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School Principal Race and the Hiring and Retention of Racially Diverse Teachers

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Exploiting variation from principal and teacher transitions over long administrative data panels in Missouri and Tennessee, we estimate the effects of principal race on the hiring and turnover of racially diverse teachers. Evidence from the two states is strikingly similar. Black principals increase the probability that a newly hired teacher is Black by 5–7 percentage points. This result appears to be partially driven by principals hiring from within their networks of educators with whom they have worked before. Black principals also decrease Black teacher mobility, reducing the probability that a Black teacher changes schools by 2–5 percentage points. Increases in Black teacher hiring and reductions in turnover mean that a change from a White to a Black principal increases the fraction of Black teachers working in a school by about 3 percentage points, on average, increasing exposure of students to Black teachers. Further evidence suggests that assignment to a Black teacher increases the math achievement of Black students, though the presence of a Black principal appears to have positive impacts on Black students' math achievement that is not explained by assignment to Black teachers.

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Research demonstrates that the racial/ethnic composition of a school's teaching faculty can matter for student outcomes and differences in outcomes across student groups. Specifically, growing evidence shows that student of color have more positive achievement and non-achievement outcomes when taught by teachers who share their racial/ethnic background (e.g., Clotfelter, Ladd, and Vigdor 2006; Dee 2004; Dee 2005; Egalite, Kisida, and Winters 2015; Gershenson, Holt, and Papageorge 2016; Grissom and Redding 2016; Lindsay and Hart 2017; Gershenson, Hart, Hyman, Lindsay, and Papageorge 2018). There may be benefits to teacher racial diversity for White students as well, including more prosocial attitudes and better preparation for employment in diverse work settings (see Wells, Fox, and Cordova-Cobo 2016). These findings have helped spur calls for increasing teacher diversity in pursuance of multiple policy goals, including combating persistent achievement disparities between White students and students of color (e.g., U.S. Department of Education 2016; Albert Shanker Institute 2015),

particularly as proportions of students of color and teachers of color rapidly diverge in U.S. public schools; from 2000 to 2012, the fraction of students of color grew from 33% to 43%, while the fraction of teachers of color remained virtually flat at 17% (Grissom, Kern, and Rodriguez 2015).This attention to teacher diversity has highlighted that the factors that determine both the supply and allocation across schools of teachers from racial/ethnic backgrounds are not well understood (Achinstein, Ogawa, Sexton, and Freitas 2010).

This article focuses on the role of school principals, or, more specifically, on how principals of different racial[1] backgrounds affect the hiring and retention of teachers from different racial groups. Two bodies of research motivate this investigation. The first is a set of studies demonstrating the importance of school principals for teacher labor market outcomes. Principals bear primary responsibility for decisions about which teachers are hired into their schools, and even more so as districts have decentralized teacher hiring processes in recent decades (Engel, Cannata, and Curran, in press; Liu 2002; Harris, Rutledge, Ingle, and Thompson 2010). Even in more centralized district hiring systems, the district's role is usually one of recruiting and screening applicants, with principals typically exerting substantial influence over final hiring decisions (Strauss, Bowes, Marks, and Plesko 2000). Principals are instrumental in teacher retention decisions as well. Teachers' perceptions of principal support and effectiveness are among the most important factors in teachers' decisions to remain in or leave their schools (Boyd et al. 2011; Grissom 2011; Ladd 2011). Moreover, principals can directly impact teacher turnover through their roles in teacher evaluation and dismissal decisions (Drake et al. 2015; Grissom and Bartanen 2019; Grissom and Loeb 2017).

[1] The proportions of non-Black, non-White educators in Missouri and Tennessee are small, which limits our ability to analyze data for these educators in these contexts. As a result, throughout we refer to the effects of principal *race* rather than *race/ethnicity*.

The second is a literature from job settings outside education on how manager race and ethnicity impacts employee hiring, dismissal, and other labor market outcomes. Black and Hispanic workers tend to be concentrated in firms or workplaces with supervisors or owners of the same race/ethnicity (Carrington and Troske 1998; Giuliano, Levine, and Leonard 2009; Stoll, Raphael, and Holzer 2004). This sorting appears to be driven by differences in both hiring and retention. For instance, using panel data from a large U.S. retail firm over a 30-month period and exploiting within-location differences in manager race/ethnicity, Giuliano, Levine, and Leonard (2009, 2011) find effects of manager race on employees' hiring and turnover outcomes. Specifically, non-Black managers are less likely to hire Black workers, with the largest effects in locations in the South, and Hispanic managers are more likely to hire Hispanic workers in areas with a large Hispanic population. They also find that, in most cases, employees with a same-race manager are less likely to quit or be dismissed and are more likely to be promoted. In another study making use of personnel records over a nine-year period from a large U.S. grocery chain, Giuliano and Ransom (2013) investigate the effects of manager ethnicity on employee hiring and retention. They find that stores with Hispanic managers are more likely to hire Hispanic employees, but only in departments with a small number of positions. In contrast, they find little evidence that manager ethnicity affects employee separation or transfer patterns. Aslund, Hensvik, and Skans (2014) use a longitudinal employer-employee database of 70,000 Swedish firms to investigate the extent to which manager-worker similarity in origin (i.e., immigrant versus native) affects hiring patterns, turnover, and wages. Similar to the findings in Giuliano, Levine, and Leonard (2009), they find that managers are substantially more likely to hire workers of the same origin. They also find that same-origin workers earn higher wages and are less likely to leave their positions, but that the patterns are driven by employee sorting rather

than a matching effect. The latter result highlights the potential for bias in matching effects from unobserved worker heterogeneity and non-random sorting of workers and managers to firms, which we address through the inclusion of multiple sets of fixed effects.

Little research on how manager race affects employee outcomes exists in public sector settings, let alone in public schools. Virtually no studies have investigated whether principal race informs how teachers with different demographic characteristics are hired, though some evidence suggests that teachers' demographic characteristics are a consideration for principals and that what factors principals weight in hiring processes (e.g., teacher communication skills, caring for children) vary by their own characteristics in ways that ostensibly might lead to differences in hiring patterns (Engel 2013; Harris et al. 2010). Slightly more evidence exists regarding teacher turnover. In particular, Grissom and Keiser (2011) demonstrate using nationally representative data from the Schools and Staffing Survey that teachers who are race-congruent with their principal are less likely to turn over than non-congruent colleagues in the same school. The analysis is essentially cross-sectional, however, preventing the authors from ruling out some alternative potential explanations for this result.

What mechanisms might make it more likely that teachers are hired into schools with principals of the same racial background? One possibility is taste-based discrimination among principals. Principals may prefer to hire teachers with whom they share background characteristics, making it more likely that they select a same-race teacher from an applicant pool. Another is taste-based bias among teachers, who may prefer to work for a same-race principal, and thus be more likely to apply to a same-race principal's school or accept a job there if offered. Even in the absence of such taste-based biases, race-based patterns in hiring may arise if, for

example, principals rely on their social networks to recruit new teachers for openings in their schools, and those networks are segregated by race (Giuliano, Levine, and Leonard 2009).

Similar mechanisms could make it more likely that teachers stay in schools with a principal of the same race. Principal bias towards same-race teachers may lead them to give preferential treatment to those teachers, including in formal personnel processes such as teacher evaluation, which may affect a teacher's propensity to remain in the school. Teacher bias towards same-race principals may mean that they are more satisfied working for such a principal than they would be working for a principal of a different background, increasing their retention probability. Alternatively, shared backgrounds, communication styles, and values that likely correlate with racial similarity may facilitate teachers and principals with similar characteristics to work together more productively, which may increase a teacher's commitment to remain in the school.

The present study contributes to the nascent literature on race-based interactions between principals and teachers in the teacher labor market by utilizing longitudinal administrative personnel records from both Missouri and Tennessee. It contributes an analysis of teacher hiring patterns that is the first of its kind, including some evidence on the role of segregated networks in driving its main hiring results. Moreover, its analysis of turnover using longitudinal data substantially improves on the estimates provided by prior work. Specifically, because we observe relatively frequent movement of teachers and principals across schools over time, we can estimate models with multiple sets of fixed effects to rule out many alternative explanations for the patterns we uncover. We supplement these turnover analyses with some additional analysis of potential mechanisms that may explain the turnover results.

We ask four main research questions. First, what is the impact of a change in the race of a school's principal on the racial composition of its teaching staff? Second, to decompose compositional changes, to what extent are principals more or less likely to hire teachers of the same race, and third, to what extent are teachers more or less likely to stay in their schools when they work for a principal of the same race? Finally, what effects do changes in principal race have on student achievement, either through teacher composition effects or via other mechanisms?

We find that principals increase the proportion of same-race teachers in the school by 2.3 percentage points in Missouri and 1.9 percentage points in Tennessee. Further, these effects compound over time—switching from a White to a Black principal, for instance, increases the proportion of Black teachers in the school after five years by 5.3 (5.2) percentage points in Missouri (Tennessee), which corresponds to 26% (24%) of the average proportion of Black teachers in the effective sample. The effect of principal race on teacher composition operates both through increased hiring and greater retention of same-race teachers. Black (White) principals are 5.3 and 6.6 percentage points more likely to hire Black (White) teachers in Missouri and Tennessee, respectively. In both states, the effects are concentrated among transferring teachers, with smaller effects for teachers who are new to the profession. Principals' segregated hiring networks partially explain the greater likelihood of hiring same-race transfer teachers.

Our analyses demonstrate a consistent negative effect of teacher-principal race-match on teacher turnover in both states. In Missouri, these match effects exist for both Black and White teachers. In our preferred specification, having a Black principal lowers the probability that a Black teacher leaves their position by 2.8 percentage points (10% of the base rate), with a 2.0

(10%) percentage point decrease for White teachers with White principals. In Tennessee, the race-match effect is 5.6 percentage points for Black teachers (23%) and 0.9 percentage points for White teachers (not statistically significant). In both states, decreased turnover primarily is driven by fewer teachers who transfer to a different school, though we also find evidence in Missouri that teacher-principal race matching decreases the probability that a teacher exits the state's education system. Consistent with these patterns, we present survey-based evidence that teachers report more positive perceptions of their school environments under same-race principals.

Given these patterns, we supplement our labor market analysis with an analysis of how the dynamics we observe may impact students. Specifically, using student-level data from Tennessee, we leverage variation in principal race across cohorts of same-race students in the same school and grade to estimate the impact of having a same-race principal on math and reading test scores. Using a modeling approach that allows the effect to vary by the length of the principal's tenure, we find positive effects on math scores (0.035 SD) of Black students after a Black principal's first year in the school. However, although we also find positive effects of Black teachers on Black students' outcomes, these effects do not explain the impacts of Black principals, suggesting that principal race matters for students through other mechanisms.

Data

We analyze administrative personnel records from two states: Missouri and Tennessee. As of 2016, Missouri has 65,000 public school teachers working in 2,400 schools and 565 districts, while Tennessee has 72,000 public school teachers working in 1,800 schools and 147 districts. Similar to national trends, the share of White students in both states has declined in recent years; between 2004 and 2014, the percentage of public school students who were White

declined from 77.3 to 72.7 in Missouri and 70.0 to 64.9 in Tennessee (U.S. Department of Education 2016). Missouri data were obtained via a data request to the Department of Elementary and Secondary Education, while the Tennessee data were accessed through the Tennessee Education Research Alliance at Vanderbilt University with approval from the Tennessee Department of Education.

Missouri personnel records were available from 1991 to 2016, while Tennessee records spanned 2002 to 2017. Because of missing covariates in the early years of both data sets, we limit the analytic samples to 1999 to 2016 in Missouri and 2007 to 2017 in Tennessee, though in both cases we make use of the earlier years of data in constructing measures of job-specific experience and tenure in schools.

Both datasets contain job classification and location information that allow identification of teachers and principals and what school they worked in each year. They also contain, for each year, each educator's years of work experience in the state's school system, highest degree obtained (e.g., Master's degree, educational specialist), and salary. Work experience in a given school or job classification (e.g., teacher or principal) is not recorded but can be calculated for any educator observed moving into a new location or job classification over the data stream.

The data also include information on educator sex (binary, listed as female or male) and race/ethnicity (White, Black, Hispanic, Asian, Native American, or other).[2] In both states, the fraction of non-White, non-Black educators was too small to permit a robust analysis, so teachers falling into these categories or schools with principals in these categories were dropped.[3] Our

[2] In a small number of cases, sex or race/ethnicity was missing or inconsistent for the same educator over time. In these cases, other years of a teacher's record were used to fill in or correct the questionable cases. Omitting these teachers from the analysis does not affect the results.
[3] In Missouri and Tennessee, 99% and 98% of teachers are White or Black, respectively.

analytic samples include approximately 1,000,000 and 690,000 teacher-year observations from Missouri and Tennessee, respectively.

We matched educator personnel records to school information contained in the Common Core of Data (CCD), a repository of school-by-year information maintained by the National Center for Education Statistics. From CCD, we obtained information on school level (e.g., elementary, middle, high) and locale (urban, suburban/town, rural), as well as student enrollment size, proportion of Black students, proportion of Hispanic students, and the proportion of students eligible for free- or reduced-price lunch, a measure of poverty.

Table 1 displays descriptive statistics for the full sample of teacher-years. The teacher workforces in Missouri and Tennessee are similar demographically. Teachers in both states are overwhelmingly White (94% and 88%) and female (78% and 79%), and have an average of 11–12 years of experience in the public education system. Roughly one-sixth of all teachers are new to their school each year, while a little less than half have worked five or more years in their current school. Ninety-one percent of Missouri teachers are in schools led by a White principal, as are 83% of Tennessee teachers, with the remainder of teachers in both states almost exclusively led by Black principals.[4]

Figure 1 shows the "representation gap" (i.e., the difference in the proportion of Black students and Black teachers in a school) as a function of the proportion of Black students in the school. The dashed line demonstrates that, in both states, there is a substantial representation gap that widens as the proportion of Black students in the school increases, before closing somewhat

[4] In both states, educators moving into principal positions typically come from another position within the same district and occasionally from the same school. In Missouri (Tennessee), 61% (90%) of principals worked in the same district immediately prior to being hired as a principal, and 23% (29%) worked in the same school. The lower percentage of within-district promotions to the principalship in Missouri makes sense given that Missouri has many more districts that are smaller in size, on average.

in schools that have 100% Black students. For instance, among schools where 50% of students are Black, the average teaching staff is 15% Black in Missouri and 20% Black in Tennessee. The average Black student in Missouri (Tennessee) is in a school where the representation gap is 32% (25%). The dotted line in Figure 1 shows the proportion of schools that have a Black principal for a given proportion of Black students. The representation gap is smaller for principals, particularly in Tennessee.

Empirical Strategy

The first section of our analysis proceeds in three parts. First, we examine the impact of principal race on the racial composition of the school's teaching staff. Next, we investigate two mechanisms that could explain this compositional effect: teacher hiring and teacher retention. We describe each analysis below.

Teacher Composition and Hiring Analysis

The analyses of teacher composition and hiring follow the approach of Giuliano, Levine, and Leonard (2009). For composition, we estimate the probability that a given teacher in a school belongs to a particular race group. Given the small number of non-White, non-Black educators in both states, we limit our analysis to teachers and principals who are either White or Black. With only two racial groups, our dependent variable simply becomes a binary indicator for whether a teacher is Black. Specifically, we estimate the following model:

$$\Pr(BlackTch_{ijkt} = 1) = \beta_1 BlackPrin_{jkt} + Z_{jkt} + S_{jt} + \alpha_j + \gamma_t + \varepsilon_{ijkt} \quad (1)$$

That is, we estimate the probability that teacher *i* in school *j* at time *t* is Black as a function of whether or not the principal is Black ($BlackPrin$). Importantly, β_1 also represents the effect of having a White principal on the probability that a teacher or new hire is White. We also adjust for other characteristics of the principal Z (highest degree earned, years of experience as a

principal, years as principal in current school) and the school *S* (proportion of Black students, proportion of Hispanic/Latino students, proportion of students eligible for free/reduced price lunch, enrollment size), plus school fixed effects (α_j). We also include an indicator for the school year γ to control for year-specific shocks to hiring or retention, such as recession-induced changes in the overall labor market. To estimate the effect of principal race on hiring, we simply estimate equation 1 for the sample of newly hired teachers—that is, teachers that are new to a school, regardless of whether they were previously a teacher elsewhere.

The inclusion of school fixed effects to isolate within-school variation in principal race is critical to disentangling the effect of principal race from other confounding factors. Even with numerous controls for school characteristics, there may be unobserved school-level factors that predict the demographics of both teachers and hiring principals. To the extent that these factors are fixed over time, they can be accounted for with a school fixed effect. However, there may also be time-varying factors that drive changes in principal race and the racial composition of the teaching staff. For example, gradual changes in neighborhood composition over time that are not completely captured by changes in the demographic composition of a school's students could lead to bias in our estimates of the effect of principal race. To further guard against such possibilities, we also estimate models that include both school fixed effects and school-specific trends. Finally, there could be policy changes at the school district level (e.g., a districtwide initiative to increase hiring of black teachers and administrators) that lead schools to simultaneously hire Black principals and Black teachers. Here, we can replace year fixed effects with district-by-year fixed effects to account for secular trends by district.[5]

[5] There could still be sudden school-level changes that cause both the hiring of a Black principal and the hiring of Black teachers. To bias our estimates, such changes would need to differentially affect certain schools within the same district and not be captured by school demographic controls and school-specific trends. While we cannot directly rule out such threats, we perform a number of checks to examine these potential issues. First, Appendix

We estimate linear probability models, which under straightforward assumptions are sufficient for estimating marginal effects from binary choice models (Angrist and Pischke 2008).[6] We cluster standard errors at the school level in composition and hiring models to account for the nested nature of the data.

