Can Good Principals Keep Teachers in Disadvantaged Schools? Linking Principal Effectiveness to Teacher Satisfaction and Turnover in Hard-to-Staff Environments

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Background: High rates of teacher turnover likely mean greater school instability, disruption of curricular cohesiveness, and a continual need to hire inexperienced teachers, who typically are less effective, as replacements for teachers who leave. Unfortunately, research consistently finds that teachers who work in schools with large numbers of poor students and students of color feel less satisfied and are more likely to turn over, meaning that turnover is concentrated in the very schools that would benefit most from a stable staff of experienced teachers. Despite the potential challenge that this turnover disparity poses for equity of educational opportunity and student performance gaps across schools, little research has examined the reasons for elevated teacher turnover in schools with large numbers of traditionally disadvantaged students.
Purpose: This study hypothesizes that school working conditions help explain both teacher satisfaction and turnover. In particular, it focuses on the role effective principals in retaining teachers, particularly in disadvantaged schools with the greatest staffing challenges.
Research Design: The study conducts quantitative analysis of national data from the 2003-04 Schools and Staffing Survey and 2004-05 Teacher Follow-up Survey. Regression analyses combat the potential for bias from omitted variables by utilizing an extensive set of control variables and employing a school district fixed effects approach that implicitly makes comparisons among principals and teachers within the same local context.
Conclusions: Descriptive analyses confirm that observable measures of teachers' work environments, including ratings of the effectiveness of the principal, generally are lower in schools with large numbers of disadvantaged students. Regression results show that principal effectiveness is associated with greater teacher satisfaction and a lower probability that the teacher leaves the school within a year. Moreover, the positive impacts of principal effectiveness on these teacher outcomes are even greater in disadvantaged schools. These findings suggest that policies focused on getting the best principals into the most challenging school environments may be effective strategies for lowering perpetually high teacher turnover rates in those schools.

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A relatively large body of recent literature has been devoted to understanding the factors that contribute to turnover in the teaching profession. One of the most consistent findings from these studies is that teachers are more likely to leave schools with larger numbers of disadvantaged students (e.g. Ingersoll, 2001; Hanushek, Kain, & Rivkin, 2004; Loeb, Darling-Hammond, & Luczak, 2005; Scafidi, Stinebrickner, & Sjoquist, 2007). However, *explanations* for the relatively higher turnover rates in schools with more poor, minority and low-achieving

students are less well-developed. The simple labor market theory underlying most analyses of teacher retention predicts that teachers are more likely to leave less attractive environments, but it says nothing about what makes those environments less attractive. In the absence of alternative explanations, one hypothesis is that teachers who leave high-needs schools are responding to an aversion to the students themselves or to the day-to-day burdens and difficulties of teaching low-achieving students (Johnson, Berg, & Donaldson, 2005).

Another hypothesis, however, is that teachers are responding to other undesirable characteristics of the working environment that are correlated with these student characteristics. For example, if disadvantaged students are more likely to attend schools with inadequate facilities in less safe neighborhoods, we may observe teachers leaving not because of the kinds of students in the schools but because they prefer to work in schools with nicer facilities where safety is less of a concern. Note that these two hypotheses are not necessarily mutually exclusive, since it is plausible that teachers are responding in varying degrees both to student characteristics and to correlated working conditions factors simultaneously. Yet because many of these correlated factors can be influenced by policy, whereas student characteristics generally cannot, the degree to which manipulable, non-student characteristics influence teacher attrition is an important question for empirical research.

The characteristic of teacher working conditions at the center of the present study is the effectiveness of the school's principal. A long literature in public administration suggests that supervisors in public organizations play a key role in influencing employee satisfaction and turnover (e.g., Jaussi & Dionne, 2004; Kim, 2002; Trottier, Van Wart, & Wang, 2008), but few studies have rigorously evaluated this relationship in the context of schools. In a meta-analysis of 34 empirical teacher retention studies conducted since 1980, Borman and Dowling (2009) include four studies that incorporate "administrative support" into their models but identify no studies that examine further measures of principal behavior or activity. This failure of quantitative work to connect principals to teacher retention is surprising given numerous

qualitative studies that suggest that principal leadership is a key factor in shaping the work environment, teachers' attitudes and their likelihood of being retained (e.g., Brown & Wynn, 2009; Johnson & Birkeland, 2003a, 2003b).

The goal of this study is to examine the links between principal effectiveness as a central component of school working conditions and teacher satisfaction and turnover. Using national data, these links are examined both in the average school and in schools that traditionally have experienced the greatest staffing challenges, i.e. those with the largest numbers of low-income students and students of color. This last piece is of particular policy relevance since high rates of teacher turnover in these schools have direct implications for student achievement. The relationships among principal effectiveness, student characteristics and teacher outcomes are examined within a regression framework that utilizes extensive control variables and district fixed effects to reduce concerns about omitted variables that have been present in many other teacher satisfaction and turnover studies.

The next section describes the staffing challenges faced by schools with large numbers of disadvantaged students and establishes why finding ways to meet those challenges has important implications for equality of opportunity and student learning. Next, the data and measurement strategies employed are detailed, followed by a description of the methods used and the results. The final section discusses the policy implications of the findings, study limitations, and directions for future related work.

Explaining Staffing Challenges in Schools with Large Numbers of Disadvantaged Students

A straightforward economic labor market model underlies most studies of teacher attrition and mobility (see Guarino, Santibañez, & Daley, 2006, for a summary). This model considers teacher work decisions within a simple supply-and-demand framework, though research typically has focused almost exclusively on factors driving the supply of teachers rather than the demand for teachers.[1] In the language of this model, *teacher supply* means the number

of qualified teachers who are willing to work in a given school, given the set of benefits and costs associated with taking the job. Benefits of teaching include the expected level of total pay (wages plus other benefits, such as employer-subsidized health insurance) as well as intangible benefits, such as the enjoyment of working with specific populations of students. Costs could include time requirements, inflexibility from prescriptive curricula or the stress of working in inadequate facilities. Studies of teacher retention assume that a current teacher deciding whether to stay in or leave a position makes a cost-benefit calculation. When a teacher estimates that the attractiveness of teaching at the same school (that is, overall benefits minus costs) is exceeded by the potential attractiveness of another work option, the teachers exits the current position. [2]

Existing research on teacher turnover can largely be conceived of as identifying which variables are benefits and thus likely to be positively predictive of retention, and which are costs and thus likely to be negatively predictive of retention (Guarino, Santibañez, & Daley, 2006; Borman & Dowling, 2009). As illustrated in Figure 1, prior work has identified several categories of key inputs to this cost-benefit calculation. One is teacher characteristics. For example, male teachers are less likely to turn over than female teachers, on average, perhaps because women are more likely to take time off to care for children in the home (Stinebrickner, 1998). Salary and related benefits, such as health care and pensions, also are important, with numerous studies finding that teachers are more likely to be retained when pay is higher (e.g., Hanushek, Kain, & Rivkin, 2004; Murnane & Olsen, 1989). Teachers' work decisions also consider employment opportunities outside the school, which is a function of local labor market conditions (Loeb & Page, 2000).

Within this cost-benefit framework, working in a school with a large number of disadvantaged students has been discussed as a potential cost in many prior studies.[3] *Disadvantaged* typically is operationalized by minority or poverty status, though sometimes by achievement level as well; these factors are all highly correlated and thus often are discussed interchangeably. One line of thinking implicit in many studies is that teaching disadvantaged

students entails higher costs because such students require more intensive teaching strategies, more individualized attention or greater amounts of out-of-class preparation. Such students are thought to have parents who are less likely to volunteer in the classroom and are less responsive to teacher requests for assistance with the child's learning at home, both of which make them more "costly" to teach relative to students from more advantaged backgrounds.

An alternative to this *students-as-costs* conceptualization is one in which the costs teachers incur in schools with large numbers of disadvantaged students are not from the students themselves but from the kinds of poor schooling environments in which such students are more likely to be found. For example, suppose that low-income students and students of color disproportionately attend schools with inadequate classroom space, less access to technology or fewer resources for purchasing supplies to aid instruction. Because these factors make teaching more difficult or less enjoyable, they will figure negatively into the cost-benefit calculation underlying a teacher's decision to stay or leave. In other words, we might observe teachers turning over more often in schools with large numbers of minority or poor students not because they bear costs directly related to those students or their families but because those students are more likely to go to schools with less favorable working conditions.

