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Professional Staff Diversity and Student Outcomes: Extending our Understanding of Race/Ethnicity-Matching Effects in Education

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Abstract

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I. Introduction

Research from the education production function literature consistently shows benefits of access to same-race/ethnicity teachers on the outcomes of students of color, including increased test-score performance (Dee 2004; Egalite, Kisida, and Winters 2015) and academic expectations (Gershenson, Holt, and Papageorge 2016), and reduced absences, suspensions, and expulsions (Gottfried, Kirksey, and Fletcher 2021; Holt and Gershenson 2019; Lindsay and Hart 2017; Shirrell, Bristol, and Britton 2021). Assignment to just one Black teacher early on in elementary school also has long-run impacts for Black students, including an increased probabilities of graduating from high school and enrolling in college (Gershenson et al. 2018). Theory suggests that a primary mechanism driving these effects is role modeling. That is—along with other mechanisms for race/ethnicity-matching effects such as exposure to culturally relevant instructional practices (Gay 2000; Irvine and Armento 2001; Ladson-Billings 1995)—Black, Hispanic, and other historically marginalized students of color benefit from seeing individuals like them in positions of power (Villegas and Lucas 2004), particularly those who exemplify academic success (Fordham and Ogbu 1986).

If role modeling effects are a primary channel through which the benefit of same-race/ethnicity teachers runs, then we would expect to see similar effects from other role models in the school, even if a student does not work with and learn from them directly. Specifically, we hypothesize that diversity amongst schools' professional staff—including administrators, instructional coaches, guidance counselors, nurses and other health professionals, etc.—would show similar benefits for Black and Hispanic students in terms of increased test-score performance and decreased absences and suspensions. While a handful of studies have examined links between principal race/ethnicity and student outcomes (e.g., Bartanen and Grissom 2019; Meier, O'Toole,

and Nicholson-Crotty 2004), to our knowledge no studies have examined the effects of diversity amongst a broader set of school professional staff on student outcomes. Because principals serve a very specific leadership role in schools, the mechanisms driving principal-student race/ethnicity matching effects likely are quite different from potential effects of diversity amongst schools' other professional staff.

To bridge this gap in the literature, we use seven years of public-school records across the state of Maryland that link students to schools and professional staff within them, and then to key academic and behavioral outcomes including end-of-year test scores in math and English language arts (ELA), absences, and suspensions. Several features of Maryland's data and context facilitate examination of our hypothesis. Access to data on school's professional staff is unique relative to other statewide administrative records on schools (Education Commission of the States 2019). State education-based data systems available to researchers may have information on principals, but rarely on all school professional staff nor on the demographic characteristics of these individuals. In addition, population characteristics across Maryland's 24 counties—the primary form of local government and also the unit at which school districts are formed—include wide variability by race/ethnicity and are indicative of national population trends towards majority non-White student populations (National Center for Education Statistics [NCES], 2021b), leading to generalizable conclusions. Three school districts in Maryland are among the 25 largest public-school systems in the country, and two more are among the 50 largest.[i]

Using a fixed-effects methodology that exploits year-to-year, within-student, and within-school/grade variation in the composition and diversity of school staff, our findings extend the education-based race/ethnicity-matching literature in multiple ways. First and foremost, we find that an increased share of same-race/ethnicity professional staff leads to increased test score

performance (particularly for Hispanic students[ii]) and decreased suspensions and chronic absenteeism (particularly for Black students). For example, the difference between having no versus all same-race professional staff results in a 2-percentage point decrease in the probability that a Black elementary school student is suspended in a given year. As a point of comparison, we find that teacher-student matching for Black elementary students also leads to decreased probability of being suspended, but at half that magnitude. Roughly 3.5 percent of Black elementary students are suspended in a given year, and so a 2-percentage point decrease is quite large, representing a 57 percent reduction.

Our findings also extend understanding of the benefits of race/ethnicity-matching effects for Hispanic students. Whereas extant literature primarily has focused on demographic matching effects for Black students (for a review, see Redding 2019), we find benefits for Hispanic students as well. Pooling across all grade levels, Hispanic teacher-student matches lead to increased test-score performance of 0.04 SD in ELA and 0.07 SD in math. We also find effects on test-score performance of 0.24 SD and higher for exposure to all-Hispanic professional staff. Although corresponding standard errors are large given the small share of Hispanic professional staff, the positive effects show up in both math and ELA; they also are similar in magnitude to other studies where Hispanic students were matched to Hispanic teachers (Jennings and DiPrete 2010) and where Black students were randomly assigned to Black teachers (Dee 2004). Despite some lack of precision, the small share of Hispanic professionals contrasted with large point estimates linking the share of Hispanic professionals to the test-score performance of Hispanic students is compelling motivation for targeted recruitment. In their interpretation of Census Bureau population projections, Putman et al. (2016) estimate that, while diversity gaps between Black

students and teachers are likely to stay constant over the next several decades, the gap for Hispanic students and teachers is likely to increase by roughly 25%.

Also building on the prior literature, we find that both Black and Hispanic students benefit from exposure to non-White teachers and school staff, in addition to race/ethnicity matching effects more narrowly. For example, Black students exposed to a larger share of non-White, non-Black school professional staff are less likely to be chronically absent by 4 percentage points; and Black students working with non-White, non-Black teachers outperform their peers on state math and reading tests by upwards of 0.05 SD. Hispanic students also benefit from exposure to non-White, non-Hispanic teachers and professional staff, as measured by increased test scores upwards of 0.15 SD and decreased chronic absenteeism of 1 percentage point. These patterns fill gaps in our understanding of spillover effects, where the extant literature is quite limited. Gershenson and coauthors (2018) find that random assignment of a Black elementary teacher to a White student has no impact on test scores, nor on longer-term outcomes at the end of high school, compared to White teachers assigned to a White teacher. However, they do not estimate effects of Black teachers on non-Black, non-White students given very limited sample size. Lindsay and Hart (2017) find that the fraction of non-Black, non-White teachers in a school results in decreased suspension rates of Black students, and Shirrell and coauthors (2021) find similar patterns for suspension rates of Hispanic students resulting from increased share of Black teachers.

More broadly, our findings contribute to the human capital literature, which consistently shows that teachers are by far the most important within-school resource that we can provide to students in terms of increased academic performance and longer-run outcomes (Chetty et al. 2011; Hanushek and Rivkin 2010). Of the observable characteristics of teachers generally available to researchers in large-scale datasets (e.g., education, degrees, experience), race/ethnicity is one of

the few that consistently explains variation in effectiveness across individual teachers (Redding 2019; Wayne and Youngs 2003). There also is emerging evidence that school staff members including principals and guidance counselors vary in their contributions to student outcomes (Grissom, Kalogrides, and Loeb 2015; Mulhern 2020). However, much less is known about the characteristics of staff members that explain these differences, particularly when looking beyond principals. To our knowledge, ours is the first study to show benefits to Black and Hispanic students' test scores and school behaviors when they are exposed to larger shares of Black, Hispanic, and other non-White school professional staff.

II. Theoretical Framework and Related Research

A. Race/Ethnicity Matching in Schools

Our study examines benefits to students of racial/ethnic diversity amongst schools' professional staff, which builds most directly from prior theory and empirical research on the benefits of access to same-race/ethnicity teachers.

