(0.06)	(0.07)	(0.07)	(0.04)	(0.06)	(0.06)
Hispanic (ref.: white)	0.16***	0.19***	0.16***	0.17***	0.35***	0.13***	-0.05	0.16***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.06)	(0.02)	(0.04)	(0.03)
Asian/PI (ref.: white)	0.14***	0.15***	0.14***	0.16***	0.28**	0.16***	0.13.	0.14***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.09)	(0.02)	(0.07)	(0.02)
Amer. Ind. (ref.: white)	-0.05	-0.06	-0.05	-0.07	0.14	-0.10	-0.13	-0.05
	(0.06)	(0.07)	(0.06)	(0.07)	(0.14)	(0.08)	(0.12)	(0.06)
Two+ races (ref.: white)	-0.02	-0.008	-0.02	-0.01	0.03	-0.005	0.06	-0.02
	(0.02)	(0.03)	(0.02)	(0.03)	(0.11)	(0.03)	(0.06)	(0.02)
8th-grade WKCE math	0.20***	0.20***	0.20***	0.19***	0.37***	0.18***	0.17***	0.20***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.009)	(0.02)	(0.01)
8th-grade WKCE ELA	0.10***	0.10***	0.11***	0.10***	0.24***	0.09***	0.03*	0.10***
	(0.007)	(0.007)	(0.007)	(0.008)	(0.02)	(0.005)	(0.01)	(0.007)
9th-grade GPA	1.2***	1.2***	1.1***	1.1***	1.0***	1.2***	1.6***	1.2***
	(0.06)	(0.06)	(0.08)	(0.06)	(0.12)	(0.03)	(0.03)	(0.06)
9th-grade GPA $\geq$ 3.0			0.13*					
			(0.05)					
Mean 9th-grade classmates'	0.51***	0.51***	0.52***	0.53***	0.27	0.54***	0.74***	0.51***
math scores	(0.08)	(0.08)	(0.08)	(0.08)	(0.22)	(0.07)	(0.11)	(0.08)
Mean 9th-grade classmates'	0.98***	0.98***	0.97***	0.97***	1.6***	0.87***	0.77***	0.98***
ELA scores	(0.07)	(0.07)	(0.07)	(0.07)	(0.23)	(0.07)	(0.11)	(0.07)
Mean cohort GPA	-0.68***	-0.68***	-0.66***	-0.67***	-0.60***	-0.20***	-0.93***	-0.68***
	(0.12)	(0.12)	(0.12)	(0.12)	(0.05)	(0.06)	(0.22)	(0.12)
Mean cohort math scores	-0.18.	-0.19.	-0.19.	-0.20.	-0.21	-0.27**	-0.28	-0.18.
	(0.10)	(0.10)	(0.10)	(0.10)	(0.29)	(0.10)	(0.17)	(0.10)
Mean cohort ELA scores	-0.57***	-0.57***	-0.57***	-0.57***	-0.74*	-0.67***	0.07	-0.57***
	(0.11)	(0.11)	(0.11)	(0.11)	(0.3)	(0.10)	(0.20)	(0.11)
Log #APs offered at school	0.47***	0.47***	0.48***	0.49***	0.60***	0.51***	-0.09	0.47***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.14)	(0.07)	(0.09)	(0.07)
Observations	144,669	144,669	144,669	144,669	70,979	72,358	144,664	143,417
Pseudo R^2	0.46318	0.46322	0.46372	0.4637	0.34705	0.31862	0.3567	0.39717

Note: Standard errors in parentheses are robust to heteroskedasticity and clustered at the school level. Models include year and school fixed effects.
Source: Data are from the Wisconsin State Longitudinal Data Systems merged with survey data from the Office of Civil Rights Data Collection.
+$p < 0.1$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$ (two-tailed t-test).