While not explicitly attempting to separate student demographics from school environmental characteristics, many studies have documented the propensity for teachers to leave schools with larger numbers of students of color and students from low-income families. Lankford, Loeb, and Wyckoff (2002) found that schools that New York teachers transfer out of average fractions of nonwhite and poor students that are 75 to 100 percent larger than their new schools. In another descriptive analysis, Elfers, Plecki, and Knapp (2006) studied administrative data from six districts in Washington State and found average school turnover rates to be significantly correlated with enrollment of African-American and low-income students. Hanushek, Kain, and Rivkin (2004) found that teachers in Texas who change school districts tend to move to districts with two percentage points fewer black students, four percentage

points fewer Hispanic students and six percentage points fewer students receiving subsidized lunches, on average. Similarly, Scafidi, Sjoquist, and Stinebrickner (2007) showed that teachers who stay in the same school in Georgia teach in schools with lower fractions of black students (0.37) and students in poverty (0.46) than do teachers who turn over (0.41 and 0.49, respectively). Clotfelter, Ladd, Vigdor, and Wheeler (2007) found that only 27 percent of teachers in elementary schools in the highest quartile of poverty in North Carolina in 1999 remained there in 2004, compared to 34 percent of teachers in the two lowest quartiles. They also found that teachers who change schools systematically choose schools with lower fractions of students in poverty than the ones they left.

While evidence of heightened teacher turnover in disadvantaged schools is troubling on its face, the likelihood that high levels of turnover contribute to the chronic low student performance many of these schools experience makes it of even greater concern. One important reason is that high levels of turnover means that a school is likely to continually employ a disproportionately high fraction of beginning teachers, who have been shown to be substantially less effective than their more experienced peers (Rivkin, Kain, & Hanushek, 2005; Clotfelter, Ladd, & Vigdor, 2006). Consistent with the worry that high turnover leads to classroom-level disparities in teacher experience by race, Clotfelter, Ladd, and Vigdor (2005) found that black students in North Carolina are much more likely than whites to be taught by a novice teacher. Also, there is evidence that turnover in the teaching workforce occurs more often among the highest achieving teachers (Podgursky, Monroe, & Watson, 2004; Boyd, Lankford, Loeb, & Wyckoff, 2005), which means that less able novice teachers may be replacing those teachers best equipped to impact student achievement. Furthermore, turnover among teachers disrupts continuity and cohesion and prevents schools from developing a sense of community, all of which have consequences for organizational performance that may be especially pronounced in schools (Ingersoll, 2001). Finally, high monetary costs of teacher turnover—the U.S. Department of Labor places average attrition costs at 30 percent of the departing employee's

salary—implies that replacing teachers diverts funds away from more productive uses (Alliance for Excellent Education, 2005). Taken together, these costs suggest higher teacher turnover is an important contributor to the performance gap between advantaged and disadvantaged schools.

Thus, while reducing teacher turnover in general is a critical issue for policymakers, the equity implications of having the highest turnover in the schools already facing the greatest challenges lend special urgency to the identification of policy strategies to promote teacher retention in high-needs schools that are effective, politically tenable, and not prohibitively expensive. Unfortunately, previous work has failed to identify many potential strategies that meet all of these criteria. The policy-amenable variable about which there is the most research, teacher pay, is perhaps a good example. Various studies have illustrated that teachers are less likely to leave their positions when their salaries are higher, particularly relative to wages in comparable professions (Baugh & Stone, 1982; Murnane & Olsen, 1989; Murnane & Olsen, 1990; Grissmer & Kirby, 1992; Stinebrickner, 1998; Hanushek, Kain, & Rivkin, 2004; Imazeki, 2004; Ingersoll, 2001; Podgursky, Monroe, & Watson, 2004). However, it is not clear that pay raises of the magnitude necessary to reduce turnover substantially in hard-to-staff schools are financially feasible for most districts. For example, Hanushek, Kain, and Rivkin (2004) estimated that a 10 percent increase in the fraction of students in Texas who are black would require a 10 percent average salary increase to neutralize the associated change in teachers' exit probabilities, with even greater increases in some districts. Imazeki (2004) arrived at similar estimates in Wisconsin. Increases of these magnitudes simply are not reasonable for most states' school finance systems.

Here it is helpful to return to the idea that teachers may be responding not just to student characteristics when making work decisions but to characteristics of the school environment that are correlated with those characteristics. The correlation between student characteristics and teacher working conditions, represented by the dotted arrow in Figure 1, is

important because, while policymakers essentially must take student characteristics as given, many environmental characteristics need not be. Many non-student characteristics of the school environment that have been omitted in prior studies are amenable to state and district policies. For example, a study by Loeb, Darling-Hammond, and Luczak (2005) showed that schools in California that are majority black or Latino have more facilities-related problems, such as dysfunctional restrooms and evidence of roaches. Since teachers dislike and are more likely to leave schools with poorly maintained facilities (Buckley, Schneider, & Shang, 2005; Loeb, Darling-Hammond, & Luczak, 2005), investing in improving and maintain facilities in disadvantaged schools may be a strategy for retaining teachers that is relatively cost-effective.

Reallocating effective principals to traditionally hard-to-staff schools may be another such strategy. Principals affect teachers both directly—by offering mentorship or by supplying teachers with necessary supplies, e.g.—and indirectly by helping shape other characteristics of the school environment, including, for example, how well school facilities are maintained. Thus it is not surprising that qualitative studies consistently describe the quality of the principal as a central determinant of teachers' satisfaction levels and decisions to stay in their schools. In Johnson and Birkeland's (2003a) longitudinal interview study of 50 teachers in Massachusetts, teachers who left the profession consistently listed mismanagement by their principals as a chief factor in their decisions (594). In contrast, teachers who felt settled in their current schools described principals who provided assistance in their improvement and worked to create a positive learning environment (603). In their study of 12 principals from schools that had been successful in retaining teachers, Brown and Wynn (2009) conclude that good principals retain teachers by providing opportunities for growth, sharing decision-making, and giving encouragement. In focus groups with new teachers, Farkas, Johnson, and Foleno (2000) find that teachers cited strong administrators as more important than salary and described strong school leadership as one of the most important factors in making the workplace more positive.

While most quantitative studies of satisfaction and retention have not focused their attention specifically on the role of the principal, a few have included factors such as teacher evaluations of administrative support in their models (e.g., Ingersoll, 2001; Smith & Ingersoll, 2004). The results generally indicate a positive relationship between administrative support and teacher work decisions (Borman & Dowling, 2009). However, just one of the four studies identified by Borman and Dowling (2009) as examining administrative support also included student characteristics as covariates (Smith & Ingersoll, 2004). In contrast, the analysis that follows examines principal effectiveness first for the average school and then for schools with the largest numbers of disadvantaged students. It analyzes both actual teacher turnover decisions that can be observed over one year and teacher reports of satisfaction, which is likely determinative of turnover over the longer term (see Mobley, 1977), as functions of principal effectiveness (not just support) and other working conditions. In so doing, it seeks to contribute to our understanding of the role of the principal in affecting teacher work and whether this role may have differential meaning for teachers in schools serving the students of greatest need.

Data and Measurement

The data used in this study come from the restricted-use versions of the 2003-04 Schools and Staffing Survey (SASS) and the 2004-05 Teacher Follow-up Survey (TFS), both of which are administered by the National Center for Education Statistics. SASS covers a nationally representative sample of schools, and several studies have used earlier iterations of these data to explore teacher work decisions on a national scale (e.g. Shen, 1997; Ingersoll, 2001). In selected schools, survey data are gathered from teachers, principals and library specialists that cover a wide variety of topics, including data on attitudes, perceptions, training, resources and various demographic characteristics of respondents. Questionnaires are also given to school and district administrators to collect information about students and various organizational characteristics.[4]

Only data collected from non-charter public schools are used in this analysis. Part-time teachers, long-term substitutes and other non-regular teachers also are excluded. After additional observations are dropped due to missing data, the study retains a minimum of 30,690 teachers in 6,290 schools for the analyses that follow.

Measuring Teacher Satisfaction and Turnover

The primary dependent variables for this analysis are teacher satisfaction and teacher turnover. Teacher satisfaction is measured using a four-point Likert scale response (*strongly disagree* to *strongly agree*) on the Teacher Questionnaire to the statement, "I am generally satisfied with being a teacher at this school." The average teacher in the sample is quite satisfied; the mean response is 3.47. However, a standard deviation of 0.75 reveals substantial variation in this measure.

The measure of teacher turnover is somewhat less straightforward. One year following the collection of the SASS data, NCES conducts the Teacher Follow-up Survey to gather additional information from teachers who were SASS participants the previous year. This process begins with a simple survey of principals to gather SASS teacher location and work information. In particular, principals are asked to identify each teacher as continuing to teach in the same school, continuing to teach but in another school, no longer in teaching and so forth, using one of ten categories. This survey of principals (called TFS-1) is used to construct a sampling frame for surveying current and former teachers for the full Teacher Follow-up Survey (TFS-2 and TFS-3), which gathers a host of information about why teachers choose to remain in or leave teaching but for a sample that is only about one-tenth the size of the full SASS sample. To take advantage of the much larger sample size available in SASS, this study uses the principals' designations of each teacher's whereabouts from TFS-1 rather than the teachers' responses from the full TFS to construct the teacher turnover measure that is the primary dependent variable of interest.

