Fix It and They Might Stay: School Facility Quality and Teacher Retention in Washington, D.C.

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The attrition of both new and experienced teachers is a challenge for schools and school administrators throughout the United States, particularly in large urban districts. Because of the importance of this issue, there is a large empirical literature that investigates why teachers quit and how they might be induced to stay. Here we build upon this literature by suggesting another important factor in the teacher decision to stay or leave: the quality of school facilities. We investigate the importance of facility quality using data from a survey of K–12 public school teachers in Washington, D.C. We find in our sample that facility quality is an important predictor of the decision of teachers to leave their current position, even after controlling for other contributing factors.

A major provision of the No Child Left Behind Act (NCLB) mandates that all teachers in core subjects be "highly qualified" by 2005–2006. Leaving aside the debate over the precise definition of "highly qualified," few would challenge the assertion that the nation needs to attract the best possible teachers to the profession. However, as school administrators and education researchers have long known, hiring bright new teachers is only part of the problem: The retention of both new and experienced teachers is a challenge for schools and school systems as well.

The importance of teacher retention to administrators and policymakers has led to a substantial literature on the subject in the field of education research. In this article, we make two contributions to this literature. First,

Teachers College Record Volume 107, Number 5, May 2005, pp. 1107–1123

0161-4681

we argue that the quality of school facilities is an important factor in the decision making of individual teachers. Although, as we note below, much of the research linking facility quality to teacher retention examines the school systems of developing countries, the results are relevant in the United States, as is confirmed in various surveys conducted by teacher unions and other domestic trade organizations. We believe this literature may be particularly applicable in large, urban school districts like Washington, D.C., in which facility quality is often poor.

Second, we test our argument empirically by comparing the effect of facilities, ceteris paribus, to that of other factors identified in the literature as affecting teacher retention. To do this, we use data from a survey of teachers in Washington, D.C., conducted in the spring of 2002. We find that, even when a host of other factors are controlled for, the quality of school facilities is an important predictor of retention/attrition.

We begin with a brief review of the relevant literature on teacher retention. After this, we discuss why the quality of facilities may be particularly important to the decision to stay at a given school or in the profession altogether. We then present our empirical evidence and briefly conclude with some implications of this research for educators and policymakers.

WHY DO TEACHERS QUIT?

Few would challenge the assertion that teacher attrition is a major component of the current school staffing problem in the United States. Indeed, research has shown that approximately one-quarter of all beginning teachers leave teaching within four years (Benner 2000; Rowan, Correnti, and Richard 2002). In general, teachers list family or personal reasons, such as pregnancy, the demands of child rearing, and health problems as reasons for leaving the profession. This finding is supported in part by the fact that most teachers who quit teaching quit the workforce altogether (Murnane and Olsen 1989, 1990).

Job dissatisfaction, primarily due to poor salary, poor administrative support, and student discipline problems, is also among the most frequent reasons teachers give for leaving the profession (Tye and O'Brien 2002; Ingersoll 2000; Macdonald 1999). In addition, some qualitative studies suggest that more general factors, including government policies, portrayal of teachers in the mass media, and community attitudes, also influence teachers' general esteem and status in society, which features largely in their professional commitment and morale.

Because there are so many possible factors identified in the literature that influence retention, we organize our review of the literature below into factors related to teachers, schools, and the broader community.

TEACHER FACTORS

The leading cause of teacher attrition cited in the literature is the profession's relatively low wages, especially considering the number of years of higher education that the average state-certified teacher has completed. For example, in a 2002 survey, teachers in California who were considering leaving the profession ranked "salary considerations" as the most important factor driving their decision (Tye and O'Brien 2002). Similarly, Gritz and Theobold (1996) find that compensation is the most important influence on the decision to remain in the profession for male teachers and experienced female teachers. From a comparative perspective, Dolton and van der Klaauw (1995) report that teacher attrition rate in the United Kingdom is also driven by poor salary relative to nonteaching jobs.

