Systematic Sorting: Teacher Characteristics and Class Assignments

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INTRODUCTION

The literature on effective schools emphasizes the importance of a quality teaching force in improving educational outcomes for students (Brewer 1993; Mortimore 1993; Sammons, Hillman, and Mortimore 1995; Taylor, Pearson, Clark, and Walpole 2000). The effect of teachers on student achievement is particularly well established (Nye, Konstantopoulos, and Hedges 2004; Rivkin, Hanushek, and Kain 2005; Rockoff 2004). However, teachers are not randomly assigned to schools or students. Many prior studies have documented the ways in which the teacher labor market works to disadvantage urban schools (Boyd, Lankford, Loeb, and Wyckoff 2005a; Hanushek, Kain, and Rivkin 2004; Lankford, Loeb, and Wyckoff 2002). These schools often face difficulty attracting and retaining effective teachers (Ferguson 1998; Krei 1998; Lankford, Loeb, and Wyckoff 2002). Between-school sorting disadvantages schools with high concentrations of low-income, minority, and low-achieving students. Students from such backgrounds are less likely to be exposed to experienced and highly qualified teachers compared to their more advantaged counterparts attending other schools.

Less clear from prior research is the extent to which the systematic matching of teachers to students also occurs *within* schools. In this paper we present a comprehensive analysis of teacher assignments in a large urban school district. We examine the relationships between teacher characteristics and classroom assignments and whether school-level factors moderate these associations. Our analyses focus on differences in classroom assignments among teachers who teach the same grade in the same school in a given year. We find that minority teachers and female teachers are assigned lower achieving students than their white and male colleagues at their school. Most of these differences are driven by the propensity to assign minority and poor students to minority teachers and by the fact that female teachers are more likely than male teachers to teach special education students. Years of teaching experience, particularly years of

experience at a teacher's current school, also is positively related to the average prior achievement of students in a teacher's class—both within schools and within teachers; and teachers who have held leadership positions or who attended more selective undergraduate institutions are assigned higher achieving students than their colleagues.

There are a range of possible reasons for class assignment patterns that we see. School leaders, parents, students, and teachers all have stakes in the decisions that lead to these patterns. School leaders may want to serve the most in-need students best, or they may aim to keep their best teachers. The latter aim may benefit the school's students or it may hurt them if that group of teachers is small and only serves a targeted group of students. Teachers clearly have preferences over who and what they teach, as parents and students have preferences over who teaches.

The patterns of assignment we document are likely to have a number of implications. First, the assignment of less experienced teachers to lower achieving students may increase teacher turnover. Prior research suggests that new teachers are more likely to leave their school when they are assigned lower achieving students with more discipline problems, while the same is not true for more experienced teachers (Donaldson and Johnson 2010; Feng 2010). Second, the assignment of less experienced teachers to lower achieving students is likely to exacerbate within school achievement gaps given that new teachers, on average, are less effective in raising student achievement than their more experienced counterparts (Clotfelter, Ladd, and Vigdor 2006; Murnane and Phillips 1981; Nye, Konstantopoulos, and Hedges 2004; Rockoff 2004). Third, within school sorting may undermine policy interventions aimed at reducing the uneven distribution of highly qualified and experienced teachers across schools. Some policies, for example, may offer financial incentives for teachers to enter or stay in harder to staff schools

(Hough and Loeb 2009). Such policies will not be as effective as intended if the most experienced or effective teachers in these schools are assigned to the relatively least disadvantaged or highest achieving students. Within school sorting may prevent the most effective teachers from being matched to students who need them most even if the sorting of teachers between schools is minimized. Finally, our findings may have implications for the estimation of teacher value-added. Nonrandom assignment of students to teachers may bias value-added estimates of teacher effects on student achievement if these differences are not controlled for (Rothstein 2009; Rothstein 2010). Typical value-added methods assume that the processes by which students are assigned to teachers is ignorable; i.e., that assignments are as if random, conditional on observables. The results presented here suggest that assignments depend upon a host of factors, not simply prior achievement.

BACKGROUND

Prior Research on Teacher Sorting

Many studies find that teachers demonstrate preferences for teaching in schools with easier to serve student populations. When given the opportunity, more qualified and experienced teachers tend to choose schools with higher achieving students, fewer minority students, higher income students, and schools that are safer and experience fewer disciplinary problems (Boyd, Lankford, Loeb, and Wyckoff 2005b; Clotfelter, Ladd, and Vigdor 2006; Hanushek, Kain, and Rivkin 2004; Horng 2009; Jackson 2009; Lankford, Loeb, and Wyckoff 2002; Scafidi, Sjoquist, and Stinebrickner 2008; Smith and Ingersoll 2004). Schools with harder to serve student bodies also often face high teacher turnover (Allensworth, Ponisciak, and Mazzeo 2009; Boyd, Grossman, Ing, Lankford, Loeb, and Wyckoff 2009; Ingersoll 2001).

In contrast to the literature that describes how teachers sort between schools, there is comparatively little research on the extent to which teacher sorting also occurs within schools. A large body of research does address the sorting of students within schools, much of which focuses on tracking and ability grouping. This research provides clear evidence that students are sorted to different types of peers (i.e., based on academic ability or race) and curricula within schools, especially at the middle and high school levels (Conger 2005; Gamoran 1987; Oakes 1985). The practice of ability grouping creates considerable variation in the average achievement levels of classrooms within schools (Gamoran 1993; National Education Association 1990), and also contributes to racial or socio-economic segregation within schools since minority and low-income students tend to have lower achievement (Gamoran 1987; Lucas and Berends 2002; Oakes 1985; Oakes and Guiton 1995). This body of research suggests that there are potentially large differences in student characteristics across classrooms within schools; however, less clear is the extent to which there is systematic sorting of teachers with different characteristics to courses that serve students of different abilities. The extent to which teacher and student sorting also occurs at the elementary school level (where tracking and ability grouping are less common) also remains unclear.

There are a few large scale studies that have investigated whether teacher characteristics are associated with the characteristics of students they are assigned. A study of 7th grade students in North Carolina in 2000 found that black students are disproportionally assigned to novice teachers as the result of both within and between school sorting (Clotfelter, Ladd, and Vigdor 2005). A recent study of schools in Florida found that novice teachers are assigned more disadvantaged students than their colleagues, including more minority and low-income students as well as those with behavioral problems (Feng 2010). A study of high school teachers in an

urban school district in 2000 found that new teachers to a school are disproportionately assigned more ninth grade students than their more experienced colleagues (Neild and Farley-Ripple 2008). Finally, Kelly (2004) uses nationally representative data and finds that teachers with more seniority and experience are more likely to teach higher level courses at the high school level. However, he is only able to examine courses taught and not the characteristics of students in those courses. There are also some qualitative studies have found that better or more experienced teachers are often assigned to high-track classes in high schools, though these studies are somewhat dated (Finley 1984; Oakes 1985). We build on these studies by examining a wider range of teacher and student characteristics, a wider range of grades and years, and variation in the assignment process across schools with different characteristics.

Factors Contributing to the Assignment Process

The preferences of parents, teachers, and school leadership are all likely to influence the assignment of students to teachers within schools. The allocation of teachers to students is likely to result from a complex process whereby principals and other school leaders attempt to balance short and long term goals while responding to pressures to meet the preferences of teachers, students, and parents.

Parents are one group that may influence the assignment process. In particular, middle and upper socio-economic status parents may try to intervene in the class assignment process to ensure that their child is taught by a teacher whom they believe to be the most desirable (Lareau 1987; 2000). Our own analysis of the Education Longitudinal Study[1] shows large differences by parental education in the proportion of the parents of 10th graders who report having contacted their child's school about course selection (13 percent of parents with less than a high school degree reported contacting their child's school about course selection compared to 33 percent of

parents with a college degree or more). Though many principals report resisting such efforts on the part of parents, there is some evidence that parents are often successful in influencing to which teachers their students are assigned (Clotfelter, Ladd, and Vidgor 2008; Monk 1987). The extent of parental influence is likely to be small relative to the influence of teachers, however. For example, one national study of principals in public secondary schools found that 70 percent of principals report that parents have no influence on teacher assignments, 25 percent report that they have a small influence, and only 5 percent report that they have a moderate or large influence (Carey and Farris 1994). In contrast, 60 percent of principals in this study said that teachers influence assignments to a moderate or large extent.