For purposes of analyzing teacher mobility, several studies have noted that teachers can be broken into *stayers*, *movers* and *leavers*. Stayers are those teachers who remain in the same school since the base year. Movers are those teachers who remain in teaching but are no longer teaching in the same school. Leavers are those teaches who have left the profession altogether. Here movers and leavers are grouped together to create a simple dichotomous comparison between those who turn over and those who do not. This choice is both theoretical and practical. The goal of this study is to examine the role of resource differences between low- and high-needs schools on teachers' decisions to stay in those schools. From an individual school's perspective, the costs are the same when a teacher leaves, regardless of whether she leaves to teach at another school or exits the profession. Thus taking an organizational perspective that focuses on implications for individual schools is more appropriate for this study than a system-level perspective that would be concerned with the overall supply of teachers in the national pool (Ingersoll, 2003). Also, from a measurement perspective, there is some concern that principals' TFS-1 responses do a much poorer job at distinguishing movers from leavers than they do at distinguishing stayers from the other two groups, for obvious reasons. Combining movers and leavers into a broader "turnover" group obviates the need to worry about the measurement error problems that might arise in a multinomial analysis.[5] Note that TFS-1 does not allow us to separate teachers who left voluntarily from those who left involuntarily; however, analysis of the 2004-05 TFS-2 and TFS-3 responses indicate that involuntary turnover (i.e. turnover that is the result of a school staffing action, such as termination or reassignment) constitutes only about 11.5 percent of all turnover decisions.[6]

Identifying Effective Principals

A primary variable of interest in this analysis is the effectiveness of the principal who manages the school. Unfortunately, an objective measure of principal effectiveness is unavailable. Instead, a measure was constructed from Likert scale responses to six statements

on the SASS Teacher Questionnaire that capture different aspects of administrator performance: setting clear expectations, providing support and encouragement, recognizing staff for a job well done, and so forth (see Appendix Table 1). After establishing the suitability of the data for factoring,[7] a principal factor analysis was performed on these six variables. The factor analytic model uses the correlations among the variables to uncover one or more common latent factors that are assumed to drive these patterns. Using the standard Kaiser criterion, the analysis identified one latent factor (Eigenvalue = 3.27) among these variables, which is defined to be the effectiveness of the principal. Cronbach's alpha (α = 0.88) suggests a high level of reliability for this latent measure. In addition, as shown in Appendix Table 1, the minimum factor loading for any of the six variables was 0.69, further evidence that the single factored measure is a good representation of its individual components. High inter-correlations among the individual principal measures suggest that principals who are strongest on one dimension, such as the "administrative support" dimension sometimes used in prior work, typically are strong on the other skills or behaviors on which teachers evaluate their effectiveness.

The common linear scoring method was employed to generate individual measures of principal effectiveness for each teacher based on the factor analysis results. However, it would be inappropriate to use these teacher-level scores to predict teacher satisfaction and turnover. A primary reason is that individual teachers who are very dissatisfied—and who may even have decided to leave their school at the end of the upcoming school year—may systematically rate principals lower to express their general dissatisfaction or to provide a rationale for their impending decision. As a result, estimates of the relationship between satisfaction or turnover and the principal effectiveness measure may be biased. To minimize this potential source of bias, instead of using individual teacher scores for principals, the school-level mean of these scores is taken as the principal effectiveness measure. While taking a mean eliminates some variation, it should represent a more robust measure of actual principal performance.

School and Teacher Characteristics

Measures of school and teacher characteristics also are collected from the data provided by SASS and included as control variables in all models because of the role past work has shown they play in teacher's decisions to stay or leave (e.g., Hanushek, Kain, & Rivkin, 2004). School characteristics include fractions of students who are African American, Hispanic and eligible for free or reduced lunch, school size, the level of the school (elementary, middle or high), and whether the school is a magnet school. An indicator for being a "regular" school, as opposed to a vocational, alternative or special program school, is included as well. A final indicator for whether the school is located in an urban, suburban or rural area is also included. Teacher characteristics include gender, race, total teaching experience, whether the teacher holds a regular certification, and possession of a Master's or higher degree.

To more precisely estimate the relationship between principal effectiveness and teacher outcomes, in some models other measures of the working conditions in the school are included as control variables. These variables are listed in Appendix Table 2. The first is average class size in the school. Several prior studies have examined the role of average class size on teacher turnover decisions, though results have been mixed (e.g. Mont & Rees, 1996; Hanushek, Kain, & Rivkin, 2004; Loeb, Darling-Hammond, & Luczak, 2005). Three measures of school personnel resources are included under the assumption that larger numbers of staff in the school to support teachers will positively affect the environment. These three variables are administrators per student, where administrators include both principals and vice or assistant principals; professional support services staff per student, which includes fulltime nurses, social workers, psychologists, and speech therapists; and instructional aides per student, including aides for Title I students, the media center, bilingual education, special education, and other classroom instruction. Because prior work has found evidence that inadequate physical resources are moderate-to-strong predictors of teacher satisfaction and turnover (Loeb, Darling-Hammond, & Luczak, 2005; Horng, 2009), four measures of facilities and other physical resources are

included. These are the fraction of the school building's student capacity in use, an indicator for whether the school utilizes common areas for instruction because of classroom overflow, an indicator for not having a school library, and the school library's total number of books per student. Finally, two measures capture different aspects of teacher professional development, an area other studies have conjectured to matter for teacher work decisions (Reynolds, Ross, & Rakow, 2002; Johnson, Berg, & Donaldson, 2005). These are the number of workshops a teacher reports attending in the past twelve months and an indicator variable for whether the teacher engaged in any professional development in the subject matter taught. An additional variable, teacher base salary, is included here as well, since other studies have considered pay as an important work characteristic informing of teacher attitudes and decisions to stay or leave (e.g., Imazeki, 2004).

Results

Summary Statistics

Summary statistics for the main variables considered in this study are shown in Table 1. Note that the complex stratification process employed in the SASS and TFS require that all analyses utilize appropriate weighting procedures to reflect population estimates. Weights are incorporated in Table 1 and in all analyses that follow.

The first two lines of Table 1 summarize the dependent variables. The average regular teacher who works full-time in a non-charter public school has a relatively high degree of satisfaction: 3.47 on a 4-point scale. Yet despite this relatively high level of job satisfaction, 13 percent of these teachers turned over between the 2003-04 and 2004-05 school years.[8] This number is one percentage point lower than the 14 percent that Strunk and Robinson (2006) find in their analysis of the 1999-2000 SASS and 2000-01 TFS but slightly higher than the 12.4 percent turnover rate for public school teachers Ingersoll (2001) reports from his analysis of the

1990-91 SASS and 1991-92 TFS. These differences likely are attributable to the differing sets of exclusions applied to the samples from which these estimates are drawn rather than to any real trends across years. Other work on all teachers across SASS and TFS administrations indicates a steady upward trend in turnover between 1991-92 (12.4 percent) and 2004-05 (16.5 percent), suggesting that staff turnover is a growing challenge for schools (Boe, Cook, & Sunderland, 2007).

Seventy-five percent of the teachers in the SASS population are women. They have an average experience level of 13.4 years. Eighty-nine percent hold regular certification status, and 47 percent hold Master's degrees or higher. Only eight percent are African American, and only six percent are Hispanic, despite the fact that those fractions are much higher in the student population (16 percent and 15 percent, respectively). The relative underrepresentation of African Americans and Hispanic in the teacher workforce is noteworthy given research both that teachers may be more likely to stay in environments where they are of the same race as large numbers of the students (Strunk & Robinson, 2006) and that students may learn better when taught by a same-race teacher (Dee, 2004).

The third section of Table 1 displays descriptive statistics for characteristics of the principals in the sample. Each variable is averaged at the school level. The first variable is the factored principal effectiveness measure. For ease of interpretation, the variable is standardized to have mean 0 and standard deviation 1. Unstandardized means and standard deviations for the six variables that comprise the factored measure are shown next, revealing substantial variation in evaluations of principals by teachers in the sample. Principals tend to score highly on some measures (e.g,, knowing what kind of school he/she wants and communicating it to the staff) but much lower on others (e.g., recognizing staff for a job well done). Standard deviations for the six variables range from 0.72 to 0.87, which are quite large given the variables' four-point scales. The bottom of the table summarizes other observable characteristics of the principals.[9]

Comparing Teachers and Principals in Disadvantaged and Other Schools

While the substantial variation in teacher and principal characteristics across schools is unsurprising, the degree to which teachers and principals with less desirable characteristics may be concentrated in schools with the largest numbers of disadvantaged students is an important issue for educational equity. Here we investigate the extent to which teachers and principals differ between schools with large populations of low-income and minority students, which traditionally have faced the greatest challenges with respect to staffing of teachers and administrators, and other schools. To simplify this comparison, schools are sorted into binary categories of *disadvantaged* and *other* on the basis of student demography. Student demographic characteristics are supplied by the SASS School Questionnaire.[10] Disadvantaged schools are defined as those that fall into the highest quartile of the fraction of black students, the fraction of Hispanic students, or the fraction of students eligible for free or reduced price lunch. Note that this definition is rather expansive; 38 percent of schools in the sample meet the criteria.[11] We then compare observable characteristics in these schools to the other schools in the sample using simple differences-in-means tests.