Appendix B

Here, we further specify the link between AP courses and AP exams in order to relate our findings from Equation 1 to our theoretical interest in racialized tracking, which concerns course enrollments. The extent to which our estimates of effects on AP exam-taking translate into effects on AP course enrollment depends on whether students' propensity to sit for the AP exam after the course differs between two groups: the *compliers* and the *always-takers* (Angrist, Imbens, and Rubin 1996). In our context, compliers are students who are prevented from enrolling in AP courses by a gatekeeping policy, and always-takers are the students who enroll in AP courses regardless of the policy they face. If compliers are just as likely to sit for the AP exam after enrolling in the course as are always-takers, then we can translate our estimates directly into effects on enrollment: a 20 percent reduction in exams would mean a 20 percent reduction in enrollments. But perhaps compliers are less likely to sit for the exam than are always-takers. Under an achievement-based criterion, compliers will typically be lower-achieving than always-takers, and lower-achieving students may be less likely to follow through with the exam, perhaps because they expect to receive a low score. If that were the case, a 20 percent reduction in exams would imply a reduction in enrollments of *more* than 20 percent. Our coefficients would be biased toward zero. However, this bias toward zero is less of a problem for our main theoretical interest: the differential effects of gatekeeping on AP course enrollment by race/ethnicity. We can make an assumption that yields unbiased racial/ethnic comparisons in effects on course enrollments: that the difference in propensity to sit for the exam between compliers and always-takers is similar within every racial/ethnic group. We view this assumption as plausible. If the assumption holds, then the interaction terms we estimate will yield unbiased estimates of the racial disproportionality of effects on exams *and* course enrollments. If that assumption does not hold, our estimates comparing effects among racial groups on course enrollment would be biased in an unknown direction, depending on differences between the compliers and always-takers in each racial group. If the difference between compliers' and always-takers' propensities to sit for exams is larger (smaller) among Black and Hispanic students than among white students, for example, then we will overestimate (underestimate) the racial disproportionality of gatekeeping's effects on course enrollment.

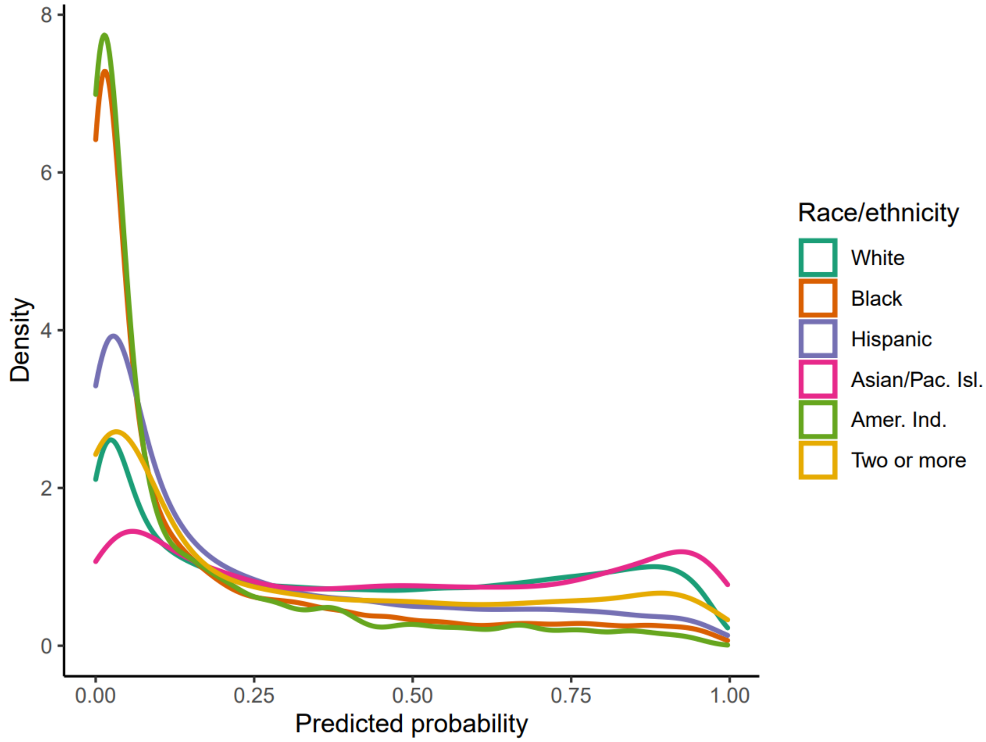
Appendix C

An anonymous reviewer raised a complex potential mechanism for our finding that gatekeeping more strongly affects students of color: gatekeeping may be particularly exclusionary to certain groups because those students are more likely to be "on the bubble" of AP participation, that is, have roughly even odds of participating in an AP course, and thus are most affected by any change in school policy. This possibility implies that if we were to effectively isolate the students on the margin of AP participation, the apparently racially disparate effects of gatekeeping would dissipate in this subset of students.