Teacher preferences also influence the assignment process. Teachers typically value specific course assignments relative to others, in terms of subject, grade, and average student ability level of the students they enroll (Donaldson and Johnson 2010; Finley 1984; Neild and Farley-Ripple 2008). Teachers who transfer schools often cite challenging assignments or feelings of inadequacy over assignments that do not match their skill set as key reasons for moving (Donaldson and Johnson 2010; Ingersoll 2004; Marvel, Lyter, Peltola, Strizek, Morton, and Rowland 2007). Within schools, teachers in more powerful positions — i.e., those with more experience or those who hold teacher-leader positions — may be better positioned to obtain their desired teaching assignments. In an ethnographic study of tracking in a high school, Finley (1984) found that more senior teachers closely guarded the most desirable courses such as advanced placement or electives, which tend to enroll higher achieving students (Finley 1984). New teachers in Finley's (1984) study continued to receive challenging schedules until they asserted themselves and made friends in the department. Administrators justified assigning new

teachers to lower-track classes by arguing that they needed time to improve their teaching skills before being qualified to teach the advanced courses effectively.

Preferences for teaching different types of students are likely to vary across teachers within schools. For example, minority teachers may have a stronger preference for working with minority students compared to white teachers. Studies of teacher turnover have found that teachers are more likely to leave when they are employed at a school with more minority or low-income students (Boyd, Lankford, Loeb, and Wyckoff 2005a). However, these higher turnover rates in schools serving more disadvantaged students are stronger for white teachers (Mueller, Finley, Iverson, and Price 1999; Strunk and Robinson 2006). Minority teachers' preferences for working with minority students could be driven by a desire to give back to the community by working with students like themselves or by a preference for shared cultural background with their students. Some studies have found that minority students learn more when they have a same race teacher (Dee 2005) and teachers tend to rate their students' behavior more favorably when they share the same race (Downey and Pribesh 2004). Given these findings, principals may view teacher-student race matching as a potential way of boosting average achievement at their school.

Principal or organizational preferences are also likely to influence class assignments. In most cases, managers prefer to retain their most effective employees and will often offer benefits such as higher compensation and/or promotions in an effort to do so (Abelson and Baysinger 1984). Rewarding effective employees may be challenging in the educational context, given rigidities of salary schedules and limited vertical differentiation of jobs within schools (Becker 1952). In lieu of salary increases or promotions, over which principals may have little control, principals may give their best teachers the most desirable class assignments as a retention

strategy. There is some evidence that supports this hypothesis. A qualitative study in ten Florida elementary schools found that principals sometimes give highly-effective teachers classes of their choosing, though effectiveness was only one of many factors that principals considered when matching teachers to classes (Cohen-Vogel and Osborne-Lampkin 2007). In our own survey of principals in the district we study in this paper, approximately 28 percent of principals indicated that they reward good teachers with their desired class assignments in hopes of retaining them.[2] Principals may feel similar pressures to offer non-financial benefits to their most experienced teachers, especially if those teachers have disproportionate influence over the school culture. Any relationship between teacher experience and class assignments may be driven by principals' desires to reward experienced teachers and to give new teachers something to look forward to if they choose to stay.

School leaders, in addition to balancing their own preferences and those of teachers and parents, face a variety of constraints when determining class assignments. For example, at the middle and high school level some teachers are not qualified to teach the most advanced courses (e.g., calculus). If teacher characteristics are correlated with certification areas or teacher ability levels, then we may find that certain types of teachers are assigned lower achieving students than their colleagues. For example, if male teachers are more likely than female teachers to be qualified to teach the most advanced math courses, then we could find that female teachers are assigned lower achieving students than their male colleagues. This would result from no bias in the assignment process on the part of school leadership but, rather, from differences in teacher preferences that affect what subjects or grades teachers choose to specialize in.

Hypotheses Examined

Our data do not allow us to examine all of the hypotheses about the assignment process discussed above. In particular, we do have data on the role of parents in influencing class assignment decisions. We therefore focus on examining a few hypotheses that our data will allow. First, we examine the relationship between teacher gender, race and class assignments. We use two approaches - the first adjusts for other differences in students and teachers that might explain the patterns in the data and the second assesses whether the relationships are stronger in schools with potentially greater incentives to systematically assign students to teachers.

Differences in assignments to lower and higher achieving students for teachers of different gender or racial backgrounds could be driven by a number of factors, including (1) preferences for teacher-student race or gender matching, (2) bias in assignment based not on teachers' race or gender but on other characteristics of teachers such as experience, or (3) actual racial bias in the assignment process. We take two approaches in an attempt to adjudicate between these alternative hypotheses. First, we use a basic regression adjustment approach, and, second, we test whether the systematic assignment differs across schools in keeping with school characteristics that theoretically could lead to different assignment processes.

If differences in prior achievement between minority and white teachers' students are driven by preferences of teachers or principals for teacher-student racial matching, we would expect that controlling for the racial composition of teachers' classrooms would explain differences the average prior student achievement. If differences remain once racial composition is controlled for, then racial matching would not explain the differences. It is also possible that the bias is not due to teachers' race or gender but to their other characteristics. To assess this hypothesis, we also control for college selectivity, highest degree earned, teaching experience,

and previous leadership positions held to examine whether differences in these teacher characteristics explain gender and race differences in the characteristics of students.

Schools differ in their assignment processes and in the pressures school leaders balance in assigning students and teachers to classrooms. In attempt understand whether there is racial bias in the assignment of students with different prior achievement, we examine whether the assignment of black and Hispanic teachers to lower achieving students is especially prevalent when schools have more white teachers and when schools are led by a white principal. This analysis is motivated by research that finds that minorities' often receive more challenging job assignments, fewer promotion opportunities, or less favorable evaluation from supervisors, particularly when their supervisor is white (Greenhaus, Parasuraman, and Wormley 1990; Kanter 1977; Tsui and O'Reilly 1989).

In addition to examining the relationship between teacher race and gender and class assignment, we also focus of our analysis on the relationship between teaching experience and class assignments. We take similar approaches, looking across all schools using multiple regression and then examining systematic differences between schools. A potential explanation for differences in assignments by teaching experience is that more experienced teachers have power within schools and knowledge about how the assignment process occurs, making it easier for them to have their preferences met when it comes to which students are in their classrooms. Prior qualitative research suggests that more senior teachers closely guard the most desirable courses and often exclude new teachers from the class assignment process (Finley 1984; Monk 1987). To investigate this hypothesis we examine whether less experienced teachers receive lower achieving students when they work in schools with more experienced colleagues. Presumably, it is in such contexts that new teachers have the least power, and that networks and

relationships among more experienced teachers are especially strong. We also distinguish between school-specific experience and overall experience as predictors of class assignments. If school-specific experience is a more important predictor of assignments than overall experience, then this suggests that the relationship between experience and assignments has something to do with teachers' position in the status hierarchy of the school rather than a difference in the skills that come with more experience that may be necessary to teach more advanced courses.

The relationship between teaching experience and class assignments may also depend upon a school's performance in the accountability system. Schools that have many low achieving students who fail to meet proficiency on state tests may feel more pressure to assign their best teachers to struggling students. Of course, teaching experience is not a perfect measure of quality but there is clear evidence that more experienced teachers tend to be more effective than the least experienced teachers (Clotfelter, Ladd, and Vigdor 2006; Murnane and Phillips 1981; Nye, Konstantopoulos, and Hedges 2004; Rockoff 2004). We therefore examine whether the relationship between teaching experience and class assignments depends upon the school's performance in the accountability system.

In summary, relatively little prior research has investigated the sorting of teachers to different types of students within schools. Systematic sorting may occur through a variety of mechanisms driven by parent, teacher, and school administrator preferences. In this paper we provide a comprehensive analysis of teacher assignments, examining whether certain types of teachers are assigned students with different characteristics and whether there is variation in the assignment process across schools with different characteristics.

DATA

To examine patterns of class assignment we use data from administrative files on all staff, students and schools in the Miami-Dade County Public School (M-DCPS) district from the 2003-04 through the 2010-11 school years. The school district we study, M-DCPS, is the largest public school district in Florida and the fourth largest in the United States, trailing only New York City, Los Angeles Unified, and the City of Chicago School District. In 2008, M-DCPS enrolled almost 352,000 students, more than 200,000 of whom were Hispanic. Nearly 90 percent of students in the district are either black or Hispanic and 60 percent qualify for free or reduced priced lunches.