Others have argued that relative wages are important, but that their effect is mediated by the larger context of the labor market. For example, Stinebrickner (2001), using the National Longitudinal Study of the High School Class of 1972, finds that graduate education and teaching experience are significant determinants of teaching salary, which, in turn, has a positive effect on teacher retention. Although men and women receive similar wages in teaching, men have much greater opportunities for higher-paying, nonteaching jobs. Additionally, individuals with higher SAT math scores have a notable wage advantage in nonteaching jobs, which they lose if they choose to teach. In turn, the relative attractiveness of nonteaching jobs may be the primary cause of teacher attrition for "academically gifted" teachers (as measured by SAT math scores) and male teachers.

The idealism of teachers also matters. Perhaps counterintuitively, Miech and Elder (1996) find that there are higher attrition rates among teachers who have a strong "service ethic" (measured by the importance of service to society for individual teachers relative to other motivations to teach) and that this effect is still strong after controlling for variables such as family socioeconomic status background, occupational commitment, salary, marital status, number of children, public or private school, race, employment history, and academic ability. The authors offer various explanations for the high attrition rates among idealists, with perhaps the most compelling one being that the school environment in general provides less than sufficient guidance on the goals, means, and evaluation of their work and people who are highly service-motivated are easily frustrated with this uncertainty.

The quality of preservice teacher preparation is also cited as a contributing factor to attrition. Teachers who graduate from traditional university-based programs have lower attrition rates than teachers with other, nontraditional forms of preparation (Harris, Camp, and Adkison 2003). A large percentage of new teachers also report that the teacher preparation programs they completed did not provide enough help for them to cope

with their first-year experience, which intensifies the need for proper mentoring, professional development, and administrative support in their working environment—factors that are all too often lacking (Tapper 1995).

SCHOOL FACTORS

Hanushek, Kain, and Rivkin (2004) argue that, although clearly important, teacher salaries are not all that matter. They show that teacher preferences across a range of job and school conditions may be just as important as salary in retention. According to their study, "teachers might be willing to take lower salaries in exchange for better working conditions" (see also Antos and Rosen 1975; Chambers 1977; Baugh and Stone 1982; Hanushek and Luque 2000).

Rosenhotz and Simpson (1990) offer a detailed analysis of how organizational factors contribute to teachers' commitment to the workplace. Their evidence shows that school management of student behavior and the burden of nonteaching obligations affect new teachers' commitment much more than they do that of experienced teachers (see also Hargreaves 1994; Macdonald 1995). On the other hand, experienced teachers appear to be more concerned with their own personal discretion and autonomy.

Other important predictors of teachers' commitment include performance efficacy (a teacher's perception of how his or her teaching, in a particular school context, will affect students' learning), psychic rewards (a variable that, like performance efficacy, is generated both from a teacher's own qualifications and from the school's organizational structure), and learning opportunities (including mentoring for new teachers and other forms of professional development). Rosenhotz and Simpson (1990) further find that teachers' commitment to the workplace, measured by their disaffection, absenteeism, and defection, is highly correlated with attrition.

The lack of resources in a school can also contribute to teachers' job dissatisfaction and, ultimately, attrition. In interviews of public school teachers in New York City in the 1990s, a large percentage of new teachers said they did not have adequate access to basic supplies. Most teachers had to use their own money to equip their classrooms. Of the teachers interviewed, 26 percent reported spending $300 to $1,000 of their own funds on classroom supplies over the year. Additionally, most teachers interviewed reported that they did not have enough textbooks or that the textbooks they did have were in poor condition and that since school copy machines were frequently broken, teachers had to rely on family, friends, or other private resources to reproduce classroom materials (Tapper 1995).

Finally, and ironically, NCLB itself may be working against the improvement of the nation's stock of quality teachers. In Tye and O'Brien's (2002) survey of teachers, the top-ranked reason for quitting teaching among those

who had already left the profession was "accountability" and the increasing use of high-stakes, standards-based testing with the associated "drill and kill" curricula that often come with it (see also Darling-Hammond and Sykes 2003).