While the teacher workforce is overwhelmingly White (roughly 80%; NCES 2021a), teachers of color are thought to be uniquely positioned to understand the social, political, and economic inequalities that students of color face (Ladson-Billings 1994). More specifically, theory indicates that the academic experiences and outcomes of students of color are informed by their lives beyond the classroom and, as such, it is important that they have teachers who recognize and seek to understand how racial inequality shapes their world (Irvine 1989; Ladson-Billings 1995). Teachers of color are described as having access to "community cultural wealth," including the cultural knowledge and contacts that can be particularly beneficial for students of color (Yosso 2005). While White teachers are not inherently unable to teach students of color, they may be more likely than teachers of color to adopt and maintain deficit views and colorblind ideologies that

presume that individual factors—rather than systemic racism—are responsible for the academic challenges that students of color may experience (Lewis 2001; Valencia 2012). Compared to White teachers, teachers of color may also have higher expectations for students of color (Ferguson 2003), which can be critical for offsetting "stereotype threat" and the risk of confirming a negative stereotype about a specific group (Steele and Aronson 1995). Theory also indicates that students of color benefit from having role models of their same race/ethnicity (Villegas and Lucas 2004), particularly those who exemplify academic success (Fordham and Ogbu 1986).

Confirming at least part of this theory, quantitative analyses indicate that Black students randomly assigned to a Black teacher in early elementary grades outperform their peers on standardized tests by over 0.2 SD (Dee 2004). Several non-experimental studies that exploit within-student and/or within-school variation in teacher demographics show that race/ethnicity-matching effects on test scores extend to students in older grades (Egalite, Kisida, and Winters 2015), as well as to social and behavioral outcomes including students' own academic expectations for themselves (Gershenson, Holt, and Papageorge 2016). Using a similar fixed-effects methodology, Holt and Gershenson (2019) find that teacher-student race/ethnicity matching results in decreased absences (0.04 days) and suspensions (0.01 total suspensions). Lindsay and Hart (2017) and Shirrell et al. (2021) find similar patterns related to suspensions, and Gottfried et al. (2021) find similar results related to absences.

Gershenson et al. (2018) extend these analyses to examine the long-run impacts of teacher-student race matching for Black students, as well as to explore potential mechanisms driving these effects. Using the experimental data also analyzed by Dee (2004) linked to end-of-high school and college outcomes, the authors find that Black students randomly assigned to a Black teacher are more likely to take the SAT or ACT (6 percentage points), graduate from high school (9 percentage

points), and attend college (6 percentage points). The authors further explore possible mechanisms driving these relationships: the overall effectiveness of Black teachers versus their position as role models. The administrative data available in that study does not provide definitive conclusions, but leads the authors to argue against the effectiveness hypothesis. Black teachers do not appear to have universal benefits on non-Black (namely White) students. Further, race-matching effects are not explained by observable characteristics of Black teachers that are thought to be proxy measures for higher-quality instruction, such as experience in the classroom.

To date, the quantitative race/ethnicity-matching literature has focused primarily on Black students, leaving other subgroups including Hispanic students understudied. The historical focus on Black students likely is due to several reasons. Black students were the largest non-White student subgroup in U.S. public schools at the time that the theoretical literature on race/ethnicity matching in school began in the late 1980s, which remained the case up until the turn of the 21st century (NCES 2002). Stemming back to the 1960s, research-based responses to educational inequality and school-based segregation also have focused primarily on Black communities (Coleman 1966). And, initial quantitative evidence on the value of teacher-student race/ethnicity matching as a means of addressing school-based inequities only found effects for Black students (Ehrenberg, Goldhaber, and Brewer 1995). The first experimental analysis on this topic had a sample comprised almost exclusively of Black or White, non-Hispanic teachers and students (Dee 2004).

Of those studies that have examined matching effects for Hispanic students, the findings often are positive, though there are some inconsistencies. Using a value-added framework of student test-score growth in nationally representative survey data, Jennings and DiPrete (2010) find evidence that Hispanic teacher-student matches are associated with a 0.3 SD increase in math

test scores; in ELA, their estimate of 0.2 SD is substantively meaningful, but estimated imprecisely due to a small number of Hispanic teachers in the sample. Gottfried and coauthors (2021) find that Hispanic high school students in one California school district are absent less frequently (roughly 10 percentage points) when they are matched to a Hispanic teacher, compared to having a non-Hispanic teacher. Shirrell and coauthors (2021) find smaller but statistically significant decreases in the probability of being suspended (0.3 percentage points) when Hispanic students are exposed to a larger share of Hispanic teachers. In contrast, in statewide data from Florida—where roughly 20% of teachers are Hispanic (NCES 2018)—Egalite and coauthors (2015) find precisely estimated, small, and *negative* relationships (roughly -0.01 SD) between Hispanic teacher-student matches and test-score gains.

B. Benefits of Diversity Amongst School Professional Staff

The same guiding theory regarding benefits of teacher-student race/ethnicity matching likely applies to other adults in the school building. In fact, the theoretical literature on this topic often has referred to benefits of racially diverse "professionals" in a broad sense. Villegas and Lucas (2004) describe how correlations between race/ethnicity and neighborhood income often mean that students of color are less likely than White students to see successful professionals who are racially and ethnically like themselves. Comparatively, minoritized students who do see adults like them in positions of power can help challenge myths of racial/ethnic inferiority. Focused more narrowly on school settings, Waters (1989) notes that, because school is "a place where cultures and value systems are fashioned…, [a]bsence of [B]lack teachers and administrators…distorts the social reality of our society and deprives all children, [B]lack or non-[B]lack, of educational experiences that are increasingly important in our pluralistic society" (p. 267). These scholars

advocate for increased diversity across both teachers and school leaders as a means of creating school climates that are conducive to students' academic and social-emotional development.

Diversity amongst schools' professional staff—aside from teachers—may benefit students of color in both direct and indirect ways. Aligned to the literature above on teacher-student matches, same-race/ethnicity staff such as administrators, guidance counselors, health professionals, and others, likely serve as role models because they work in positions of power and exemplify academic success (Fordham and Ogbu 1986). Further, school leaders—and principals in particular—oversee disciplinary policies, potentially implementing "zero tolerance" policies that can result in a school-to-prison pipeline for minoritized students (Wald and Losen 2003), versus restorative justice programs and policies (Fronius et al. 2016). Indirectly, school leaders also serve as key mechanisms to recruit, hire, and retain a diverse group of teachers (Bartanen and Grissom 2019; D'Amico et al. 2017; Goff, Rodriguez-Escutia, and Yang 2018) and to support them in their work (Brezicha and Fuller 2019), which in turn can benefit students.