The data used for our analyses come from three different files provided by the district: test score and basic demographic information for all students in the district, course-level data that link students to each of their teachers in each year, and a staff-level file with information on all district employees. The student-level files include student race, gender, free/reduced price lunch eligibility, number of times the student was absent that year, and the number of days the student missed school due to suspensions that year. The test score data include math and reading scores from the Florida Comprehensive Assessment Test (FCAT). The FCAT is given in math and reading to students in grades 3-10. It is also given in writing and science to a subset of grades, though we only use math and reading tests in our analyses. The FCAT includes criterion referenced tests measuring selected benchmarks from the Sunshine State Standards (SSS). We standardize students' test scores to have a mean of zero and a standard deviation of one within each grade and school-year.

We construct a database with one observation for each teacher in each year with the characteristics of students in their class. We start with course-level student data which lists the unique identifier for the teacher of each course in which a student enrolled. We then add student

characteristics and test scores to this course-level file before collapsing it to the teacher level, computing the proportion of students from different demographic backgrounds (i.e., by race and poverty level) and the mean of the one-year lag of time-varying achievement (i.e., test scores, test proficiency levels, student grade retention) and behavioral outcomes (i.e., absences and suspensions). We average the characteristics of students across all classes for teachers with multiple classes in a given year. To this class-level data we add various teacher characteristics from the M-DCPS staff database which includes demographic measures, prior experience in the district, current position, and highest degree earned for all district staff from the 2003-04 through the 2010-11 school years. We focus our analysis on the average prior year math achievement of teachers' students but our findings are consistent across a variety of class characteristics.

In addition to these administrative data, we also use data from a survey of teachers we conducted in M-DCPS in the spring of 2008. We received survey responses from 6800 of 10074 surveyed teachers who were in the administrative data and who taught students in grades 4 through 11, for a response rate of 68 percent. The survey provides additional information on the characteristics of teachers that may be associated with the types of students they are assigned but that are unavailable in the administrative data. We asked teachers about previous leadership positions they held in their school. Specifically, we examine whether teachers who were ever a grade or department head, a member of school-wide leadership team, or a professional development leader receive more desirable class assignments than their colleagues who have not held such positions. Our survey also asked teachers which undergraduate college they attended. In the absence of teacher test scores or some other measure of "ability", we instead create measures of the selectivity of teachers' undergraduate institutions to serve as a rough proxy for this information. Teachers entered the name of their undergraduate institution which we matched

by hand to the identifier used for each school by the Integrated Postsecondary Education Data System maintained by the National Center for Education Statistics. After assigning each college the appropriate identification code, we combine our survey data with other information about the colleges teachers attended. We use the acceptance rate of teachers' undergraduate institution and the 75th percentile of SAT/ACT scores from their undergraduate institution.[3] Since we do not know in which year teachers entered college, we use IPEDS data from a recent year (2007). Finally, we use the survey data to distinguish school specific experience from total experience in the district. School specific experience is not available in the administrative data but was included on our survey instrument. [4]

Table 1 lists the mean and standard deviations of variables used in our analyses. Teachers average about 9 years of experience in the district, are predominately female (76 percent), 43 percent are Hispanic, 27 percent are black and 40 percent have a master's degree. Nearly 90 percent of students in the district are black (27 percent) or Hispanic (60 percent) and more than 60 percent qualify for free/reduced priced lunches.

METHODS

Our analysis has two primary components. First, we examine the relationship between teacher characteristics (i.e., experience, race, gender, highest degree, college selectivity, leadership positions) and class assignments. Second, we investigate whether there is variation in the magnitude of some of these relationships in different types of schools.

Teacher Characteristics and Class Assignments

In the first set of analyses we examine differences in the attributes of students assigned to teachers with varying experience levels, educational backgrounds, and demographic characteristics. We focus on two different samples of teachers. The first sample includes all

teachers in the administrative data that teach students that were tested in the prior year. Students are tested in grades 3-10 in Florida so our sample includes teachers of 4^{th}-11^{th} grade students. The second sample is restricted to teachers who responded to our 2008 survey and that teach students who were tested in the prior year. The administrative sample has the advantage of including the entire population of teachers in several years but only includes a select number of covariates. The survey sample includes fewer teachers from only one year but has many more measures that are not available from the administrative data.

The basic equation below describes the models we estimate:

$$Y_{itsg} = \beta_0 + T_{itsg}\beta_1 + \pi_{stg} + \varepsilon_{itsg} \quad (1)$$

We predict the average prior year math achievement of teachers' current students for teacher *i* in year *t* in school *s* and in grade *g*, Y_{itsg}, as a function of a vector of teacher level measures and a school by year by grade fixed effect, π_{stg} . Our inclusion of the school by year by grade fixed effect means that our estimates reflect differences in class assignments for teachers of varying experience or demographic characteristics teaching the same grade and in the same school in the same year. We focus our discussion on prior math achievement but the results are consistent across other class characteristics as well such as reading achievement, prior year student absences, and prior year student suspensions. We introduce the teacher characteristics in a few different models. The analysis that uses the administrative sample includes 3 models. Model 1 includes teacher gender and race/ethnicity. Model 2 adds total years of teaching experience in the district and whether the teacher has a master's degree or higher. Model 3 adds controls for the proportion white and proportion poor students in the course. Comparing the coefficients on race/ethnicity between Model 2 and Model 3 shows the extent to which preferences toward assigning minority teachers to minority and poor students can account for racial differences in

the average prior year achievement of teachers' students. The analysis that uses the survey sample includes 5 models. Model 1 includes teacher gender and race. Model 2 adds college selectivity. Model 3 adds teaching experience and highest degree earned. For the survey sample, teaching experience is separated into school-specific years of experience and years of experience spent at other schools in the district. Model 4 adds prior leadership positions held (grade or department head, school-wide leadership team, professional development leader) and Model 5 adds controls for proportion white and proportion poor in the class as discussed above.

Next, we examine whether there are features of schools that moderate the relationship between teacher characteristics and class assignments. We include three different sets of interactions between school and teacher characteristics. First, we interact teacher experience with the proportion of senior (10 years of experience or more) teachers at the school. The proportion of senior teachers at the school is computed by excluding the focal teacher. We anticipate that less experienced teachers might receive the most challenging assignments when they are in schools with more experienced teachers. Second, we interact teacher experience with the proportion of students at the school that failed to score at the proficient level on the state test in the prior year. Schools where more students fail to meet proficiency may feel more pressure to assign their more experienced teachers to struggling students. Finally, we interact teacher race with the race of their principal and with the percentage of white teachers at the school. Given tendencies toward racial homophily, we expect that friendships and social ties among teachers and principals may occur along racial lines. To the extent that class assignments partially result through informal processes, black and Hispanic teachers in schools led by white principals or with more white teachers may be assigned particularly difficult classes.

RESULTS

Table 2 presents the results from estimating Equation 1 where the average prior year math achievement of teachers' current students is predicted as a function of teacher characteristics and a school by year by grade fixed effect. Prior year student test scores were standardized to a mean of 0 and a standard deviation of 1 (within grade and year) at the student level before they were collapsed to the teacher by year level. At the teacher by year level, the standard deviation of average prior year math achievement is .80 across the whole sample and is .60 within school-grade-year. In interpreting the results below, we compare the size of the coefficients to the .60 standard deviation of average class achievement within school-grade-year.

Model 1 for the administrative sample shows that female and minority teachers have lower achieving students in their classes compared to their male and white colleagues in their grade at their school. The gender gap is small—a coefficient of -.030 is about one-twentieth of a standard deviation. The difference between black and white teachers and Hispanic and white teachers is considerably larger. The black-white difference in the average achievement of teachers' students is about one-quarter of a standard deviation and the difference between Hispanic and white teachers is about one-sixth of a standard deviation (using the within school .60 standard deviation as the relevant metric). When we add controls for teaching experience and whether the teacher has a master's degree in Model 2, the coefficients on race and gender only change slightly. Teaching experience is positively related to the average prior achievement of students in teachers' classes. A ten year increase in teaching experience is associated with about a one-third of a standard deviation increase in the average prior achievement of teachers' students.

We further describe the relationship between teacher experience and the average prior achievement of students in Figure 1 and Figure 2, separately by school-level. We present the figures separately by grade level since tracking and ability grouping are more common at the middle and high school levels compared to the elementary school level. Greater within school sorting of students with different characteristics across classrooms may allow for more sorting of teachers to different types of students. In these figures teacher experience is plotted on the x-axis and the difference in a given class characteristic between first-year and more experienced teachers is plotted on the y-axis. Here we allow the relationship between teacher experience and the average prior achievement of teachers' students to be non-linear with experience entered as dummy variables (top coded at 21 or more years of experience) with first-year teachers serving as the comparison group. The error bars on the graphs represent the 95 percent confidence intervals.