BROADER COMMUNITY FACTORS

Erratic government education policies (such as those relating to teacher licensing and certification) and unresponsive education bureaucracies are also a significant source of frustration for new teachers. Tapper (1995), for example, reports that a majority of the teachers interviewed "spoke at length and with anger" about confusion over policies, the lack of clear and accurate information, and repetitive and costly licensure or certification procedures. Some also expressed concern about staying in the teaching profession because of government budget cutting.

Another important factor in the decision to stay or leave may be the social status of the teaching profession in the broader community (Tye and O'Brien 2002). Interviews with rural Australian teachers, for example, reveal that a primary source of their anxiety about the profession is dealing with a misinformed community. Teachers report that they have to repeatedly battle public stereotypes that their professional day begins at 9 A.M. and ends at 3 P.M., that they enjoy high salaries and numerous vacations, and that their jobs are easier than most other professions. All the teachers in the sample report being alienated from people in nonteaching professions. Overall, teachers report a professional paradox: Their communities have great expectations from education, but teachers are accorded low social status and held in low esteem (Jones 2001).

In the United States, this problem may again be exacerbated by the same legislation that currently mandates high-quality teachers. As several researchers have suggested, the provisions in NCLB that brand schools as failing if they do not meet "adequate yearly progress," by stigmatizing them with the "in need of improvement" or "failing" label, may perversely increase the difficulty of hiring and retaining good teachers in the schools where they are needed most (Darling-Hammond and Sykes 2003; Figlio 2001).

WHAT ABOUT SCHOOL FACILITIES?

Most, if not all, teaching takes place in a specific physical location (usually a school building) and the quality of that location can affect the ability of teachers to teach, teacher morale, and the very health and safety of teachers.[1] Despite the importance of the condition of school buildings, serious deficiencies have been documented, particularly in large, urban school dis-

tricts (see, for example, General Accounting Office 1995). Moreover, since school buildings in the United States are, on average, over forty years old—just the age when rapid deterioration often begins—we should expect problems with school facilities to worsen in the near future.

Many factors contribute to the quality of the school building and, in turn, may affect the quality of teacher life—and pupils' educational outcomes.[2] For example, poor indoor air quality is widespread, and many schools suffer from "sick building syndrome," which in turn increases student absenteeism and reduces student performance (see Environmental Protection Agency 2000; Kennedy 2001; Leach 1997; Smedje and Norback 1999; Rosen and Richardson 1999). Since current student-focused asthma studies show that students lose considerable school time because of the poor conditions present in schools, it is likely that poor indoor air quality affects teachers' health as well. Furthermore, in our study, we find that fully two-thirds of Washington teachers surveyed reported poor indoor air quality in their schools.[3]

Another area in which research has linked school facilities to teacher performance is thermal comfort. Lowe (1990) finds that the best teachers in the country (winners of state teacher of the year awards) emphasize their ability to control classroom temperature as central to the performance of both teachers and students. Lackney (1999) shows that teachers believe thermal comfort affects both teaching quality and student achievement. Corcoran, Walker, and White (1988) focus on how the physical condition of school facilities, including thermal factors, affects teacher morale and effectiveness.

Classroom lighting may also play a particularly critical role in teacher morale and student performance (Phillips 1997; see also Heschong Mahone Group 1999). Jago and Tanner (1999) cite results of seventeen studies from the mid-1930s to 1997 that find that appropriate lighting improves test scores, reduces off-task behavior, and plays a significant role in the achievement of students. Over one-fifth of the Washington, D.C., teachers in our study reported that the lighting in their schools was inadequate.

Recently there has been renewed interest in increasing natural daylight in school buildings. Until the 1950s, natural light was the predominant means of illuminating most school spaces, but as electric power costs declined, so too did the amount of daylighting utilized in schools. Recent changes, however, including the advent of energy-efficient windows and skylights and a renewed recognition of the positive psychological and physiological effects of daylighting, have heightened interest in increasing natural daylight in schools (Benya 2001).