To our knowledge, only a handful of quantitative studies examine links between school professional staff diversity and student outcomes, all of which focus on principals (for a recent review, see Grissom, Egalite, and Lindsay 2021). In largely correlational analyses, Brockmeier et al. (2013) find higher student test scores when they have a principal of color, though estimates are sensitive to grade level and subject. Bowers and White (2014) find no relationship between principal race and average student outcomes, while Bastian and Henry (2015) find several negative relationships. All three of these studies consider the benefits of Black or non-White principals for students as a whole, rather than disaggregating by student subgroups. Focusing more narrowly on principal-student demographic matches, Meier and coauthors (2004) find that an increased share of Hispanic principals is not associated with increased academic performance on key metrics (e.g.,

test scores, advanced course taking, college entrance exams). However, the authors do observe a relationship between the share of Hispanic principals and an increased share of Hispanic teachers, which, in turn, predicts student outcomes. These analyses rely on district-level data with limited sets of controls, and therefore should be interpreted with caution. Using student-level data across two states and a value-added framework of student test score growth, Bartanen and Grissom (2019) find that the math test scores of Black students increase when they have a Black principal (0.04 to 0.07 SD) but only when the principal has been in the school for more than a year. In other words, the effects likely reflect principals' job-specific human capital accumulation over time.

Our study builds on this prior work by considering diversity of schools' administrative staff broadly, including administrators other than principals, instructional staff such as content coaches, guidance and counselor specialists, health specialists, and special education staff. All of these individuals have advanced degrees and training that signal academic success. We specifically exclude principals from our measures of diversity amongst schools' professional staff, given the very unique role that they play in schools and multiple possible mechanisms potentially leading to increased student outcomes. Instead, we ask a narrower question related to representation and less about the policy and programmatic choices that principals make: Does having a more diverse school staff who serve in positions of power benefit students? We hypothesize that, where relationships exist, they are likely to be driven primarily by role-modeling effects, given the more limited direct, one-on-one interactions students have with the set of professionals that are included in our sample. In many instances, students may only see professional staff in the hallway.

Analytically, we take several additional steps in an effort to narrow in on role-modeling channels. To control for any changes in policy or programming at the school or classroom levels—including strategic hiring of more diverse teachers and professional staff—we control for school-

grade fixed effects, principal fixed effects, and teacher-student race/ethnicity matches. We also operationalize professional staff diversity in the aggregate (i.e., the proportion of the staff of certain racial/ethnic groups), rather than considering the direct linkages between an individual staff member and a given student. At the same time, we recognize that our data do not allow us to rule out other possible mechanisms that may work in tandem with role-modeling effects.

III. Data and Sample

Analyses presented in this paper focus on K-12 public-school administrative records from the state of Maryland, between the 2012-13 and 2018-19 school years. Data provided by the Maryland State Department of Education (MSDE) include information on all students enrolled in public schools during these years, their demographic characteristics, and academic and behavioral outcome measures including end-of-year test scores in math and ELA, suspensions, and absences. Two key features of the Maryland data facilitate our analyses. First, students are connected to teachers via course rosters collected statewide.[iii] Second, all other school personnel also are included in the data system and can be linked to schools. In addition to teachers, professional staff members include administrators (e.g., principals, assistant principals, department chairs), instructional specialists (e.g., content coaches), guidance and counselor specialists, nurses and other health specialists, and special education specialists.[iv]

Our sample includes more than 5.9 million student/year observations and 717,320 professional staff/year observations. Each year, roughly 800,000 to 850,000 students enroll in public schools in Maryland, and they are taught by roughly 55,000 teachers. In our primary analyses, we estimate effects on students across all grade levels. We supplement these analyses by dividing the full sample into two groups based on school level: elementary- versus middle/high-school. This approach aligns with other work examining benefits of demographic matching at

different grade levels (e.g., Egalite, Kisida, and Winters 2015; Lindsay and Hart 2017; Shirell, Bristol, and Britton 2021), and accounts for the fact that certain outcomes tend to be more malleable at some grade levels versus others. Students tend to experience larger test-score growth in the earlier rather than later schooling years (Hill et al. 2008); comparatively, absences and suspensions are much more common in the later grades (see our own estimates below). We pool middle and high school students into one group due to methodological considerations. Our student fixed effects strategy depends on year-to-year variation in outcomes; however, following federal law on school accountability, high school students generally take just one math and one ELA assessment during these schooling years.

As we show in Table 1, most students in Maryland public schools are not White. Approximately 34% of student/year observations are Black and 15% are Hispanic, while White students account for 39% of the observations. We observe similar trends for elementary- and middle/high-school students. In contrast to the racial-ethnic composition of students in Maryland, the majority of the public-school workforce is White. This is evident when we consider teachers (74% of teacher/years in elementary and 70% in middle/high-school levels are White) and professional staff (70% of staff member-years in elementary and 62% in middle/high-school levels are White). Appendix Table 1 presents proportions disaggregated by professional groups.

Our key independent variables focus on students' exposure to teachers and professional staff from different racial/ethnic groups and, more specifically, include the: (i) proportion of students' own teachers in the school of the same race/ethnicity; (ii) proportion of students' own teachers in the school that are not the same race/ethnicity as the student and also are not White; (iii) proportion of professional staff (i.e., other teachers in the school, administrative personnel other than principals, instructional specialists, guidance/counselor specialists, nurses and other

health specialists, special education specialists, and other professional staff) in the school of the same race/ethnicity as the student; and (iv) proportion of professional staff in the school that are not of the same race/ethnicity as the student and are also not White. We refer to "own teachers" as those who taught any subject to the student in a given year.[v] We identify these teacher-student links from course roster data. We refer to "not own" teachers as those who work in a given school and year but not with a given student. While professional staff diversity generally can be thought of as a school-level characteristic, separation of "own" and "not own" teachers in operationalizing racial/ethnic diversity of professional staff means that proportions vary slightly across students within the same school and year. As noted above, we exclude principals from the professional staff group, given that year-to-year changes in principal characteristics—due to principal turnover—likely is correlated with unobserved factors that may simultaneously impact staff diversity and student outcomes, including changes in school mission and strategic hiring decisions. Instead, we aim to control for these sorts of unobserved characteristics by including principal fixed effects.

We link these independent variables to end-of-year test scores in math and ELA, administered in all grades 3 through 8 and once in high school.[vi] We standardize test scores by grade and year to have a mean of 0 and a SD of 1. We also link our independent variables to two dichotomous outcomes that are available in every grade K through 12: ever suspended in a given academic year, and chronic absenteeism in a given year.[vii] We dichotomize these variables given that they are highly skewed (see Table 3). Following Holt and Gershenson (2019) and Gottfried (2019), students are considered chronically absent when their records report 18 or more absences within an academic year, representing approximately 10% of the school year.

We examine effects of demographic matching and school outcomes for Black and Hispanic students as distinct subgroups, both of whom are described as likely benefitting from access to

same-race/ethnicity role models in school (Bristol and Martin-Fernandez 2019; Redding 2019). To assess our results' potential externalities and policy implications, we also look at effects for White students exposed to non-White own teachers and professional staff.

Table 3 reports descriptive statistics of these independent and dependent variables by demographic subgroups and school levels. On average, students tend to work directly with five teachers and be exposed to roughly 40 total school staff in each year of elementary school; middle/high school students work directly with an average of eight teachers and are exposed to roughly 75 total professional staff per year. Regarding our key independent variables, for elementary students (see Table 3, panel A1), 27% of Black and 4% of Hispanic elementary students' own teachers are of their same race/ethnicity, respectively. This proportion slightly increases for both groups of students when we consider all professional staff: 31% of professional staff members are of the same race/ethnicity for Black students, compared to 4% for Hispanic students. In contrast, for White students, approximately 90% of their own teachers and of the professionals that work in schools in which they enroll are of their same race/ethnicity. We observe similar race/ethnicity-matching trends for middle/high-school students (see Table 3, panel A2).

