

Teacher Quality and Teacher Labor Markets

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Introduction

Students experience schools through their classrooms and their teachers. The ability of a teacher to motivate students and facilitate learning affects each student's educational attainment, perhaps more than any other single characteristic of schooling. A large body of research generated over the last 50–60 years has improved our understanding of who teachers are, how they make decisions on whether to teach and where to teach, and how these factors ultimately impact students. This chapter reviews the evidence on teacher labor markets. It asks what factors influence the career decisions of teachers and potential teachers, and how these career decisions then affect the overall teacher workforce, the distribution of teachers across schools, and students' educational opportunities.

The chapter is organized as follows: We begin by looking at the size and composition of the teaching labor force in the United States and changes therein over time. We discuss teacher attributes found to be associated with student learning, as well as attributes for which there is ambiguity, drawing upon recent literature and data from the latest Schools and Staffing Survey (SASS) and Teacher Follow-up Survey (TFS).¹ The section that follows describes the distribution of teachers across schools and discusses our understanding of why the teacher workforce appears the way it does, drawing on insights from extant research on both supply and demand-driven factors. We then study the transfer and quit behavior of teachers using existing literature and data from the latest TFS (2004–05); next, we consider teacher-focused policy measures and their impact on student achievement, and briefly review the research on charter schools and private schools in the United States and how the country fares vis-à-vis teacher labor markets in other developed countries. The chapter then concludes with suggestions for areas for future research.

Teacher Characteristics

Size of the Teaching Force The number of elementary and secondary school teachers in public schools in the United States has grown steadily over the last 50 years. In 1955, there were 1.14 million public elementary and secondary school teachers. The 2003–04 SASS puts this number at 3.25 million for the country's 15,500 school districts, serving approximately 47.3 million students (Strizek, Pittsonberger, Riordan, Lyter, & Orlofsky, 2006). The increase in teaching staff has been driven primarily by rising student enrollment, falling student-teacher ratios, and increased demand for teachers in specific areas such as special education.

Student enrollment increased in the 1950s and 1960s due to the post-war baby boom. It declined by approximately 5 million between 1970 and 1990, but has been increasing since then (NCES, 2008). Immigration into the United States explains some part of the increase in enrollment rates, especially in California. Another important factor driving the increase in demand for school teachers is the change in student-teacher ratios. These ratios decreased from 26.9 in 1955 to 14.5 in 2003–04 (Strizek et al., 2006). Part of this decline comes from class size reduction policies targeted at all students, while another part comes from laws making the provision of education to all handicapped children mandatory.² The special education sector has become more staff-intensive; from 194,802 special education teachers in 1978, the number of teachers in this sector rose to 307,575 in 1990 and 412,750 in 2003–04 (Hanushek & Rivkin, 2002).³

Age and Experience The average age of teachers has increased over the last 30 years. The median age of teachers was 41 years in 1961, falling to 33 years in 1976, but increasing thereafter. The average age of public school

teachers was 42.5 years in 2003–04 (Strizek et al., 2006). At least two forces have been driving the increase in the average age of teachers. First, teachers hired to educate the children of the baby boom era have aged and are now reaching retirement. Approximately 31% of public school teachers were aged 50 years or more in 2004–05 (Marvel, Lyter, Peltola, Strizek, & Morton, 2007). These teachers are likely to retire over the next 10–15 years, creating a demand for new teachers. Second, those entering teaching today are older than in the past. For example, over 80% of new teachers in New York were under 25 years of age in 1970. By the mid-1980s this had decreased to roughly 40%. It has continued to decline slowly ever since (Loeb & Reininger, 2004).

In keeping with the changing age distribution of teachers, experience levels have changed over time. Whereas the 1987–88 SASS found that only 9.9% of all public school teachers had taught for 3 or fewer years, the 2003–04 SASS found that 17.8% of all full-time public school teachers had teaching experience of 3 or fewer years. Roughly the same percentage of teachers have been teaching for 20 or more years in 2003–04 as in 1987–88. In terms of numbers, however, there were more than 160,000 teachers in 2003–04 with teaching experience of 20 or more years than there were in 1987–88. The latest SASS also tells us that approximately 57% have been teaching at their current school for more than 4 years (Strizek et al., 2006).