Figure 1 shows that teachers with about two to seven years of experience have students with slightly higher—though not statistically significant—prior achievement compared to their first-year colleagues at both the elementary and middle/high school levels. However, teachers with 10 to 20 years of experience have students with average prior achievement that is .10 to .20 standard deviations higher relative to their first-year colleagues (recall that the standard deviation of average class achievement within school-grade-year is .60). In Figure 2 we examine whether the relationship between experience and assignments is also found within teachers. We predict the average prior year achievement of teachers' students as a function of teacher experience, school fixed effects, and teacher fixed effects. We find a positive relationship between experience and the average achievement of teachers' students, even within teachers. In fact, the

relationship appears stronger within teachers than within school-grade-years.[5] This great increase within teachers could be due to teachers changing grades from year to year.

In Model 3 of Table 2 we add controls for the proportion of white and poor students in the class and whether the teacher is designated as a special education teacher. Including these controls changes the coefficients on race and gender considerably. The coefficient on gender flips in sign—this is because female teachers are more likely to teach special education students and special education students have much lower achievement than other students. The coefficients that capture differences between black and white teachers and between Hispanic and white teachers are reduced considerably in magnitude in Model 3—this change occurs because black and Hispanic teachers are more likely than white teachers at their school to teach black, Hispanic and poor students and those students are lower achieving on average.[6] Even with the additional controls, there are still significant differences by race/ethnicity in average prior achievement of teachers' students in Model 3, but the differences are relatively small after controlling for the racial and income makeup of students in the class.[7] Comparing the size of the estimates in Model 3 suggests the difference between a first and tenth year teacher is similar in size as the difference between Hispanic and white teachers and is slightly smaller in size than the difference between black and white teachers.

Next, we turn to the results from the last four columns of Table 2 which are based on the 2008 survey sample. The results from Model 1 based on the survey sample are similar to those found in the administrative data. When we control for the selectivity and average SAT scores of teachers' undergraduate institutions, the black-white and Hispanic-white differences in the average prior achievement of teachers' students are reduced by about 30 percent. Teachers who attended colleges that had higher average admissions test scores (which, for our purposes, serve

as a rough proxy for teachers' own scores) are assigned higher achieving students. Black and Hispanic teachers attended colleges with lower average test scores than white teachers which accounts for some of the race/ethnic gaps in the average prior achievement of teachers' students. In Model 3 for the survey sample we add school-specific experience, experience at other schools in the district, and whether the teacher has a master's degree. Interestingly, years of experience spent at the current school is positively related to the average prior achievement of teachers' students while years spent at other schools has no effect.[8]

In Model 4 for the survey sample we add measures that reflect whether teachers have held leadership positions (either currently or previously). We find that teachers who have ever served as a grade or department head, those who were ever a member of a school leadership team, and those who were ever a professional development leader or instructor are assigned students with higher prior year math achievement (after controlling for other measures including teaching experience). When we control for special education status and the proportion white and poor students in the class in Model 5, we find no remaining gender and race differences.

In results not shown we replicate all of the analysis in Table 2 separately for elementary and middle/high school teachers. The results are all very similar by grade level, with one exception. The selectivity of teachers' undergraduate institutions bears a smaller relationship with the average prior achievement of the students in their class for elementary school teachers than for middle/high school teachers. This difference is likely because there is more variation in the cognitive demands of middle and high school level courses than of elementary level courses. Therefore, a teacher's own ability/test scores (proxied by the average test scores of their undergraduate institution) are more strongly related to the types of students (and courses) to which middle and high school teachers are assigned.[9]

Variation in Assignments across Schools

Next, we examine whether school-level characteristics moderate the relationships between teacher characteristics and class assignments. The results are shown in Table 3. Note that in all of these models the main effect on the school characteristic is absorbed by the school-year-grade fixed effect. The interaction terms are identified from within school variation in the teacher characteristics with which the school measures are interacted. In Model 1 we interact teacher experience with the proportion of teachers at the school with 10 or more years of experience. We standardize the proportion of senior teachers at the school so that the main effect on teacher experience reflects the relationship between experience and the outcome at a school that is at the mean on the proportion of senior teachers measure.

The results from Model 1 suggest that more experienced teachers get even better assignments when they are employed in schools with a higher proportion of senior teachers. Therefore, less experienced teachers receive particularly challenging classes when they work in schools with more experienced colleagues. We graph the interaction effects in Figure 3. We choose schools that are at the mean on the proportion of senior teachers and schools that are two standard deviations above and below the mean and plot the relationship between experience and the average prior achievement of teachers' students in each type of school. Teacher demographics and highest degree earned are held at the sample mean. The relationship between experience and the achievement of students in teachers' classes is clearly stronger in schools with more senior teachers. For example, the gap between a first and fifteenth year teacher in schools with a high proportion of senior teachers is about .20 standard deviations compared to a gap of only about half that size in schools with a low proportion of senior teachers.

Table 3 also examines differences across schools in student achievement. In column 2 of Table 3 we include an interaction between teacher experience and the proportion of students at the school that failed to score at the proficient level on the state test in the prior year. The proportion of students who were not proficient in the prior year is standardized to have a mean of 0 and a standard deviation of 1 to facilitate interpretation. Here we find a negative interaction suggesting that the relationship between experience and the average prior achievement of students in teachers' courses is weaker in schools where more students were not proficient in the prior year. We graph the interaction effects in Figure 4—choosing schools at the mean of students meeting proficiency in the prior year and schools two standard deviations above and below the mean. The slope of the line is fairly flat in schools where high proportions of students failed to meet proficiency and is much steeper in schools where fewer students fail to meet proficiency. This suggests that schools may respond to accountability pressures by matching their more experienced teachers to struggling students or at least by making some effort to reduce the tendency for experienced teachers to be assigned higher achieving students.

In the final set of analysis in Model 3 and Model 4 we add interactions between teacher race and both the race of their principal and the percentage of teachers at their school that are white. Model 3 includes interactions between teacher race and the proportion of teachers at the school that are white (the proportion of white teachers at the school is computed by excluding the focal teacher). Here we find that black teachers receive the most challenging assignments when they have more white colleagues. Moving a black teacher from a school at the mean of the percent white teachers to a school that is one standard deviation above the mean nearly doubles the magnitude of the black-white gap in the average prior achievement of teachers' students. Note that these models include controls for the race and free lunch composition of the classes as

well. Model 4 includes interactions between teacher race and principal race. The results suggest that the black-white and Hispanic-white gap in students' prior achievement is smaller when black and Hispanic teachers' schools are led by black principals.

There are likely to be other features of schools that influence class assignments. In particular, we hypothesized that principals would play an important role in the assignment process, as prior evidence suggests. For example, seventy-five percent of public school principals in a national study reported that they played a large role in determining teacher class placements (Carey and Farris 1994). In analyses not shown, we examine several characteristics of principals to see whether the assignment of less experienced teachers to more challenging students happens to a greater or lesser extent schools led by different types of principals. The principal characteristics we examined include: overall years of principal experience; years of service as principal at the current school; the principal's highest degree; and several scales based on principal self-reports of their effectiveness across several domains from surveys we conducted.[10] We estimated models similar to those shown in Table 3 with the inclusion of interactions between each of these principal characteristics and teacher experience. Such an analysis allows us to gauge whether assignment by teacher experience happens more evenly in schools led by different types of principals. We find little evidence that any of these characteristics of principals moderate the relationship between teacher experience and class assignments. This does not necessarily mean that principals play no role in the assignment process. Rather, it suggests that principals with different (observable) characteristics employ similar practices when assigning novice teachers.

CONCLUSION

In this paper we studied the pattern of teacher-student matching within schools in a large urban school district. We examined the relationship between teacher characteristics and the prior average achievement of teachers' students and variation in patterns of teacher-student matching across schools with different characteristics. We find clear evidence that some teachers systematically receive lower achieving students in their classes compared to their colleagues.

Relative to their colleagues in the same school, female and minority teachers are assigned lower achieving students. The gender gaps we document can be explained by differences between male and female teachers in the probability of teaching special education students. Female teachers in this district are more likely to specialize in special education and special education students have lower test scores. The race/ethnic gaps we document are largely explained by the tendency for black and Hispanic teachers to be assigned more minority and poor students than their white colleagues at their school. The remaining race/ethnic gaps in the average prior achievement of teachers' students are explained by racial/ethnic differences in the selectivity and average SAT scores of teachers' undergraduate institutions.