IV. Empirical Strategy

We provide evidence on the relationship between professional staff-student racial/ethnic matching and short-term educational outcomes (i.e., test scores, suspensions, absences). Following other scholars who have studied race/ethnicity-matching effects in schools, we exploit plausibly random variation in the demographics of school staff within students and within schools over time by specifying models that include student fixed effects, school/grade fixed effects, and year fixed effects (e.g., Egalite, Kisida, and Winters 2015; Holt and Gershenson 2019; Lindsay and Hart 2017; Shirell, Bristol, and Britton 2021). Variation comes from the natural turnover of staff due to

factors such as maternity leave (Bettinger and Long 2010). To account for time-invariant differences in principal quality that also can impact staff hiring, school contexts, and student outcomes, we further include principal fixed effects in our preferred estimation model (Branch, Hanushek, and Rivkin 2008).

Our main set of results are derived from the following model:

$$Y_{igspt} = \beta_0 + \beta_1 PropSameRaceOwnTch_{it} + \beta_2 PropNotSameRaceNotWhiteTch_{it} + \beta_3 PropSameRaceProf_{it} + \beta_4 PropNotSameRaceNotWhiteProf_{it} + \sigma SchoolCharacteristics_{st} + \zeta StudentCheracteristics_{it} + \theta_i + \omega_{sg} + \gamma_t + \lambda_p + \varepsilon_{igspt}$$

where Y is the outcome of interest (i.e., math test scores, ELA test scores, ever suspended, chronically absent) for student *i* in grade *g* in school *s* with principal *p* in year *t*. We specify each outcome as a function of the proportion of same-race/ethnicity teachers and professional staff (two variables), as well as the proportion of non-White but not same-race/ethnicity teachers and professional staff (two variables), with coefficients on these independent variables captured by β_1 through β_4. We include proportions of teachers and professional staff of different races/ethnicities in the same model in an effort to parse the unique contribution of each.

To control for time-invariant characteristics at each level, we include fixed effects for student, θ_i, school-grade, ω_{sg} academic year, γ_t, and principal λ_p. We further control for time-varying observable school characteristics (i.e., proportion of students of different race/ethnicity groups; test scores, suspensions, and absences in year *t*-1 all averaged to the school level; the numbers of teachers and professional staff), as well as time-varying student characteristics (i.e., free-reduced price lunch [FRPL] status, special education status). We calculate heteroskedasticity-robust standard errors clustered at the school-grade level.

We estimate the model above separately for our primary subgroups of interest: Black and Hispanic students. To estimate potential externalities on White students enrolling in schools with diverse, non-White teacher and professional staff, we estimate separate models for White students. Here, we include two key independent variables that capture the proportion of own teachers and the proportion of professional staff that are not White.

V. Results

We present our main results in Table 4, which provide estimates of the effect of teacher and professional staff race/ethnicity on student outcomes. The three panels/sets of rows correspond to three student subgroups (i.e., Black, Hispanic, White), while sets of columns correspond to the four outcomes of interest (i.e., end-of-year math and ELA test scores, ever suspended in a given year, chronically absent in a given year). Each panel-column combination represents estimates from a single regression model that includes all of the main independent variables. In order to examine the robustness of our empirical strategy against threats to internal validity, we explore models with different sets of fixed effects, starting first with fixed effects for school/grades and years only, and then adding student and principal fixed effects. In Table 4, estimates come from the pooled sample of elementary, middle, and high school students, where we have the greatest statistical power. In Tables 5a and 5b, we present estimates separately for elementary and middle/high school students, respectively. In these latter tables, we exclude tests of sensitivity of results to different sets of fixed effects, as patterns are similar to those presented in Table 4.

A. Student Sorting and Specification Checks

Before interpreting estimates substantively, we begin with discussion of our modeling strategy and changes in estimates due to the set of fixed effects included. We consider estimates from models that only control for school/grade and year fixed effects to be naïve given that we do

not control for student background characteristics or prior measures of the outcome. Negative coefficients relating the proportion of Black own teachers to math and ELA test scores largely are indication of within-school sorting patterns (Clofelter, Ladd, and Vigdor 2006), where Black teachers tend to be assigned to lower-performing Black students. Even though these models focus on end-of-year rather than prior-year student outcomes, prior- and current-year measures tend to be highly correlated. This is the main motivation for specifying models that examine changes over time. Black teachers also tend to be assigned to lower-performing students overall, regardless of race/ethnicity (see negative correlations between proportion of non-White, non-same ethnicity teachers to test scores of Hispanic students, as well as negative correlation between proportion non-White teachers and the test scores of White students). We observe similar patterns of negative sorting for Black teachers with regard to student absences and suspensions, where positive coefficients indicate that Black teachers tend to have students with more absences and suspensions, compared to other teachers in the same school and grade.

Accounting for the proportion students' teachers who are Black appears to serve as a useful control variable to address sorting when considering the relationship between other independent variables and student outcomes. For example, even in these naïve models, the relationship between student outcomes and the proportion of non-Black, non-White teachers, the proportion of Black professionals, and the proportion of non-Black, non-White professionals generally go in expected directions (positive for test scores and negative for absences and suspensions) or are close to zero.

Adding student fixed effects accounts for fixed differences across students in terms of underlying academic performance, absences, suspensions, and a range of unobserved characteristics. Unsurprisingly, then, many of the coefficients described above that signal negative sorting patterns now switch signs. For example, when including student fixed effects in addition

to school-grade and year fixed effects, we observe a positive relationship between the proportion of Black teachers and the test scores of Black students, and negative relationships between the proportion of Black teachers and the absence and suspension rates of Black students. Our preferred models also include principal fixed effects, which aim to account for the ways in which principals may simultaneously impact the proportion of teachers and school professionals from different racial/ethnic backgrounds, and student outcomes. Inclusion of principal fixed effects does not change estimates substantially after including student fixed effects. We view these patterns as evidence that our models account for non-random sorting patterns, and that we can, in turn, interpret estimates linking the proportion of teachers and school professionals from different racial/ethnic backgrounds to student outcomes as causal relationships.

B. Teacher-Student Matches

Next, we discuss our primary estimates of interest, focusing first on patterns related to teacher-student matching, which have been discussed extensively in the extant literature and so provide a useful point of comparison when interpreting patterns related to professional staff-student demographic matching. Results for exposure to same-race/ethnicity own teachers are quite consistent with what other scholars have found, especially for Black students. Specifically, we find that exposure to all-Black own teachers compared to Black students having exclusively non-Black own teachers increases end-of-year math test scores by 0.02 SD, and decreases both the probability of being suspended and being chronically absent by 1 percentage point (see Table 4). These patterns are driven primarily by elementary school students, where estimates are larger (e.g., 0.04 SD for test scores; see Table 5a). We also find that Black students exposed to larger shares of non-White, non-Black teachers leads to improved ELA test scores (0.03 SD) and decreased chronic absenteeism (1 percentage point; see Table 4).