The results are shown in Table 2. Consistent with expectations, job satisfaction is significantly lower—approximately one-fourth of a standard deviation—among teachers in disadvantaged schools. Annual turnover rates also are much higher: 15 percent to 11 percent, indicating that teacher turnover rates in schools with the largest numbers of minority and low-income students are 36 percent higher than in other schools. Both of these differences are statistically significant at the 0.001-level. The next few rows show that the demographic composition of the two school types also is very different. While the average school not meeting the disadvantaged definition has only 3.4 percent black and 3.5 percent Hispanic students, the average disadvantaged school has percentages of 29.5 and 27.7, respectively. Differences in free and reduced price lunch eligibility are similarly stark: 63.2 to 26.7 percent. While creating a dichotomous variable to represent multiple student characteristics is coarse, it is nonetheless

clear from this table that indeed there are important associations between student demography and teacher satisfaction and retention that raise substantial concerns for equity and policy.

The next section of Table 2 examines differences by disadvantaged status in teacher characteristics. Women and minorities both are more likely to work in disadvantaged environments than men or whites. The differences for African Americans (15 vs. 2 percent) and Hispanics (11 vs. 2 percent) are especially large. Unsurprisingly, given the different rates of turnover, teachers in disadvantaged schools have lower average experience (about a year-and-a-half, on average) and are more likely to be in their first year of teaching, confirming the worry that students in these schools are more likely to be taught by teachers earliest in their careers when they are least effective. These teachers also are less likely to hold a regular teaching certificate or an advanced degree.

Next Table 2 tests for differences in principal characteristics. Once again, we observe that women and minorities are more likely to be principals in disadvantaged schools. The differences are large. Fifty-seven percent of principals in disadvantaged schools are female compared to 39 percent in other schools. Twenty percent of principals in disadvantaged schools are black, and 10 percent are Hispanic, compared to just two percent and one percent, respectively, in other schools. Principals in disadvantaged schools tend to have less experience in the principalship (7.1 vs. 8.5 years), though they tend to have slightly more teaching experience (13.4 vs. 12.8 years) and a slightly higher probability of holding a doctorate (9.9 percent vs. 7.6 percent).

The bottom of the table compares the measures of principal effectiveness created from the teacher survey data that are of special interest in this study. There are systematic differences in principal evaluations between the two school types. In particular, principals in disadvantaged schools tend to fall below the mean on the aggregated effectiveness measure while principals in other schools tend to fall above. On average, the difference in these principals is about four one-hundredths of a standard deviation, which is seemingly small but statistically significant at the

0.01-level. Though not shown, the standard deviations in the effectiveness measure are somewhat higher in the disadvantaged schools as well (1.03 to 0.96), suggesting that there is more variation in principal performance across the two school types as well. Next the table shows how differences in the principal effectiveness measure are reflected in the six component variables. While differences for three of the variables are marginal and not statistically significant, three show large differences. In particular, teachers in disadvantaged schools give much lower ratings to administrative support and encouragement, enforcement of school rules and their general assessment of how the school is run. Note that aside from the potential implications for teacher satisfaction and turnover, these findings imply that students from the most disadvantaged backgrounds attend schools with systematically less effective managers. Given the large role of the principal in establishing the learning environment in a school, the concentration of less effective principals in high-needs schools has potentially substantial implications for the schooling experiences of disadvantaged students.

For completeness, a comparison of the other working conditions variables between the two school types appears in the Appendix. The results are consistent with the expectation that working conditions are less desirable in disadvantaged schools. These schools have larger average class sizes, fill a larger portion of their building capacity, are less likely to have a library and offer students fewer library books. Each of these differences is statistically significant at the 0.05-level or less. However, disadvantaged schools report larger per-student ratios of non-teaching personnel: administrators, professional support staff and instructional aides per student. For example, disadvantaged schools employ approximately one principal or vice principal for every 250 students, compared to one per 333 students in other schools. One possible interpretation from this comparison of personnel resources is that disadvantaged schools are more top-heavy and bureaucratic, which may negatively impact teachers. This conclusion is consistent with work by Eller, Doerfler, and Meier (2000), who found a negative association between bureaucracy and retention in Texas. Another interpretation is that these

patterns are the result of a reverse causal relationship in which larger numbers of personnel are hired in these schools in order to support teachers in improving student performance. Disadvantaged schools also report attending larger numbers of workshops and more professional development in their subject area of teaching. There are no systematic differences in teacher base salary.

Regression Analysis

To analyze the relationships between teacher satisfaction and retention and principal effectiveness, a series of models are estimated that consider teacher satisfaction and the probability that a teacher turns over between SASS and TFS administrations as functions of those variables, with controls for other school, teacher, principal, and working conditions characteristics. Equation 1 shows the basic set-up.

$$O_i = \beta_0 + \beta_1 \, Principal\ Effectiveness_j + \beta_2 \, S_j + \beta_3 \, T_i + \beta_4 \, P_j + \beta_5 \, W_j + \gamma + e_{i,j} \qquad (1)$$

In equation 1, O_i is a teacher-level outcome, either satisfaction (on a four-point scale) or turnover (an indicator variable). *Principal Effectiveness* is the standardized school-level average of the factored teachers' ratings of principal performance. S is a vector of exogenous school characteristics for school j, including student demography, while T is a vector of characteristics of teacher i. P is a vector containing the principal characteristics, such as experience and education level, that are considered in Table 2. W is a vector of other school-level working conditions variables, such as average class size and library books per student, that are shown in Appendix Table 2.

The term γ represents a district-level fixed effect, which is included in all models to control for unobserved district heterogeneity that may affect teacher turnover decisions, such as conditions in the local labor market or overall district expenditure levels. By including a district

fixed effect, the coefficients estimated for principal effectiveness can be interpreted as representing the impact on teacher satisfaction or turnover among principals at different levels of effectiveness in comparable schools *within the same district*. Estimates based on district fixed effects extend nearly all prior studies that have failed to take this source of heterogeneity into account.

All models are estimated using ordinary least squares. When turnover is the dependent variable, the model becomes a linear probability model, which is estimated instead of logit or probit models for ease of interpretability and to accommodate the inclusion of district fixed effects. Standard errors are clustered at the school level to take into account observations from multiple teachers within schools.

Four models each are estimated for satisfaction and turnover. Both sets of models are summarized in Table 3. The first model in each set contains only exogenous school and teacher characteristics to give a baseline association between satisfaction or turnover and student demographic characteristics. The second model adds the principal effectiveness measure. The third and fourth models add other principal characteristics and the working conditions measures as possible omitted variables that may affect the estimate of the association between principal effectiveness and outcomes, though for brevity these coefficients are not included in the table.[12]

Teacher Satisfaction Results

The satisfaction models are discussed first. As column 1 shows, the fractions of black, Hispanic and low-income students all are negatively associated with teacher satisfaction. Teachers in elementary schools, smaller schools and regular public schools tend to be more satisfied. There are no important associations between teacher satisfaction and other teacher characteristics.

Column 2 adds the principal effectiveness variable. Importantly, the addition of this variable to the model coincides with large drops in the magnitudes of the coefficients for all three student demographic variables, suggesting that the distribution of principal effectiveness across schools explains a significant portion of the correlation between student characteristics and teacher satisfaction that prior work observes. The amount of attenuation of these coefficients from model 1 to model 2 is larger for student race characteristics than for student poverty, though all three variables remain relatively large and statistically significant at the 0.05-level. The coefficient of 0.25 for the principal effectiveness measure suggests that a one standard deviation increase in this variable is associated with about one-fourth of a point on the four-point teacher satisfaction scale for a comparable teacher in a similar school within the same district. The magnitude of this association is both statistically and practically significant, suggesting that differences in principal effectiveness need not to be very large to predict rather substantial differences in how favorably teachers view their jobs.

Columns 3 and 4 add additional controls for principal characteristics and school working conditions. These variables are entered separately to assess how much of the effect of principals on satisfaction is due to correlations between principal effectiveness and these other factors. The addition of these variables causes virtually no change in the coefficient on principal effectiveness, suggesting that effectiveness principals may impact teacher satisfaction independent of their other personal characteristics or characteristics of the school environment.[13]

Teacher Turnover Results

Columns 5 through 8 estimate the same sets of models for the more policy-relevant dependent variable, teacher turnover. Again, the model with only school and teacher characteristics provides a baseline for comparison to other models. Several patterns emerge. First, the coefficients on all three student demographic variables are positive, though only the

coefficient on the fraction of black students is statistically significantly associated with teacher turnover.[14] The coefficient for this variable is 0.15 ($p < 0.01$), which suggests that the average school with no African American students will have a turnover rate that is 15 percent lower than the average school with only African American students. Teacher turnover is uncorrelated with other school characteristics. However, teacher characteristics are important explanatory variables for turnover. Female teachers are less likely to turn over than male teachers (β = -0.02), and Hispanic teachers are less likely to turnover than white teachers (β = -0.04). No important differences are found for black teachers. Teacher experience, entered as a series of indicator variables for different experience levels, shows the conventional U-shape (Hanushek, Kain, & Rivkin, 2004), with turnover rates the highest for first year teachers, declining through approximately years 9 to 11, and then increasing again late in the career. Teachers with regular teaching certificates are significantly less likely to leave than those with non-regular certifications (β = -0.04). There is no significant correlation with having an advanced degree and probability of turning over. Each of these results persists with the addition of other covariates.