Teacher Turnover Analysis

We operationalize teacher turnover as both a binary and a categorical outcome. For a given teacher working in school *j* in year *t*, the binary turnover outcome takes a value of 1 if that teacher is not working as a teacher in school *j* in year *t+1*, and 0 otherwise. The categorical outcome differentiates among four types of turnover: teachers who exit from the state's education system entirely (exits), teachers who remain in teaching but work at a different school in the same district (within-district move), teachers who change to a teaching position in a different district (across-district move), and teachers who stay in the education system but are no longer teachers (position changes). The binary model takes the form:

$$\Pr(Turnover_{ijkt} = 1) = \beta_1(BlackPrin_{jkt} \times BlackTch_i) + \beta_2(WhitePrin_{jkt} \times WhiteTch_i) + S_{jt} + Z_{jkt} + \alpha_i + \phi_j + \gamma_t + \varepsilon_{ijkt} \quad (2)$$

We model the probability that teacher *i* in school *j* with principal *k* in school year *t* turns over as a function of fixed characteristics of the teacher (α_i) and school (ϕ_j), in addition to time-varying

Figure 2 shows trends in the proportion of Black students before and after principal transitions. We find no evidence of any substantial pre-turnover trends in student composition in either state. We also implement a series of robustness checks similar to those used in Giuliano et al. (2009) to examine whether changes in teacher composition predict changes in principal race, which are shown in Appendix Table 9. We find no evidence that changes in the percent of Black new hires or overall teacher composition predict the probability that a new principal is Black. We do, however, find a small, statistically significant relationship between hiring a Black principal and the "representation gap" between the proportion of Black students and Black new hires in Tennessee. Specifically, increases in the representation gap positively predict that a new principal is Black. However, the magnitude is small—a one percentage point change in the difference between the percentage of Black students and Black new hires (which corresponds to roughly 10% of a standard deviation in the effective sample) predicts a 0.38 percentage point increase in the probability that the new principal is Black.

[6] The fixed effects probit model can be estimated by including indicator variables for each school in the model, though such estimates are only consistent if a sufficient number of teachers within each school are observed. We observe a median of 59 and 46 new hires in each school in Missouri and Tennessee, respectively.

school (S) and principal (Z) characteristics, and an indicator for the school year, γ. We also interact teacher race with each of the principal and school characteristics to account for differential responsiveness between Black and White teachers.[7] The parameters of interest are β_1 and β_2, which are the effects of having a same-race principal race for Black and White teachers, respectively. A negative estimate of β_1 (β_2) would indicate that Black (White) teachers are less likely to leave their position when they have a same-race principal. With only two adequately sized racial groups in Missouri and Tennessee, we cannot disentangle any main effects of principal race from the race-specific matching effects. β_1 and β_2, then, capture the combination of any "main effect" of principal race (e.g., if Black principals tend to have leadership styles that foster teacher retention among all racial/ethnic groups) and teacher-principal race matching.[8]

Identification of β_1 and β_2 comes from within-teacher variation in principal race across school years, holding constant the fixed characteristics of their school. Having (nearly) the full population of teachers and principals in each state over a long time span allows us to observe many teachers and principals working in multiple schools—variation we exploit to identify multiple sets of fixed effects. To be specific, two sources of variation in principal race identify

[7] Including these interactions with school contextual variables, in particular, is important to avoid conflating the interactions of interest (Teacher Race x Principal Race) with differences in Black and White teachers' responsiveness to school context. If, for instance, White teachers are more responsive than Black teachers to changes in the racial composition of the student body, omitting the interaction between teacher race and student racial demographics could lead to bias in the Black Teacher x Black Principal or White Teacher x White Principal interactions since principal race is correlated with student demographics.

[8] Previous studies (e.g., Giuliano et al. 2011) have proposed exploiting the presence of three or more groups to identify race-specific matching effects. The intuition behind such models is that comparing turnover outcomes of Black and White teachers under Hispanic principals, for example, provides a "no-bias" comparison (i.e., neither group is race-matched) that can be used to establish baseline differences in turnover rates. This approach requires both adequate precision to estimate individual comparisons and that the outcomes of race *j* and *k* under race *l* principals in fact represent a "no-bias" condition. This assumption may not hold if, for instance, having a Hispanic principal lowers turnover among White teachers but increases turnover among Black teachers (or any other scenario in which there is a differential response). Given the extremely small number of non-Black, non-White educators in both states and concerns about the required assumptions, we do not pursue this approach. Yet another alternative is to include the main effect of principal race and a "race-match" indicator that conflates the race-specific matching effects for Black and White teachers.

β_1 and β_2: teachers moving between schools (e.g., a teacher moves from a school with a White principal to a school with a Black principal) and principal turnover within the same school (e.g., a school transitions from a White principal to a Black principal). In Missouri (Tennessee), 10% (13%) of teachers have worked with both Black and White principals, including 31% (29%) of Black teachers and 8% (13%) of White teachers.[9] Among the effective sample of teachers in Missouri, 61% worked under Black and White principals within the same school and 71% between schools. In Tennessee, these percentages are 60 and 66, respectively.

We also examine whether principal race differentially affects specific types of turnover events. Here, we adjust equation 2 to the multinomial case and estimate the probability of each category of turnover outcome (exits, within-district moves, across-district moves, and position changes) relative to the same base category, staying in the same teaching position.

Teacher Composition Results

We begin by examining the average racial composition of teachers, broken down by the race of the school's principal. This description is shown in Table 2. Six percent of teachers in Missouri are Black, as are roughly 12% in Tennessee. In both states, Black principals lead schools with substantially more Black teachers than do White principals. For instance, in Missouri schools with Black principals, 41.2% of teachers are Black, compared to only 2.4% in schools with White principals. Tennessee has a similar disparity.

While Table 2 demonstrates stark descriptive differences in the racial composition of teachers by the race of the principal, much of this difference likely is driven by other factors that are correlated with principal race. Schools that have Black principals, for instance, are more likely to be located in districts with a larger pool of Black teachers. A way to pin down the effect

[9] In Missouri and Tennessee, respectively, 12% and 16% of schools have variation in principal race across the study period.

of principal race is to exploit variation in principal race within the same school over time. We begin by showing descriptive event studies of the composition of teachers before and after principal transitions.[10] Specifically, we examine the four years preceding and following each transition. Because schools can have multiple principal transitions within a brief period, some of these eight-year windows will overlap. In our unrestricted sample (left panels in Figure 2), we allow for overlapping windows, whereas our restricted sample (right panels) only includes principal transitions that were not preceded or followed by another transition within four years. The restricted sample, while providing a cleaner comparison, limits generalizability by dropping schools that experience higher rates of principal turnover.

The four plotted lines correspond to the combinations of the race of the departing and incoming principals. Prior to the principal transition, the proportion of Black teachers is fairly flat across all groups, though there are slight trends for schools that will experience a change in principal race. When schools transition to a principal of the same race as the departing principal (White to White and Black to Black lines), there is virtually no change in the racial composition of teachers. However, when the incoming principal is a different race, there is an increase in the proportion of teachers of that race that appears in the first year of the new principal and continues in the years following the transition. In our restricted samples (i.e., between two principals who stay in the school for at least four years), these patterns increase in magnitude. While these types of transitions are relatively less common, they illustrate the potentially large impacts that principals can have on the composition of the teaching staff, particularly when given the opportunity to affect teacher hiring and retention across several years.

[10] Specifically, these figures contain indicators for the combination of time and group (e.g., four years before a White-principal-to-White-principal transition), year fixed effects, and school fixed effects.

Figure 2 provides descriptive evidence that principal race affects the racial composition of a school's teaching staff. Table 3 directly estimates this effect. Specifically, we estimate linear probability models that predict the likelihood that a given teacher is Black as a function of whether the principal is Black. For each state, we begin with a model that includes school fixed effects, then successively add district-by-year fixed effects, school-specific trends, and indicators for principal race in prior and future years.

Across specifications, we find consistently that principal race affects the racial composition of the school's teaching staff. For instance, columns 3 and 7 demonstrate that having a Black (White) principal increases the proportion of Black (White) teachers in a school by 2.3 percentage points in Missouri and 1.9 percentage points in Tennessee, on average. Columns 4 and 8 add indicators for principal race in past and future years.[11] Incoming principals largely inherit the teachers hired under previous principals, and thus we would expect that the effects of principal race do not fade out immediately. In fact, we do find that principal race in prior years affects the current composition of the teaching staff. By contrast, if we are successfully capturing the causal effect of principal race rather than other confounding factors, we would expect that principal race in the future has no effect on current racial composition, which is supported by the precise null coefficient for having a Black principal in the next school year. Summing across coefficients, columns 4 and 8 imply that after five years in the same school, a Black (White) principal increases (decreases) the proportion of Black teachers in the school by 5.3 percentage points in Missouri and 5.2 percentage points in Tennessee. Among schools that have variation in principal race across the study period, these effects correspond to 26% and 24% of the average proportion of Black teachers.

[11] While the specification in Table 3 only includes one leading indicator, adding additional leads does not change the results. Results for the full set of leads and lags are shown in Appendix Table 1.

Overall, our results demonstrate that principal race affects the racial composition of the school's teaching staff. In the next part of our analysis, we investigate the mechanisms for this relationship by examining the effect of principal race on teaching hiring and teacher retention.

Teacher Hiring Results

The bottom of Table 2 shows that the racial breakdown of newly hired teachers (i.e., teachers who are in their first year in a given school) by principal race closely mirrors the patterns for all teachers, though Black teachers comprise a larger share of new hires relative to the overall teacher workforce. Descriptively, Black principals are substantially more likely to hire Black teachers than are White principals. To isolate the causal effect of principal race on hiring, we follow the same approach used for the composition models but limit the sample to teachers who new to their school in the given year.

Figure 3 shows the descriptive event study results for new hires. Prior to a principal transition, the trends in the proportion of Black new hires are roughly flat. For transitions between principals of the same race, there is no change in the composition of newly hired teachers under the new principal. However, transitioning from a White to a Black principal increases the proportion of newly hired teachers that are Black, with a corresponding decrease for Black to White transitions. Moreover, these changes persist beyond the first year after the transition and are still apparent four years afterward.

Table 4 shows the estimated effects of principal race on the racial composition of new hires. Columns 1 and 4 include school and year fixed effects, along with time-varying school characteristics and principal characteristics, with successive columns adding district-by-year fixed effects and school-specific trends. Our preferred specification (columns 3 and 6) shows that

having a Black (White) principal increases (decreases) the probability that a newly hired teacher is Black by 5.3 percentage points in Missouri and 6.6 percentage points in Tennessee, which corresponds to 22% and 26% increases (decreases) in the effective samples in these states.[12]

Heterogeneity in Hiring Networks

To shed light on the possible mechanisms that explain the hiring effects shown in Figure 3 and Table 4, we next examine whether the effects are more or less concentrated among certain types of new hires. One possible explanation for principals hiring more same-race teachers is that principals recruit teachers through networks that tend to be segregated by race. We examine this possibility in Table 5. Specifically, we examine heterogeneity in hiring effects for four types of teachers. In each panel, we estimate a model with all covariates and fixed effects (corresponding to our preferred specification in Table 4) and include interactions between the *type* variable and all covariates.

First, we examine teachers that are "new-to-state," meaning they are first-year teachers or have not worked previously at a K-12 public school in Missouri/Tennessee (Panel A). If segregated networks help to explain the hiring effects, the estimated effect of principal race should be smaller for new-to-state teachers, who likely have the weakest networks among new hires. In both states, the effect of principal race on the probability that a newly hired teacher is Black is indeed smaller in magnitude for new-to-state teachers. However, there is still a positive effect among new-to-state teachers, demonstrating that segregated networks do not completely explain the connection between principal race and teacher hiring. Further, this finding is consistent with (though not necessarily strong evidence of) Black principals brining new Black

[12] Appendix Table 2 shows the results with indicators for leads and lags. Consistent with a causal interpretation, we find no evidence that future principal race affects the race of current new hires. In Missouri, we do find evidence of a lagged effect of principal race (only in the immediate prior year), where in Tennessee the effect of principal race only appears in the current year.

teachers into the workforce, rather than merely changing the allocation of existing Black teachers.

In the remaining panels, we examine three types of transferring new hires (teachers that are not new-to-state): teachers who are moving from a different school district (*New to District*), teachers who have worked previously with at least one teacher at their new school (*In Teacher's Network*), and teachers who have worked previously with the hiring principal, including prior to the principal entering school leadership (*In Principal's Network*). Panel B shows that there is no difference in the effect of principal race for teachers from outside of the district. In other words, principals are not merely pulling same-race teachers away from schools in the same district. Instead, the results imply that increasing the number of Black principals in a district can increase the number of Black teachers in the district. In Appendix Table 3, we confirm this connection by estimating models at the district-by-year level (in a district fixed effects framework) that regress the proportion of Black teachers on the proportion of Black principals. We find a positive association.[13]

Panels C and D explicitly test for heterogeneity in hiring effects by observed networks. Panel C shows no difference in the effect of principal race for new hires who have worked previously with one or more of the teachers at their new school. In both states, however, the magnitude of principal race is substantially larger among new hires who have worked previously with the hiring principal. In Missouri, the effect of having a principal on the probability that new hire is Black is 3.9 percentage points for teachers not in the principal's network, compared to

[13] Specifically, we estimate three specifications in each state that add successive controls: (1) district and year fixed effects, (2) time-varying average demographic characteristics (e.g., proportion of Black students in the district), and (3) district-specific trends. The results are consistent across each of these specifications, although including district-specific trends in Tennessee greatly increases the standard errors because Tennessee has fewer districts and a shorter panel.

12.7 percentage points for teachers who have worked with the principal previously. In Tennessee, the effects are 8.6 and 15.5 percentage points, respectively. However, principal network hiring is uncommon overall; only 6–7% of new hires in Missouri and Tennessee have previously worked with their hiring principal.

Overall, the results in Table 5 suggest that networks are an important mechanism through which principal race affects the racial composition of newly hired teachers. One limitation of these analyses is that our network measures are only proxies based on job history; connections between teachers and principals likely propagate through more complex processes that are unobservable in our administrative data. For example, teacher-principal connections could be driven by an intermediary, such as a teacher's former principal or assistant principal. Given that we cannot easily identify many teacher-principal connections, our results likely understate the magnitude of networking in explaining hiring effects.

Is Black Principals' Hiring of Black Teachers Zero-Sum?

One question raised by the results in Table 5 is whether the hiring patterns simply reflect the reshuffling of teachers among demographically similar schools. Under this scenario, for instance, Black teachers could be sorting away from schools with White principals to demographically similar schools (in terms of student population) with Black principals. The benefits to Black students of having a Black teacher, then, would merely be a zero-sum transfer between students at the "sending" and "receiving" schools.[14] On the other hand, if Black principals are pulling Black teachers into schools with a larger percentage of Black students, these hiring patterns could be welfare-enhancing.

[14] Note that this is from the perspective of society or the state policymaker. As discussed above, the results in Table 5 Panel B suggest that from the perspective of an individual district, Black principals can increase the proportion of Black teachers in the district through transfers from schools in other districts.

Appendix Table 4 shows descriptive statistics of sending and receiving schools for Black teacher transfers, broken down by the race of the sending and receiving principal. On average, Black teachers in both states transfer between schools with similar percentages of Black students. However, for Black teachers who move from a White principal to a Black principal, the receiving schools have substantially more Black students than sending schools, on average (85% vs. 64% in Missouri, 75% vs. 59% in Tennessee). In terms of the "representation gap" between Black students and teachers, we find that Black teachers tend to move to schools where the gap is *larger*, meaning that on balance they are moving to schools where the need for Black teachers is greater.

Differences in the Qualifications and Effectiveness of Same-Race and Different-Race New Hires

Aside from segregated hiring networks, same-race effects on teacher hiring may arise from taste-based discrimination by either principals or teachers. If teachers systematically attempt to work with same-race principals by applying to work in their schools at higher rates, we would expect the applicant pool to have a larger fraction of teachers of the same race as the principal. Even principals who select teachers to hire at random would produce a race-matching pattern in this case. Assuming similar measures of quality among same- and different-race applicants, a principal attempting to hire the best teacher from the applicant pool, ignoring race, would produce a race-matching correlation under this scenario as well. Alternatively, if principals are exercising taste-based discrimination, we might expect that they are willing to sacrifice dimensions of teacher quality to choose a same-race teacher for a vacant position.

Unfortunately, we cannot observe teacher applicant pools, which might help us distinguish these two scenarios (see D'Amico et al. 2017). We can, however, provide partial evidence. We test for differences in observable proxies for teacher quality for teachers hired by

same-race and different-race principals. We focus this analysis on Tennessee, where more such proxies are available in our data. We identify four such measures: a teacher's year of experience, degree attained at time of hiring, classroom observation scores (collected as part of the statewide evaluation system since 2011–12), and value-added to student achievement. For both observation scores, we use average prior scores (if available), scores the year of hiring (i.e., in their first year in their new school), and career-average scores. For value-added, we draw on two measures. The first are single-year estimates from the Tennessee Value-Added Assessment System (TVAAS), which are used as part of the statewide evaluation system.[15] We supplement this measure with a leave-year-out, drift-adjusted VA score proposed by Chetty, Friedman, and Rockoff (2014).[16] Using each measure as a dependent variable, we first estimate the difference between teachers hired by Black and White principals within schools, controlling for time-varying school characteristics and year fixed effects. We then estimate the difference between same-race (Black Principal x Black Teacher and White Principal x White Teacher) and different-race teachers, adjusting for average differences in qualifications and effectiveness between Black and White teachers.

Results are shown in Table 6. Panel A shows the main effect of principal race on the qualifications and effectiveness of newly hired teachers. On average, Black principals hire teachers with higher education levels (1.8 percentage points more likely to have a master's

[15] To increase precision, we average all available years within teacher.

[16] The estimation steps are as follows. First, we residualize student test scores (separately by subject) on a vector of prior-year test scores, student characteristics (race/ethnicity, gender, FRPL eligibility, gifted status, special education status, lagged absences, grade repetition, and whether the student changed schools at least once during the year), school- and grade-level averages of these student characteristics, grade-by-year fixed effects, and teacher fixed effects. After computing the student residuals, we add back the teacher fixed effects and estimate the best linear predictor of a teacher's average student residuals in the current year based on their residuals from prior and future years. The coefficients from this best linear predictor are then used to predict a teacher's value-added in the current year. We then standardize these estimates within subject and year. For teachers with value-added estimates in multiple subjects, we average these estimates within each year, weighting by the number of students taught in each subject.

degree or greater) and lower observation ratings (0.087 SD lower when averaging across a teacher's career). In terms of prior teaching experience and value-added, there are no significant differences between teachers hired by Black and White principals.