Lemasters's (1997) synthesis of fifty-three studies pertaining to school facilities, student achievement, and student behavior reports that daylight fosters higher student achievement. A 1999 study by the Heschong Mahone Group, covering more than 2,000 classrooms in three school districts, is

perhaps the most cited evidence about the effects of daylight. The study indicates that students with the most classroom daylight progressed 20 percent faster in one year on math tests and 26 percent faster on reading tests than those students who learned in environments that received the least amount of natural light (Heschong Mahone Group 1999; see also Plympton, Conway, and Epstein 2000). Despite the importance of natural lighting for learning and achievement, over 20 percent of the teachers in Washington, D.C., reported that they can't see through the windows in their classrooms.

The final facility condition that we note here is soundproofing to reduce ambient noise levels. The research linking acoustics to learning is consistent and convincing: Good acoustics are fundamental to good academic performance. Earthman and Lemasters (1998, 18) report three key findings: that higher student achievement is associated with schools that have less external noise, that outside noise causes increased student dissatisfaction with their classrooms, and that excessive noise causes stress in students (see also Crandell, Smaldino, and Flexer 1995; Nabelek and Nabelek 1994; American Speech-Language-Hearing Association 2002; Crandell 1991; Crandell and Bess 1986; Evans and Maxwell 1999). Teachers also attach importance to noise levels in classrooms and schools. Lackney (1999) found that teachers believe that noise impairs academic performance. Indeed, it appears that external noise may cause more discomfort and lowered efficiency for teachers than for students (Lucas 1981). Again schools in our study are failing to provide this basic input to education: Almost 70 percent of Washington teachers report that their classrooms and hallways are so noisy that it affects their ability to teach.

FACILITIES AND RETENTION

Although a literature linking school facilities to pupil learning outcomes and teacher morale is developing, there has been little research on the effects of school facility quality on teacher retention. The existing research is generally limited to two areas: research on the education systems of developing nations and research by unions and other trade groups. In developing nations, a general finding is that the poor condition of classrooms, lighting, and furniture is linked to attrition (Chapman 1994; Kemmerer 1990).

Among the union and trade group research, the findings are similar. For example, a National Education Association survey finds that among the association's nationally representative sample of public school teachers, 5.8 percent in 1991 and 8.7 percent in 1996 identified "good materials, resources, and facilities" as the factor that helped them the most in providing the best service in their teaching position. In terms of hindrances to teaching, 12.4 percent of teachers in 1991 and 10.6 percent of teachers in 1996

ranked "lack of materials, resources, and facilities" as the top factor (National Education Association Research 1997). Another survey conducted by American Association of School Administrators shows that "safe, clean schools" are ranked as the seventh-most-effective factor in retaining teachers among other elements such as salary and professional development (Steuteville-Brodinsky, Burbank, and Harrison 1989). Similarly, summarizing the research literature on effective in-service techniques for promoting teacher retention, Gayles (1989) reports that adequate facilities and equipment form an important factor in teachers' job satisfaction and are necessary to maintain even a minimal level of professional commitment (see also Louis and Smith 1990).

Thus school facilities are a potentially important factor for a variety of educational outcomes, not the least of which is teacher retention. Nowhere in the research literature, however, has the quality of facilities been included in a systematic, multivariate study of retention of individual teachers. It is to such a model that we now turn.

DATA AND METHODS

In order to test the extent to which facilities quality affects teacher retention, we use data from the survey of teachers in Washington, D.C., noted above.[4] Our dependent variable is the dichotomous response to a question that asked teachers, "Do you plan to remain another year in your current school?" Thus we are operationally defining attrition more narrowly than a departure from the profession; however, retaining teachers in any given school is essential to its functioning and ultimately to meeting the mandate of NCLB.

The review of the literature above identified many potential factors associated with teacher retention. Therefore, in order to get an accurate estimate of the effect of school facilities on teacher decisions to remain or leave, we must control for other factors in any empirical model. Accordingly, we estimate a maximum-likelihood probit regression of individual teachers' reported decision to stay (coded 1 if yes) on a set of covariates reflecting a host of factors that may drive the decision to stay or leave.