Multiple studies have estimated the effects of teaching experience on students' learning, though few have looked at the effects of teachers' age. Using data on New York City schools for grades 4–8, Boyd, Lankford, Loeb, Rockoff, and Wyckoff (2007) found that, on average, first and second year teachers did not add as much to student learning in English Language Arts (ELA) or math as more experienced teachers did. Gains accrued thereafter, but stopped being substantial after the fifth year. Using a 10-year panel from North Carolina, and focusing on students from grades 3, 4, and 5, Clotfelter, Ladd, and Vigdor (2007a) found that the more experienced a teacher was, the more student test scores in reading and math increased over the course of a year. Compared to a teacher with no experience, the benefits of experience rose continuously, peaking at 21–27 years of experience. They too found that more than half of the gain occurred during the first couple of years of teaching. This is consistent with other studies in Texas and New Jersey (for Texas, see Hanushek, Kain, & Rivkin, 2004; for New Jersey, see Rockoff, 2003). The evidence from New Jersey, however, suggests that the effect of experience may vary by subject matter. Using a panel from New Jersey, Rockoff (2003) found that the impact of teacher experience on student vocabulary achievement increased until the sixth year of teaching after which it flattened. The impact on reading comprehension, however, increased monotonically past the tenth year. The effect of teacher experience on math computation skills, on the other hand, increased until year 3, after which it began to decrease. All of these studies

suggest that experience matters for student learning, but that on average, the gains to experience are greatest in the first years of teaching.

The better performance of more experienced teachers could reflect either improvement with experience or the differential attrition of ineffective teachers. If those who are less effective, on average, are also the ones to leave initially, then what looks like gains to experience might simply be gains to more effective teachers regardless of experience. In other words, we might see more experienced teachers, on average, registering higher student test scores, even if they as individuals did not get any better with experience. Using a Florida Panel for grades 3–10, Harris and Sass (2006) find that while experience generated positive effects for student learning in both math and reading, those effects became very small when teacher fixed effects were included. This suggests it may be differential attrition, not improvement in teaching skills, which drive the better performance of more experienced teachers. Clotfelter et al. (2007a), however, find little support for the differential attrition hypothesis from their analysis of North Carolina schools. They argue that positive returns to experience in their models come primarily from experience and not from a sample biased by the attrition of ineffective teachers. Thus, while it is clear that on average more experienced teachers are more effective than first-year teachers, the extent to which this is driven by learning or attrition is less clear. There are likely to be differences in learning opportunities available to teachers from place to place, which could influence the effect of teacher experience on student learning, as well.

Gender Approximately 75% of public school teachers are female, with 83.8% in elementary schools and 57.3% in secondary schools (Strizek et al., 2006). These proportions are similar across the urban and rural spectrum, though schools in the South and Midwest employ relatively more women than other schools (Bacolod, 2005). The proportion of female teachers has *not* changed dramatically over the last 50 years. Two things, however, have changed. First, the number of women completing college has risen dramatically. As a result, the test score of the average college graduate is now lower relative to the full distribution of high school students in a given cohort, than was previously the case, when a smaller proportion of high school students went onto college.¹ Second, as Corcoran, Schwab, and Evans (2004) note, the labor market for women has changed considerably since the mid-1960s with traditionally male-dominated professions such as law and medicine becoming increasingly open to women. Using data from five longitudinal surveys of high school graduates spanning the classes of 1957 to 1992, they found that while the math and verbal test scores of the average new teacher had fallen only slightly, the likelihood that a female from the top of her class would enter teaching had fallen dramatically. Bacolod (2005) reached similar conclusions. Using indices of teacher quality such as test scores and selectivity of undergraduate institution,

she establishes an empirical link between an increase in professional opportunities for women and a decline in the quality of teachers as measured by these indices.⁵

The research literature assessing the effect of teachers' gender on student outcomes is relatively small. Ehrenberg, Goldhaber, and Brewer (1995) did not find a systematic relationship between teacher gender and student outcomes; while Nixon and Robinson (1999) found no relationship between gender and outcomes for boys, but found that girls attending high schools with a higher proportion of female teachers had higher educational attainment. In a recent study of the relationship between teacher gender and student outcomes, Dee (2007) finds that same gender matches between teachers and students improves student learning. In particular, boys appear to learn less with female teachers.