The relationship between teacher race or ethnicity and student assignment differs across schools. When schools are led by white principals or are made up of more white teachers, the minority-white gap in students' average prior achievement is larger. This pattern might result from a lower status position of minorities in such contexts. The pattern could be driven by out-group antipathy on the part of whites or by in-group affinity of black and Hispanic teachers. Research in organizational demography argues that people tend to develop better relationships and feelings of liking with members of their own group than with those of out-groups (Brewer and Kramer 1985; Elliot and Smith 2001; Stewman 1988; Tsui and O'Reilly 1989). If white principals tend to develop better relationships with white teachers in their school than they

develop with black of Hispanic teachers, then a desire to reward their friends with desired classes may contribute to the racial differences in class assignments we observe in schools led by white principals.

Teaching experience and having graduated from a more competitive college also are consistently associated with the types of students teachers are assigned. These patterns could be the result of principals' desires to reward teachers that they wish to retain or to sanction teachers that they wish to remove but lack the formal recourse to do so. Alternatively, these teachers could hold more power in the school for achieving their own desires for the student composition of their classrooms. This hypothesis is consistent with our finding that teachers who have held leadership positions in the schools also consistently receive higher achieving students than their colleagues who have not held such positions, even after conditioning on teaching experience. These may be more involved in the assignment process and may reward themselves with higher achieving students. A third potential explanation for differences by teaching experience and undergraduate institution, is that principals assign more experienced or effective teachers to more advanced courses not with the explicit intention of rewarding them but, rather, because such courses require more mastery over the subject matter. This argument suggests that assigning the best teachers to the most advanced students is a rational practice, especially in subjects where the curriculum is cumulative and the most advanced courses require a strong command of the material (Neild and Farley-Ripple 2008). While this explanation is plausible for the patterns of assignment we observe at the high school level, it cannot explain the patterns of assignment we observe at the elementary level where curricular differentiation between classrooms is uncommon.

The relationship between teacher experience and student assignment differs across schools. Although less experienced teachers receive more challenging classes in all types of schools, the relationship between experience and the prior achievement of students is stronger in schools with more senior teachers. This is consistent with the argument that relations within schools may work to the detriment of those with less experience and therefore less power. In contexts where teachers have been working together longer and have formed stronger social ties, experienced teachers may be particularly adept at excluding their new colleagues from the most desirable courses. Since principal turnover is fairly high in this district and principals tend to stay at a school for only a few years, principals may be vulnerable to pressures from senior teachers who have been at the school longer (Loeb, Kalogrides, and Horng 2010). In fact, the majority of principals (71 percent in one study) are influenced by senior teachers to at least some extent when making class assignments (Carey and Farris 1994). That school-specific experience is positively related to the achievement of teachers' students but experience in other schools is not is also evidence that teachers' position in the status hierarchy of the school may play a role in the assignment process.

Overall, the patterns of teacher assignment we observe likely result from a complex process where school leaders attempt to respond to teacher, parent, and organizational preferences. Some of the teacher sorting we describe is likely to be neutral or beneficial to students. For example, if minority students learn more when taught by minority teachers, then teacher-student racial matching should improve average student achievement. If teachers who attended more competitive colleges have higher test scores themselves and are more capable of teaching advanced content, then assigning these teachers higher achieving students may be beneficial. However, some of our results imply potentially negative consequences. The

relationship between teacher experience and the average prior achievement of teachers' students could have two negative implications. First, it could increase turnover among new teachers. Prior research suggests that new teachers are more likely to leave their school when assigned more students who are low-achieving and who create disciplinary problems than their colleagues (Donaldson and Johnson 2010; Feng 2010). The same is not true for more experienced teachers who tend to leave at relatively low rates, regardless of class assignments. Second, it could exacerbate within school achievement gaps. Within schools, minority and poor students are assigned less experienced teachers since they tend to be lower achieving on average. Although student learning gains do not necessarily increase linearly with teacher experience, novice teachers are consistently less effective at raising student achievement compared to their more experienced peers (Rockoff 2004). Consequently, given their higher likelihood of receiving a inexperienced teacher, the achievement of black, Hispanic, and low-income students is likely to suffer as a result of the patterns of assignment we document. In fact, we find that controlling for teacher and peer characteristics reduces the magnitude of within school-grade-year black-white learning gaps by 20 percent, Hispanic-white learning gaps by 45 percent and free lunch-not free lunch learning gaps by 50 percent.[11]

The findings presented may have implications for the estimation of teacher value-added. Nonrandom assignment of students to teachers can bias value-added estimates of teacher effects on student achievement if the characteristics of students are not adequately accounted for (Rothstein 2009; Rothstein 2010). Typical value-added methods assume that the processes by which students are assigned to teachers is ignorable; i.e., that assignments are as if random, conditional on observables. The results presented here suggest that assignments depend upon a host of observables, not simply prior achievement. They may depend upon unobservables as

well, since principals have access to more information about teachers and students than is available to the researcher (Rothstein 2009; Rothstein 2010).

This study is not without limitations. First, it is based on data from a single school district and the results do not necessarily generalize to all schools in the U.S. At the same time, however, Miami is the fourth largest school district in the country with nearly 400 schools and 350,000 students. Also, we find similar results when we conduct analysis in two other districts from which we have data (Milwaukee Public Schools and San Francisco Unified School District). However, we cannot be certain whether these results are specific to these urban school districts or whether they are found more generally. A second limitation is that we only have information on a select number of teacher characteristics so we cannot fully explain all of the relationships we document. While we cannot necessarily determine how much of a role teacher, parent, or principal preferences play in determining class assignments, the analyses presented here are a useful first step in describing within school teacher sorting. Future research that further examines the mechanisms underlying the relationships we document is warranted.

ENDNOTES

[1] The Education Longitudinal Study is a nationally representative survey of U.S. students who were in the 10th grade in 2002 and is conducted by the National Center for Education Statistics. More information on the study can be found at: http://nces.ed.gov/surveys/els2002/.

[2] Survey administered to principals in the Miami-Dade County School District during the spring of 2010.

[3] IPEDS collected data on the SAT and ACT scores of students at the 25th and 75th percentiles of the college's incoming freshmen class. Since these measures correlate at about .91, we only use the 75th percentile measure. For schools that report SAT scores, we take the sum of verbal and mathematics scores at the 75th percentile. If schools reported ACT composite scores, we convert those scores to their SAT score equivalents based on an equivalency table published by the College Board (see: http://professionals.collegeboard.com/profdownload/act-sat-concordance-tables.pdf).

[4] Though the overall response rate on our survey was high, we have a considerable amount of missing data. We received responses from 6800 of 13000 teachers in grades where students were scheduled to be tested in the prior year. Of these 6800 respondents, about 4200 have complete data on all of the covariates included in our models. The majority of missing data is from the college-level measures. There are a variety of reasons that these data are missing. First, there is item non-response—some teachers simply did not provide the name of their undergraduate institution. Second, some teachers provided responses that could not be coded or were ambiguous. Third, some teachers provided the name of their undergraduate institution but they attended a school that does not report test score data to IPEDS. These are teachers who were educated abroad or who attended colleges that do not require test scores for admissions. The administrative data is fairly complete, however. About 5 percent of student observations are missing test scores but all other measures from the administrative data are missing in less than 1 percent of cases. We use listwise deletion to address missing data in our models.

[5] Interestingly, the relationship between teaching experience and the average prior achievement of teachers' students is even stronger in a model that only includes teacher fixed effects but excludes school fixed effects. This suggests that one way that teachers end up with higher achieving students in their classes as they acquire more experience is by moving to higher achieving schools. This is consistent with the literature on teacher turnover that finds that transferring teachers tend to move to schools with higher average achievement relative to where they start.

[6]In results not shown we replicate the analysis shown in Table 2 but instead use the proportion black, proportion Hispanic, and proportion of students receiving free lunch as the outcomes. These results show that within school-grade-years black teachers are assigned 5% more black students than their white colleagues, Hispanic teachers are assigned 3% more Hispanic students than their white colleagues, and both black and Hispanic teachers are assigned 2-3% more students on free lunch than their white colleagues.

[7] In results not shown we also find that black and Hispanic teachers are assigned students who were absent and suspended more in the prior year even after controlling for the percent white and poor in their classes.

[8] The correlation between these two measures is about -.02. Teachers who have spent more time at their current school have generally spent less time at other schools in the district but the correlation is quite small.