Here we test this possibility using two steps. First, we sought to identify "on the bubble" students in our sample. To do so, we estimated a logit model for taking at least one AP exam, conditional on all the predictors in our earlier models, but only among schools with always open-enrollment policies and excluding the school fixed effects. We restricted the estimation sample to open-enrollment schools because we want the model to accurately identify "on the bubble" students in the absence of gatekeeping policies. We then used the coefficients from that model to predict the probability that each student in our full analytic sample took at least one AP exam. In Figure C.1, we graph the density of those predicted probabilities by race/ethnicity. From this figure it is evident that Black and Hispanic students are less likely, and Asian/Pacific Islander students equally likely, to be close to 0.5 probability compared to white students. This finding itself provides some evidence against the possibility described above.

Second, we defined students as "on the bubble" if they fell between a 0.25 to 0.75 probability of taking an AP exam, which identified 47,994 students, or about one third of our sample, and we re-estimated our main model specification for racially heterogeneous effects among that subsample. Table C.1 presents those results. We find that the racially disparate effects of gatekeeping hold in this sample of students, with a particularly large—although nonsignificant—difference between the effect on Black and white students, and a large, statistically significant difference in effect between Hispanic and white students. These results give us more confidence that racial differences in students' propensity to take AP exams alone are not driving the racialized effects of gatekeeping. Surprisingly, however, the effects in Table C.1 are more similar in size to the effects measured in the full sample (Table 3) compared to the below-median GPA sample (Table 4). This suggests grades are stronger moderators of the effects of gatekeeping compared to the more multidimensional status of being on the margin of AP participation. We speculate this may be because prior grades themselves are a common assignment mechanism for AP course gatekeeping.

Figure C.1. Kernel density of students' predicted probability of taking at least one AP exam by race/ethnicity



Source: Data are drawn from the Wisconsin State Longitudinal Data Systems and the Office of Civil Rights Data Collection.

Table C.1. Estimated effects of AP gatekeeping policy on AP exams taken from fixed-effects poisson models, heterogeneous effects by race among students with a predicted probability of 0.25 to 0.75 of taking at least one AP exam

Outcome:	Number of AP exams taken (1)
Main effect	
AP gatekeeping	-0.19* [-0.33, -0.04]
Race interactions	
AP gatekeeping × White	-
AP gatekeeping × Black	-0.41 [-0.92, 0.10]
AP gatekeeping × Hispanic	-0.23* [-0.44, -0.03]
AP gatekeeping × Asian/PI	-0.21 [-0.48, 0.06]
AP gatekeeping × Amer. Ind.	0.25 [-0.15, 0.64]
AP gatekeeping × Two+ races	0.13 [-0.19, 0.45]
Covariates	X
School and cohort FE	X
School observations	327
Student observations	47,994
Pseudo R^2	0.163

Note: Coefficients are from fixed-effects Poisson regressions. All models control for prior GPA and test scores, prior classmate test scores, race/ethnicity, binary sex, English-language learner status, disability status, economic disadvantage, number of AP subjects offered, and school-by-cohort average grades and test scores. Standard errors in parentheses are robust to heteroskedasticity and clustered at the school level.
Source: Data are from the Wisconsin State Longitudinal Data Systems merged with survey data from the Office of Civil Rights Data Collection.
+p < 0.1; *p < 0.05; **p < 0.01; ***p < 0.001 (two-tailed t-test).

Appendix D

Table D.1. Estimated effects of AP gatekeeping policy on AP exams taken by subject among students with below-median GPAs