Model 6 adds the principal effectiveness measure. The coefficient is negative and significant (β = -0.014, $p < 0.01$), suggesting that each standard deviation increase in principal effectiveness is associated with about a 1.5-point decrease in a teacher's probability of leaving the school. This decrease is approximately 11 percent in the average school, a significant drop. Moreover, the inclusion of this variable results in a decrease in the coefficient on the percent black variable (0.154 to 0.135, or about 12 percent), again suggesting that principal effectiveness is a characteristic of the work environment that helps explain a significant portion of the correlation between student characteristics and turnover.

The final two models add the principal and working conditions variables. Between columns 6 and 8, the coefficient on percent black falls substantially (0.135 to 0.073) and becomes only marginally statistically significant, illustrating the importance of working conditions for teachers in schools with many disadvantaged students.

The coefficient on the principal effectiveness measure remains stable across these models, suggesting a direct association between principal performance and teacher turnover even conditional on the other school, teacher, principal and working conditions variables. The coefficient on principal effectiveness in model 8 is identical to the one in model 6 (β = -0.014). To illustrate the magnitude of this coefficient, consider two observationally equivalent teachers in identical schools in the same district. The only difference between the two is that one works in a school with a principal whose effectiveness rating is one standard deviation below the mean while the other's is one standard deviation above. The predicted difference between the two teachers' turnover probabilities, based on Model 8, is 2.5 percentage points. On a base of 13 percent, this difference is substantial. This finding on the importance of principal leadership for teacher work decisions helps quantitatively substantiate similar observations made by qualitative studies (e.g., Johnson & Birkeland, 2003; Brown & Wynn, 2009).

The Differential Effects of Principals on Satisfaction and Turnover in Disadvantaged Schools

The large associations among student demographics, principal effectiveness and teacher satisfaction and turnover in the average school raise the question of whether principals may have differential net effects on teachers in schools with greater staffing challenges. Both the descriptive analysis presented in Table 2 and the attenuation of the coefficients on the student demographic variables when the principal measure is included in Table 3 suggest that good principals—as judged by their teachers' ratings—tend disproportionately to be located in schools with lower concentrations of nonwhite and poor students. But when good principals *are* hired or assigned to lead traditionally hard-to-staff schools, it stands to reason that there might be even larger effects on satisfaction and turnover than in other schools where greater resources and more favorable working conditions make strong principals less instrumental in teachers' attitudes and decisions to stay or leave. Good principals in disadvantaged schools may promote teacher retention by finding intangible ways to recognize teachers for working hard under

relatively more difficult circumstances, for example, or they may provide teachers with a positive vision for the school that makes teachers want to stay and take part. They may create more orderly work environments by establishing norms for behavior and discipline and school routines that matter more in challenging environments (Johnson & Birkeland, 2003). In contrast, in resource-rich schools with many intangible benefits to teaching, the performance of the principal may be less salient. Conversely, it may be the case that the "good principal effect" is the same regardless of what kinds of students attend and that this effect is not moderated by the degree of staffing challenge.

To test whether principal effectiveness matters more or less in disadvantaged environments, a version of equation (1) is estimated that replaces student demographic characteristics with the *disadvantaged school* variable created for the differences-in-means analysis shown in Table 2. It then includes other school and teacher characteristics, principal effectiveness, and the interaction between effectiveness and disadvantaged status. A statistically significant coefficient on the interaction term would indicate that principals have differential impacts on teacher satisfaction and turnover across the two types of schools.

The results, shown in Table 4, support the hypothesis and illustrate the potential impact a good principal can have on satisfaction and turnover in a high-needs environment. In the satisfaction regression, the interaction term is positive (β = 0.058, $p < 0.05$), suggesting that principals have a more positive effect on satisfaction in challenging environments than they do in the average school. Holding other factors constant, mean teacher satisfaction in a disadvantaged school would be higher under a very effective principal than would satisfaction in an average school with that same principal.

A similar pattern is observed for teacher turnover. The interaction term is negative (β = -0.02) and significant at the 0.05-level, suggesting that teacher turnover may be impacted more by the quality of the principal in a disadvantaged, traditionally hard-to-staff school than in an average school. In fact, the size of the coefficients imply that a 1.5 standard deviation increase in

principal effectiveness is enough to offset the turnover differential between disadvantaged schools and other schools, as defined by student demographics.

Figure 2 illustrates this moderating effect by defining an "average" principal to be one with a mean effectiveness rating and an effective principal to be one with an effectiveness rating 1.5 standard deviations above the mean. While differences in turnover in schools not defined as disadvantaged are very small for the two types of principals, the differences for disadvantaged schools are sizable, with effective principals estimated to have teacher turnover rates approximately 3.4 percentage points lower than average principals. Having an effective principal in the school completely offsets the effect of being in a disadvantaged environment. Obviously this difference would be even more pronounced if a comparison was made between an effective principal and one scoring below the mean effectiveness rating. While no causal claims can be made with these data, this finding does suggest that more rigorous studies of principal allocation by effectiveness across schools of differing levels of disadvantage and the implications for teacher retention are warranted.

Discussion and Conclusions

Teachers working in schools with larger numbers of nonwhite and low-income students have significantly lower levels of job satisfaction and significantly higher propensities to leave the school. However, the estimates presented here, which are based on national data, suggest that prior studies have overestimated the association between student demography and satisfaction and turnover by failing to take into account the generally less favorable measures of working conditions for teachers in schools with large numbers of disadvantaged students. Including these measures substantially weakens the relationship between student demographic characteristics and these teacher outcomes. The effectiveness of the school principal is found to be an especially important component of teacher working conditions; average teacher ratings of principal effectiveness are strong predictors of teacher job satisfaction and one-year turnover

probability in the average school. Moreover, these correlations are even stronger in schools with large numbers of disadvantaged students that traditionally have faced greater staffing challenges.

Prior research has identified high rates of teacher turnover as a contributor to the disappointing performance of many schools serving disadvantaged populations (Hanushek & Rivkin, 2007). The conclusion from this study is that elevated turnover in disadvantaged schools results in part from inequities in school characteristics, including the performance of the school's principal and other school resources. Minority and poor students attend schools with less favorable characteristics, on average, and this fact has consequences for the workforce of teachers in those schools. However, many school characteristics are amenable to policy change. The results presented in this paper suggest that teacher retention in high-needs schools might be reduced by addressing some of the tangible and intangible factors differentiating those schools from their less challenged counterparts.

Coupled with results from previous studies linking teacher turnover to student achievement, the finding that good principals can impact teacher retention is consistent with research on how principals affect student learning that shows such effects to be indirect (Hallinger & Heck, 1998). This research suggests that effective principals promote student achievement not by influencing students directly but by helping to create school environments that are conducive to student learning. Building instructional capacity by maintaining a more stable teacher workforce is an overlooked avenue whereby effective principals can positively affect student performance. Likewise, increased teaching staff turnover may be a way that disadvantaged schools are negatively impacted by the lower school leadership capacity that is often characteristic of those schools. The potential implications for students of the differential effectiveness of principals by student characteristics that this study uncovers highlights school leadership quality as a consideration in future discussions of educational equity.

Future work should delve further into the connection between school leadership and teacher retention. While it is useful for policy to know that good principals matter, much more useful would be to know precisely what characteristics of principals and their management styles and characteristics predict lower turnover and other positive organizational outcomes. Identification of such attributes would allow districts and educational leadership programs to focus on developing them in other school leaders via in-service and pre-service training. It would also provide state and district policymakers with guidance in how to recruit and select potential principals who have the capacity to build productive working environments for teachers and their students.

Even without yet being able to identify the specific traits of good principals, the differences in principal effectiveness observed between disadvantaged and other schools is an important consideration for policymakers. At a minimum, it does not appear that districts currently are implementing a strategy of moving their best principals into the neediest environments. Through its relationship with teacher satisfaction and turnover, and likely through relationships with other variables that influence student achievement as well, the misallocation of high quality principals may be an important source of outcome gaps between students in high-needs and low-needs environments. It is worth pointing out that the estimates these factors on teachers are made *within district* (due to the district fixed effect), thus drawing attention to the impacts of allocations made by local district leaders. Removing the district-level indicators would allow differences in district resources to come into play as well, no doubt exacerbating the links between working conditions and teacher work decisions. In short, states and districts would benefit from reconsideration of policies governing how school leaders are recruited and assigned across schools.