[9] We also conducted an analysis specific to high school teachers where we examine assignment to AP/honors courses and to ninth and twelfth grade students. In this analysis we found that less experienced, minority and female

teachers are assigned fewer AP/honors courses, more ninth and fewer twelfth grade students than their white and male colleagues.

[10] For details on our survey and construction of principal self-reported effectiveness scales see Author (2010).

[11] To obtain these figures we estimate the following models: First, we predict current year math test scores as a function of prior year math test scores, student race/ethnicity, student free lunch eligibility and a school-year-grade fixed effect. The coefficients on race/ethnicity and free lunch eligibility show the raw within school-year-grade gaps in achievement gains. In a subsequent model we control for the characteristics of students' teachers and classmates (within school sorting influences both teacher and peer characteristics) and compute the reduction of the size of the gap by comparing the coefficients in model 1 and model 2.

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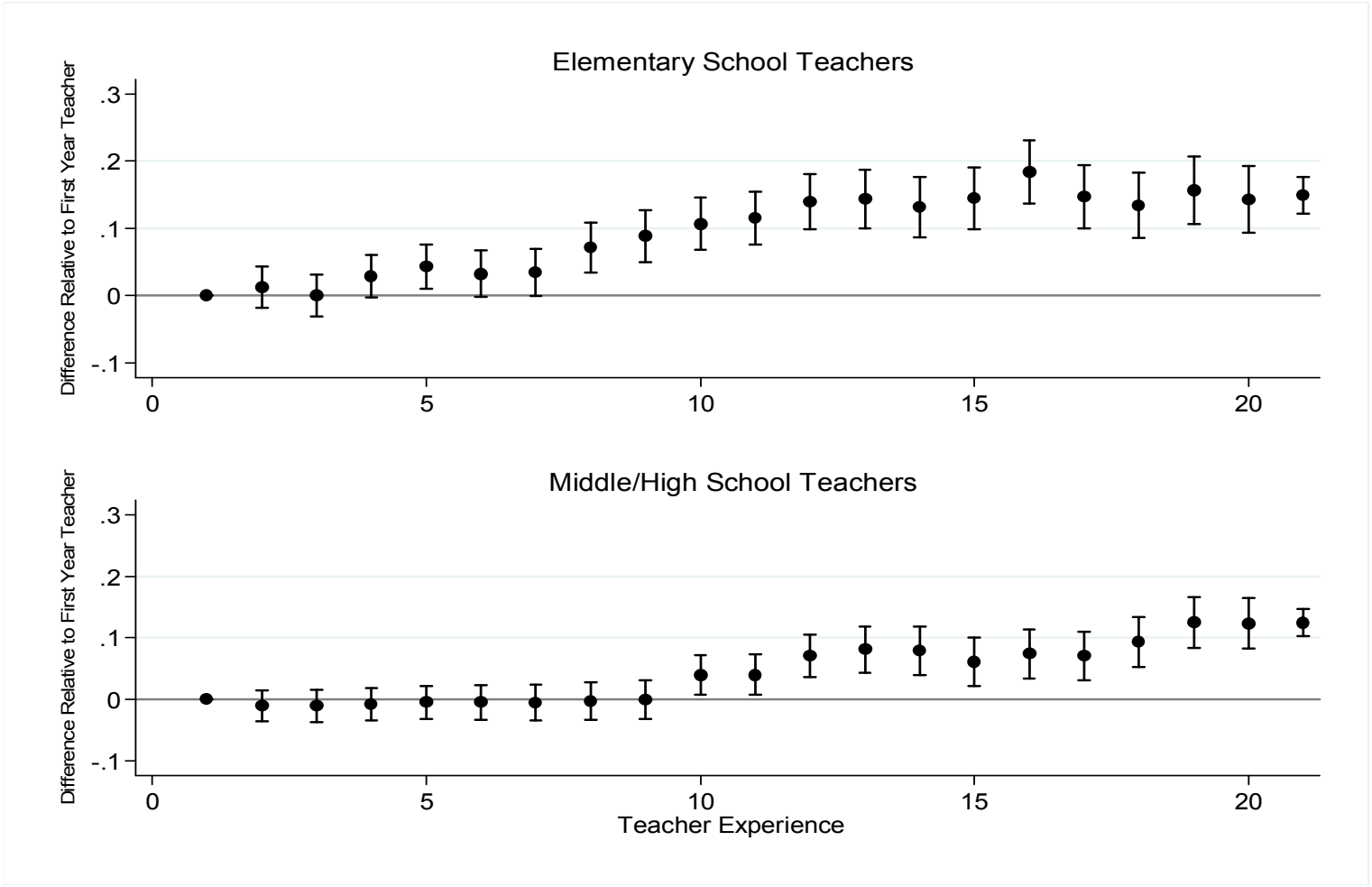

Figure 1. Average Prior Math Achievement of Teachers' Students, With School by Year by Grade Fixed Effects

Notes: The outcome (the average prior year math achievement of a teacher's current students) is predicted as a function of teacher characteristics (race, gender, highest degree earned) and a school by year by grade fixed effect. The experience measure is top coded at 21 or more years of experience. The models are based on the administrative data sample.

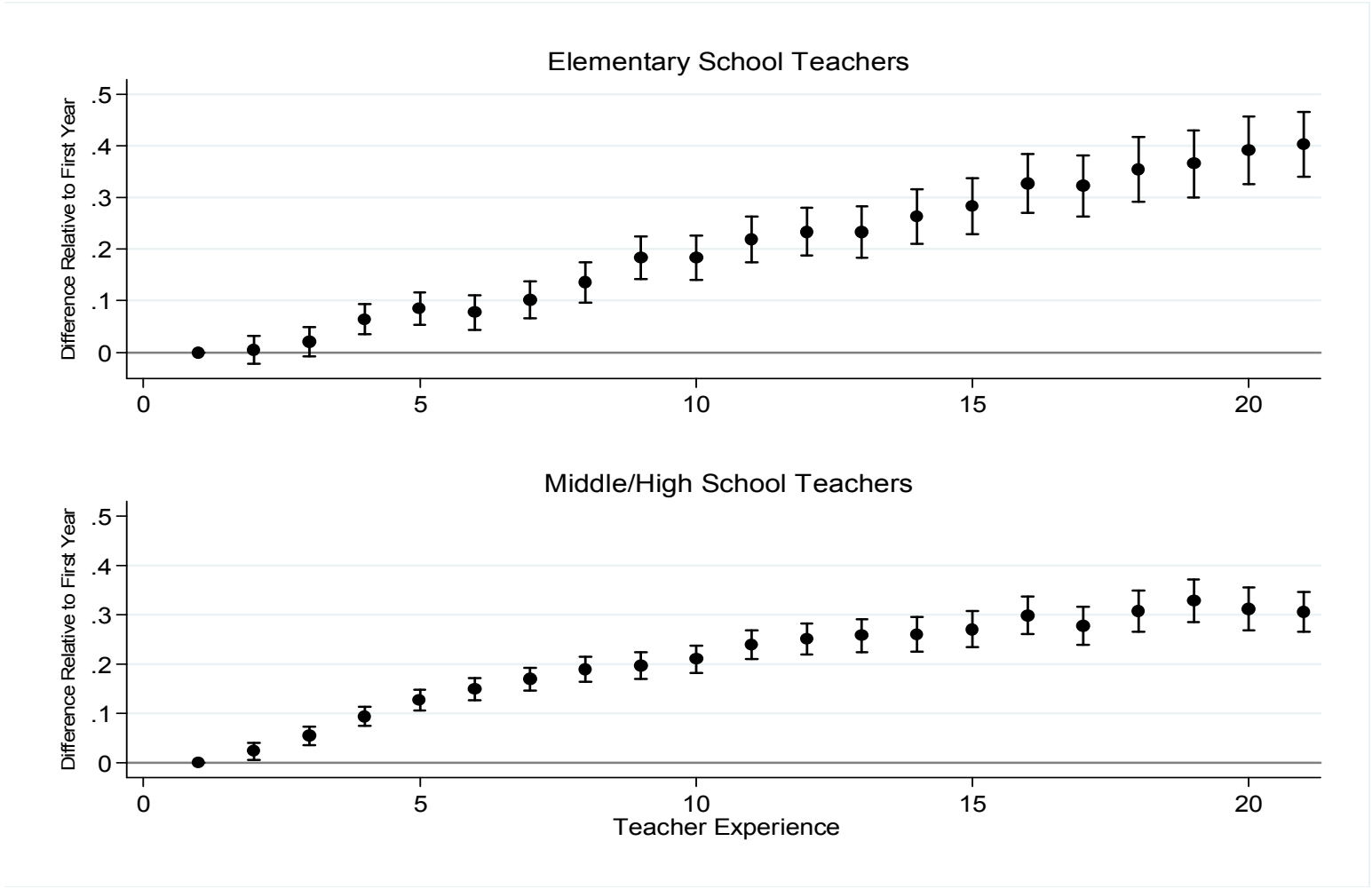

Figure 2. Average Prior Math Achievement of Teachers' Students, With Teacher and School Fixed Effects

Notes: The outcome (the average prior year math achievement of a teacher's current students) is predicted as a function of teacher and school fixed effects. The experience measure is top coded at 21 or more years of experience. The models are based on the administrative data sample.