For Hispanic students, teacher-student ethnicity matching leads to increased test scores in math and ELA of 0.07 and 0.04 SD, respectively, and decreases in chronic absenteeism of 2 percentage points (see Table 4). These estimates are slightly larger than race-matching effects for Black student-teacher combinations. Exposure to larger shares of non-White, non-Hispanic (largely Black) own teachers also benefits the test-score outcomes of Hispanic students (roughly 0.02 SD). Different than for Black students, these estimates for Hispanic students are slightly larger in middle/high school grades (see Table 4b).

Finally, for White students across all grade levels, exposure to all non-White own teachers does not have any statistically significant impact on test scores or suspensions. Evidence of no harm is relevant from a policy perspective centered on diversifying the school workforce. However, we do observe evidence of slightly increased chronic absenteeism for exposure to all-minority own teachers (less than 1 percentage point; see Table 4).

C. Professional Staff-Student Demographic Matches

Above and beyond exposure to same-race/ethnicity teachers, we provide novel evidence that exposure to diverse school professional staff results in improved test-score performance (particularly for Hispanic students) and to improved school behaviors (particularly for Black students). For Black students, benefits come primarily from larger shares of non-White, non-Black school professionals—rather than professional staff-student race-matching—where we observe decreases in chronic absenteeism of 4 percentage points (see Table 4). When disaggregating by grade levels, we also observe decreased suspension rates of 2 percentage points for exposure to all-Black professionals in elementary school (see Table 4a). In middle/high school, exposure to all non-White, non-Black professionals leads to increased ELA test scores of 0.23 SD and decreased chronic absenteeism of 7 percentage points (see Table 4b). Given the limited number of non-

White, non-Black professionals in the data (see Table 2), these estimates have relatively large standard errors and so exact magnitudes should be interpreted with caution.

For Hispanic students, exposure to all-Hispanic professional staff also results in large increases in test scores (0.24 SD in ELA and 0.38 SD), though here too the magnitude of estimates should be interpreted in light of large standard errors (see Table 4). Hispanic professional staff-student matches are rarer than Black students matched to non-Black, non-White professional staff. We observe that exposure to larger shares of non-White, non-Hispanic (mostly Black) professionals also increases the ELA test scores of Hispanic students (0.08 SD when pooling across grade levels, and 0.15 SD in middle/high school). However, these estimates only are statistically significant at the 0.1 threshold (see Tables 4 and 5b).

For both Black and Hispanic students, the impacts of professional staff-student matching described above often are larger than analogous estimates of teacher-student matches. One reason for this is the way we operationalize our independent variables, which capture the difference between having none versus all professional staff or teachers of a given race/ethnicity. Because students are exposed to many more professional staff than teachers (see Table 3), the difference between having none versus all is more realistic for the latter group than the former. It may be more appropriate to interpret our estimates for the share of professional staff of color in smaller increments, say from none to 30% or 50%. As a point of comparison, White students in our data tend to be exposed to roughly 90% of teachers and professional staff who also are White, whereas Black students have an average of roughly 30% of teachers and professional staff who are Black, and Hispanic students have an average of roughly 4% of teachers and professional staff who are Hispanic. Rescaling estimates in half or a third would make the effects of exposure to a larger

share of professional staff of color quite similar to effects of exposure to a larger share of teachers of color, which still speaks to the great value of having a more diverse school professional staff.

Returning to patterns for Hispanic professional staff-student matches: While we consistently observe positive effects on test scores, the evidence is more mixed with regard to impacts on school behaviors. In middle/high school, exposure to all-Hispanic professionals results in a 22-percentage point decrease in chronic absenteeism (see Table 5b); however, the pattern is reversed in elementary school, where exposure to all-Hispanic professionals results in increased chronic absenteeism of 9 percentage points. When pooling across grade levels, these differences wash out and we observe no impact on chronic absenteeism (see Table 5). Also pooling across grade levels, we find an increased probability of being suspended of 4 percentage points for exposure to all-Hispanic professionals. These results are similar when we exclude the proportion of Hispanic students' own teachers from different racial/ethnic backgrounds from our models.

For White students, findings also are mixed. As with exposure to all non-White teachers, we find evidence of no harm with regard to the impact of all non-White professionals on the test scores of White students. In several models, point estimates are positive, but not statistically significantly different from zero. We find evidence of decreased chronic absenteeism of 2 percentage points for exposure to all non-White professionals. Above, we describe a smaller but opposite impact of exposure to all non-White teachers. In equilibrium, diversity amongst all staff—including own teachers and other school professionals—is unlikely to have either a positive or negative impact on the absence rates of White students. However, we also find that exposure to all non-White professionals results in increased suspension rates of 1 percentage point for White students.

VI. Discussion and Conclusion

For both Black and Hispanic students, we find consistent evidence that increased diversity amongst teachers and broader sets of school professionals benefits test-score performance, and—in several instances—also leads to improved school behaviors.

The administrative records that we rely on in our analyses cannot tell us definitively what is happening between students, teachers, and professional staff of color, nor why exactly this might matter for student outcomes. With regard to effects of teachers of color on the outcomes of students of color, there is rich discussion describing multiple possible benefits and pathways, including enactment of culturally relevant or responsive practices that draw on students' cultural backgrounds as a resource to guide instruction (Gay 2000; Irvine and Armento, 2001; Ladson-Billings, 1995), as well as role modeling (Fordham and Ogbu 1986; Villegas and Lucas 2004). To date, attempts to tease out one from the other has been challenging (Gershenson et al. 2018), potentially because instruction-based and role-modeling channels are not mutually exclusive.

With regard to our estimates linking the share of professional staff of color to the outcomes of students of color, we argue that role modeling is a more likely explanation. We find that the benefits of exposure to professional staff of color are above and beyond the effect of direct work with teachers of color (given that we include both sets of independent variables in our models), where students' own teachers are primarily responsible for delivering instruction, preparing students for tests, monitoring daily school/class attendance, etc. Our estimates also are above and beyond the contributions of principals (since we control for principal fixed effects), where principals generally are responsible for setting school policies related to testing, absenteeism, and discipline, as well as hiring that can lead to an increased share of teachers or professional staff of color. Inclusion of school/grade fixed effects further accounts for components of school climate

and culture that are stable over time and may simultaneously influence the share of staff members of color interested in working in that school and student outcomes. We included this rich set of controls primarily to address concerns of omitted variables bias (also addressed through inclusion of student fixed effects). At the same time, restricting variation in this way likely rules out specific pedagogical approaches or school-based practices as a mechanism for our findings

Understanding the specific mechanisms at play linking professional staff diversity to improved outcomes of students of color can help inform school-based policies and programs, including approaches to staff training and school climate initiatives. Even without this knowledge, our findings provide additional support for district, state, and national campaigns for recruiting more individuals of color into teaching and into school professional staff positions more broadly. This call is longstanding. Yet, to date, there is very little—if any—evidence on the causal effects of various recruitment strategies for diversifying the teaching and school professional staff professions. Future research and policy efforts should prioritize filling this gap.