Several limitations of this study should be noted. First, because the study is observational in nature, we cannot necessarily draw the conclusion that improving principal effectiveness or other working conditions in any school will improve employee satisfaction and

reduce turnover as a direct result. More rigorous analysis using, for example, data on teachers and principals over an extended time period that could observe how teachers' work decisions change under different principals within the same school might get us closer to drawing such conclusions. However, the use of a long list controls for school, teacher, principal and working conditions variables, plus the district fixed effect, does limit the potential for bias from omitted variables to a degree not achieved in most previous studies using similar data.

A second limitation is the study's reliance on survey data. We do not know, for example, whether teachers report their true job satisfaction, or even if they are capable of knowing its true value. While we can feel more confident in the turnover analysis in this respect, we still may have concerns that teacher satisfaction and decisions to leave may contribute to teachers' evaluations of their principals. If, for example, teachers who leave in the TFS year make up their minds to do so in advance of being surveyed in SASS, the data may capture attitudes that are jointly determined with the exit decision; that is, teachers who have decided to leave may rate their principals as ineffective as a way of justifying their decision, not because the principal is any less effective. The study attempts to guard against this concern by aggregating all attitudinal measures to the school level, but this correction is imperfect. More detailed data sets may be able to employ further methodological strategies for evaluating these findings.

The potential sensitivity of the principal effectiveness measure to other factors highlights the limitation of operationalizing principal effectiveness from teacher responses. Teacher perceptions can capture only some aspects of school leadership. Perspectives of parents, students and district-level supervisors may provide other pieces. Principals' self-perceptions may provide still another perspective. An altogether different approach would be to operationalize principal effectiveness using more objective measures, such as student test score gains. A more complete rendering of what constitutes high-quality school leadership will require a combination of these approaches. In this sense, the simple measure based on teacher evaluations of principal behavior used in this study is quite limited.

A final limitation is that the data employed here are limited in time span. Longitudinal data linking teachers to principals as they change schools would allow for analysis of how the same teachers respond to principals with different characteristics, background and skill sets. This kind of analysis is necessary for gaining a better understanding of the interactions between teacher and principal characteristics in predicting teacher outcomes and how those interactions depend on school contextual factors. Longitudinal data would also make it possible to examine the implications of time-varying factors on teacher satisfaction and turnover. For example, district financial distress and changing patterns of segregation among student bodies and teacher workforces may have implications for the relationships among teachers, students and school leaders that are beyond the scope of this study.

Because the data used here are confined to the 2003-04 and 2004-05 school years, an additional area of potential importance that is beyond the scope of what can be examined in this analysis is the impact of No Child Left Behind (NCLB). Besides increasing accountability pressure on principals and teachers, NCLB contains a number of provisions with direct implications for teacher turnover, including parental school choice options, which could result in the loss of teaching positions for some schools, and the potential for teacher dismissals under school restructuring. It also sets out plans for schools in need of improvement that change the roles of school leaders and teachers. Because of the timeline NCLB specifies for corrective action, the data predate the time period in which schools could feel the direct effects of many of these provisions. The impacts of NCLB on principals and teacher work decisions will be a fruitful area for future inquiry.

An additional area for future work is analysis of the implications of the relationships among principal effectiveness, satisfaction and turnover for the allocation of teacher quality. While this study illustrates that effective principals matter for teacher retention in general, it is not able to say whether these effects may have disproportionate impacts on *better* teachers, who may, for example, be more responsive to working conditions than lower quality teachers who

may have fewer work options outside a low-performing school. Identification of principal characteristics or other working conditions that may specifically affect retention of higher quality teachers would provide policymakers with additional tools for alleviating outcome disparities between high-needs and low-needs schools. State-level administrative data sets that can match teachers both to students and to school characteristics are more appropriate for such analysis.

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Notes

[1] This study maintains a similar focus. The empirical models presented later assume that demand for teachers is the result of unobservable district-level factors that controlled for by a district fixed effect.
[2] An additional complication is that turnover can be voluntary or involuntary, with very different mechanisms driving the two types. However, "given widespread tenure rates and the prevalence of unionized grievance policies regarding termination" (Guarino, Santibañez, & Daley, 2006, 175), voluntary turnover is overwhelmingly more common, making it the centerpiece of most empirical research.
[3] For example, Hanushek, Kain, and Rivkin (2004) suggest that teacher moves away from disadvantaged schools could be due to teacher "preferences for factors related to race or ethnicity," to school policies, or to a combination of the two, noting the difficulty of disentangling these determinants (340). Scafidi, Sjoquist, and Stinebrickner (2007) conclude that differential preferences for student ethnicity by teacher race, including racial bias, could be driving mobility away from high-minority schools in Georgia, though they also note that other omitted factors could be driving this pattern as well. Boyd et al. (2005) similarly find that white and Hispanic teachers become more likely to leave as the number of black students and low-achieving students in a school increases, which they suggest could be the result of teacher preferences for student characteristics or to "correlates of student composition" (171).
[4] Because of National Center for Education Statistics (NCES) non-disclosure rules for restricted-use data, all unweighted sample size numbers reported in this study are rounded to the nearest ten.
[5] For purposes of this analysis, a *stayer* is identified as any teacher for whom principals gave one of the following TFS-1 responses: "Teacher currently is teaching in this school," "Teacher is on leave (e.g., maternity/paternity, disability, sabbatical), but returning to teaching in this school by the end of this school year (2004-05)," or "Teacher is working in this school, but not as a teacher." Any other response identified the teacher as having turned over. Teachers for whom no response was provided by the principal were excluded.
[6] Source: author's calculations. The percentage cited is based on the weighted fraction of movers and leavers who responded that a staffing action was the most important factor in their decision not to return to the teaching assignment they held in 2003-04. The fraction was much higher for movers (15.1 percent) than for leavers (7.9 percent). Note that these numbers are substantially lower than those calculated by Ingersoll (2001), who looked at data from a previous iteration of TFS and who based his calculations on whether or not teachers cited staffing decisions as one of the top three contributors to the turnover decision, not just as the most important reason.
[7] Bartlett sphericity test: $p < 0.001$. Kaiser-Meyer-Olkin statistic: 0.89.
[8] Further analysis shows that turnover is split approximately equally between movers and leavers.
[9] Descriptive statistics for the other working conditions variables are displayed in the Appendix.
[10] A few schools had missing school demographic data, particularly for free and reduced price lunch recipiency. These missing values were filled in using school-level data from the NCES Common Core of Data (CCD), where available. The correlation between non-missing values for the two data sets was 0.99.
[11] In comparison, a study by the National Center for Teaching Quality (2002) defines a "hard-to-staff" school as one in which at least 50% of students are below grade level, 50% receive free/reduced lunch (40% in high schools), the annual teacher turnover rate is 15-18%, and 25% or more of teachers hold non-regular licenses. Only 2.1% of schools in North Carolina met the NCTQ definition. The definition used in the current study obviously is less restrictive.
[12] Available from author upon request.
[13] Separate joint F-tests for the principal and working conditions variables included in models 3 and 4 allow us to reject the null hypothesis that these coefficients all are zero and should be excluded ($p < 0.01$ for both).
[14] This result is not driven by high inter-correlations among the three variables. While fraction black and fraction Hispanic both are correlated with fraction receiving free or reduced lunch ($r = 0.42$ and $r = 0.49$, respectively), the correlations are moderate, and the black and Hispanic variables almost are uncorrelated with one another ($r = -0.12$).