Our main variable of interest is the condition of the school facility, reflected by the grade that the teacher assigns to his or her school facility (on the familiar A–F scale, which we treat here as a continuous measure in which A = 4, B = 3, . . ., F = 0). In addition, we include a series of measures that reflect individual, school, and community factors that can affect the propensity to leave. These include such individual measures as the respondent's age (actually measured categorically but assumed to be continuous here) and age squared (to account for a likely nonlinear effect);

whether the respondent is female; whether he or she is "very dissatisfied" with his or her present salary; the number of years spent at his or her present school; whether he or she holds D.C. teaching certification; and dichotomous variables for self-reported race as white or other (black is the excluded, modal category).

To reflect school and community conditions, we measure teacher responses to a series of conditions: their level of satisfaction with their central district leadership and management; how they judge the level of involvement of parents and the local community; whether or not they feel the community and parents are "very important" to the functioning of the school; and whether they would be willing to be involved in planning improvements in their school's facilities.

Table 1 summarizes the list above and reports the observed sample mean or proportion responding in the affirmative for the various covariates. After listwise deletion of missing values, the remaining sample size is 835. The results of the estimation of our model are presented in Table 2. We should note that because, in most cases, we received responses from several teachers in the same school, we estimate robust standard errors clustered on the reported D.C. school building number (White 1980; Rogers 1993).[5]

As Table 2 shows, we find a statistically significant coefficient for the effect of facilities grade on the decision to stay. As the perceived quality of the school facilities improves, ceteris paribus, the probability of retention increases. We also find significant effects for teacher age,[6] dissatisfaction with pay, dissatisfaction with the involvement of parents and the community, and length of service at the present school. Overall, the model correctly predicts 83 percent of the observations, for a modest but measurable reduction in error of 6 percent over simply using the modal category to predict. In

Table 1. Factors that may affect retention

	Sample mean, percentage, or modal category
Facilities grade	1.98
Age (categorical)	41–50
Female	75.3%
Very dissatisfied with pay	21.2%
Very dissatisfied with community	40.5%
Very dissatisfied with administration	26.2%
Years at same school (categorical)	4–10
Community very important	75.5%
Willing to volunteer	50.3%
D.C. certified	78.0%
White	18.7%
Other race	7.2%

Note: Number of observations = 835.

Table 2. Quality of facilities affects teacher retention

	Coefficient (standard error)
Facilities grade	.117 (.059)**
Age	.950 (.248)***
Age squared	−.153 (.043)***
Female	.137 (.104)
Very dissatisfied with pay	−.319 (.110)***
Very dissatisfied with community	−.469 (.117)***
Very dissatisfied with administration	−.055 (.114)
Years at same school	.094 (.055)*
Community very important	−.177 (.143)
Willing to volunteer	.175 (.116)
D.C. certified	−.025 (.120)
White	−.171 (.158)
Other race	.035 (.226)
Constant	−.455 (.406)
Log-likelihood	−346.78
Percentage correctly predicted	83%
Percentage reduction in error	6%

Note: Number of observations = 835. Coefficients are from probit regression of respondents' intention to remain at present school. Standard errors reported are robust standard errors (Huber-White) clustered on individual schools.
***$p < .01$; **$p < .05$; *$p < .10$, two-tailed.

addition, based on a chi-square test of the ratio of log-likelihoods, we can reject a constant-only model compared to the full model at $p < .01$.

As is well known, because of the nonlinearity of the probit model, we cannot gauge the magnitudes or relative effects of the various factors on the decision to stay or leave simply by looking at the estimated coefficients (Liao 1994). Accordingly, we compute predicted probabilities using stochastic simulation (King, Tomz, and Wittenberg 2000; Tomz, Wittenberg, and King 2000) to explore our results in greater detail. Our general approach is to present the marginal effects of the various factors individually while holding the other covariates constant at their observed sample means or, for dichotomous variables, the modal values as reported in Table 1.