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Tables

Table 1. Student Characteristics

	All Levels	Elementary	Middle/High
Asian	0.064	0.064	0.064
Black	0.337	0.332	0.341
Hispanic	0.154	0.169	0.140
White	0.392	0.381	0.402
Other Race/Ethnicity	0.053	0.054	0.053
Female	0.489	0.488	0.490
Free-Reduced Price Lunch Eligibility	0.433	0.474	0.396
English-Language Learner	0.082	0.117	0.050
Special Education	0.145	0.135	0.154
Total (Person/Years)	5,949,487	2,814,301	3,135,186

Table 2. Staff Characteristics

	Teachers			Professional Staff		
	All Levels	Elem.	Middle/ High	All Levels	Elem.	Middle/ High
Asian	0.037	0.034	0.040	0.014	0.014	0.014
Black	0.186	0.169	0.203	0.278	0.244	0.311
Hispanic	0.027	0.026	0.029	0.024	0.021	0.027
White	0.719	0.740	0.697	0.665	0.703	0.627
Other Race/Ethnicity	0.030	0.030	0.031	0.019	0.018	0.019
Female	0.789	0.840	0.737	0.816	0.863	0.770
Total (Person/Years)	614,250	307,388	306,862	103,070	51,309	51,761

Notes: Teachers include both own and not own teachers; professional staff includes principals, other administrative professional staff, instructional specialists, guidance/counselor specialists, nurses and other health specialists, special education specialists, and other professional staff.

Table 3. Descriptive Statistics for Primary Independent and Dependent Variables

	All Students		Black Students		Hispanic Students		White Students	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
PANEL A: ELEMENTARY STUDENTS								
A1: Independent Variables								
Same-Race/Ethnicity Own Teachers (Count)	2.101	2.164	1.227	1.378	0.181	0.442	4.320	1.447
Same-Race/Ethnicity Own Teachers (Proportion)	0.445	0.423	0.272	0.290	0.037	0.091	0.905	0.161
Same-Race/Ethnicity Professional Staff (Count)	18.083	17.246	11.685	9.718	2.058	2.594	35.873	11.983
Same-Race/Ethnicity Professional Staff (Proportion)	0.452	0.392	0.307	0.237	0.039	0.047	0.891	0.112
A2: Dependent Variables								
Math Test Scores (SD)	0.000	1.000	-0.410	0.883	-0.335	0.897	0.363	0.925
Reading Test Scores (SD)	0.000	1.000	-0.363	0.915	-0.339	0.908	0.346	0.943
Suspensions (Count)	0.054	0.622	0.119	0.966	0.020	0.319	0.022	0.337
Ever suspended (Binary)	0.018	0.133	0.036	0.186	0.008	0.091	0.009	0.097
Absences (Count)	9.056	8.520	10.049	10.281	9.486	8.131	8.384	7.090
Chronically Absent (Binary)	0.122	0.327	0.165	0.371	0.133	0.339	0.088	0.284
PANEL B: MIDDLE/HIGH STUDENTS								
B1: Independent Variables								
Same-Race/Ethnicity Own Teachers (Count)	3.900	3.510	2.587	2.346	0.460	0.723	7.258	2.261
Same-Race/Ethnicity Own Teachers (Proportion)	0.476	0.397	0.327	0.278	0.053	0.087	0.879	0.151
Same-Race/Ethnicity Professional Staff (Count)	36.378	33.890	25.792	23.734	4.423	4.334	66.239	26.559
Same-Race/Ethnicity Professional Staff (Proportion)	0.477	0.376	0.350	0.245	0.044	0.035	0.865	0.116
B2: Dependent Variables								
Math Test Scores (SD)	0.000	1.000	-0.396	0.869	-0.317	0.902	0.368	0.929
Reading Test Scores (SD)	0.000	1.000	-0.347	0.934	-0.286	0.948	0.311	0.934
Suspensions (Count)	0.388	2.210	0.709	3.006	0.271	1.862	0.211	1.542
Ever suspended (Binary)	0.078	0.268	0.130	0.336	0.057	0.232	0.051	0.219
Absences (Count)	12.164	15.519	14.038	18.775	14.403	17.472	10.725	12.001
Chronically Absent (Binary)	0.198	0.399	0.239	0.426	0.253	0.435	0.164	0.370

Table 4. Relationship Between Staff Diversity and Outcomes of All Students (Pooled), Varying Included Fixed Effects

	Math			ELA		
	School-grade & Year FE	+ Student FE	+ Principal FE	School-grade & Year FE	+ Student FE	+ Principal FE
Panel A: Black Students						
Proportion Black Own Teachers	-0.1463***	0.0163+	0.0196*	-0.1652***	0.0114	0.0029
	(0.0155)	(0.0098)	(0.0098)	(0.0158)	(0.0085)	(0.0088)
Proportion non-White, non-Black Own Teachers	0.0623**	0.0176	0.0177	0.0953***	0.0295**	0.0256*
	(0.0195)	(0.0126)	(0.0130)	(0.0214)	(0.0110)	(0.0114)
Proportion Black Professionals	0.0794*	-0.0021	0.0107	0.1993***	0.0328	-0.0012
	(0.0383)	(0.0351)	(0.0388)	(0.0376)	(0.0311)	(0.0356)
Proportion non-White, non-Black Professionals	-0.0143	0.0058	-0.0308	0.1374**	0.0755+	0.0709
	(0.0541)	(0.0470)	(0.0532)	(0.0518)	(0.0435)	(0.0498)
Observations (student/year)	1,126,473	1,057,378	1,053,873	1,121,863	1,034,357	1,030,790
Panel B: Hispanic Students						
Proportion Hispanic Own Teachers	0.0006	0.0483*	0.0745**	-0.0713+	0.0330	0.0436+
	(0.0395)	(0.0242)	(0.0248)	(0.0410)	(0.0222)	(0.0226)
Proportion non-White, non-Hispanic Own Teachers	-0.0800***	0.0252*	0.0229+	-0.1033***	0.0186+	0.0142
	(0.0176)	(0.0118)	(0.0122)	(0.0182)	(0.0109)	(0.0113)
Proportion Hispanic Professionals	0.0760	0.2590*	0.3794**	0.0602	0.2189+	0.2434*
	(0.1353)	(0.1163)	(0.1212)	(0.1305)	(0.1131)	(0.1236)
Proportion non-White, non-Hispanic Professionals	0.0097	0.0177	0.0011	0.1166*	0.0764+	0.0505
	(0.0529)	(0.0443)	(0.0512)	(0.0493)	(0.0425)	(0.0490)
Observations (student/year)	496,661	463,350	462,551	482,575	442,883	442,119
Panel C: White Students						
Proportion non-White Own Teachers	-0.1381***	-0.0207+	-0.0111	-0.1248***	0.0001	-0.0026
	(0.0213)	(0.0117)	(0.0119)	(0.0209)	(0.0114)	(0.0115)
Proportion non-White Professionals	-0.0494	-0.0546	-0.0094	0.0349	0.0472	0.0214
	(0.0581)	(0.0549)	(0.0583)	(0.0520)	(0.0532)	(0.0565)
Observations (student/year)	1,221,780	1,150,148	1,145,420	1,266,804	1,164,073	1,159,237

Table 4. (CONTINUED—WIDE)