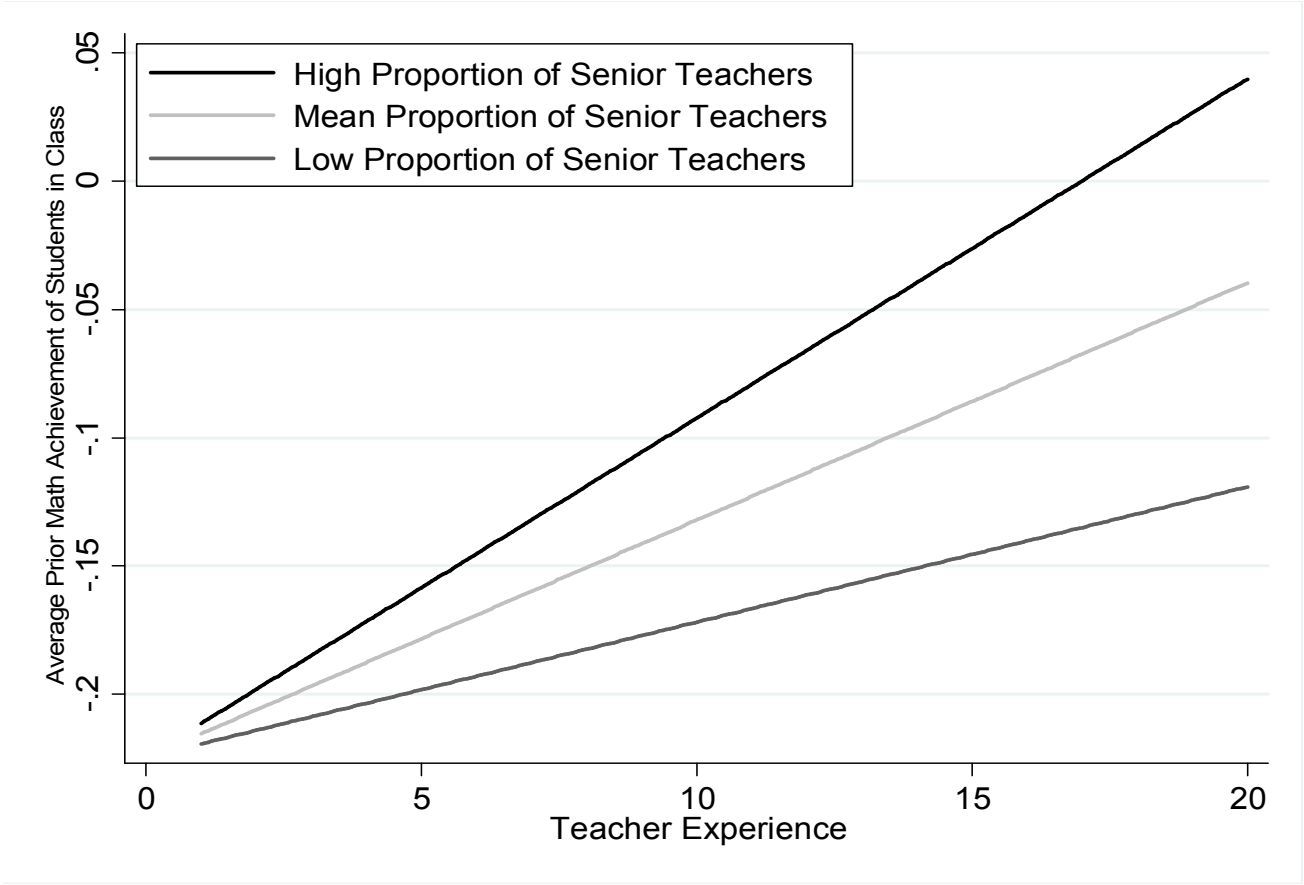

Figure 3. Variation in the Relationship between Teaching Experience and Average Prior Achievement of Teachers' Students by the Proportion Senior Teachers at the School

Notes: The outcome (the average prior year math achievement of a teacher's current students) is predicted as a function of teacher characteristics (race, gender, highest degree earned), a school by year by grade fixed effect, and an interaction between years of teaching experience and the proportion of senior teachers at the school. Teacher race, gender, and highest degree earned are held at the sample mean. The proportion of senior teachers is computed by excluding the focal teacher from the computation. A high proportion of senior teachers is defined as 2 standard deviations above the mean and a low proportion of senior teachers is defined as 2 standard deviations below the mean.

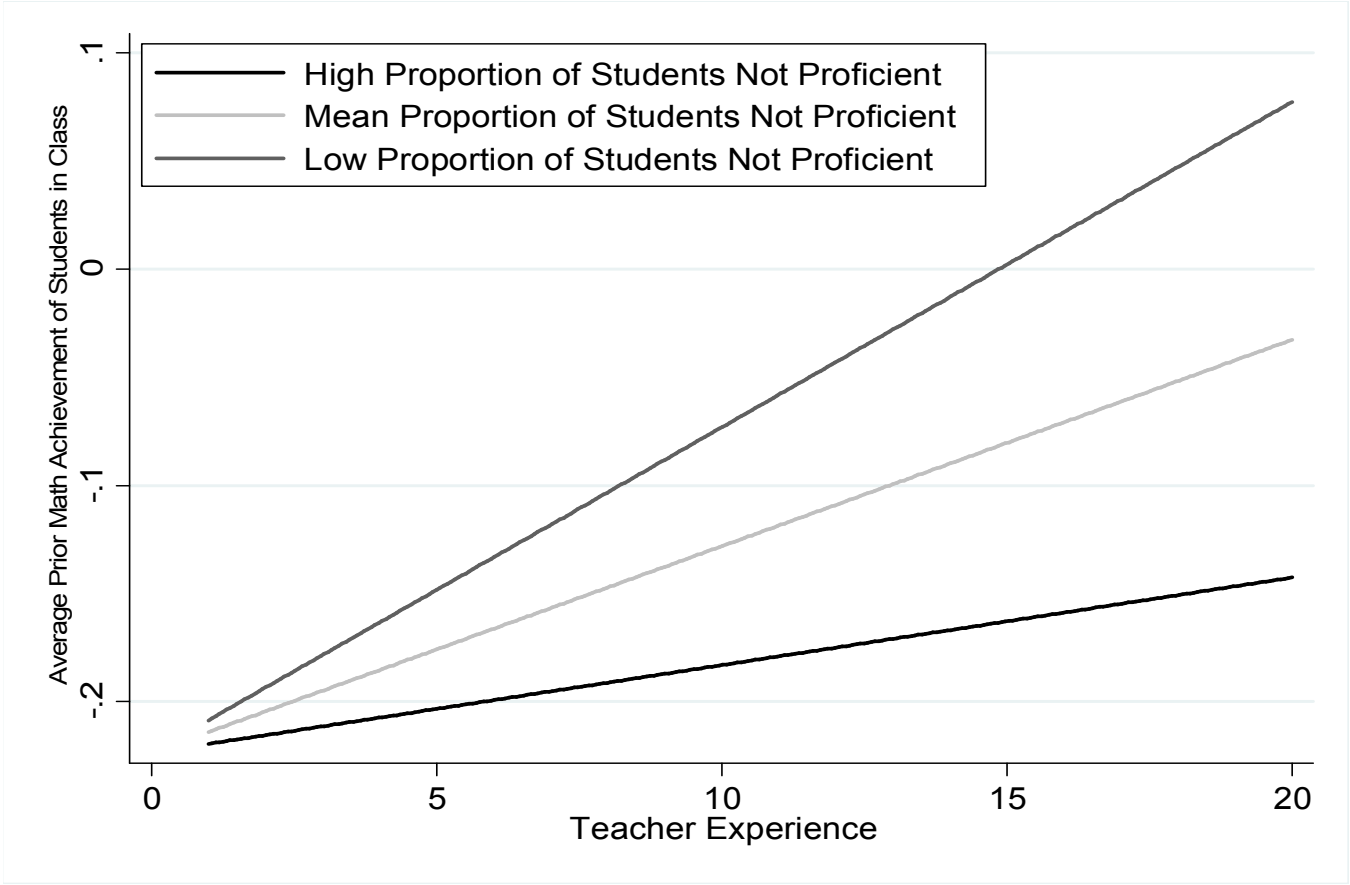

Figure 4. Variation in the Relationship between Teaching Experience and Average Prior Achievement of Teachers' Students by the Proportion of Students at the School Scoring Below Proficient in Math in the Prior Year