Appendix Table 1: Factor Loadings for Principal Effectiveness Factor

Variable	***Factor loadings***
Principal effectiveness factor (Eigenvalue = 3.26, Cronbach's *a* = 0.88)	
"The principal knows what kind of school he/she wants and has communicated it to the staff."	0.78
"The school administration's behavior toward the staff is supportive and encouraging."	0.78
"My principal enforces school rules for student conduct and backs me up when I need it."	0.74
"The principal lets staff members know what is expected of them."	0.73
"In this school, staff members are recognized for a job well done."	0.70
"I like the way things are run at this school."	0.69

Appendix Table 2: Descriptive Statistics and Comparison between School Types of Working Conditions Variables

	Full Sample Descriptive Statistics					Comparison between School Types				
	N	Mean	SD	Min	Max	Disadvantaged Schools	Other Schools	Difference		p-value
Average class size	6290	14.66	4.22	0.95	57.5	14.879	14.479	0.400	**	0.016
Administrators per student	6290	0.004	0.004	0	0.15	0.004	0.003	0.001	***	< 0.001
Professional support staff per student	6290	0.004	0.01	0	0.18	0.004	0.003	0.001	***	< 0.001
Instructional aides per student	6290	0.01	0.03	0	0.9	0.016	0.013	0.003	**	0.023
Fraction building capacity filled	6290	0.85	0.22	0.04	1.97	0.867	0.834	0.033	***	< 0.001
Utilizes common areas for instruction because of overflow	6290	0.19		0	1	0.194	0.192	0.002		0.886
No library in school	6290	0.03		0	1	0.046	0.026	0.020	**	0.029
Library books per student	6290	23.6	22.91	0	428.57	21.223	25.657	-4.434	***	< 0.001
Average workshops attended (last 12 months)	6290	3.77	1.76	0	10	4.047	3.532	0.515	***	< 0.001
Fraction of teachers that did some professional development in subject taught	6290	0.84		0	1	0.857	0.826	0.031	***	< 0.001
Teacher base salary ($)	31340	44213	13251	15000	200000	43986	44422	-436		0.26

Figure 1: Factors Contributing to Teachers' Turnover Decisions

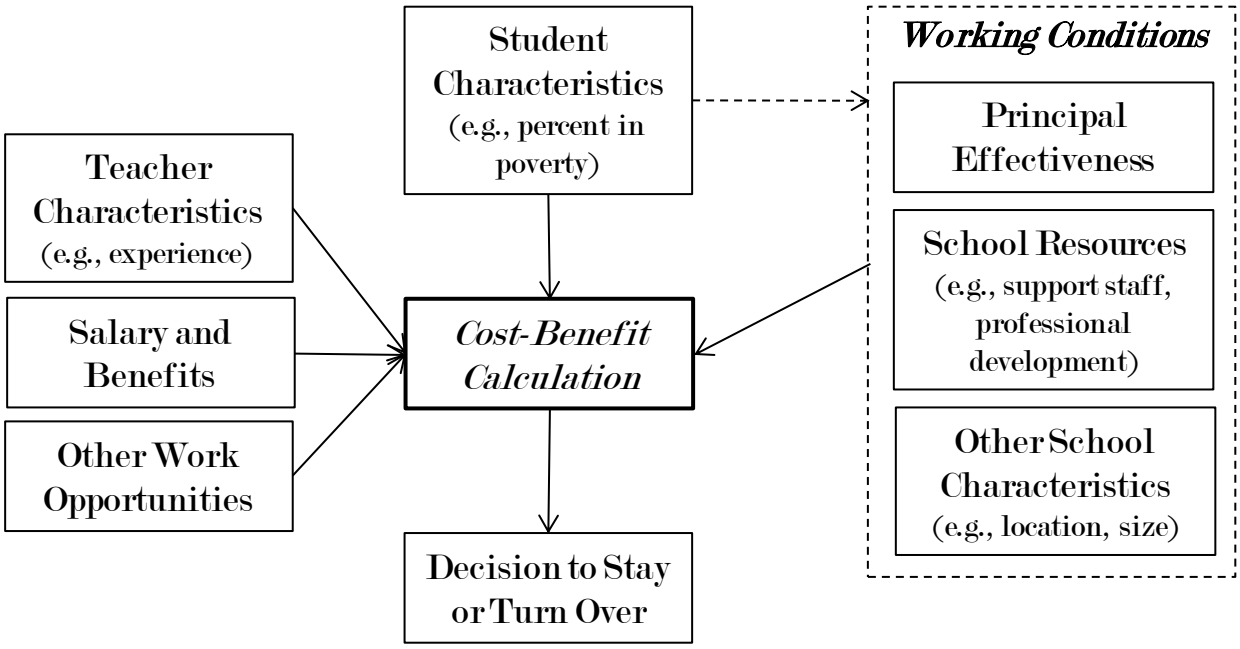

Figure 2: The Relative Importance of Principal Effectiveness for Teacher Turnover Rates in Disadvantaged and Other Schools

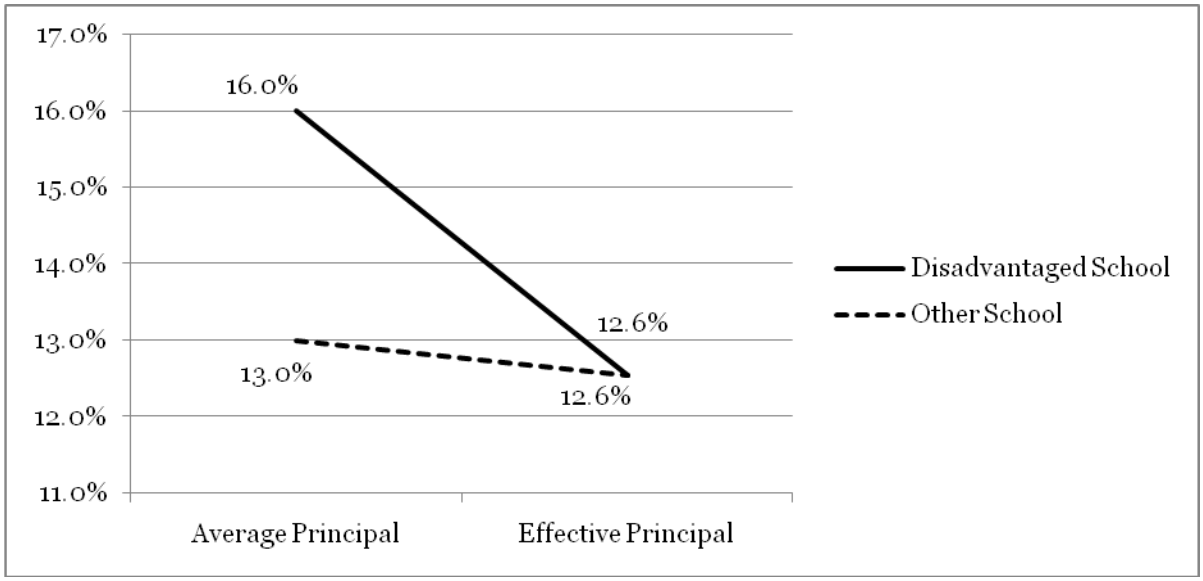

Table 1: Descriptive Statistics

	N	Mean	SD	Min	Max
Dependent Variables					
Teacher satisfaction	33360	3.47	0.75	1	4
One-year turnover	33270	0.13		0	1
School Characteristics					
Fraction black students	6800	0.16	0.25	0	1
Fraction Hispanic students	6800	0.15	0.24	0	1
Fraction free/reduced price lunch students	6800	0.44	0.29	0	1
School size (in 100s)	6800	5.74	4.35	0.06	45.82
Elementary school	6800	0.58	0.49	0	1
Middle school	6800	0.16	0.37	0	1
Magnet school	6800	0.06	0.23	0	1
Urban	6800	0.24	0.43	0	1
Rural	6800	0.27	0.45	0	1
Regular (non-special) school	6800	0.91	0.29	0	1
Teacher Characteristics					
Female	33360	0.75		0	1
Black	33360	0.08		0	1
Hispanic	33360	0.06		0	1
Total teaching experience	33360	13.38	9.98	0	54
Holds regular certification	33360	0.89		0	1
Holds MA or higher	33360	0.47		0	1
Principal Measures					
Principal effectiveness (factored)	6800	0	1	-5.27	1.60
"The principal knows what kind of school he/she wants and has communicated it to the staff."	6800	3.48	0.72	1	4
"The school administration's behavior toward the staff is supportive and encouraging."	6800	3.32	0.85	1	4
"My principal enforces school rules for student conduct and backs me up when I need it."	6800	3.38	0.81	1	4
"The principal lets staff members know what is expected of them."	6800	3.4	0.79	1	4
"In this school, staff members are recognized for a job well done."	6800	3.01	0.87	1	4
"I like the way things are run at this school."	6800	2.95	0.79	1	4
Female	6800	0.47		0	1
Black	6800	0.1		0	1
Hispanic	6800	0.05		0	1
Highest degree is Masters	6800	0.59		0	1
Highest degree is doctorate	6800	0.09		0	1
Total experience in principalship	6800	7.83	7.13	0	41
Total prior teaching experience	6800	13.12	6.9	0	41

Estimates adjusted using SASS probability weights. Sample sizes rounded due to NCES non-disclosure rules.