Panel B tests for differences in the qualifications and effectiveness of same-race and different-race hires, with results plotted in Figure 4. Each plot within the figure shows the average qualifications/effectiveness for the combination of teacher and principal race. The lines represent the marginal effect of principal race (i.e., the difference between Black and White principals) on the given measure for Black and White teachers, respectively. As demonstrated by Figure 4 and the corresponding coefficients in Table 6, when principals hire same-race teachers, they tend to have higher qualifications and effectiveness. Further, except for education level, where Black principal-teacher matches drive the matching effect, the "benefits" of same-race hiring appear for both Black and White matches, illustrated by the upward sloping lines for Black teachers and downward sloping lines for White teachers.[17]

These results suggest that teacher sorting is an important driver of the race-match result for hiring. Although we cannot rule out that principals exhibit bias in hiring that is compensated for by teacher sorting, we do not see evidence in these results that principal bias toward same-race hires leads them to hire lower-quality teachers, on average.

Teacher Turnover Results

Descriptive Analysis of Teacher Turnover

We now turn from teacher hiring to teacher turnover. Table 7 shows teacher turnover rates disaggregated by principal race. Panel A shows the overall turnover rate (i.e., the

[17] While some of the estimated coefficients for Black Principal x Black Teacher or White Principal x White Teacher are not statistically significant at conventional levels, we cannot reject equality of the coefficients except for education level (column 2).

percentage of teachers in year *t* who are not teaching in the same school in year *t+1*), while Panels B through E differentiate among three types of teacher turnover: exiting the state education system, moving to a different school in the same district, moving to a school in a different district, and changing to a non-teaching position in the state education system.

Comparing Missouri and Tennessee, there are some important descriptive differences. First, Missouri experiences higher average turnover rates than Tennessee, which is primarily due to higher exit rates. The states have similar rates of teacher transfers and position changes, though across-district moves are more common in Missouri and within-district moves are more common in Tennessee. Second, in both states, Black teachers turn over at higher rates than White teachers. The disparity is larger in Missouri, where 28% of Black teachers and 17% of White teachers leave their position each year, compared to 22% and 16% in Tennessee. In Missouri, increased rates of exits and within-district moves drive higher turnover among Black teachers, while in Tennessee, Black teachers are substantially more likely to move within the same district but only slightly more likely to exit. Position changes constitute a small portion of teacher turnover, with slightly higher rates among Black teachers in both states.

Another notable descriptive finding is that all teachers have higher turnover rates in schools with Black principals, though this difference is larger for White teachers than Black teachers. For example, White (Black) teachers in Missouri have a turnover rate of 16.6% (23.2%) under White principals and 27.2% (30.8%) under Black principals. This pattern holds for exits and moves, apart from Black teachers in Tennessee, who have slightly lower rates of exit and across-district transfer in schools with Black principals than White principals.

Figure 5 shows the descriptive event studies of teacher turnover among Black and White teachers before and after principal transitions. Similar to Figures 2 and 3, there are large

differences between schools transitioning from Black-to-Black and White-to-White principals—schools with Black principals have substantially greater teacher turnover rates in both states. In general, there is a strong correlation between principal turnover and teacher turnover. In the year that a principal leaves their position, a much larger proportion of the school's teachers leave their positions as well. This spike encompasses multiple possible mechanisms. Teachers may choose to leave in response to their principal leaving, but there could also be a school-level shock (i.e., a downturn in student performance on end-of-year exams) that drives both administrator and teacher turnover.

Whereas the event studies for composition and hiring had clear patterns with respect to changes in principal race, the patterns in Figure 5 are more complicated. Among White teachers, there is no consistent difference in the turnover rate trends between White-to-Black and Black-to-White transitions. Comparing transitions from Black-to-White and White-to-Black principals among Black teachers, the descriptive patterns are consistent with the hypothesis that the race of the incoming principal also influences teachers' turnover decisions (which we investigate further below). Black teachers in both states are comparatively less likely to turn over in the year of a White-to-Black principal transition than a Black-to-White transition. One confounding factor in these plots is that the composition of a school's teaching staff changes after switching to a different-race principal due to the hiring effects demonstrated earlier. In a school in which a Black principal hires more Black teachers, the turnover rate among Black teachers may go up initially because new teachers tend to have higher turnover propensities.[18]

Linear Probability Models for Teacher Turnover

[18] As a check, we also created a version (Appendix Figure 1) that includes only teachers who were in the school prior to the principal transition and find similar patterns. The main difference between the figures is that restricting to returning teachers results in a downward trend in turnover over time, as the likelihood of turnover decreases with each additional year of tenure in a school.

As with patterns of hiring, differences in school context contribute to these large racial disparities in turnover. Teachers and principals are non-randomly sorted to schools, such that simply comparing descriptive differences in turnover rates among different combinations of teacher and principal races conflates any causal effect of principal race with other factors, such as the working conditions in the school, or that teachers inherently more likely to turn over (i.e., have a higher latent propensity of leaving their position) may be systematically allocated to Black or White principals (even within the same school over time).

To isolate the impact of principal race on the probability of turnover for Black and White teachers, we turn to teacher fixed effects models that exploit variation in principal race within the same teacher over time. Table 8 shows the focal coefficients (Black Principal x Black Teacher and White Principal x White Teacher) for various specifications of equation 2. Columns 1 and 4 include teacher fixed effects and district-by-year fixed effects, columns 2 and 5 add school fixed effects, and columns 3 and 6 (our preferred specification) add school-specific trends. In addition to the coefficient estimates, we report the *p*-values from *F*-tests that the coefficients are different and that the coefficients are jointly significant.

Across all specifications, the Black Principal x Black Teacher and White Principal x White Teacher coefficients are negative and jointly significant ($p < 0.001$ for all), providing strong evidence that having a same-race principal lowers the probability of teacher turnover. However, when examining whether this average race-matching effect is driven by Black or White teachers, we find differences by state. Focusing on the specification in columns 3 and 6, in Missouri we find that White teachers are 2.6 percentage points less likely to leave their positions when they have a White principal, whereas Black teachers have only marginally lower turnover rates under Black principals (-0.4 percentage points, n.s.). This decrease for White teachers is

13% of the base rate. In Tennessee, by contrast, Black teachers drive the matching effect, with a 3.7 percentage point (15%) decrease in the probability of turnover when working for a Black principal. We note that the difference between Black and White matches is on the margin of conventional statistical significance in both states ($p = 0.15$ in Missouri, $p = 0.07$ in Tennessee) and is sensitive to model specification.

In Table 9, we examine how controlling for principal turnover affects our estimates of the effect of principal race on teacher turnover. As shown in Figure 5, teacher turnover spikes in the year of a principal transition, but the magnitude (and in some cases, the direction) of the change differs by the race of the outgoing and incoming principal. Intuitively, this pattern suggests that teachers' own mobility decisions may be related not only to whether they race-match with the outgoing principal, but also to whether they race-match with the incoming principal. In many cases, teachers know whether their current principal is leaving (e.g., the transition is a planned retirement) and who the replacement will be before making a turnover decision. Even in the case where the principal transition occurs after the end of the school year, the new principal often is installed early in the summer, such that teachers have time to pursue a transfer. If teacher responses to principal transitions are independent of the race of the outgoing and incoming principal, our estimates of principal race would be unaffected. If, however, teachers are more likely to leave their positions in the year that a same-race principal leaves or when the replacement is a different-race principal, our estimates would be closer to zero, since we are modeling the effect of principal race in the current year.

We explore this dynamic in several ways. First, in columns 1 and 5 we re-estimate our preferred specification for the sample of school-years when the principal does not leave her position. In Missouri and Tennessee, respectively, 22% and 17% of principals leave their

positions each year. Consistent with our expectations, we find that our estimates of having a same-race principal race on teacher turnover change for both states relative to those from the full sample (Table 8, columns 3 and 6). In columns 2 and 6, we retain the full sample but include an indicator for principal turnover (i.e., the principal in year *t* was not the principal in year *t+1*). In years where the principal leaves, the probability of teacher turnover increases by 3.1 and 3.0 percentage points in Missouri and Tennessee, respectively. However, controlling for principal turnover does not affect the Black Principal x Black Teacher and White Principal x White Teacher coefficients.

In the remaining columns, we include interactions between principal turnover and the combinations of teacher and principal race. Columns 3 and 7 show that the effect of principal turnover is greater when the departing principal is Black—particularly among Black teachers. Finally, columns 4 and 8 demonstrate substantial heterogeneity by the combination of teacher race and principal race in the current *and* future years. The patterns are consistent across states: conditional on the race of the departing principal, the effect of principal turnover is greater when the next principal is a different race than the teacher. Conversely, in cases where the transition is from a different-race to same-race principal, the estimated effect of principal turnover on teacher turnover is small or even negative.

When accounting for differential responsiveness to principal turnover by teacher and principal race, the estimated effect of having a same-race principal increases substantially in magnitude for Black teachers, with little to change for White teachers. Specifically, in years without a principal transition, having a Black principal decreases the probability of Black teacher turnover by 2.8 percentage points (10%) in Missouri (compared to 0.4 in the main models) and 5.6 percentage points (23%) in Tennessee (compared to 3.7).

The results in Table 9 illustrate that matching effects are dependent on the race of the current and future principal (in the case where there is a principal transition). Failing to account for this dynamic leads to understating the importance of principal-teacher race matching for Black teachers.

Next, we examine the effect of teacher-principal race matching on different types of teacher turnover. Specifically, we run separate models predicting whether teachers leave the state education system (exits), whether teachers move to a teaching position in a school in the same district (within-district move) or a different district (across-district move), and whether teachers change to a non-teaching position (position changes). Table 10 displays the multinomial results. Given the results from the previous table demonstrating the importance of accounting for principal turnover, we include these controls in the model, though we also show the results without controlling for principal turnover in Appendix Table 5.

In both states, the effect of having a same-race principal most clearly reduces the probability that a teacher moves to another school, including within-district and across-district moves. In Missouri, Black teachers are 1.8 percentage points (17%) less likely to move within the same district and 1.2 percentage points (31%) less likely to move across districts when they work for a Black principal (who remains in the school). In Tennessee, the effects are even larger in magnitude (4.6 and 1.6 percentage points, 33% and 53% of the base rates). Among White teachers, having a White principal lowers the probability of within-district transfer by 1.1 (16%) and 1.6 (18%) percentage points in Missouri and Tennessee, respectively. There is no evidence of an effect on across-district moves for White teachers. The results for exits are less clear. In Missouri, the coefficients for having a same-race principal are negative for both Black and White teachers and are jointly significant ($p = 0.02$). In Tennessee, the coefficient for Black Principal x

Black Teacher is negative and the coefficient for White Principal x White Teacher is positive, though neither is significant at conventional levels, and they are not jointly significant. Neither state shows evidence of an effect for position changes.

If teachers' preferences for working with same-race principals are driving the higher rates of transfer among teachers with other-race principals, we might expect that those teachers would systematically sort into schools with same-race principals. Indeed, in both states, sorting patterns for Black teachers are consistent with this expectation. Among Black teachers transferring from a school with a White principal in Missouri, 53% moved to a school with a Black principal. However, only 44% of other teachers in the district of the receiving school work for a Black principal, so 53% is much higher than what would be expected if teachers were transferring at random. In Tennessee, 56% of teachers transferring from a school with a White principal move to a school with a Black principal (41% of other teachers in the district work for a Black principal). In contrast, in neither state is there evidence of similar sorting for White teachers. White teachers leaving schools with Black principals are overwhelmingly likely to move to schools with White principals (55% in Missouri, 67% in Tennessee), but the proportions are virtually identical to the total fraction of teachers in the district working for a White principal.

Finally, we examine whether the effect of having a same-race principal on teacher turnover is different between hiring principals (i.e., the principal entered the school prior to the teacher[19]) and new principals (i.e., the teacher entered the school prior to the principal).[20] To the extent that teachers apply to positions (or principals choose which applicants to hire) based on their preferences for race congruence, we would expect that matching effects are smaller in

[19] We include in this group teacher-principal pairs that entered in the same school year, principals are typically installed earlier in the summer. However, our results are not sensitive to this choice.
[20] This analysis follows Giuliano, Levine, and Leonard (2011).

magnitude for teachers who were hired by the current principal. In contrast, teachers who enter the school before the principal have no opportunity to "select" the characteristics of the new principal outside of their decision to stay or leave the school. Thus, we would expect matching effects on turnover to be larger for new principals. We show these results for Missouri and Tennessee in Appendix Table 6. Similar to Giuliano, Levine, and Leonard (2011), we find larger effects of same-race principals for teachers who were not hired by the principal, which is consistent with teacher and/or principal selection at the initial application/hiring stage. The only exception is for Black teachers in Tennessee, where the negative effect of having a Black principal is not significantly different between incumbent teachers and teachers hired by the current principal.[21]

Exploring Mechanisms for the Effect of Race Matching on Turnover

Next, we explore potential mechanisms for the effect of principal race on teacher turnover. Specifically, we test whether having a same-race principal affects salary, job satisfaction, and teacher perceptions of school leadership and climate. Each measure proxies one or more channels through which matching effects on turnover may operate. For example, while teacher pay is typically constrained by a salary schedule, principals can delegate extra work opportunities (e.g., coaching a sports team) to teachers to provide them with a small pay increase. By raising the opportunity costs of alternative employment, extra pay could be a means for principals to increase retention of same-race teachers (see Grissom and Keiser 2011). Increases in either salary or numerous other working conditions factors that principals can affect may positively impact same-race teachers' perceptions of their school and job satisfaction.

[21] We also considered whether the impact of principal-teacher race-match varied by teacher value-added. For instance, high-performing teachers who have more opportunities to seek alternative school placements might be more responsive to changes in principal race. However, we found no evidence of heterogeneity by teacher value-added in the race-match effect for Black or White teachers. These results are show in Appendix Table 8.

Higher job satisfaction has been closely linked to lower turnover in many studies (e.g., Clark 2001; Guarino, Santibañez, and Daley 2006).

Although we do not have access to fine-grained salary information that would allow us to distinguish base pay from other sources, we do have total salary for both states. The first two columns of Table 11 show the impacts of teacher-principal race matching on salary. In neither state do we find evidence of a substantial salary effect. While the coefficients are all positive, they are small in magnitude (all are less than $100 per year) and only statistically significant at a conventional level in one case.

Tennessee administers a statewide annual survey (since 2011–12)[22] to teachers that includes series of questions aimed at gauging teachers' job satisfaction, perceptions of school leadership, and school climate.[23] Using factor analysis, we combined these responses into standardized scales of *job satisfaction*, *school climate*, and *school leadership*. For satisfaction, we can include both teacher and school fixed effects, since we have enough teachers who responded in multiple years. For perceptions of leadership and school climate, we only have teacher responses for the three most recent years, which is not sufficient variation to include teacher fixed effects, so the estimates for these measures compare the responses of same-race and different-race teachers within a given school. Across all three outcomes, we find that having a same-race principal improves teachers' perceptions of their school and their satisfaction. In each case, the joint test for *Black Principal x Black Teacher* and *White Principal x White Teacher* is statistically significant, with no evidence that the matching effect is different between

[22] Teacher response rates across years ranged from 27% to 56%.
[23] Responses were on a four-point Likert scale from "Strongly Disagree" to "Agree". Examples of items include, "The stress and disappointments involved in being at this school aren't really worth it" and "I feel appreciated for the job I am doing".

Black and White teachers. As an example, column 3 shows that teachers report 0.16 SD greater job satisfaction in years when they have a same-race principal.

Do Principals Improve Outcomes for Same-Race Students?

The prior sections demonstrate that principals hire and retain same-race teachers at higher rates, which increases the proportion of same-race teachers in the school. Because research suggests that exposure to teachers of color increases achievement among students of color (e.g., Egalite et al., 2015), diversification of a school's teaching force may be a mechanism through which principals of color can affect the outcomes of such students. However, other mechanisms are possible as well. As an example, Black principals may be more likely to implement restorative justice practices that help level discipline disparities between Black and White students. There may also be role-modeling effects, given that principals are prominent leaders in the school and interact with students and families regularly. The final part of our analysis, which focuses on student-level Tennessee data, aims to establish the extent to which having a same-race principal improves student achievement and the degree to which principals' effects on teacher racial composition explain this relationship. As a supplementary analysis, we also examine whether principal race affects disciplinary outcomes of same-race students.

Data and Empirical Strategy

We access student-level data from Tennessee beginning in the 2006–07 school, which we connect to the staff data used in the teacher composition analyses. The student files contain detailed information on demographics, enrollment, attendance, suspensions,[24] and performance on statewide exams. Specifically, we examine math and reading scores from mandatory end-of-year exams in grades 3–8 in addition to end-of-course exams for high school students.[25] We also

[24] Reliable data on suspensions starts a year later in 2007–08.
[25] These high schools exams include English I, English II, English III, Algebra I, and Geometry.

access student-teacher linkage files which allow us to identify, for those in tested grades and subjects, a student's assigned teacher. These linkage files allow us to directly examine exposure to Black teachers as well as construct value-added measures of teacher quality.[26]

To examine the effect of principal race on student outcomes, we first estimate a linear probability model for assignment to a Black teacher:

$$BlackTch_{ijgst} = \beta_1 BlackPrin_{jst} + \gamma X_{it} + \psi S_{st} + \eta P_{jst} + \theta_1(School_s \times Grade_g \times BlackStu_i) + \theta_2(Year_t \times BlackStu_i) + \epsilon_{ijgst} \quad (3)$$

where i, j, g, s, and t indexes students, principals, grades, schools, and years, respectively. β_1 is the marginal effect of having a Black principal (instead of a White principal) on the probability that a student has a Black teacher in math or reading (we estimate separate models by subject). By including school-by-grade-by-race fixed effects, we identify the effect of principal race by comparing cohorts of same-race students within the same school and grade across years. The intuition of this design is that same-race students from prior or future cohorts (when the school had a different principal) serve as a counterfactual for the current cohort if they would have had a Black instead of White principal (or vice-versa). [27] To account for possible changes in the composition of the cohort, grade, or school more broadly, we also include a rich set of controls for student characteristics (prior-year test scores and attendance rate, race/ethnicity, gender, free/reduced-price lunch eligibility, special education assignment, gifted classification, an indicator for starting the school year at a different school) as well as year-by-year averages of these student characteristics at the grade and school level. We also interact these controls with

[26] We previously described the estimation of leave-year-out, drift-adjusted VA in footnote 15.

[27] An advantage of using school-by-grade-by-race fixed effects instead of school or school-by-race fixed effects is that we can control for students' prior-year outcomes without violating strict exogeneity. With school fixed effects, prior-year outcomes are endogenous as most students remain in the same school between year $t-1$ and year t. Interacting school-by-grade fixed effects with race accounts for the possibility that unobserved school- or school-by-grade factors differentially affect Black students. However, replacing school-by-grade-by-race with school-by-grade fixed effects produces very similar results.

student race to account for the possibility that the underlying factors captured by these controls may differentially affect Black versus White students. We cluster standard errors at the school level.