In Figure 1, we present predicted probabilities of an average teacher's deciding to remain at his or her present school across increasing levels of perceived facilities quality. As the figure shows, the mean predicted probabilities increase over the range of grades, but at a slightly decreasing rate. The maximum difference between predicted probabilities is about .05; this represents the predicted average increase in probability of a teacher's deciding to stay at his or her job were he or she to be moved from a school with the lowest facility quality to one with the highest, with all other factors held constant.

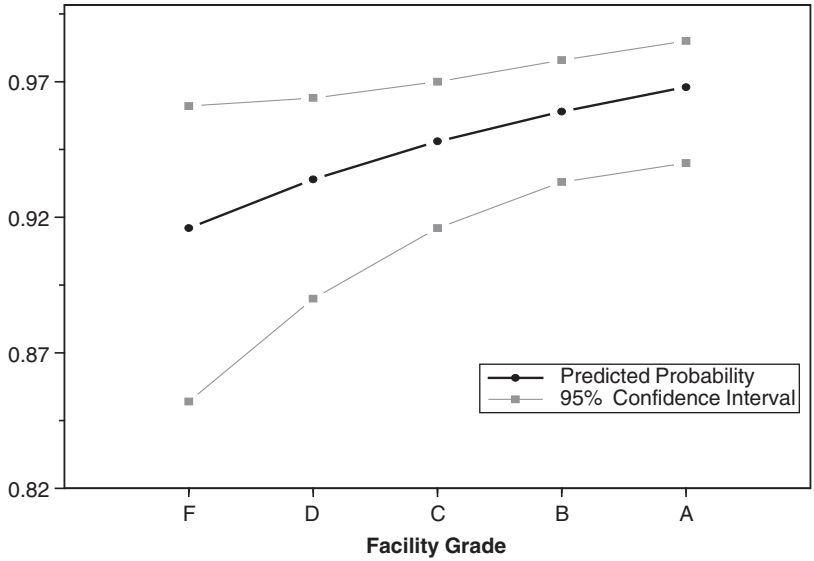

Figure 1. The Likelihood of a Teacher's Remaining in His or Her School Increases with Reported School Quality. Predicted probabilities (and 95 percent confidence intervals) of deciding to remain at present school for increasing levels of school facility quality, holding all other covariates constant at their mean or modal values.

Perhaps a more important question than just the marginal effect of facilities on retention, at least to the administrator or policy analyst, is the effect of facilities relative to the other significant covariates in the model. In Figure 2, we compare the marginal change in predicted probability estimated by varying facility quality over its entire range to the maximum marginal age effect (between those 20–30 and those 41–50), the marginal effect of being very dissatisfied with pay, the marginal effect of being very dissatisfied with the community, and the marginal effect of length of service at the same school (again holding all else constant at the mean/modal values).

As Figure 2 shows, the effect of facilities quality, although small in comparison to the effects of age, time, and community satisfaction, is nevertheless larger than the effect of dissatisfaction with pay ($p < .05$). Although this comparison is based on the change of a school's facility quality from F to A, even a change in perceived quality from F to only C yields an increase in predicted probability of retention of .03—almost two-thirds of the pay effect. In short, the effect of facilities quality on retention is substantively significant.