Table 2: Comparison of School and Teacher Characteristics and Principal Measures in Disadvantaged and Other Schools

	Disadvantaged Schools	Other Schools	Difference		p-value
Teacher satisfaction	3.37	3.56	-0.20	***	< 0.001
One-year turnover	0.15	0.11	0.04	***	< 0.001
School Characteristics (N = 6,800)					
Fraction black students	0.30	0.03	0.26	***	< 0.001
Fraction Hispanic students	0.28	0.04	0.24	***	< 0.001
Fraction free/reduced price lunch students	0.63	0.27	0.37	***	< 0.001
School size (in 100s)	6.05	5.47	0.58	***	< 0.001
Urban	0.40	0.10	0.30	***	< 0.001
Rural	0.20	0.34	-0.14	***	< 0.001
Teacher Characteristics (N = 33,360)					
Female	0.77	0.73	0.04	***	< 0.001
Black	0.15	0.02	0.13	***	< 0.001
Hispanic	0.11	0.02	0.10	***	< 0.001
First-year teacher	0.07	0.05	0.02	***	< 0.001
Holds regular certification	0.87	0.90	-0.03	***	< 0.001
Holds MA or higher	0.43	0.51	-0.08	***	< 0.001
Total teaching experience	12.57	14.17	-1.60	***	< 0.001
Principal Characteristics (N = 6,800)					
Female	0.57	0.39	0.18	***	< 0.001
Black	0.20	0.02	0.18	***	< 0.001
Hispanic	0.10	0.01	0.10	***	< 0.001
Highest degree is Masters	0.58	0.61	-0.03		0.112
Highest degree is doctorate	0.10	0.08	0.02	**	0.023
Total experience in principalship	7.13	8.45	-1.32	***	< 0.001
Total prior teaching experience	13.44	12.83	0.62	**	0.013
Principal Effectiveness Measures (N = 33,360)					
Principal effectiveness (factored)	-0.02	0.01	-0.04	***	< 0.001
"The principal knows what kind of school he/she wants and has communicated it to the staff."	3.41	3.40	0.01		0.414
"The school administration's behavior toward the staff is supportive and encouraging."	3.28	3.36	-0.08	***	< 0.001
"My principal enforces school rules for student conduct and backs me up when I need it."	3.33	3.42	-0.10	***	< 0.001
"The principal lets staff members know what is expected of them."	3.49	3.48	0.02		0.23
"In this school, staff members are recognized for a job well done."	3.00	3.02	-0.02		0.30
"I like the way things are run at this school."	2.85	3.04	-0.19	***	< 0.001

*Estimates adjusted using SASS probability weights. Sample sizes rounded due to NCES non-disclosure rules. p-value given is for difference-in-means test (t-test). Asterisks indicate differences statistically significant at * 0.10-level, ** 0.05-level, or *** 0.01-level.*

Table 3: How Principal Effectiveness Predicts Teacher Satisfaction and Turnover

Dependent Variable:	Teacher Satisfaction								Teacher Turnover							
	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
School Characteristics																
Fraction black students	-0.400***	(0.118)	-0.289***	(0.087)	-0.224**	(0.091)	-0.292***	(0.082)	0.154***	(0.042)	0.135***	(0.041)	0.107**	(0.043)	0.073*	(0.042)
Fraction Hispanic students	-0.427***	(0.127)	-0.285***	(0.106)	-0.224**	(0.104)	-0.199*	(0.115)	0.057	(0.052)	0.047	(0.052)	0.034	(0.053)	0.022	(0.057)
Fraction free/reduced lunch students	-0.188**	(0.073)	-0.141**	(0.060)	-0.139**	(0.059)	-0.147**	(0.062)	0.030	(0.029)	0.038	(0.028)	0.041	(0.028)	0.022	(0.030)
School size (in 100s)	-0.005**	(0.003)	-0.004*	(0.002)	-0.005**	(0.002)	-0.001	(0.003)	-0.001	(0.001)	-0.001	(0.001)	-0.001	(0.001)	-0.000	(0.001)
Elementary school	0.107***	(0.034)	0.021	(0.026)	0.020	(0.029)	0.020	(0.033)	-0.003	(0.013)	-0.003	(0.012)	-0.008	(0.013)	-0.004	(0.015)
Middle school	-0.007	(0.036)	-0.019	(0.029)	-0.019	(0.030)	-0.019	(0.032)	0.005	(0.013)	0.005	(0.013)	0.005	(0.014)	0.012	(0.014)
Magnet school	-0.003	(0.045)	-0.002	(0.034)	-0.009	(0.035)	-0.021	(0.033)	-0.010	(0.015)	-0.010	(0.015)	-0.010	(0.015)	-0.002	(0.015)
Urban	0.051	(0.039)	0.040	(0.033)	0.036	(0.033)	0.045	(0.035)	-0.019	(0.019)	-0.010	(0.018)	-0.007	(0.019)	-0.016	(0.019)
Rural	-0.031	(0.071)	0.037	(0.065)	0.025	(0.065)	0.054	(0.072)	0.034	(0.034)	0.034	(0.033)	0.036	(0.033)	0.050	(0.033)
Regular (non-special) school	-0.113**	(0.046)	-0.109***	(0.040)	-0.109***	(0.039)	-0.123***	(0.041)	0.003	(0.016)	0.001	(0.016)	0.003	(0.017)	0.004	(0.017)
Teacher Characteristics																
Female	0.027	(0.019)	0.027	(0.019)	0.024	(0.019)	0.028	(0.019)	-0.021**	(0.009)	-0.021**	(0.008)	-0.021**	(0.009)	-0.016*	(0.009)
Black	0.018	(0.042)	0.019	(0.039)	0.022	(0.040)	0.029	(0.042)	0.010	(0.016)	0.005	(0.015)	0.006	(0.016)	0.011	(0.017)
Hispanic	0.040	(0.045)	0.031	(0.045)	0.037	(0.045)	0.024	(0.047)	-0.041*	(0.022)	-0.039*	(0.022)	-0.043*	(0.022)	-0.046*	(0.024)
One year experience or less	0.016	(0.041)	0.021	(0.039)	0.024	(0.039)	0.038	(0.043)	0.109***	(0.018)	0.106***	(0.018)	0.110***	(0.018)	0.098***	(0.020)
2-3 years experience	-0.016	(0.031)	-0.018	(0.030)	-0.022	(0.030)	-0.011	(0.036)	0.086***	(0.016)	0.085***	(0.016)	0.087***	(0.016)	0.077***	(0.019)
4-5 years experience	-0.059**	(0.029)	-0.057**	(0.028)	-0.063**	(0.028)	-0.050	(0.033)	0.053***	(0.013)	0.053***	(0.013)	0.056***	(0.013)	0.052***	(0.015)
6-8 years experience	-0.045	(0.029)	-0.048*	(0.029)	-0.056*	(0.029)	-0.043	(0.033)	0.030**	(0.012)	0.029**	(0.012)	0.034***	(0.012)	0.037***	(0.013)
9-11 years experience	-0.062**	(0.030)	-0.058*	(0.030)	-0.058*	(0.030)	-0.043	(0.031)	0.015	(0.011)	0.011	(0.011)	0.015	(0.011)	0.015	(0.012)
21+ years experience	0.015	(0.023)	0.014	(0.022)	0.011	(0.022)	0.015	(0.024)	0.035***	(0.009)	0.035***	(0.009)	0.040***	(0.009)	0.043***	(0.010)
Holds regular certification	-0.038	(0.029)	-0.046*	(0.027)	-0.041	(0.027)	-0.053*	(0.028)	-0.036**	(0.015)	-0.036**	(0.015)	-0.036**	(0.015)	-0.042***	(0.016)
Holds MA or higher	-0.017	(0.018)	-0.019	(0.017)	-0.022	(0.017)	-0.020	(0.019)	0.004	(0.008)	0.004	(0.008)	0.002	(0.008)	0.005	(0.009)
Principal effectiveness			0.249***	(0.014)	0.245***	(0.014)	0.248***	(0.013)			-0.014***	(0.005)	-0.011**	(0.005)	-0.014***	(0.005)
Principal Characteristics Included?	*No*		*No*		*Yes*		*Yes*		*No*		*No*		*Yes*		*Yes*	
Working Conditions Included?	*No*		*No*		*No*		*Yes*		*No*		*No*		*No*		*Yes*	
Constant	3.806***	(0.069)	3.787***	(0.065)	3.807***	(0.066)	3.494***	(0.639)	0.102***	(0.028)	0.101***	(0.028)	0.103***	(0.033)	0.350	(0.286)
Observations	34500		34070		33360		30770		34410		33980		33270		30690	
R-squared	0.234		0.262		0.264		0.267		0.232		0.227		0.228		0.224	

*Models include district fixed effects. Clustered standard errors in parentheses. Estimates adjusted using SASS probability weights. Sample sizes rounded due to NCES non-disclosure rules. * p<0.10, ** p<0.05, *** p<0.01.*

Table 4: Differential Effects of Principal Effectiveness in Different Kinds of Schools

Dependent Variable:	Teacher Satisfaction		Teacher Turnover	
Disadvantaged School	-0.152***	(0.028)	0.030**	(0.014)
Principal Effectiveness	0.216***	(0.015)	-0.003	(0.008)
Disadvantaged x Principal Effectiveness	0.058**	(0.023)	-0.020**	(0.010)
Constant	3.338***	(0.600)	0.309	(0.270)
Observations	34660		34560	
R-squared	0.261		0.225	

*Models include district fixed effects plus school and teacher variables (not shown). Clustered standard errors in parentheses. Estimates adjusted using SASS probability weights. Sample sizes rounded due to NCES non-disclosure rules. * p<0.10, ** p<0.05, *** p<0.01.*