While equation 3 captures the average effect of Black (White) principals on the probability of having a Black (White), the previous composition analysis suggests that this effect is dynamic; specifically, we expect that the effect of principal race will increase as the principal has time to shape the composition of the teaching staff. To investigate this possibility, we modify equation 3 to allow the effect of principal race to vary by principal tenure (i.e., number of years served as principal) in the school:

$$BlackTch_{ijgst} = \beta_1 BlackPrin_{jst} + \delta\left(BlackPrin_{jst} \times TenurePrin_{jst}\right) + \gamma X_{it} + \psi S_{st} + \eta P_{jst} + \theta_1(School_s \times Grade_g \times BlackStu_i) + \theta_2(Year_t \times BlackStu_i) + \epsilon_{ijgst} \quad (4)$$

Specifically, we parametrize tenure as a set of indicator variables (1st year in school, 2nd-3rd year, 4th-5th year, 6th+ year) and interact them with the principal race indicator.

To examine the effect of principal race on student achievement, we estimate a similar set of specifications but interact principal race with student race:

$$Achievement_{ijgst} = \beta_1 BlackPrin_{jst} + \beta_2(BlackPrin_{jst} \times BlackStu_i) + \gamma X_{it} + \psi S_{st} + \eta P_{jst} + \theta_1(School_s \times Grade_g \times BlackStu_i) + \theta_2(Year_t \times BlackStu_i) + \epsilon_{ijgst} \quad (5)$$

Here, β_2 is the parameter of interest and represents the effect of principal-student race-match. More concretely, it captures the average difference in the effect of having a Black principal between Black and White students. Our dynamic model is as follows:

$$Y_{ijgst} = \beta_1 BlackPrin_{jst} + \beta_2\left(BlackPrin_{jst} \times BlackStu_i\right) + \delta\left(BlackPrin_{jst} \times BlackStu_i \times TenurePrin_{jst}\right) + \omega_1\left(BlackPrin_{jst} \times TenurePrin_{jst}\right) + \omega_2\left(BlackStu_i \times TenurePrin_{jst}\right) + \gamma X_{it} + \psi S_{st} + \eta P_{jst} + \theta_1(School_s \times Grade_g \times BlackStu_i) + \theta_2(Year_t \times BlackStu_i) + \epsilon_{ijgst} \quad (6)$$

Equation 6 is effectively a difference-in-difference-in-differences estimator, where δ represents the difference in the principal-student race-match effect between principals with varying levels of tenure in school (using the tenure categories described above). The other covariates are the same as described above for the exposure models.

Results

Table 12 shows the estimated effect of principal race on the race of a student's teacher in math and reading. Columns 1 and 3 show that, on average, having a Black (White) principal increases the probability of assignment to a Black (White) teacher by 4.9 percentage points and 4.1 percentage points in math and reading, respectively. As would be expected from the composition analyses, columns 2 and 4 demonstrate that this exposure effect for math grows in magnitude as the principal gains experience in the same school. For reading, there is a jump after one year in the school but no evidence that the effect of principal race increases after the principal's second year in the school.[28]

The patterns in Table 12 encompass multiple potential mechanisms. First, as shown in prior analyses, principals increase the share of same-race teachers in the school, which will increase the likelihood that a student is assigned to a teacher of that race. Principals may also influence student-teacher assignment even conditional on the teacher composition effect, such as strategically matching students to same-race teachers (e.g., Black principals may be more likely to assign Black students to Black teachers) or increasing the share of same-race teachers who are in tested grades and subjects. We examine these latter two explanations in Appendix Tables 9 and 10 and find little evidence that the exposure effects are driven by differential student-teacher

[28] In column 4, the interaction terms are jointly statistically significant but not significantly different from one another.

assignment or moving same-race teachers to tested grades/subjects.[29] In other words, the mechanism that drives the pattern in Table 12 is that Black (White) principals increase the proportion of Black (White) teachers in the school, which in turn increases the likelihood that any student (regardless of race) is assigned to a Black teacher.

Table 13 shows the achievement results. Here, the parameter of interest is the interaction between Black principal and Black student. Columns 1 and 4 show the simplest specifications for math and reading, which do not account for possibility that the principal-student race-match grows over time. For both subjects, the coefficient estimates are positive but not statistically significant at conventional levels. However, when allowing the match effect to change as the principal remains in the school (columns 2 and 5), we find evidence of a positive effect in math beyond the principal's first year in the school. Whereas the estimated race-match effect for math achievement is -0.022 SD (p =0.21) in the principal's first year in the school, it increases to 0.020 SD (p =0.21) in their second and third years and 0.048 SD (p =0.02) in their fourth and fifth years. For reading, the estimates are uniformly smaller and not statistically significant at conventional levels, even when we combine the post-first year math effects in column 6.

To what extent are these principal-student race-match effects driven by Black versus White matches? As with our teacher turnover analysis, we can disaggregate these matching

[29] Appendix Table 9 examines whether having a same-race principal increases the likelihood that a teacher is assigned to a tested grade/subject in the given year. We estimate two specifications: one that includes teacher fixed effects and one that does not. The models also include the full set of covariates from the teacher turnover models in addition to school fixed effects, district-by-year fixed effects, and school-specific trends. The estimated race-match effects are small for Black and White teachers and there is no clear pattern of statistical significance. Appendix Table 10 examines whether Black students are more likely to be assigned to a Black teacher than White students in the same school, grade, and year when the school has a Black principal. To isolate differential assignment from the compositional effect of principal race, we employ school-by-grade-by-year fixed effects and estimate the interaction between *Black Principal* and *Black Student*. We find precise null effects for both math and reading, indicating that Black principals are not systematically assigning Black students to Black teachers at greater rates than White principals.

coefficients by removing the main effect of principal race from the model.[30] These race-specific coefficients, then, combine any main effect of principal race (i.e., Black principals have higher average effectiveness than White principals, or vice-versa) with the race-specific principal-student match effect. As shown in Table 14, we find that the estimated match effects from the dynamic models (i.e., that allow the match effect to vary by principal tenure) are larger for Black matches. In particular, for math achievement in column 3, we can reject the null hypothesis that the *Match x Principal's 2nd+ Year in School* coefficients are equal ($p = 0.014$). For reading, we find no consistent evidence of principal-student match effects for Black or White students.

Appendix Tables 11 and 12 repeat this exercise for student discipline outcomes. Specifically, we examine the effect of principal-student race match on the probability that a student is suspended one or more times during the school year.[31] We also show results separating in-school and out-of-school suspensions. We find no effect of principal-student race match on suspensions (pooling both types), but there is some evidence of an effect for in-school suspensions, which is driven by Black matches. Specifically, Appendix Table 11 shows that having a same-race principal lowers the probability of in-school suspension by 1.8 percentage points ($p < 0.05$), relative to a base rate of 7.3%. Disaggregating Black and White matches and allowing the effect to vary by principal tenure in school, the marginal effect on in-school suspensions of having a Black principal for Black students is 1.1 percentage points ($p = 0.30$) in the principal's first year and grows in magnitude over time to 3.8 percentage points ($p < 0.01$) by the principal's sixth year in the school.

[30] Specifically, instead of estimating coefficients for *Black Principal* and *Black Principal x Black Student*, we estimate *Black Principal x Black Student and White Principal x White Student*.

[31] Here, we replace prior-year test scores with prior-year suspensions, which allows us to include students in all grades, rather than the subset of tested grades. However, our results are very similar if we use the subset of students with prior test scores and include these scores in the model.

Next, we examine how much of the principal-student race-match effect on achievement is explained by principals' impacts on teacher composition. Table 15 shows how controlling for various teacher characteristics changes our estimated match effects. For simplicity and to improve precision, we focus on the specifications that estimate match effects for a principal's first year versus second or greater year in the school (i.e., the models shown in Table 13, columns 3 and 6). We treat these teacher characteristics as potential mediators; if principals' positive impacts on same-race students operate through teacher composition, controlling for measures of teacher composition should attenuate the match effects. On the other hand, if match effects remain even conditioning on teacher characteristics, it would suggest that the match effects are at least in part driven by other mechanisms.[32]

Columns 1 and 5 show the baseline model for math and reading scores, respectively. Columns 2 and 6 add teacher race (i.e., an indicator for whether the student's assigned teacher in math/reading is Black) and the interaction between teacher race and student race. The student-teacher interaction is positive and statistically significant in math but not reading. Importantly, however, accounting for this relationship does not appreciably change the principal-student match effects relative to columns 1 and 5. In other words, while we find evidence of a student-teacher race-match effect (at least in math) and we previously demonstrated that Black (White) principals increase the likelihood that a student is assigned to a Black (White) teacher, this mechanism explains little of the positive effects of principals on same-race students. This finding may appear counterintuitive until considering the relatively small effects of principal race on student exposure from Table 12 (4–5 percentage points) and of teacher-student race match in

[32] To ensure comparisons across models are not driven by sample selection, we restrict this analysis to a common sample of students for whom we can calculate value-added for their assigned teacher. This drops roughly 8% of student-by-year observations relative to the main models.

Table 15 (0.035 SD[33]); a back-of-the-envelope calculation based on these effects suggests that the average impact on achievement via this channel would be no more than 0.002 SD.

Columns 3 and 7 examine whether the principal-student match effects are explained by changes in teacher quality, which we operationalize using drift-adjusted value-added, years of experience, and an indicator for being new to the school. Here we find that controlling for teacher quality appears to explain some of the principal-student race-match effect. For instance, the coefficient for *Black Principal x Black Student x Principal's 2nd+ Year in School* is reduced from 0.053 SD to 0.045 SD in the model for math achievement. Columns 4 and 8 include both teacher-student race-match and teacher quality. Including teacher quality measures attenuates the estimated teacher-student race-match effect, but even including both sets of teacher characteristics does relatively little to explain the positive impact of having a same-race principal (after their first year in the school).

On balance, we find little evidence that the principal-student race-match effect on math achievement is driven by the impact of principal race on teacher composition. What, then, could explain this relationship? Despite our focus on teacher composition in this analysis, there are a variety of potential mechanisms that could explain how principals benefit same-race students. As opposed to teachers, who have direct effects on students through classroom instruction and interactions, principals' effects on student outcomes are indirect—mediated by their influence

[33] This coefficient is likely an upper bound for the teacher-student race-match effect in our data, given that we have not included other teacher-level controls (e.g., value-added, experience). When we include those covariates in columns 4 and 8, the match effect is attenuated but remains statistically significant in math at 0.021 SD. Our estimates are comparable to teacher-student match effects from other studies. Egalite et al. (2015) find that having a same-race teacher increases math (reading) scores by 0.018 (0.005) SD for Black students and 0.008 (0.005) SD for White students. Similarly, Clotfelter et al. (2007) find that having a same-race teacher increases math scores by 0.02–0.03 SD and reading scores by 0.01–0.02 SD. Other work finds larger student-teacher match effects on test scores. For instance, leveraging random assignment of students to classrooms in the TN STAR experiment, Dee (2005) finds that having a same-race teacher increased math and reading scores of K–3 by 2 to 4 percentile points. Given our use of statewide administrative data and test scores from grades 3 to 8 and high school, however, we think the Egalite et al. (2015) and Clotfelter et al. (2007) estimates are more relevant to our analysis.

over myriad school-level factors, such as climate and resource allocation. Further, given recent work suggesting that role model effects explain the benefits of teacher-student race match on Black students' educational attainment (Gershenson et al. 2019), role model effects could also be important for principal-student race matching, particularly given our suggestive finding that these match effects are more apparent among Black principals and students.

Discussion and Conclusions

This study provides strong evidence that racial diversity in the principal's office matters for racial diversity of a school's teaching force. Drawing on rich longitudinal administrative records from Missouri and Tennessee, we demonstrate—remarkably consistently across the two state contexts—that hiring a Black principal to lead a school substantially increases the number of Black teachers in that school in subsequent years, relative to what the composition would have been under a White principal.

Moreover, we find that these effects on composition come through both hiring and retention channels. In both states, switching from a White principal to a Black principal increases the probability that a newly hired teacher is Black (and vice versa). This increase appears to come partly from differences in how principals access their own networks in the hiring process. We do not find appreciable evidence that an increase in the likelihood of hiring a teacher from one's own racial group (for either Black or White principals) lowers the quality of new hires, suggesting that taste-based bias is unlikely to be a primary driver of the hiring results. Changes in the race of the school's leader also reduce turnover among teachers from the same racial background, though the results are nuanced, with own-race effects concentrated among Black teachers and principals in Tennessee but White teachers and principals in Missouri, on average. These average results are complicated by the principal turnover event itself and teachers'

responses to the race of the outgoing and incoming principal; in particular, in both states the positive impact of principal turnover on teacher turnover is even greater for teachers of a different race than the incoming principal. Principal race effects are concentrated on teacher moves rather than exits or switches to non-teaching positions. We also find that teachers give higher ratings to school leadership, school climate, and their own satisfaction in years in which they have a race-congruent principal, and some evidence (in Tennessee only) that there may be very small salary benefits to teachers as well.

These findings help bridge two bodies of existing research. First, we provide further evidence that principals affect teacher labor market outcomes. Principals exercise substantial influence over teaching hiring and are also instrumental in teacher retention decisions, which gives them substantial power to shape the composition of their school's workforce. However, little work to date has examined principals' human capital management in the context of race/ethnicity. Comparatively more work examines the importance of manager race/ethnicity for workers' labor market outcomes in other industries, such as manufacturing plants and retail stores. Our results generally confirm that the findings of these prior studies (e.g., Giuliano, Levine, and Leonard 2009, 2011) hold in K-12 public schools.

We also extend this work by examining how these impacts of leaders on personnel in turn affect students. The presence of a Black principal increases the likelihood that a Black student is taught by a Black teacher, which we show is driven by composition effects rather than differential assignment practices within the school. As in prior work, Black students have higher achievement under Black teachers, at least in math, though importantly we find positive effects of Black principals on Black student math achievement after the principal's first year that appear to operate through channels other than the indirect effect on the presence of Black teachers.

Identifying these channels with more detailed data on principal behaviors and school processes would be a useful endeavor for future research.

Our results may have implications for local school district policy. Our findings suggest that a strategy for increasing the numbers of teachers of color in a school is to hire principals of color, who will be more likely to hire and retain those teachers. In our data, increasing teacher diversity in schools with Black principals comes with no apparent loss with respect to measures of teacher quality. Moreover, outcomes for students of color appear to benefit from the presence of Black leaders, an important finding given longstanding concerns about outcome gaps between Black and White students. Increasing principal diversity may require more concerted efforts to strengthen the pipeline of people of color into school leadership (Castro, Germain, and Gooden 2018), given that, nationally, just 19% of principals are people of color (Grissom, Kern, and Rodriguez 2015).

The study faces several limitations. Perhaps most important is the generalizability of the current study. While our personnel results are strikingly similar between Missouri and Tennessee, these states are demographically similar and less diverse than the United States as a whole. Most notably, neither state has a significant number of Hispanic teachers, who comprise 8% of the national teacher workforce. Our results may not be representative of states with large numbers of non-White, non-Black teachers. The consistency of our results with other studies using national data suggest our results have some external validity (Grissom and Keiser 2011), but future work investigating these patterns in more racially and ethnically diverse states would be useful. Also, because our student results come from just one state, external validity may be even more of a concern.

Future work might also employ additional data sources to further investigate the mechanisms driving our results. Studies with teacher application data might better distinguish differences in teacher job-seeking from principals' hiring decisions as a means to explain own-race hiring patterns. Additional mechanisms driving differences in teacher turnover might include differences in how principals evaluate teachers from the same racial/ethnic background, job opportunities provided to those teachers (e.g., opportunities for teacher leadership), or intangible benefits, such as encouragement or job recognition. Future research might investigate effects of racial/ethnic congruence on other teacher outcomes, such as their instructional improvement over time.