Outcome:	# of math APs taken (1)	# of English APs taken (2)	# of other STEM APs taken (3)	# of other non-STEM APs taken (4)
Main effect				
AP gatekeeping	-0.17 [-0.63, 0.29]	-0.18 [-0.57, 0.22]	0.08 [-0.24, 0.40]	0.01 [-0.53, 0.54]
Race interactions				
AP gatekeeping × White	-	-	-	-
AP gatekeeping × Black	-1.59+ [-3.58, 0.21]	-0.42 [-1.45, 0.62]	-0.81* [-1.56, -0.07]	-0.98 [-2.63, 0.30]
AP gatekeeping × Hispanic	-0.47 [-1.22, 0.29]	-0.16 [-0.71, 0.38]	-0.58* [-1.07, -0.09]	-0.74+ [-1.49, 0.01]
AP gatekeeping × Asian/PI	-0.84 [-1.94, 0.25]	-0.75 [-2.35, 0.84]	-0.31 [-0.92, 0.29]	-0.18 [-1.07, 0.71]
AP gatekeeping × Amer. Ind.	1.26 [-1.04, 3.55]	-0.04 [-1.77, 1.69]	-0.06 [-1.20, 1.08]	-0.79 [-1.99, 0.41]
AP gatekeeping × Two+ races	1.07* [0.05, 2.08]	-0.07 [-1.20, 1.06]	-0.18 [-1.03, 0.68]	-0.33 [-1.31, 0.65]
Covariates	X	X	X	X
School and cohort FE	X	X	X	X
School observations	194[a]	228[a]	248[a]	254[a]
Student observations	59,698	61,038	65,774	67,427
Pseudo R^2	0.366	0.278	0.299	0.275

Note: Coefficients are from fixed-effects Poisson regressions. All models control for prior GPA and test scores, prior classmate test scores, race/ethnicity, binary sex, English-language learner status, disability status, economic disadvantage, number of AP subjects offered, and school-by-cohort average grades and test scores. We define other STEM APs to include the physical and biological sciences, social sciences, and computer science. Other non-STEM APs are all other subjects, excluding English and math. Standard errors in parentheses are robust to heteroskedasticity and clustered at the school level.

Source: Data are from the Wisconsin State Longitudinal Data Systems merged with survey data from the Office of Civil Rights Data Collection.

[a]The number of schools in these models is smaller than in the full sample because a few schools have no students who attended a college of that type. The fixed effects for those schools perfectly separate the outcome and must be dropped for estimation to be possible.

+p < 0.1; *p < 0.05; **p < 0.01; ***p < 0.001 (two-tailed t-test).

Appendix E

We might be concerned that the students affected by gatekeeping are unlikely to have a positive academic outcome in AP courses. For instance, gatekeeping may be good for students' outcomes if they are not prepared for the advanced content in AP courses, receive bad grades, and are discouraged from pursuing college. We can partially evaluate this possibility by looking at whether students affected by gatekeeping pass the AP exams they take, that is, score at least 3 out of 5. In Table E.1, we replicate the models from Table 4 but use the number of exams students *pass* as the outcome. In a process analogous to the attrition between course enrollment and exam-taking, we can measure the amount of attrition between exam-taking and exam-passing by comparing the coefficients between our exam-taking and exam-passing models. If we see similar coefficients across the two outcomes, we can infer that students induced into taking the exam by open enrollment are approximately equally likely to pass the exam as students whose exam participation does not depend on the gatekeeping policy. We find this is the case: the coefficients on the gatekeeping-by-race interactions are similar in size and valence to those in Table 4, although they are not always statistically significant. This suggests students of color who are excluded from taking AP courses by gatekeeping policies are about as likely to do well on the exam as are students of color who enroll regardless of the gatekeeping policy.

Table E.1. Estimated effects of AP gatekeeping policy on number of AP exams passed from fixed-effects Poisson models, heterogeneous effects by race/ethnicity and 9th-grade GPA quantile

Outcome:	Total number of AP exams passed	
Subgroup:	Below median GPA (3.0)	Above median GPA (3.0)
	(1)	(2)
Main effect		
AP gatekeeping	0.45	-0.04
	[-0.10, 1.00]	[-0.16, 0.08]
Race interactions		
AP gatekeeping × White	–	–
AP gatekeeping × Black	-0.66	0.18
	[-2.31, 0.99]	[-0.21, 0.57]
AP gatekeeping × Hispanic	-0.77*	-0.05
	[-1.41, -0.12]	[-0.27, 0.16]
AP gatekeeping × Asian/PI	-0.30	-0.12
	[-1.12, 0.51]	[-0.28, 0.03]
AP gatekeeping × Amer. Ind.	-0.11	-0.03
	[-1.45, 1.22]	[-0.59, 0.53]
AP gatekeeping × Two+ races	-0.31	-0.02
	[-1.27, 0.65]	[-0.21, 0.17]
Covariates	X	X
School and cohort FE	X	X
School observations	265[a]	319[a]
Student observations	67,704	72,229
Pseudo R^2	0.383	0.384

Note: Coefficients are from fixed-effects Poisson regressions. All models control for prior GPA and test scores, prior classmate test scores, race/ethnicity, binary sex, English-language learner status, disability status, economic disadvantage, number of AP subjects offered, and school-by-cohort average grades and test scores. Confidence intervals in brackets are robust to heteroskedasticity and clustered at the school level.