Notes: The outcome (the average prior year math achievement of a teacher's current students) is predicted as a function of teacher characteristics (race, gender, highest degree earned), a school by year by grade fixed effect, and an interaction between years of teaching experience and the proportion of students failing to meet math proficiency in the prior year. Teacher race, gender, and highest degree earned are held at the sample mean. A high proportion of non-proficient students is defined as 2 standard deviations above the mean and a low proportion of non-proficient students is defined as 2 standard deviations below the mean.

Table 1. Descriptive Statistics

	Mean	SD
Teacher Characteristics, Adminstrative Data		
Total Years in District	9.00	7.10
White	0.29	
Black	0.26	
Hispanic	0.42	
Female	0.71	
Master's Degree or Higher	0.37	
Teacher's Principal is White	0.28	
Teacher's Principal is Black	0.27	
Teacher's Principal is Hispanic	0.46	
Average Prior Standardized Math Achievement of Teachers' Students	-0.20	0.77
Teacher Characteristics, Survey Data		
Ever Served as Grade or Department Head	0.37	
Ever a Member of School-Wide Leadership Team	0.22	
Ever a Professional Development Leader/Instructor	0.19	
Acceptance Rate of Undergraduate Institution	47.80	15.40
75th Percentile of SAT/ACT Scores of Undergraduate School (in 100s)	11.86	1.22
Years of Experience at Current School	7.61	7.31
Years of Experience at Other Schools in the District	4.41	6.60
Student Characteristics		
Black	0.27	
Hispanic	0.60	
Female	0.49	
Limited English Proficient	0.16	
Retained in Year Prior	0.04	
Eligible for Subsidized Lunch	0.61	

Notes: All figures are averaged over the 2003-04 to the 2010-11 school years except for the survey items which were measured in the spring of 2008.

Table 2. Average Prior Math Achievement of Students in Teachers' Class(es) by Teacher Characteristics

	Administrative Data Sample					*2008 Survey Sample*				
	1	2	3	1	2	3	4	5		
Female Teacher	-0.030 ***	-0.033 ***	0.037 ***	-0.072 ***	-0.072 **	-0.069 **	-0.085 ***	-0.010		
	(0.009)	(0.009)	(0.005)	(0.024)	(0.024)	(0.024)	(0.024)	(0.017)		
Black Teacher	-0.154 ***	-0.140 ***	-0.052 ***	-0.123 ***	-0.087 **	-0.072 *	-0.073 *	-0.024		
	(0.011)	(0.011)	(0.007)	(0.030)	(0.032)	(0.032)	(0.032)	(0.022)		
Hispanic Teacher	-0.108 ***	-0.082 ***	-0.039 ***	-0.077 ***	-0.049 +	-0.014	-0.007	-0.003		
	(0.010)	(0.010)	(0.007)	(0.025)	(0.026)	(0.026)	(0.026)	(0.019)		
Other Race Teacher	-0.044	-0.024	-0.013		0.010	0.044	0.043	0.032		
	(0.031)	(0.032)	(0.018)		(0.090)	(0.090)	(0.089)	(0.063)		
Total Years of Experience in the District		0.021 ***	0.011 ***							
		(0.002)	(0.001)							
Teacher Has MA		0.008	0.018 **			-0.000	-0.014	-0.015		
		(0.008)	(0.005)			(0.023)	(0.023)	(0.016)		
Acceptance Rate of Undergraduate					0.001 +	0.001 +	0.001 +	0.000		
School					(0.001)	(0.001)	(0.001)	(0.001)		
Undergraduate Institution SAT Score					0.047 ***	0.046 ***	0.043 ***	0.009		
in 100s					(0.010)	(0.010)	(0.010)	(0.007)		
Years of Experience at this School						0.021 ***	0.015 ***	0.010 **		
						(0.005)	(0.005)	(0.003)		
Years of Experience at Other Schools						-0.001	-0.006	-0.004		
in District						(0.004)	(0.004)	(0.003)		
Ever Served as Grade or Department							0.088 ***	0.032 +		
Head							(0.025)	(0.018)		
Ever a Member of School-Wide							0.059 *	0.020		
Leadership Team							(0.028)	(0.020)		
Ever a Professional Development							0.109 ***	0.090 ***		
Leader/Instructor							(0.029)	(0.021)		
N	67697	67697	67697	3941	3941	3941	3941	3941		
Control for Whether Teacher is Special Ed	---	---	X	---	---	---	---	X		
Control for Percent White and Poor in the Class	---	---	X	---	---	---	---	X		

Notes: *p<.05, **p<.01, ***p<.001 All models include school by year by grade fixed effects. The models based on the full administrative data sample include multiple observations for the same teacher in different years. We therefore cluster the standard errors at the teacher level in these models. Since students are tested in grades 3-10 in Florida, all models are restricted teachers who taught students in grades 4-11 (i.e., those with prior year test scores). For teachers with multiple classes (i.e., middle and high school teachers), the outcome is the average prior year achievement of the students in all of their classes. All models also include quadradic terms for teacher experience--these terms are quite small and not consistently significant.

Table 3. School-Level Factors Moderating the Relationship Between Average Prior Math Achievement of Students in Teachers' Class(es) and Teacher Characteristics.

	Administrative Data Sample							
	1		2		3		4	
Female Teacher	-0.034	***	-0.035	***	0.035	***	0.036	***
	(0.009)		(0.009)		(0.005)		(0.005)	
Black Teacher	-0.135	***	-0.136	***	-0.041	***	-0.076	***
	(0.011)		(0.011)		(0.007)		(0.011)	
Hispanic Teacher	-0.074	***	-0.075	***	-0.026	***	-0.049	***
	(0.010)		(0.010)		(0.007)		(0.009)	
Other Race Teacher	-0.013		-0.015		0.005		-0.008	
	(0.032)		(0.032)		(0.018)		(0.035)	
Years of District Experience	0.009	***	0.010	***	0.003	***	0.003	***
	(0.001)		(0.001)		(0.000)		(0.000)	
Teacher Has MA	0.013		0.012		0.021	***	0.021	***
	(0.008)		(0.008)		(0.005)		(0.005)	
School-Level Moderators								
Years of District Experience*	0.002	***						
Proportion of Senior Teachers at School	(0.001)							
Years of District Experience*			-0.003	***				
Proportion Students Not Proficient Last Year			(0.000)					
Black Teacher*Percent White Teachers at School					-0.037	***		
					(0.006)			
Hispanic Teacher*Percent White Teachers at School					-0.028	***		
					(0.006)			
Black Teacher*Hispanic Principal							0.031	*
							(0.014)	
Hispanic Teacher*Hispanic Principal							0.006	
							(0.011)	
Black Teacher*Black Principal							0.057	***
							(0.014)	
Hispanic Teacher*Black Principal							0.075	***
							(0.014)	
N	67697		67697		67697		67697	
Control for Whether Teacher is Special Ed	---		---		X		X	
Control for Percent White and Poor in the Class	---		---		X		X	

Notes: *p<.05, **p<.01, ***p<.001 All models include school by year by grade fixed effects. The models include multiple observations for the same teacher in different years. We therefore cluster the standard errors at the teacher level in these models. Since students are tested in grades 3-10 in Florida, all models are restricted teachers who taught students in grades 4-11 (i.e., those with prior year test scores). For teachers with multiple classes (i.e., middle and high school teachers), the outcome is the average prior year achievement of the students in all of their classes. All of the school-level moderators are standardized to facilitate interpretation. The main effects on the school-level measures are absorbed by the school by year by grade fixed effects. The proportion of senior teachers at the school measure is computed by excluding the focal teacher from the average--i.e., the measure reflects the proportion of a teacher's colleagues that are senior.