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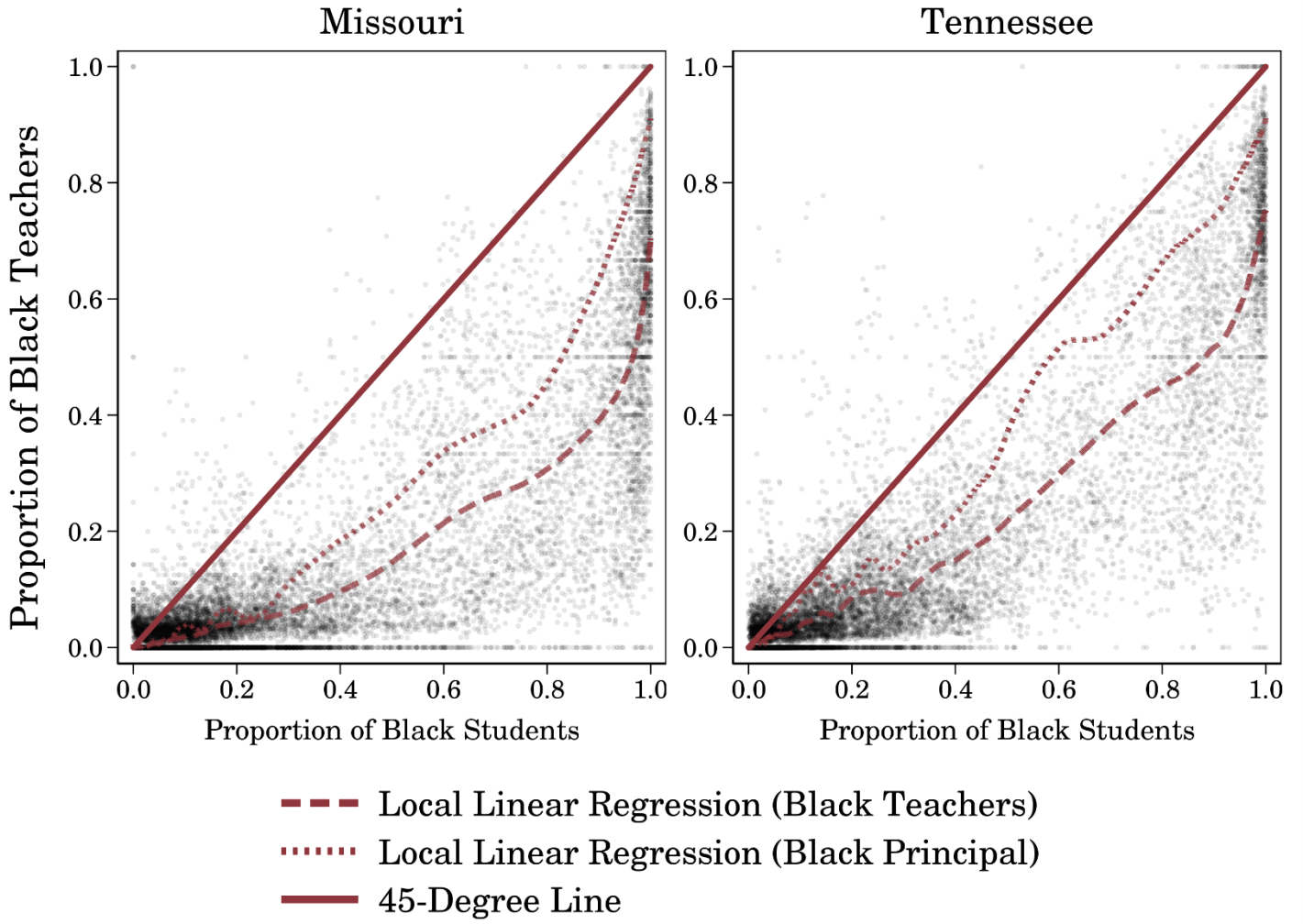
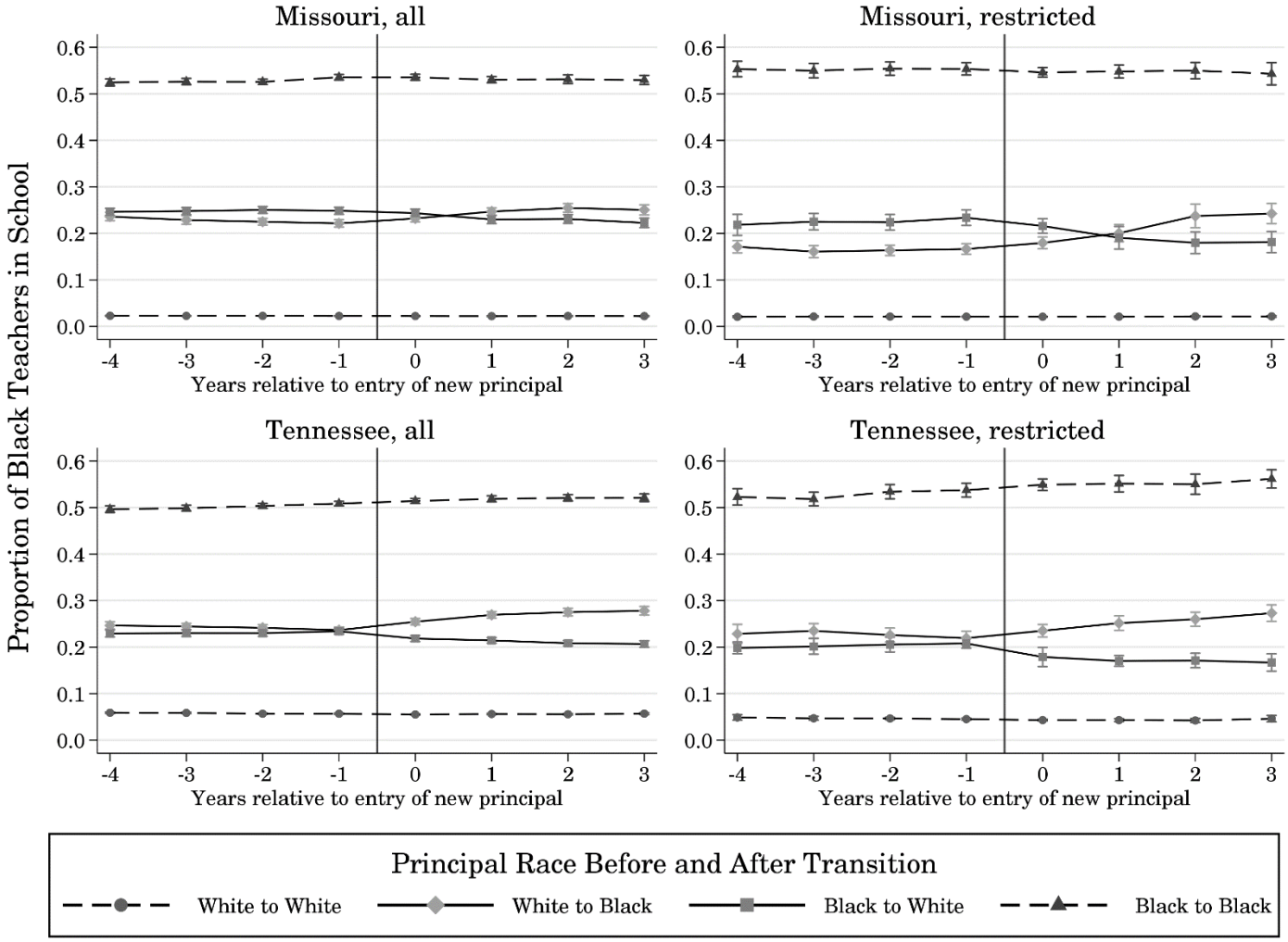
Figure 1: Representation Gaps Between Black Students and Black Teachers



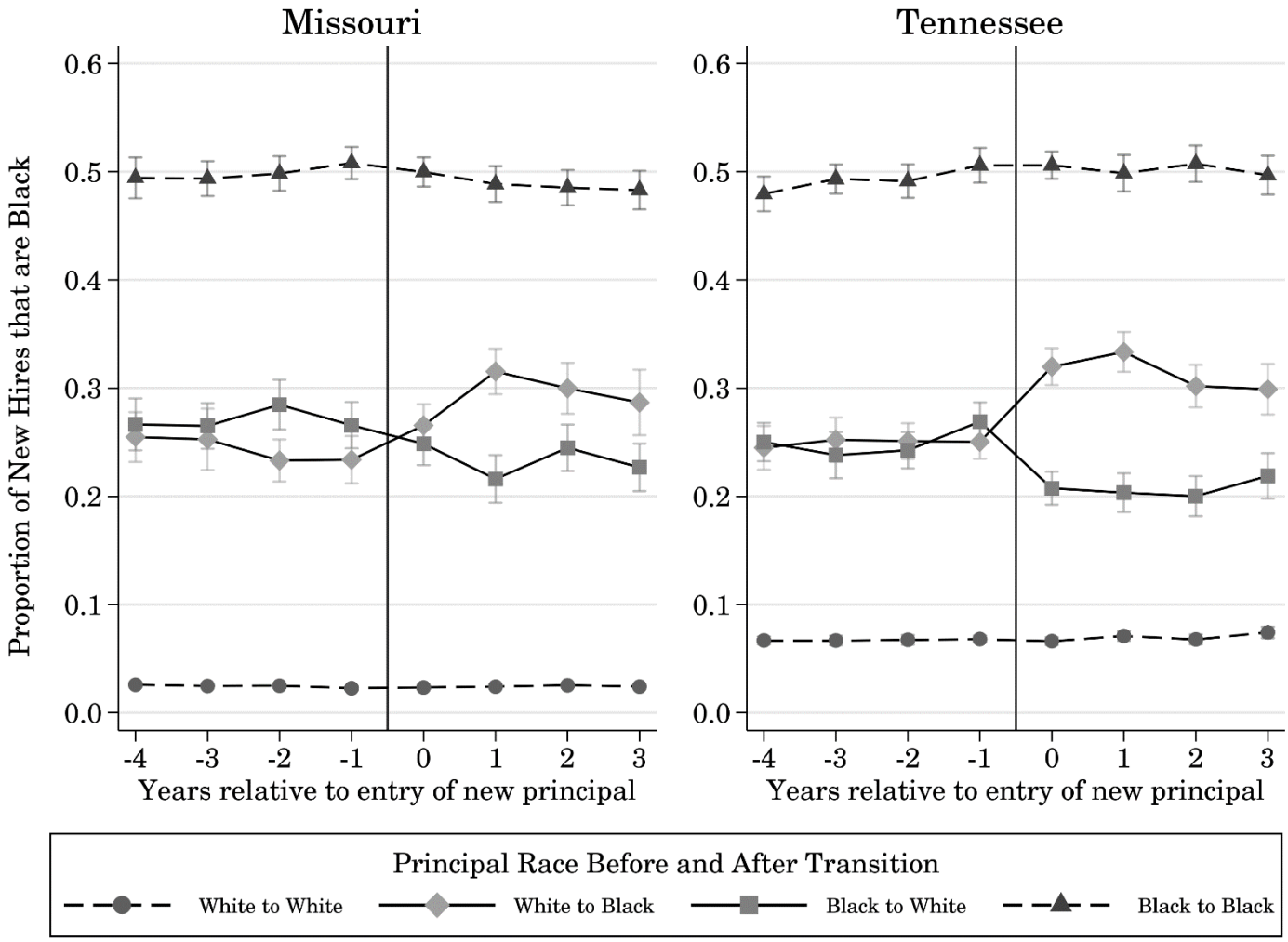
Notes: Each dot represents a school-by-year observation. Solid line represents equal proportions of Black students and Black teachers. The dashed line is a local linear regression that predicts the proportion of Black teachers in a school as a function of the proportion of Black students. The dotted line is a local linear regression that predicts the probability of having a Black principal in a school as a function of the proportion of Black students.

Figure 2: Teacher Racial Composition Before and After Principal Transitions



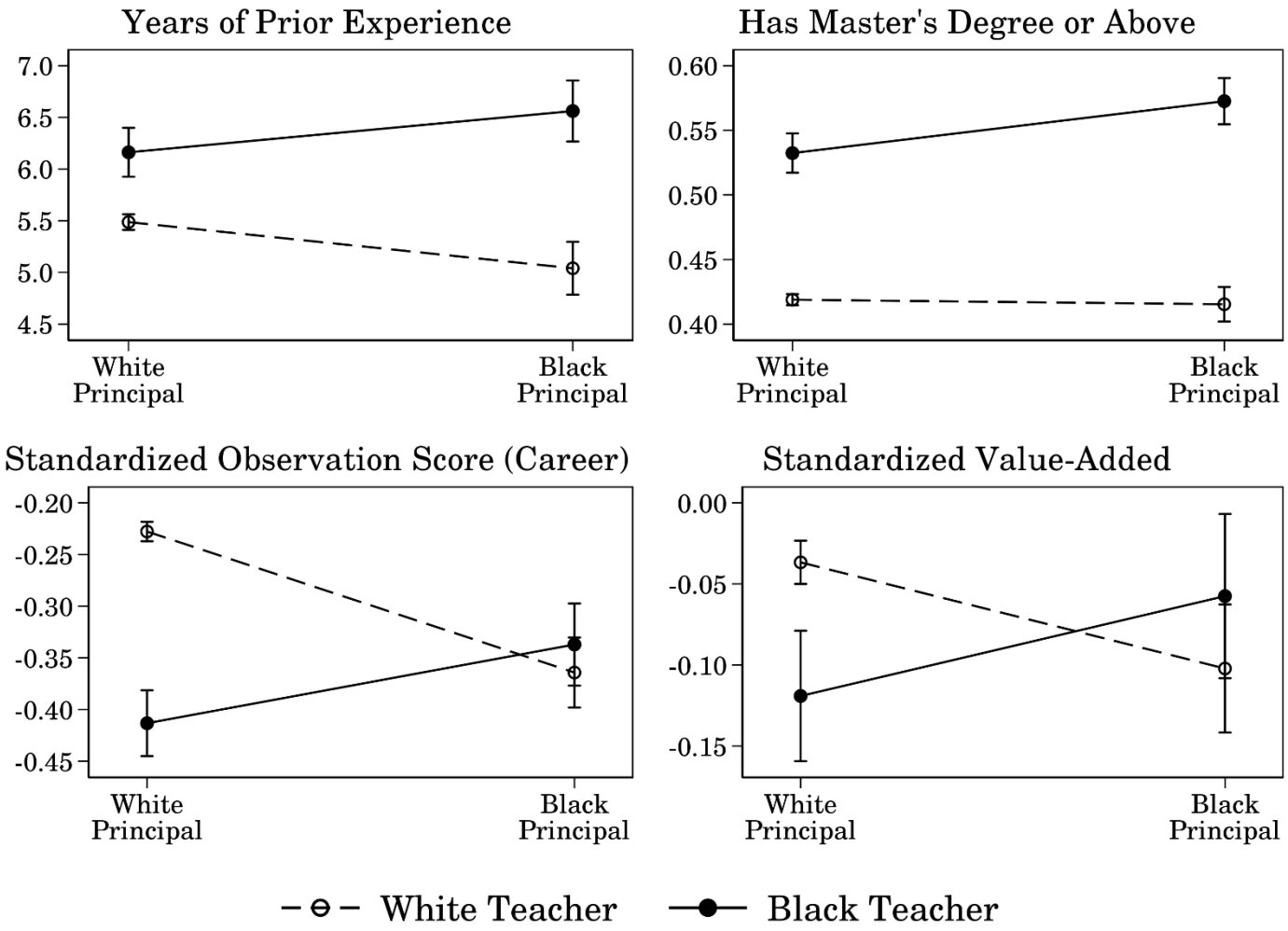
Notes: These figures plot event studies (8-year window) of the proportion of a school's newly hired teachers that are black by year. Models include school and year fixed effects. Left panels (all) include all principal transitions, such that school-by-year observations are duplicated by the total number of principal transitions across the data stream. Right panels (restricted) limit the sample to cases where the old and new principal each stayed at least four years in the school. Errors bars show 95% confidence intervals.

Figure 3: Proportion of Black Hires Before and After Principal Transitions



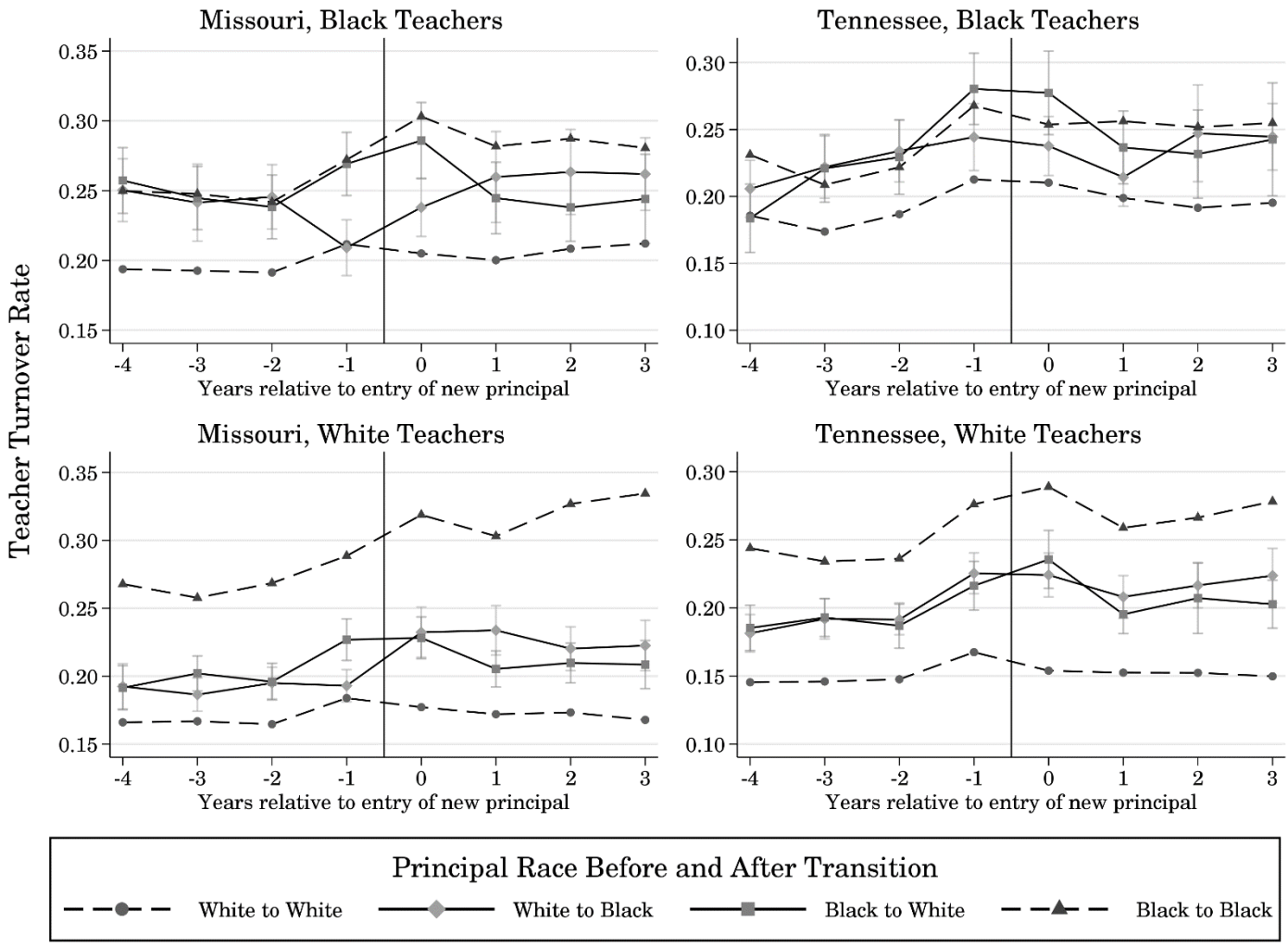
Notes: These figures plot event studies (8-year window) of the proportion of a school's newly hired teachers that are black by year. Sample includes all principal transitions between Black and White from Missouri and Tennessee, respectively. Models include school and year fixed effects. Schools with multiple principal transitions have a corresponding number of 8-year windows in the regression model. School-by-year observations are weighted by the number of new hires. Errors bars show 95% confidence intervals.

Figure 4: Qualifications and Effectiveness of New Hires by Teacher and Principal Race



Notes: These figures plot the predicted margins of the combination of teacher and principal race based on the results shown in Table 6 Panel B. Standardized value-added refers to the drift-adjusted VA measure (column 7). Specifically, the model predicts the given qualification/effectiveness measure of a newly hired teacher as a function of teacher race, principal race, and the interaction of teacher and principal race, with controls for time-varying school characteristics, school fixed effects, and year fixed effects. Error bars show 95% confidence intervals.