	Ever Suspended			Chronically Absent		
	School-grade & Year FE	+ Student FE	+ Principal FE	School-grade & Year FE	+ Student FE	+ Principal FE
Panel A: Black Students						
Proportion Black Own Teachers	0.0185***	-0.0043*	-0.0040*	0.0279***	-0.0051+	-0.0061*
	(0.0024)	(0.0021)	(0.0020)	(0.0035)	(0.0028)	(0.0028)
Proportion non-White, non-Black Own Teachers	-0.0039	-0.0028	-0.0029	-0.0048	-0.0033	-0.0059+
	(0.0030)	(0.0026)	(0.0026)	(0.0045)	(0.0035)	(0.0035)
Proportion Black Professionals	-0.0308**	-0.0090	-0.0028	-0.0122	-0.0007	-0.0177
	(0.0098)	(0.0091)	(0.0100)	(0.0131)	(0.0113)	(0.0128)
Proportion non-White, non-Black Professionals	0.0101	0.0046	0.0076	-0.0867***	-0.0083	-0.0368*
	(0.0118)	(0.0125)	(0.0126)	(0.0167)	(0.0153)	(0.0170)
Observations (student/year)	1,981,810	1,908,314	1,902,976	1,981,810	1,908,314	1,902,976
Panel B: Hispanic Students						
Proportion Hispanic Own Teachers	-0.0060	-0.0007	-0.0015	-0.0239**	-0.0191**	-0.0190*
	(0.0038)	(0.0033)	(0.0034)	(0.0089)	(0.0071)	(0.0074)
Proportion non-White, non-Hispanic Own Teachers	0.0088***	0.0016	0.0009	0.0297***	0.0046	0.0049
	(0.0018)	(0.0015)	(0.0016)	(0.0053)	(0.0039)	(0.0041)
Proportion Hispanic Professionals	0.0334*	0.0438**	0.0415*	-0.0293	0.0311	0.0081
	(0.0138)	(0.0160)	(0.0175)	(0.0344)	(0.0348)	(0.0373)
Proportion non-White, non-Hispanic Professionals	-0.0159*	-0.0065	-0.0090	-0.0312*	-0.0068	0.0051
	(0.0069)	(0.0076)	(0.0082)	(0.0144)	(0.0144)	(0.0162)
Observations (student/year)	901,570	868,174	866,866	901,570	868,174	866,866
Panel C: White Students						
Proportion non-White Own Teachers	0.0084***	0.0005	0.0010	0.0263***	0.0083***	0.0059*
	(0.0015)	(0.0014)	(0.0014)	(0.0032)	(0.0025)	(0.0025)
Proportion non-White Professionals	0.0027	0.0061	0.0143*	-0.0010	-0.0103	-0.0182+
	(0.0062)	(0.0060)	(0.0065)	(0.0099)	(0.0099)	(0.0109)
Observations (student/year)	2,302,124	2,215,544	2,208,537	2,302,124	2,215,544	2,208,537

Notes: Coefficients in each column and panel come from separate regression models that include covariates at the individual (i.e., FRPL status and special education status) and school level (i.e., proportion of students of different race/ethnicity groups; average test scores, suspensions, and absences in year t-1; and the absolute number of teachers and professional staff members). Heteroskedasticity-robust standard errors, clustered at the school-grade level, in parentheses. + p<0.1; * p<0.05; ** p<0.01; *** p<0.001

Table 5a. Relationship Between Staff Diversity and Outcomes of Elementary School Students

	Math	ELA	Ever Suspended	Chronically Absent
Panel A: Black Students				
Proportion Black Own Teachers	0.0384*	0.0155	-0.0087***	-0.0120***
	(0.0150)	(0.0126)	(0.0021)	(0.0034)
Proportion non-White, non-Black Own Teachers	-0.0042	-0.0033	-0.0010	-0.0015
	(0.0209)	(0.0168)	(0.0025)	(0.0045)
Proportion Black Professionals	0.0042	-0.0015	-0.0225*	-0.0137
	(0.0584)	(0.0502)	(0.0093)	(0.0146)
Proportion non-White, non-Black Professionals	-0.0889	0.0517	-0.0101	0.0056
	(0.0767)	(0.0654)	(0.0114)	(0.0197)
Observations (student/year)	398,449	397,205	850,279	850,279
Panel B: Hispanic Students				
Proportion Hispanic Own Teachers	0.0654+	0.0271	-0.0022	-0.0003
	(0.0354)	(0.0345)	(0.0031)	(0.0082)
Proportion non-White, non-Hispanic Own Teachers	0.0468*	0.0418*	0.0005	-0.0065+
	(0.0201)	(0.0179)	(0.0012)	(0.0039)
Proportion Hispanic Professionals	0.2465	-0.0234	0.0175	0.0872*
	(0.1891)	(0.1570)	(0.0123)	(0.0417)
Proportion non-White, non-Hispanic Professionals	0.0389	-0.0495	0.0044	-0.0159
	(0.0813)	(0.0786)	(0.0059)	(0.0179)
Observations (student/year)	195,680	191,335	431,691	431,691
Panel C: White Students				
Proportion non-White Own Teachers	0.0078	0.0016	0.0003	0.0037
	(0.0189)	(0.0158)	(0.0012)	(0.0032)
Proportion non-White Professionals	-0.0043	0.0131	0.0060	-0.0269*
	(0.0814)	(0.0680)	(0.0054)	(0.0125)
Observations (student/year)	463,398	461,905	969,791	969,791

Notes: Coefficients in each column and panel come from separate regression models that include covariates at the individual (i.e., FRPL status and special education status) and school level (i.e., proportion of students of different race/ethnicity groups; average test scores, suspensions, and absences in year t-1; and the absolute number of teachers and professional staff members). Models include school-grade, year, student, and principal fixed effects. Heteroskedasticity-robust standard errors, clustered at the school-grade level, in parentheses. + p<0.1; * p<0.05; ** p<0.01; *** p<0.001

Table 5b. Relationship Between Staff Diversity and Outcomes of Middle/High-School Students

	Math	ELA	Ever Suspended	Chronically Absent
Panel A: Black Students				
Proportion Black Own Teachers	-0.0103	-0.0132	-0.0047	-0.0065
	(0.0144)	(0.0145)	(0.0038)	(0.0050)
Proportion non-White, non-Black Own Teachers	0.0297	0.0475**	-0.0037	-0.0089
	(0.0195)	(0.0182)	(0.0047)	(0.0058)
Proportion Black Professionals	0.0189	-0.0400	0.0176	-0.0004
	(0.0643)	(0.0649)	(0.0199)	(0.0237)
Proportion non-White, non-Black Professionals	0.0062	0.2294*	0.0314	-0.0724*
	(0.0892)	(0.0952)	(0.0259)	(0.0317)
Observations (student/year)	602,107	580,388	1,000,040	1,000,040
Panel B: Hispanic Students				
Proportion Hispanic Own Teachers	0.0971*	0.0417	-0.0042	-0.0476***
	(0.0388)	(0.0362)	(0.0067)	(0.0142)
Proportion non-White, non-Hispanic Own Teachers	0.0092	-0.0037	-0.0003	0.0108
	(0.0200)	(0.0177)	(0.0036)	(0.0084)
Proportion Hispanic Professionals	0.4160*	0.5932*	0.0551	-0.2178*
	(0.2107)	(0.2393)	(0.0443)	(0.0887)
Proportion non-White, non-Hispanic Professionals	-0.0679	0.1514+	-0.0230	0.0086
	(0.0867)	(0.0844)	(0.0220)	(0.0368)
Observations (student/year)	241,748	226,098	410,085	410,085
Panel C: White Students				
Proportion non-White Own Teachers	-0.0112	0.0007	-0.0014	0.0025
	(0.0206)	(0.0209)	(0.0025)	(0.0042)
Proportion non-White Professionals	0.0434	0.0771	0.0215	-0.0285
	(0.1185)	(0.1203)	(0.0145)	(0.0217)
Observations (student/year)	622,585	637,821	1,179,849	1,179,849