Source: Data are from the Wisconsin State Longitudinal Data Systems merged with survey data from the Office of Civil Rights Data Collection.

[a]The number of schools in these models is smaller than in the full sample because some schools have zero students taking AP courses within the subsamples split by median GPA. The fixed effects for those schools perfectly separate the outcome and must be dropped for estimation to be possible.

+$p < 0.1$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$ (two-tailed t-test).

CHAPTER 5: CONCLUSION

In three empirical studies, this dissertation has contributed to our understanding of higher education's changing role in social stratification, illuminating how educational institutions contribute to or mitigate racial inequality and the transmission of advantages across generations. The first chapter explored inequality in attainment and earnings outcomes among graduate and professional degree holders, contributing a new framework and set of empirical findings for understanding the influence of institutional prestige on labor market outcomes, and revealing an emerging pattern of social reproduction at the upper echelons of the US educational system. The second chapter examined a common empirical finding—the net-Black advantage in college attendance—from a new perspective, leveraging spatial heterogeneity in local labor markets to test an underlying mechanism for these racial differences in behavior. The third chapter examined the importance of high school officials' decision-making in producing racialized tracking among Advanced Placement courses and later disparities college attendance.

A key finding that emerged in Chapter Two was that top graduate and professional degrees have long been an important path to the top of the earnings distribution, and that the strength of this pathway has not much changed in the last three decades. However, the increasing share of earnings captured by the top of the distribution has meant that the earnings returns to elite programs have increased in absolute terms. In this context, I further found evidence that children with highly educated parents are increasingly likely to earn graduate and professional degrees from top programs. The extent to which this increasing competition among the elite for top credentials and growing earnings inequality are linked should be pursued in future research.

One theme that emerged in these studies is the importance of the linkages between educational institutions and labor markets for understanding students' behavior and their later socioeconomic outcomes. In the first chapter, I found widely varying earnings returns to prestige across fields. To explain these patterns, and to differentiate them from parallel research at the baccalaureate level, I highlighted the relatively tight linkage between graduate degree fields and the professions (Abbott 1988). In the second chapter, I examined how racialized labor market opportunities influence college attendance behavior by race and gender. I found suggestive evidence that in more racially segregated labor markets, low-income white boys are particularly likely to attend two-year colleges, suggesting that the alignment between vocational programs and the occupational pathways that are more available to white than Black boys. These two chapters therefore affirm and add to our understanding of the importance of school-to-work linkages in the sociology of education.

Findings from Chapters Three and Four yielded insight into how racial inequality operates in the contemporary US educational system. By examining racial differences in behaviors—either taking AP courses or enrolling in college—in contexts with differing constraints, particular mechanisms of racism and racial inequality came into focus. In Chapter Three, I found little evidence that local labor market segregation affected net differences in four-year college attendance, but some evidence that it did so for two-year college attendance among boys, suggesting that the importance of racialized labor market opportunities differs by higher education sector. In Chapter Four, I found that racial inequality in AP course taking and college attendance tended to be larger in schools where officials excluded students from upper-level coursework based on achievement criteria. These studies and their methodology echo a recent emphasis in the quantitative methodological literature on approaching racial disparities in outcomes through the causal mechanisms that produce them (e.g., Lundberg, 2022). Future iterations of this work can employ these new methodological developments to make more defensible causal claims.

The studies in this dissertation open multiple avenues for future research. In particular, the rich data source developed in Chapter Two holds the potential to contribute new findings on social stratification among the highly educated. The rich information on household composition and income in these data can provide new insight into how graduate and professional degrees shape inequality across households as well as individuals. Although that chapter examined institutional prestige as the key source of variation across institutions, future work can explore other institutional distinctions, including a wider range of fields of study, the growing market for online degrees, or at Historically Black Colleges and Universities compared to predominantly white institutions. Chapter Three serves as an initial study in a broader research agenda examining how racial inequality in educational attainment varies across space in the United States. Future work can have broader geographic scope and take a more explicitly spatial methodological approach.

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