Figure 5: Teacher Turnover Before and After Principal Transitions



Notes: These figures plot event studies (8-year window) of the proportion of a school's Black and White teachers that leave their position. Sample includes all principal transitions between Black and White from Missouri and Tennessee, respectively. Models include school and year fixed effects. Schools with multiple principal transitions have a corresponding number of 8-year windows in the regression model. School-by-year observations are weighted by the number of Black or White teachers. Errors bars show 95% confidence intervals and are omitted for White to White and Black to Black lines for the sake of readability.

Table 1: Descriptive Statistics for Missouri and Tennessee Teachers

	Missouri					Tennessee				
	Mean	SD	Min	Max	N	Mean	SD	Min	Max	N
Teacher Characteristics										
White	0.94				1007707	0.88				690835
Black	0.06				1007707	0.12				690835
Male	0.22				1007700	0.21				690835
Years of Experience	10.9	8.7	0	57	1007707	12.6	10.3	0	63	682236
0 Years in Current School	0.16				1007707	0.16				690835
1-4 Years in Current School	0.36				1007707	0.36				690835
5+ Years in Current School	0.47				1007707	0.48				690835
Highest Degree is MA	0.51				1006899	0.48				679027
Highest Degree is Ed.S. or Doctorate	0.01				1006899	0.07				679027
Principal Characteristics										
White	0.91				1007707	0.83				690835
Black	0.09				1007707	0.17				690835
Male	0.54				1007707	0.48				684757
Years of Experience	17.4	8.3	0	56	1007707	23.3	9.3	0	66	687378
0 Years in Current School	0.13				1007707	0.15				690835
1-4 Years in Current School	0.39				1007707	0.49				690835
5+ Years in Current School	0.48				1007707	0.37				690835
Highest Degree is Ed.S.	0.30				1007501	0.27				687570
Highest Degree is Doctorate	0.16				1007501	0.13				687570
School Characteristics										
Proportion Black	0.17	0.27	0.00	1.00	1004590	0.23	0.29	0.00	1.00	689375
Proportion Hispanic/Latino	0.03	0.06	0.00	0.98	1004590	0.07	0.09	0.00	0.74	689375
Proportion FRPL	0.42	0.23	0.00	1.00	995367	0.53	0.26	0.00	1.00	689375
Enrollment (100s)	6.47	4.75	0.00	28.82	1005842	8.40	4.81	0.01	115.83	690483
Elementary School	0.46				1007495	0.52				690835
Middle School	0.20				1007495	0.18				690835
High School	0.31				1007495	0.26				690835
Other School	0.03				1007495	0.04				690835
Urban School	0.19				1007495	0.30				689229
Suburban School	0.32				1007495	0.18				689229
Town School	0.18				1007495	0.16				689229
Rural School	0.31				1007495	0.36				689229

Notes: For all variables, observations are at the teacher-by-year level. Missouri sample includes all Black and White teachers from 1999 to 2016. Tennessee sample includes all Black and White teachers from 2007 to 2017. Due to the very small number of non-Black, non-White educators in both states, we drop these teachers and principals from the analysis.

Table 2: Average Racial Composition of Teachers by Principal Race

	Missouri			Tennessee		
	All Principals	Black Principals	White Principals	All Principals	Black Principals	White Principals
All Teachers						
% who are Black	6.0	41.2	2.4	11.7	43.4	5.3
% who are White	94.0	58.8	97.6	88.3	56.6	94.7
New Hires						
% who are Black	8.5	42.3	3.1	14.7	44.4	6.3
% who are White	91.5	57.7	96.9	85.3	55.6	93.7

Notes: This table is constructed using the full analytic sample of teachers and principals from Tennessee and Missouri. New hires are defined as teachers who are in their first year in the given school, which includes brand-new teachers (i.e., those who have no prior teaching experience in the state) and teachers transferring from different school.

Table 3: Estimates of the Effect of Principal Race on the Racial Composition of the Teaching Staff

	Missouri				Tennessee			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Black Principal	0.035***	0.031***	0.023***	0.017***	0.040***	0.034***	0.019***	0.017***
	(0.005)	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.003)	(0.003)
Black Principal (next year)				0.001				0.000
				(0.004)				(0.003)
Black Principal (last year)				0.014***				0.010***
				(0.004)				(0.003)
Black Principal (two years ago)				0.009**				0.010***
				(0.004)				(0.003)
Black Principal (three years ago)				0.006**				0.009***
				(0.003)				(0.003)
Black Principal (four years ago)				0.007*				0.006*
				(0.004)				(0.003)
School Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District-by-Year Fixed Effects	No	Yes	Yes	Yes	No	Yes	Yes	Yes
School-Specific Trends	No	No	Yes	Yes	No	No	Yes	Yes
Observations	950995	950989	950989	850391	704474	704474	704474	604357
R^2	0.395	0.398	0.402	0.405	0.393	0.394	0.399	0.393

Notes: School-level clustered standard errors in parentheses. The unit of observation is teacher-by-year. In each column the dependent variable is an indicator for whether the teacher is Black. Models estimated via OLS. Models control for school demographics (enrollment size, proportion of Black students, proportion of Hispanic students, proportion of students qualifying for free/reduced-price lunch) and principal characteristics (categorical indicators for principal experience and tenure in school, indicator for Ed.S. degree, indicator for Ph.D. degree, flag for male gender).Columns 1 and 5 include year fixed effects in lieu of district-by-year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Estimates of the Effect of Principal Race on the Probability that a Newly Hired Teacher is Black

	Missouri			Tennessee		
	(1)	(2)	(3)	(4)	(5)	(6)
Black Principal	0.070***	0.063***	0.053***	0.077***	0.075***	0.066***
	(0.009)	(0.009)	(0.009)	(0.008)	(0.008)	(0.009)
School Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
District-by-Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
School-Specific Trends	No	No	Yes	No	No	Yes
Observations	150829	150829	150829	108258	108258	108258
R^2	0.376	0.392	0.404	0.373	0.377	0.390

Notes: School-level clustered standard errors in parentheses. The unit of observation is teacher-by-year. In each column the dependent variable is an indicator for whether the teacher is Black. Models estimated via OLS. Models control for school demographics (enrollment size, proportion of Black students, proportion of Hispanic students, proportion of students qualifying for free/reduced-price lunch) and principal characteristics (categorical indicators for principal experience and tenure in school, indicator for Ed.S. degree, indicator for Ph.D. degree, flag for male gender).Columns 1 and 4 include year fixed effects in lieu of district-by-year fixed effects.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Examining Heterogeneity in the Effect of Principal Race on the Probability that a Newly Hired Teacher is Black

	Missouri		Tennessee	
	Coef.	Pr > F	Coef.	Pr > F
Panel A				
Not New to State x Black Principal	0.067***		0.088***	
	(0.010)	< 0.01	(0.010)	< 0.01
New to State x Black Principal	0.027**		0.036***	
	(0.010)		(0.010)	
Panel B				
Not New to District x Black Principal	0.051***		0.088***	
	(0.014)	0.52	(0.013)	0.68
New to District x Black Principal	0.042***		0.093***	
	(0.015)		(0.015)	
Panel C				
Not In Teacher's Network x Black Principal	0.046***		0.087***	
	(0.014)	0.98	(0.013)	0.43
In Teacher's Network x Black Principal	0.046***		0.097***	
	(0.016)		(0.015)	
Panel D				
Not In Principal's Network x Black Principal	0.039***		0.086***	
	(0.013)	< 0.01	(0.012)	0.01
In Principal's Network x Black Principal	0.127***		0.155***	
	(0.031)		(0.029)	

Notes: School-level clustered standard errors in parentheses. The dependent variable is a binary indicator for whether the newly hired teacher is Black. Models estimated via OLS. Panel A includes all new hires, while the remaining panels include new hires with previous experience in the state education system. Teacher Network is an indicator for whether the new hire previously worked with any teachers in the new school. Principal Network is an indicator for whether the new hire worked previously with the hiring principal in a different school. All models include: school fixed effects; school-specific trends; district-by-year fixed effects; controls for time-varying school characteristics and principal characteristics; interactions between the grouping variable (new to state, new to district, in teacher's network, in principal's network) and all control variables. In the effective sample in Missouri (Tennessee), 43% (46%) of new hires are new-to-state; among transfers, 49% (32%) are from a different district, 39% (37%) have a teacher connection, and 6% (7%) have a principal connection.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Predicting Characteristics of New Hires in Tennessee

	Qualifications		Classroom Observations (SD)			Value Added (SD)	
	Total Experience	MA or above	Prior	Current	Career	Career TVAAS	Drift-Adjusted
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A							
Black Principal	-0.148	0.018**	-0.068	-0.097	-0.087***	-0.018	-0.031
	(0.159)	(0.009)	(0.048)	(0.063)	(0.020)	(0.029)	(0.025)
Panel B							
Black Principal x Black Teacher	0.399*	0.040***	0.126*	0.106	0.076***	0.090**	0.062*
	(0.213)	(0.013)	(0.065)	(0.072)	(0.028)	(0.037)	(0.034)
White Principal x White Teacher	0.447***	0.004	0.126***	0.156**	0.136***	0.058*	0.065**
	(0.165)	(0.009)	(0.048)	(0.064)	(0.021)	(0.030)	(0.026)
Black Teacher	1.122***	0.117***	-0.106*	0.027	-0.049*	-0.045	-0.017
	(0.199)	(0.011)	(0.057)	(0.070)	(0.027)	(0.036)	(0.029)
Observations	110656	106776	22425	33291	84820	34658	48526

Notes: School-level clustered standard errors in parentheses. In each column, the unit of observation is teacher-by-year. The dependent variable is listed above the column number. Models estimated via OLS. Models include school and year fixed effects and school characteristics. MA or above is an indicator for having a master's degree or other advanced degree. Classroom observation scores come from Tennessee's teacher evaluation system first implemented in the 2011–12 school year. Prior scores are a teacher's average observation and value added scores from all prior years. Current scores are teachers' scores in the first year at their new school. Career scores are teachers' average scores in all available years of data. Career TVAAS are teacher-level averages of one-year TVAAS estimates available beginning in 2007–08; for teachers with estimates for multiple subjects, we create an average score that is inversely weighted by the standard error of the estimate for an individual subject (math, reading, science, or social studies). Drift-adjusted value-added measure are constructed using the approach outlined in Chetty, Friedman, and Rockoff (2014). In Panel B, the difference between the Black Principal x Black Teacher and White Principal x White Teacher coefficients is not statistically significant except for column 2 ($p < 0.05$). The Black Principal x Black Teacher and White Principal x White Teacher coefficients are jointly significant in all columns ($p < 0.01$).

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Average Teacher Turnover Rates by Principal Race

	Missouri			Tennessee		
	All Principals	Black Principals	White Principals	All Principals	Black Principals	White Principals
Panel A: All Teacher Turnover						
Black Teachers (%)	28.0	30.8	23.2	22.3	23.6	20.1
White Teachers (%)	17.2	27.2	16.6	15.9	23.2	15.0
Panel B: Exit Education System						
Black Teachers (%)	14.3	15.5	12.1	8.3	8.1	8.5
White Teachers (%)	8.5	14.0	8.2	7.8	10.9	7.4
Panel C: Within-District Move						
Black Teachers (%)	8.3	9.5	6.3	10.5	12.1	7.9
White Teachers (%)	4.1	7.5	3.9	4.8	8.3	4.4
Panel D: Across-District Move						
Black Teachers (%)	2.8	3.1	2.4	1.9	1.8	2.1
White Teachers (%)	3.3	4.3	3.2	2.2	2.8	2.1
Panel E: Change Positions						
Black Teachers (%)	2.4	2.5	2.3	1.6	1.6	1.6
White Teachers (%)	1.3	1.2	1.3	1.2	1.2	1.2

Notes: This table is constructed using the full analytic sample of teachers and principals from Tennessee and Missouri.

Table 8: Estimates of the Effect of Principal Race on the Probability of Teacher Turnover

	Missouri			Tennessee		
	(1)	(2)	(3)	(4)	(5)	(6)
Black Principal x Black Teacher	-0.011	-0.013	-0.004	-0.025**	-0.036***	-0.037***
	(0.009)	(0.010)	(0.010)	(0.011)	(0.011)	(0.010)
White Principal x White Teacher	-0.022***	-0.021***	-0.026***	-0.014**	-0.003	-0.010
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)
p-value (coefficients are equal)	0.40	0.60	0.15	0.49	0.04	0.07
p-value (jointly zero)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Teacher Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
District-by-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
School Fixed Effects	No	Yes	Yes	No	Yes	Yes
School-Specific Trends	No	No	Yes	No	No	Yes
Observations	924233	924229	924229	605125	605882	605882
R^2	0.257	0.268	0.277	0.277	0.297	0.309

Notes: School-level clustered standard errors in parentheses. The unit of observation is teacher-by-year. In each column the dependent variable is an indicator for whether the teacher left their position between year t and t+1. Models estimated via OLS. Models control for school demographics (enrollment size, proportion of Black students, proportion of Hispanic students, proportion of students qualifying for free/reduced-price lunch) and principal characteristics (categorical indicators for principal experience and tenure in school, indicator for Ed.S. degree, indicator for Ph.D. degree, flag for male gender), and interactions between teacher race and all other controls.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: The Effect of Principal Race with Controls for Principal Turnover

	Missouri				Tennessee			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Black Principal x Black Teacher	-0.028**	-0.004	-0.025**	-0.028***	-0.057***	-0.037***	-0.065***	-0.056***
	(0.012)	(0.010)	(0.011)	(0.010)	(0.014)	(0.011)	(0.012)	(0.012)
White Principal x White Teacher	-0.020**	-0.024***	-0.015**	-0.020***	-0.009	-0.009	-0.000	-0.009
	(0.008)	(0.007)	(0.007)	(0.007)	(0.009)	(0.006)	(0.007)	(0.008)
Prin Turnover		0.031***				0.030***		
		(0.002)				(0.003)		
Prin Turnover x White Tch x White Prin			0.026***				0.022***	
			(0.002)				(0.003)	
Prin Turnover x White Tch x Black Prin			0.051***				0.042***	
			(0.009)				(0.009)	
Prin Turnover x Black Tch x White Prin			0.021**				0.018*	
			(0.009)				(0.009)	
Prin Turnover x Black Tch x Black Prin			0.075***				0.099***	
			(0.010)				(0.011)	
Prin Turnover x White Tch x White Prin x White Prin Next				0.015***				0.015***
				(0.002)				(0.003)
Prin Turnover x White Tch x White Prin x Black Prin Next				0.026***				0.022**
				(0.008)				(0.009)
Prin Turnover x White Tch x Black Prin x White Prin Next				0.015				0.007
				(0.011)				(0.011)
Prin Turnover x White Tch x Black Prin x Black Prin Next				0.023**				0.049***
				(0.010)				(0.011)
Prin Turnover x Black Tch x White Prin x White Prin Next				-0.003				0.023**
				(0.010)				(0.010)
Prin Turnover x Black Tch x White Prin x Black Prin Next				-0.030**				-0.020
				(0.015)				(0.017)
Prin Turnover x Black Tch x Black Prin x White Prin Next				0.040**				0.061***
				(0.018)				(0.017)
Prin Turnover x Black Tch x Black Prin x Black Prin Next				0.024***				0.056***
				(0.009)				(0.010)
Drop Principal Turnover Years?	Yes	No	No	No	Yes	No	No	No
Observations	729651	924229	924229	888004	496131	605882	605882	595991
R^2	0.282	0.278	0.278	0.263	0.321	0.310	0.310	0.299

Notes: School-level clustered standard errors in parentheses. The unit of observation is teacher-by-year. In each column the dependent variable is an indicator for whether the teacher left their position between year t and t+1. Models estimated via OLS. Models include: fixed effects for teacher, school, and district-by-year; school-specific trends; school demographics (enrollment size, proportion of Black students, proportion of Hispanic students, proportion of students qualifying for free/reduced-price lunch) and principal characteristics (categorical indicators for principal experience and tenure in school, indicator for Ed.S. degree, indicator for Ph.D. degree, flag for male gender), and interactions between teacher race and all other controls. The Black Principal x Black Teacher and White Principal x White Teacher coefficients are significantly different in model 5 ($p = 0.01$), model 6 ($p = 0.07$), model 7 ($p < 0.001$), and model 8 ($p = 0.005$). The Black Principal x Black Teacher and White Principal x White Teacher coefficients are jointly significant in all models ($p < 0.001$). Prin = Principal, Tch = Teacher, Prin Next refers to the principal in the school in year t+1.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Examining Differences in the Effect of Teacher-Principal Race Match on Types of Teacher Turnover

	Missouri				Tennessee			
	Exit System	Within District Move	Across District Move	Position Change	Exit System	Within District Move	Across District Move	Position Change
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Black Principal x Black Teacher	-0.012	-0.018**	-0.012**	0.003	-0.014	-0.046***	-0.016***	-0.002
	(0.008)	(0.008)	(0.005)	(0.004)	(0.009)	(0.011)	(0.005)	(0.003)
White Principal x White Teacher	-0.010	-0.011**	-0.004	-0.002	0.007	-0.016**	0.001	0.001
	(0.007)	(0.005)	(0.003)	(0.002)	(0.005)	(0.006)	(0.003)	(0.002)
p-value (coefficients are equal)	0.87	0.52	0.18	0.31	0.07	0.05	0.003	0.46
p-value (jointly zero)	0.02	<0.001	0.02	0.49	0.20	<0.001	0.01	0.75
Controls for Principal Turnover	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Teacher Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District-by-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
School Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
School-Specific Trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	809904	770402	763172	746816	543246	529326	511337	505111
R^2	0.272	0.265	0.288	0.278	0.314	0.291	0.319	0.295

Notes: School-level clustered standard errors in parentheses. The unit of observation is teacher-by-year. In each column the dependent variable is an indicator for the turnover type listed in the header. All models are relative to the base category of stayers, such that teachers who turned over in a different category than listed in the header are not included in the model. Models estimated via OLS. Models include: fixed effects for teacher, school, and district-by-year; school-specific trends; school demographics (enrollment size, proportion of Black students, proportion of Hispanic students, proportion of students qualifying for free/reduced-price lunch) and principal characteristics (categorical indicators for principal experience and tenure in school, indicator for Ed.S. degree, indicator for Ph.D. degree, flag for male gender), and interactions between teacher race and all other controls. The controls for principal turnover follow the fully saturated specification show in columns 4 and 8 in Table 9. Appendix Table 5 shows the results without controlling for principal turnover.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: The Effect of Principal Race on Teacher Salary, Satisfaction, and Climate