Notes: Coefficients in each column and panel come from separate regression models that include covariates at the individual (i.e., FRPL status and special education status) and school level (i.e., proportion of students of different race/ethnicity groups; average test scores, suspensions, and absences in year t-1; and the absolute number of teachers and professional staff members). Models include school-grade, year, student, and principal fixed effects. Heteroskedasticity-robust standard errors, clustered at the school-grade level, in parentheses. + p<0.1; * p<0.05; ** p<0.01; *** p<0.001

Appendix

Appendix Table 1. Professionals Characteristics

	Principals		Other Administrative		Instructional Specialists		Guidance/ Counselor Specialists		Nurses/Health Specialists		Special Education Specialists		Other Professional Staff	
	N	Prop	N	Prop	N	Prop	N	Prop	N	Prop	N	Prop	N	Prop
Asian	174	0.012	293	0.014	439	0.019	389	0.012	37	0.008	200	0.013	116	0.016
Black	5,474	0.366	8,300	0.387	4,974	0.221	9487	0.294	273	0.059	1,400	0.093	4,206	0.586
Hispanic	240	0.016	475	0.022	441	0.020	928	0.029	51	0.011	171	0.011	414	0.058
White	8,852	0.592	11,981	0.559	16,235	0.720	20829	0.646	4,138	0.902	13,111	0.870	2,275	0.317
Other	220	0.015	398	0.019	456	0.020	616	0.019	90	0.020	190	0.013	172	0.024
Female	10,175	0.680	14,127	0.659	19,273	0.855	27197	0.843	4,527	0.986	14,731	0.977	4,332	0.603
Observations	14,960		21,447		22,545		32,249		4,589		15,072		7,183	

Notes: Table reports person/year number and proportion. Professional staff in elementary, middle, and high schools pooled together in this table.

[i] For example: Baltimore City is a majority Black or Hispanic and below-median income population; Prince George's County is a mixed urban-suburban county adjacent to Washington, D.C., with a majority Black or Hispanic and above-median income population; and Montgomery County is a wealthy suburb of Washington D.C. whose general population is majority White but whose public-school population is now majority non-White. The full statewide data also includes seven counties identified as over 50% rural (three over 75% rural). (Statistics come from our own calculations of the statewide data.)

[ii] We refer to individuals as Hispanic rather than Latino, Latina, or Latinx given that the former is the way individuals are identified in the Maryland data. Administrative records identify individuals' ethnicity (i.e., Hispanic or not Hispanic) and race (i.e., American Indian or Alaska native, Asian, Black, Native Hawaiian or other Pacific islander, White, or two or more races). To create a unique identifier of race-ethnicity for everyone in our sample (i.e., students, teachers, and professional staff) we proceed as follows. First, all individuals identified in the ethnicity variable as Hispanic are assigned to the Hispanic race-ethnicity group, regardless of their race. Second, non-Hispanic individuals identified as Hispanic Asian, Black, or White, are assigned to these race-ethnicity groups. The other three race groups (i.e., American Indian or Alaska native, Native Hawaiian or other Pacific islander; two or more races), in addition to individuals with missing race-ethnicity information, are assigned to an "Other" race-ethnicity group.

[iii] Generally speaking, teacher-student links come from course rosters collected by individual school districts, which often are not shared with state agencies. In Maryland, sharing of course roster data between districts and the state is more straightforward than in other contexts, given that there are only 24 total school districts, all of which operate at the county level. The Maryland State Department of Education standardized the process in which districts collected course roster data in the 2012-13 school year.

[iv] Teacher and professional staff information come from two sources: a staff-level data file that includes all professional staff positions, links to schools, and full-time equivalence (FTE); and course roster data that directly links teachers of record to students. The staff-level dataset includes a wide range of staff members, including professionals and school support staff such as teacher aids, janitorial staff, bus drivers, etc. We exclude school support staff from our analyses given our theoretical framework indicating that role modeling effects likely operate amongst professional staff who have advanced degrees and are in positions of power. The staff-level data also identify some staff members as "Other Professional Staff." While we do not know the exact positions these individuals hold, we include them in our analyses given that they are specifically described as "professionals". Estimates available upon request are similar when we include versus exclude these individuals when creating our independent variables.

With the two files, we assign each staff member to a unique school/year position. If the staff member appears in the course roster data as teaching a course to a given student, that professional is counted as own teacher for that student. If the staff member is identified as a teacher but is not directly linked to a given student in the course roster data, that professional is counted as not own teacher for that student. We take the same approach for professional staff members (e.g., administrators, counselors, health professionals), most of whom never show up in the course roster data because they are not classroom teachers. For professional staff members that have multiple roles in a given school/year, we use FTE information to assign them to a primary position, based on the number of hours that the individual spends on each role. In the rare cases in which an individual has two positions in the same school/year with the same FTE (less than 0.2% of the data), we keep the position that is not other professional, special education specialist, nurse, guidance/counselor, or instructional specialist (in that order).

[v] After grouping staff members to specific teacher or professional staff positions and identifying their primary school, we checked for missing data at the school level of counts of teacher and professional staff members and proportions by race/ethnicity. In total, 1.05% of school/year observations did not have a teacher count and 0.98% did not have a professional staff count for any positions. For schools that did not have a count of teachers coming from the professional staff dataset but did have a count of own teachers coming from the course roster dataset, we used the total number of teachers counted as own in the course data as the total number of teachers for that school and year. For schools that did not have information on one or more specific positions (including own teachers) but data was available the year before and/or after, we used that information to impute values. If both before and after information was available, we used the average of both to impute information on the missing position in a given year. After this imputation, if schools have some staff information but are missing information in one or more positions, we added zeros to those positions; here, we assume that missingness indicates no staff members of a specific position type in that year. If schools did not have information coming from the course roster file and/or the professional staff datasets, then those cases were dropped.

[vi] High-school students are required to take and pass Algebra and English tests. In general, these are taken in grade 10, but in some cases are taken by the students earlier or later. Given the testing requirement, there is very little missingness: 4.28% of student/year observations in third grade or higher did not have tests scores available. We exclude these observations from our analyses.

[vii] All students in our sample had attendance data. For suspensions, only students who were suspended or expelled show up in that data file. Therefore, we assume that students who did not have records in the suspensions and expulsions data in a given academic year had no disciplinary infraction, and we assign values of zero.