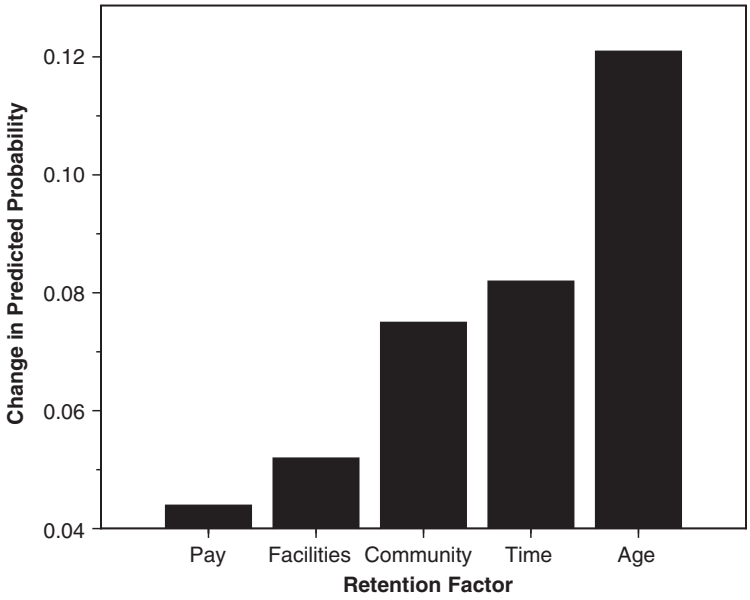

Figure 2. The Quality of Facilities Has a Substantively Important Effect on Teacher Retention. Comparison of the marginal effects of the various statistically significant factors on the predicted probability of the decision to remain at the present school.

DISCUSSION

Schools and school districts attempting to increase their rate of teacher retention have several possible strategies, some more feasible than others. The results of our empirical analysis suggest that the most important factors—age and time in service at the school—are largely not under the control of administrators.

Of the remaining significant factors, pay, parent and community involvement, and facilities quality, the one with the largest effect is improving the teachers' relationship with parents and the broader community. Strategies to improve this relationship have been a staple of education reform for decades, but progress is difficult, and the challenge of increasing parental involvement is perhaps greatest in urban districts such as Washington, D.C., the school system we study in this research. Increasing teacher salaries appears to improve retention, but this is also a difficult task in a time of reduced budgets—and personnel are the single largest expense in the provision of education.

Improving the quality of school facilities can be expensive as well. However, as our research here suggests, the benefits of facility improvement for

retention can be equal to or even greater than those from pay increases. Furthermore, a major facilities improvement is likely to be a one-time expense, last for many years, and have supplemental sources of state or federal funding available. It could thus be a more cost-effective teacher retention strategy than a permanent salary increase for teachers in the medium to long term. Indeed, in the limited research on facilities and retention in developing nations, facilities improvement has been found to offset low wages (Macdonald 1999; Oliveira and Farrell 1993). Our research suggests the same may be true in the United States as well.

Notes

1 There is a large literature linking facility quality to educational outcomes. See, for example, Cash 1993; Earthman and Lemasters 1996; Lemasters 1997; Lackney 1999; and Schneider 2002.

2 In the next few paragraphs we supplement our review of the literature linking facilities to outcomes with examples from Washington, D.C. The data upon which these examples are drawn, and which we use more extensively later in the article, are from a pencil-and-paper survey of all teachers in Washington, D.C., administered in May–June 2002. Approximately 25 percent of teachers in the District returned the survey, which was distributed and collected by building representatives of the Washington Teachers Union.

3 In a study of Chicago teachers that paralleled the D.C. survey, over one-quarter of Chicago teachers reported asthma and respiratory problems as the most frequent health problems they encountered. Another 16 percent reported other problems (such as sinus infections) that may also be linked to poor indoor air quality. See Schneider 2003.

4 Recall that the response rate was about 25 percent. Although this is low, it nevertheless represents an improvement over much of the empirical literature on retention. For example, Tye and O'Brien (2002) obtained a response rate of only 12.6 percent to their mail survey. The key issue, of course, is whether or not the self-selection to respond biases our results in any way (e.g., if only the most disgruntled teachers respond). Even if it does, this self-selected sample may actually be exactly those teachers most likely to respond to changes in the various factors discussed below.

5 The number of teachers responding to the survey from a given school ranged from one to thirty-four, with an average of about thirteen. As a sensitivity test of our model, we also estimated a generalized estimating equations (Liang and Zeger 1986) model assuming that the teachers are exchangeable within schools. The results of this model are substantively similar to those reported below.

6 Note that the fact that the coefficient on age is positive but the coefficient on the square of age is negative supports the general conclusion of the teacher retention literature that "most of those who leave teaching in any given year are either disillusioned beginners with just two or three years in the classroom or 30-year veterans who are ready to retire" (Tye and O'Brien 2002, 24).

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