	Missouri	Tennessee			
	Total Salary (1000s)	Total Salary (1000s)	Satisfaction (SD)	Leadership Perception (SD)	Climate Perception (SD)
	(1)	(2)	(3)	(4)	(5)
Black Principal x Black Teacher	0.097	0.041	0.162*	0.181*	0.126
	(0.098)	(0.087)	(0.094)	(0.097)	(0.087)
White Principal x White Teacher	0.024	0.067*	0.161***	0.047	0.081
	(0.052)	(0.040)	(0.061)	(0.087)	(0.079)
p-value (coefficients are equal)	0.52	0.81	0.99	0.45	0.78
p-value (jointly zero)	0.54	0.14	<0.001	<0.001	<0.001
Teacher Fixed Effects	Yes	Yes	Yes	No	No
District-by-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
School Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	962112	603656	105282	80073	80494
R^2	0.961	0.942	0.651	0.181	0.173

School-level clustered standard errors in parentheses. The dependent variable is listed in the column header. Models estimated via OLS. Models control for school demographics, principal characteristics, teacher characteristics, and interactions between teacher race and all school and principal controls. In both states, salary is available for all years. In Tennessee, teacher survey responses for satisfaction are available beginning in the 2011–12 school year. Leadership and climate perception are available beginning in 2014–15. Each of these measures are constructed using factor analysis to collapse multiple survey items into a single standardized score.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: The Effect of Principal Race on Assignment to a Black Teacher

	DV = Math Teacher is Black		DV= Reading Teacher is Black	
	(1)	(2)	(3)	(4)
Black Principal	0.049***	0.029**	0.041***	0.030***
	(0.011)	(0.012)	(0.010)	(0.011)
Black Principal x 2nd-3rd Year in School		0.019*		0.015
		(0.010)		(0.009)
Black Principal x 4th-5th Year in School		0.033**		0.017
		(0.014)		(0.013)
Black Principal x 6th+ Year in School		0.041**		0.016
		(0.016)		(0.013)
Observations	3006540	3006540	4122756	4122756
R^2	0.609	0.609	0.571	0.571

School-level clustered standard errors in parentheses. Unit of observation is student-by-year. The dependent variable is a binary indicator for whether the student's assigned teacher in the given subject is Black. Models estimated via OLS. For students with multiple teacher assignments in a given year, the student has multiple observations that are weighted by the percentage claim of each teacher. Models include: school-by-grade-by-race fixed effects, prior-year test scores and attendance, student characteristics, school characteristics, grade characteristics, principal tenure in school, and year fixed effects. Additionally, we control for interactions between student race and all school- and grade-level controls.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 13: Do Principals Improve the Achievement of Same-Race Students?

	Math Achievement			Reading Achievement		
	(1)	(2)	(3)	(4)	(5)	(6)
Black Principal	-0.012	0.006	0.004	-0.005	-0.000	-0.000
	(0.011)	(0.013)	(0.013)	(0.006)	(0.008)	(0.008)
Black Principal x Black Student	0.019	-0.022	-0.021	0.003	-0.005	-0.005
	(0.013)	(0.017)	(0.017)	(0.007)	(0.010)	(0.010)
Black Principal x 2nd-3rd Year in School x Black Student		0.042**			0.019	
		(0.019)			(0.012)	
Black Principal x 4th-5th Year in School x Black Student		0.070***			0.005	
		(0.024)			(0.013)	
Black Principal x 6th+ Year in School x Black Student		0.068**			0.003	
		(0.031)			(0.014)	
Black Principal x 2nd+ Year in School x Black Student			0.056***			0.012
			(0.019)			(0.010)
Observations	3006540	3006540	3006540	4122756	4122756	4122756
R^2	0.618	0.618	0.618	0.646	0.646	0.646

Notes: School-level clustered standard errors in parentheses. In the first three columns, the dependent variable is a student's math test score, standardized within subject, grade, and year. The last three columns show the same score for reading. Models estimated via OLS. Models include: school-by-grade-by-race fixed effects, prior-year test scores and attendance, student characteristics, school characteristics, grade characteristics, principal tenure in school, and year fixed effects. Additionally, we control for interactions between student race and all school- and grade-level controls. "Year in school" variables refer to the number of years the principal has worked in the school as the principal, with the omitted category being "1st year in school."

* p < 0.10, ** p < 0.05, *** p < 0.01

Table 14: Race-Specific Estimates of Principal-Student Race-Match Effects on Achievement

	Math Achievement			Reading Achievement		
	(1)	(2)	(3)	(4)	(5)	(6)
Black Matches (Black Principal x Black Student)						
Match	0.007	-0.016	-0.017	-0.002	-0.005	-0.005
	(0.013)	(0.016)	(0.016)	(0.006)	(0.008)	(0.008)
Match x Prin 2nd-3rd Year in Sch		0.034**			0.020*	
		(0.016)			(0.011)	
Match x Prin 4th-5th Year in Sch		0.048**			0.006	
		(0.021)			(0.011)	
Match x Prin 6th+ Year in Sch		0.062**			0.007	
		(0.028)			(0.013)	
Match x Prin 2nd+ Year in Sch			0.045***			0.014
			(0.017)			(0.010)
White Matches (White Principal x White Student)						
Match	0.012	-0.006	-0.004	0.005	0.000	0.000
	(0.011)	(0.013)	(0.013)	(0.006)	(0.008)	(0.008)
Match x Prin 2nd-3rd Year in Sch		0.008			-0.001	
		(0.009)			(0.005)	
Match x Prin 4th-5th Year in Sch		0.022**			-0.001	
		(0.010)			(0.005)	
Match x Prin 6th+ Year in Sch		0.006			-0.005	
		(0.011)			(0.005)	
Match x Prin 2nd+ Year in Sch			0.011			-0.002
			(0.008)			(0.004)
Observations	3006540	3006540	3006540	4122756	4122756	4122756
R^2	0.618	0.618	0.618	0.646	0.646	0.646

Notes: School-level clustered standard errors in parentheses. In the first three columns, the dependent variable is a student's math test score, standardized within subject, grade, and year. The last three columns show the same score for reading. Models estimated via OLS. Models include: school-by-grade-by-race fixed effects, prior-year test scores and attendance, student characteristics, school characteristics, grade characteristics, principal tenure in school, and year fixed effects. Additionally, we control for interactions between student race and all school- and grade-level controls. "Year in school" variables refer to the number of years the principal has worked in the school as the principal, with the omitted category being "1st year in school." "Match" refers to either "Black Principal x Black Student" or "White Principal x White Student."

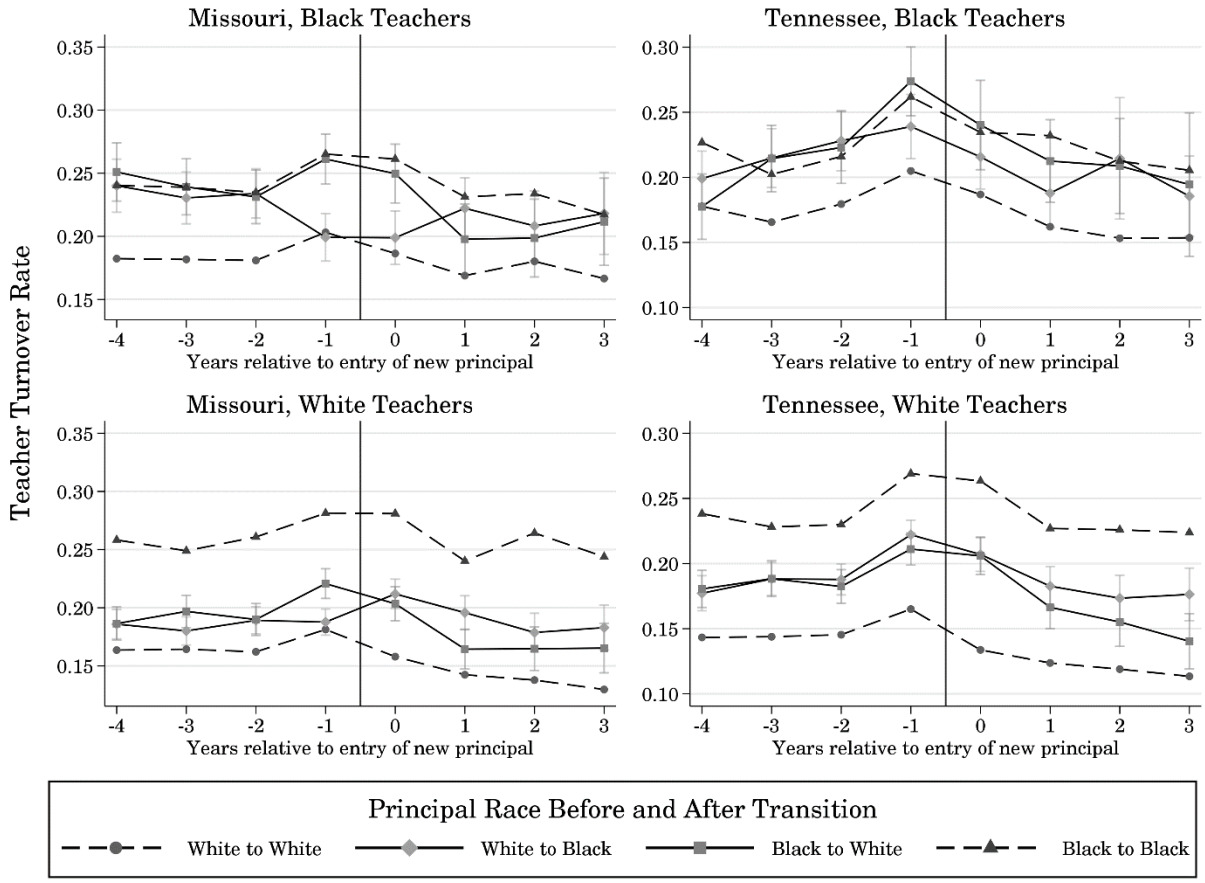
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 15: Does Teacher Composition Explain the Benefits of Having a Same-Race Principal?

	Math Achievement				Reading Achievement			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Black Principal x Black Student x Prin 2nd+ Year in Sch	0.053***	0.052***	0.045**	0.044**	0.016	0.016	0.013	0.013
	(0.020)	(0.020)	(0.019)	(0.019)	(0.011)	(0.011)	(0.011)	(0.011)
Black Principal x Black Student	-0.017	-0.018	-0.022	-0.022	-0.006	-0.006	-0.005	-0.005
	(0.017)	(0.017)	(0.016)	(0.016)	(0.010)	(0.010)	(0.010)	(0.010)
Black Principal	0.002	0.002	0.005	0.005	0.000	0.001	0.000	0.000
	(0.013)	(0.013)	(0.012)	(0.012)	(0.008)	(0.008)	(0.009)	(0.009)
Black Teacher		-0.021**		-0.015**		-0.011**		-0.012***
		(0.010)		(0.006)		(0.004)		(0.004)
Black Teacher x Black Student		0.035***		0.021***		0.007		0.004
		(0.012)		(0.007)		(0.006)		(0.005)
Teacher Value-Added			0.109***	0.109***			0.040***	0.040***
			(0.001)	(0.001)			(0.001)	(0.001)
Teacher First Year in Sch			-0.039***	-0.039***			-0.022***	-0.021***
			(0.004)	(0.004)			(0.002)	(0.002)
Teacher Exp = 1 years			0.039***	0.039***			0.014***	0.014***
			(0.006)	(0.006)			(0.004)	(0.004)
Teacher Exp = 2 years			0.056***	0.056***			0.018***	0.019***
			(0.007)	(0.007)			(0.004)	(0.004)
Teacher Exp = 3 years			0.050***	0.050***			0.018***	0.018***
			(0.007)	(0.007)			(0.004)	(0.004)
Teacher Exp = 4 years			0.055***	0.055***			0.026***	0.026***
			(0.007)	(0.007)			(0.004)	(0.004)
Teacher Exp = 5 years			0.058***	0.058***			0.013***	0.013***
			(0.007)	(0.007)			(0.004)	(0.004)
Teacher Exp = 6-10 years			0.049***	0.048***			0.020***	0.021***
			(0.006)	(0.006)			(0.003)	(0.003)
Teacher Exp = 11-15 years			0.051***	0.051***			0.018***	0.018***
			(0.006)	(0.006)			(0.004)	(0.004)
Teacher Exp = 16+ years			0.043***	0.043***			0.019***	0.019***
			(0.006)	(0.006)			(0.004)	(0.004)
Observations	2766784	2766784	2766784	2766784	3812211	3812211	3812211	3812211
R^2	0.617	0.617	0.628	0.628	0.644	0.644	0.645	0.645

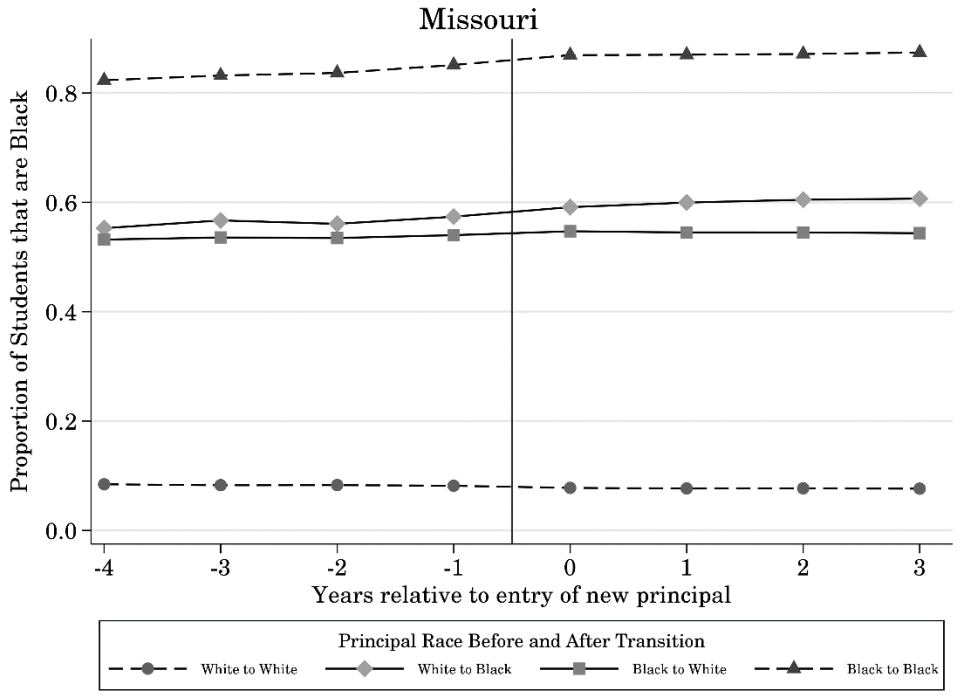
Notes: School-level clustered standard errors in parentheses. In the first four columns, the dependent variable is a student's math test score, standardized within subject, grade, and year. The last four columns show the same score for reading. Models estimated via OLS. Models include: school-by-grade-by-race fixed effects, prior-year test scores and attendance, student characteristics, school characteristics, grade characteristics, principal tenure in school, and year fixed effects. Additionally, we control for interactions between student race and all school- and grade-level controls. "Year in school" variables refer to the number of years the principal has worked in the school as the principal, with the omitted category being "1st year in school." "Match" refers to either "Black Principal x Black Student" or "White Principal x White Student." Teacher value-added calculated using the leave-year-out, drift-adjusted approach outlined in Chetty, Friedman, & Rockoff (2014).

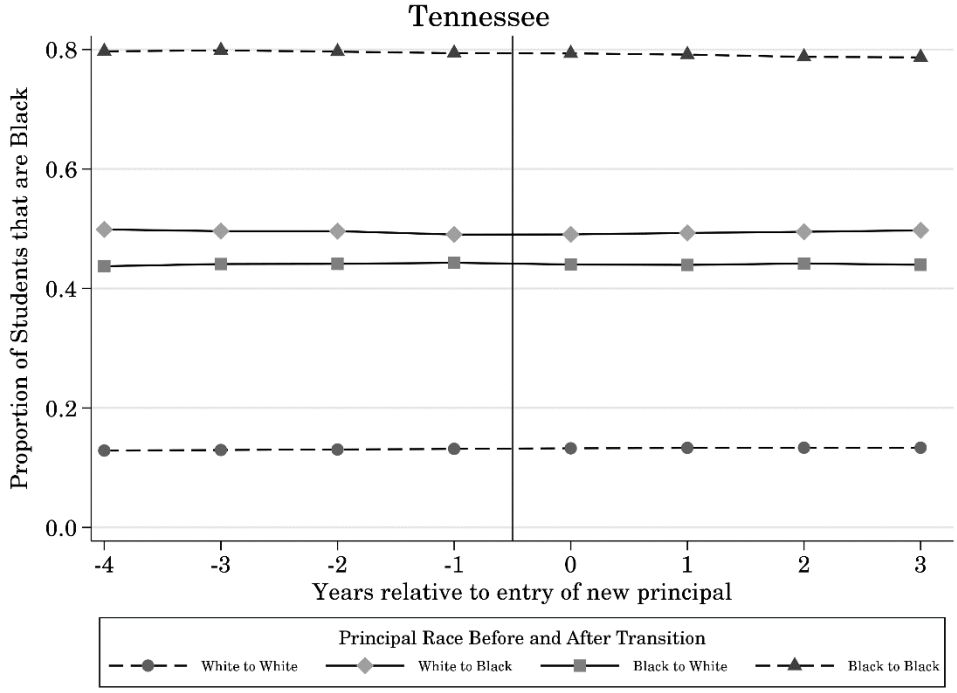
Appendix Figure 1: Teacher Turnover Before and After Principal Transitions (Returning Teachers Only)



Notes: These figures plot event studies (8-year window) of the proportion of a school's Black and White teachers that leave their position. Teachers who were hired by the new principal (i.e., in year 0 or later) are dropped. Sample includes all principal transitions between Black and White from Missouri and Tennessee, respectively. Models include school and year fixed effects. Schools with multiple principal transitions have a corresponding number of 8-year windows in the regression model. School-by-year observations are weighted by the number of Black or White teachers (not counting teachers who were dropped).

Appendix Figure 2: Black Student Composition Before and After Principal Turnover





Notes: These figures plot event studies (8-year window) of the proportion of a school's students that are black by year. Models include school and year fixed effects. Plots include all principal transitions, such that school-by-year observations are duplicated by the total number of principal transitions across the data stream. Errors bars show 95% confidence intervals.

Appendix Table 1: Predicting Racial Composition of Teaching Staff with Leads and Lags

	Missouri			Tennessee		
	(1)	(2)	(3)	(4)	(5)	(6)
Black Principal (t + 3)	0.002	0.001	-0.001	-0.001	-0.003	-0.004
	(0.005)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Black Principal (t + 2)	0.003	0.002	0.004	-0.001	-0.003	-0.003
	(0.005)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Black Principal (t + 1)	-0.004	-0.004	-0.002	0.005	0.004	0.000
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
Black Principal	0.016***	0.016***	0.016***	0.024***	0.022***	0.019***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Black Principal (t - 1)	0.010***	0.008**	0.009**	0.011***	0.011***	0.009**
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)
Black Principal (t - 2)	0.010**	0.009***	0.009**	0.011***	0.011***	0.007**
	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)
Black Principal (t - 3)	0.009**	0.008**	0.003	0.002	0.002	0.004
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Black Principal (t - 4)	0.007*	0.006	0.003	0.012***	0.007*	0.004
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
School Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
District-by-Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
School-Specific Trends	No	No	Yes	No	No	Yes
Observations	721531	721531	721531	458853	458853	458853
R^2	0.406	0.409	0.412	0.383	0.383	0.387

Notes: School-level clustered standard errors in parentheses. The unit of observation is teacher-by-year. In each column the dependent variable is an indicator for whether the teacher is Black. Models estimated via OLS. Models control for school demographics (enrollment size, proportion of Black students, proportion of Hispanic students, proportion of students qualifying for free/reduced-price lunch) and principal characteristics (categorical indicators for principal experience and tenure in school, indicator for Ed.S. degree, indicator for Ph.D. degree, flag for male gender).Columns 1 and 4 include year fixed effects in lieu of district-by-year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 2: Predicting Black Hires with Leads and Lags

	Missouri			Tennessee		
	(1)	(2)	(3)	(4)	(5)	(6)
Black Principal (t + 3)	0.013	0.005	0.006	0.008	0.006	-0.010
	(0.014)	(0.012)	(0.014)	(0.010)	(0.011)	(0.015)
Black Principal (t + 2)	0.009	0.015	0.019	0.001	-0.001	-0.012
	(0.016)	(0.015)	(0.016)	(0.012)	(0.012)	(0.014)
Black Principal (t + 1)	-0.008	-0.012	-0.007	0.008	0.009	-0.009
	(0.013)	(0.014)	(0.015)	(0.011)	(0.011)	(0.014)
Black Principal	0.036***	0.039***	0.036**	0.075***	0.073***	0.056***
	(0.013)	(0.014)	(0.014)	(0.011)	(0.011)	(0.013)
Black Principal (t - 1)	0.048***	0.041***	0.039**	-0.003	-0.001	-0.018
	(0.014)	(0.016)	(0.016)	(0.011)	(0.011)	(0.015)
Black Principal (t - 2)	-0.010	-0.012	-0.012	0.005	0.001	-0.015
	(0.013)	(0.013)	(0.014)	(0.012)	(0.013)	(0.015)
Black Principal (t - 3)	0.011	0.010	0.005	-0.007	-0.004	-0.005
	(0.015)	(0.014)	(0.015)	(0.012)	(0.012)	(0.015)
Black Principal (t - 4)	0.002	-0.006	-0.008	0.020*	0.018	0.006
	(0.013)	(0.013)	(0.014)	(0.011)	(0.012)	(0.016)
School Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
District-by-Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
School-Specific Trends	No	No	Yes	No	No	Yes
Observations	106853	106853	106853	70735	70735	70735
R^2	0.387	0.403	0.415	0.370	0.375	0.389

Notes: School-level clustered standard errors in parentheses. The unit of observation is teacher-by-year. In each column the dependent variable is an indicator for whether the teacher is Black. Models estimated via OLS. Models control for school demographics (enrollment size, proportion of Black students, proportion of Hispanic students, proportion of students qualifying for free/reduced-price lunch) and principal characteristics (categorical indicators for principal experience and tenure in school, indicator for Ed.S. degree, indicator for Ph.D. degree, flag for male gender). Columns 1 and 4 include year fixed effects in lieu of district-by-year fixed effects.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 3: Does Having More Black Principals Increase the Number of Black Teachers in a District?

	Missouri			Tennessee		
	(1)	(2)	(3)	(4)	(5)	(6)
Proportion of Black Principals	0.054**	0.060***	0.061***	0.075**	0.075**	0.075
	(0.024)	(0.022)	(0.023)	(0.037)	(0.037)	(0.060)
District Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls	No	Yes	Yes	No	Yes	Yes
District-Specific Trends	No	No	Yes	No	No	Yes
Observations	9135	8540	8540	1524	1515	1515
R^2	0.941	0.946	0.969	0.966	0.966	0.975

Notes: District-level clustered standard errors shown in parentheses. Unit of observation is district-by-year. The dependent variable is the proportion of teachers in the district who are Black. Demographic controls include district-level averages of student demographics and district enrollment size.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 4: Demographics of "Sending" and "Receiving" Schools for Black Teacher Transfers

	% Black Students			% Black Stu - % Black Tch		
	Receive	Send	Diff	Receive	Send	Diff
Panel A: Missouri						
All Moves	78.7	78.6	0.0	34.4	31.6	2.8
White Principal to White Principal	44.1	42.3	1.8	28.5	25.0	3.5
White Principal to Black Principal	84.9	64.4	20.4	36.9	34.3	2.6
Black Principal to White Principal	64.7	86.2	-21.5	36.5	33.6	2.9
Black Principal to Black Principal	89.3	89.9	-0.6	34.4	31.7	2.7
Panel B: Tennessee						
All Moves	71.7	73.9	-2.2	24.2	22.7	1.5
White Principal to White Principal	40.0	42.3	-2.3	19.7	19.1	0.6
White Principal to Black Principal	75.1	59.2	15.9	25.7	23.7	2.0
Black Principal to White Principal	60.1	80.1	-20.0	26.0	24.5	1.5
Black Principal to Black Principal	85.1	87.5	-2.4	24.4	22.8	1.6

Notes: The left column categorizes the type of transfer (e.g., White Principal to Black Principal means that a teacher transferred from a school where their principal was White to a school where their principal was Black). "Receive" are the characteristics of the school to which the teacher transferred and "Send" are the characteristics of the teacher's prior school. "Diff" is the difference between "Receive" and "Send". The school characteristics for sending and receiving are tabulated in the teacher's final year in the sending school to avoid double-counting.

Appendix Table 5: Multinomial Teacher Turnover Results Excluding Controls for Principal Turnover

	Missouri				Tennessee			
	Exit System	Within District Move	Across District Move	Position Change	Exit System	Within District Move	Across District Move	Position Change
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Black Principal x Black Teacher	-0.000	0.006	-0.005	0.003	-0.009	-0.031***	-0.013***	-0.003
	(0.008)	(0.009)	(0.005)	(0.003)	(0.007)	(0.010)	(0.004)	(0.003)
White Principal x White Teacher	-0.012**	-0.022***	-0.002	-0.003	0.004	-0.015***	0.000	-0.000
	(0.006)	(0.006)	(0.003)	(0.002)	(0.004)	(0.006)	(0.003)	(0.001)
p-value (coefficients are equal)	0.31	0.04	0.57	0.22	0.16	0.60	0.01	0.67
p-value (jointly different from zero)	0.08	<0.001	0.44	0.32	0.35	<0.001	0.01	0.66
Teacher Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District-by-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
School Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
School-Specific Trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	837740	799228	788774	821180	549615	537399	516834	510406
R^2	0.277	0.303	0.299	0.276	0.316	0.317	0.321	0.295

Notes: School-level clustered standard errors in parentheses. The unit of observation is teacher-by-year. In each column the dependent variable is an indicator for the turnover type listed in the header. All models are relative to the base category of stayers, such that teachers who turned over in a different category than listed in the header are not included in the model. Models estimated via OLS. Models include: fixed effects for teacher, school, and district-by-year; school-specific trends; school demographics (enrollment size, proportion of Black students, proportion of Hispanic students, proportion of students qualifying for free/reduced-price lunch) and principal characteristics (categorical indicators for principal experience and tenure in school, indicator for Ed.S. degree, indicator for Ph.D. degree, flag for male gender), and interactions between teacher race and all other controls. The controls for principal turnover follow the fully saturated specification show in columns 4 and 8 in Table 9.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 6: The Effect of Race Matching Between Hiring and New Principals

	Missouri		Tennessee	
	Coefficient	Pr > F	Coefficient	Pr > F
New Principal x Black Principal x Black Tch	-0.014		-0.034***	
	(0.011)	0.01	(0.012)	0.51
Hiring Principal x Black Principal x Black Tch	0.011		-0.028**	
	(0.011)		(0.011)	
New Principal x White Principal x White Tch	-0.033***		-0.015**	
	(0.008)	0.07	(0.007)	<0.001
Hiring Principal x White Principal x White Tch	-0.021***		0.012	
	(0.008)		(0.008)	
Observations	890771		559966	
R^2	0.299		0.341	

Notes: School-level clustered standard errors in parentheses. The second and fourth columns test the null hypothesis that the coefficients are equal. New principal is a flag for whether the principal's tenure is less than the teacher's tenure. Hiring principal is a flag for whether the principal's tenure is greater than or equal to the teacher's tenure. We drop a small number of observations where both the principal and teacher have worked at the school since the beginning of the data stream, since we cannot determine who first entered the school. Models include teacher, school, and district-by-year fixed effects, and school-specific trends. Controls include school characteristics, principal characteristics, and teacher experience and tenure in school.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 7: The Effect of Teacher Demographics on the Probability that a New Principal is Black

	Missouri			Tennessee		
	(1)	(2)	(3)	(4)	(5)	(6)
Departing Principal is Black	0.1918***	0.1911***	0.1954***	0.3598***	0.3617***	0.3383***
	(0.0446)	(0.0435)	(0.0468)	(0.0364)	(0.0355)	(0.0385)
% Change in % Black Hires	-0.0009			-0.0019		
	(0.0012)			(0.0011)		
% Change in % Black Teachers		-0.0002			-0.0038	
		(0.0027)			(0.0024)	
% Black Students - % Black Hires			0.0016			0.0038***
			(0.0012)			(0.0008)
Observations	2354	2354	2354	1767	1767	1767
R^2	0.485	0.485	0.487	0.407	0.407	0.422

Standard errors clustered by district shown in parentheses. The unit of observation is a principal transition. All change variables are between the two years prior to the new principal. Sample includes all principal transitions in districts that employed both Black and White principals. Hiring and composition changes are estimated using the five years prior to the principal transition. Models include district and year fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 8: Do Principal-Teacher Race-Match Effects Vary by Teacher Quality?

	(1)
Black Principal x Black Teacher	-0.052**
	(0.021)
Black Principal x Black Teacher x Low VA	-0.002
	(0.026)
Black Principal x Black Teacher x High VA	-0.017
	(0.026)
White Principal x White Teacher	-0.022*
	(0.012)
White Principal x White Teacher x Low VA	0.015
	(0.018)
White Principal x White Teacher x High VA	0.004
	(0.017)
Observations	166761
R^2	0.320

Notes: School-level clustered standard errors in parentheses. The unit of observation is teacher-by-year. The dependent variable is an indicator for whether the teacher left their position between year t and t+1. Models estimated via OLS. Models control for school demographics (enrollment size, proportion of Black students, proportion of Hispanic students, proportion of students qualifying for free/reduced-price lunch) and principal characteristics (categorical indicators for principal experience and tenure in school, indicator for Ed.S. degree, indicator for Ph.D. degree, flag for male gender), and interactions between teacher race and all other controls. Value-added is estimated using the drift-adjusted, leave-year-out approach described in Chetty et al. (2014). To construct a time-invariant, categorical value-added measure, we average teacher-by-year estimates within teacher, then split teachers into low VA (bottom 25%), middle VA (middle 50%), and high VA (top 25%). The sample is restricted to teachers for whom we can calculate value-added.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 9: Predicting Teacher Assignment to Tested Grade and Subject

	Math or Reading		Math		Reading	
	(3)	(4)	(5)	(6)	(7)	(8)
Black Principal x Black Teacher	0.007	0.009	0.002	0.007	0.010	0.011*
	(0.008)	(0.007)	(0.008)	(0.006)	(0.008)	(0.006)
White Principal x White Teacher	0.008**	0.002	0.000	-0.002	0.004	-0.003
	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)
Teacher Fixed Effects	No	Yes	No	Yes	No	Yes
School Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
District-by-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
School-Specific Trends	Yes	Yes	Yes	Yes	Yes	Yes
Observations	651235	664376	651235	664376	651235	664376
R^2	0.087	0.690	0.067	0.668	0.084	0.654

Notes: School-level clustered standard errors in parentheses. The unit of observation is teacher-by-year. In each column the dependent variable is an indicator for whether the teacher is a "tested teacher" (i.e., can be identified in the student-teacher linkage files as being responsible for students' test scores for accountability purposes) in math/reading. The first two columns use an indicator that is equal to one if the teacher is tested in math and/or reading. Models estimated via OLS. Models control for school demographics (enrollment size, proportion of Black students, proportion of Hispanic students, proportion of students qualifying for free/reduced-price lunch) and principal characteristics (categorical indicators for principal experience and tenure in school, indicator for Ed.S. degree, indicator for Ph.D. degree, flag for male gender), and interactions between teacher race and all other controls.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 10: Are Same-Race Principals More Likely to Assign Students to Same-Race Teachers?

	Assigned to Black Teacher (Math)	Assigned to Black Teacher (Reading)
	(1)	(2)
Black Principal x Black Student	-0.002	-0.004
	(0.003)	(0.003)
Black Student	0.001	-0.005
	(0.012)	(0.012)
School-by-Grade-by-Year FE	Yes	Yes
Observations	3005790	4122069
R^2	0.736	0.691

Notes: School-level clustered standard errors in parentheses. Unit of observation is student-by-year. The dependent variable is a binary indicator for whether the student's assigned teacher in the given subject is Black. Models estimated via OLS. For students with multiple teacher assignments in a given year, the student has multiple observations that are weighted by the percentage claim of each teacher. Models include: school-by-grade-by-year fixed effects, prior-year test scores and attendance, student characteristics. Additionally, we control for interactions between student race and all school- and grade-level characteristics. The main effects of these characteristics are absorbed by the school-by-grade-by-year FE.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix Table 11: The Impact of Principal Race on Student Suspensions

	All Suspensions		In-School Suspensions		Out-of-School Suspensions	
	(1)	(2)	(3)	(4)	(5)	(6)
Black Principal	0.003	0.004	0.003	0.004	0.002	0.003
	(0.004)	(0.005)	(0.005)	(0.006)	(0.002)	(0.002)
Black Principal x Black Student	-0.008	-0.011	-0.018**	-0.015	0.006	0.001
	(0.006)	(0.008)	(0.008)	(0.010)	(0.005)	(0.006)
Black Principal x 2nd-3rd Year in School x Black Student		0.005		-0.002		0.007
		(0.006)		(0.007)		(0.005)
Black Principal x 4th-5th Year in School x Black Student		0.003		-0.009		0.007
		(0.008)		(0.010)		(0.007)
Black Principal x 6th+ Year in School x Black Student		-0.003		-0.011		0.003
		(0.011)		(0.012)		(0.007)
Observations	7222606	7222606	7222606	7222606	7222606	7222606
R^2	0.260	0.260	0.219	0.220	0.228	0.228

Notes: School-level clustered standard errors in parentheses. In the first three columns, the dependent variable is a binary indicator for whether the student was suspended one or more times during the given school year. Models estimated via OLS. Models include: school-by-grade-by-race fixed effects, prior-year suspensions, student characteristics, school characteristics, grade characteristics, principal tenure in school, and year fixed effects. Additionally, we control for interactions between student race and all school- and grade-level controls. "Year in school" variables refer to the number of years the principal has worked in the school as the principal, with the omitted category being "1st year in school."
* p < 0.10, ** p < 0.05, *** p < 0.01

Appendix Table 12: Race-Specific Estimates of Principal-Student Race-Match Effects on Suspensions

	All Suspensions		In-School Suspensions		Out-of-School Suspensions	
	(1)	(2)	(3)	(4)	(5)	(6)
Black Matches (Black Principal x Black Student)						
Match	-0.005	-0.007	-0.015	-0.011	0.008	0.005
	(0.007)	(0.008)	(0.009)	(0.010)	(0.005)	(0.006)
Match x Prin 2nd-3rd Year in Sch		-0.004		-0.009*		0.002
		(0.005)		(0.005)		(0.004)
Match x Prin 4th-5th Year in Sch		-0.008		-0.020**		0.001
		(0.007)		(0.008)		(0.006)
Match x Prin 6th+ Year in Sch		-0.018*		-0.028***		-0.004
		(0.010)		(0.010)		(0.006)
White Matches (White Principal x White Student)						
Match	-0.003	-0.005	-0.003	-0.005	-0.002	-0.004**
	(0.004)	(0.004)	(0.005)	(0.005)	(0.001)	(0.002)
Match x Prin 2nd-3rd Year in Sch		0.009***		0.007**		0.005*
		(0.003)		(0.004)		(0.003)
Match x Prin 4th-5th Year in Sch		0.012***		0.011**		0.006*
		(0.004)		(0.005)		(0.003)
Match x Prin 6th+ Year in Sch		0.016***		0.017***		0.007**
		(0.004)		(0.005)		(0.003)
Observations	7222606	7222606	7222606	7222606	7222606	7222606
R^2	0.260	0.260	0.219	0.220	0.228	0.228

Notes: School-level clustered standard errors in parentheses. In the first three columns, the dependent variable is a binary indicator for whether the student was suspended one or more times during the given school year. Models estimated via OLS. Models include: school-by-grade-by-race fixed effects, prior-year suspensions, student characteristics, school characteristics, grade characteristics, principal tenure in school, and year fixed effects. Additionally, we control for interactions between student race and all school- and grade-level controls. "Year in school" variables refer to the number of years the principal has worked in the school as the principal, with the omitted category being "1st year in school."
* p < 0.10, ** p < 0.05, *** p < 0.01