Teacher and Student Race The racial and ethnic makeup of teachers does not reflect that of their students in most school districts. The share of non-White students is much larger than the share of non-White teachers. For instance, the proportion of African American and Hispanic students (16.8 and 17.7%, respectively) is nearly three times the percentage of African American and Hispanic teachers (7.9 and 6.2%).

The underrepresentation of racial and ethnic minority teachers stems largely from their underrepresentation in the college-educated population. Among college graduates in 1976–77, for example, 90% were White, 7% were African American, and 2% were Hispanic. By 1999–2000, the gap had decreased slightly to 78%, 9%, and 6%, respectively. Nevertheless, non-Hispanic White teachers were considerably overrepresented in the group of college graduates.

How important is having a teacher of the same race for student achievement? A recent study using data from the Tennessee STAR experiment in which students and teachers were randomly assigned to each other found that an additional year with an own-race teacher increased student performance by two to four percentile points (Dee, 2004). As Dee (2004) notes, a comparison with other estimated effects suggests these gains are considerable. Specifically, they are comparable to those associated with a small-class assignment. The results are in tune with those from a large school district in Texas, where Black students' scores improved by 0.1 standard deviations when they had a Black teacher compared to when they had a White teacher (Hanushek, Kain, O'Brien, & Rivkin, 2005). These results should be interpreted with caution to the extent that teacher quality varies systematically with school-level student racial composition, making it difficult to separate teacher quality from teacher race. If, for instance, the best White teachers self-select themselves into more affluent schools, leaving the least competent White teachers in schools with a high share of low-income, low-achievement Black students, then such studies might end up comparing the "average" Black teacher with a set of "below-average" White teachers, leading one to overstate the benefit of having a same-race teacher (Jacob, 2007).

Educational Attainment Almost all public school teachers have bachelor's degrees and nearly 41% have master's degrees as their highest degree earned (Strizek et al., 2006). In 1961, 15% of teachers did not have a bachelor's degree, but by the early 1980, nearly all teachers had completed an undergraduate degree. As an example, in 2003–04, only 1.1% of all public school teachers did not have a bachelor's degree. The percentage of teachers with master's degrees as their highest degree has risen considerably, from approximately 23% in 1961 to 41% in 2003–04 (Strizek et al., 2006). Degree attainment varies by the grade the teacher teaches, with high school teachers more likely to hold a master's degree than middle school teachers, who in turn are more likely to hold a master's degree than primary school teachers. However, there is little difference across community types (rural, suburban, and urban) in the percentage of teachers with masters' degrees.

The increase in master's degree attainment, at least in part, is related to changes in state requirements and the additional pay linked to educational attainment in district or state salary schedules. The incentives that encourage teachers to get a master's, unfortunately, are not likely to have benefited students. Master's degrees have *not* been found to predict higher student achievement, except for content specific masters' degrees in high school mathematics. For example, using North Carolina data, Clotfelter et al. (2007a) found no impact of master's degrees on student achievement in elementary school; in some cases, the impact was negative; though they find more positive effects in high schools. A study using Florida panel data also found that advanced degrees were not effective, on average, in increasing teacher productivity. There was some evidence that teachers with subject-specific master's degrees had students who learned more over the course of a year, but, as just mentioned, this was only found to hold for high school math, and has yet to be confirmed using current empirical techniques (Harris & Sass, 2006). Even here, it is unclear whether it is the master's degree per se, or greater interest in math (which presumably led them to the master's) which leads to better student performance. If it is the latter, then these teachers might have helped improve student performance even without the master's (Boyd, Goldhaber, Lankford, & Wyckoff, 2007).

Subject-Matter Knowledge Basic reasoning would lead one to expect teacher effectiveness to be linked to adequate subject-matter knowledge. There are several ways of measuring a teacher's subject-matter knowledge; for instance, scores in field-specific examinations, such as the Praxis series, teaching certificates, or undergraduate or graduate course-taking. While none of these captures subject-matter knowledge completely, they nevertheless give us some sense on average of a teacher's content knowledge.

Most teachers have a graduate or undergraduate major or minor in their primary teaching field, and this has been increasing over the years (Ingersoll, 2003). As of 1997–98, 86% of 7th- to 12th-grade English teachers, 89% of social

science teachers, 82% of math teachers, and 88% of science teachers reported having an undergraduate or graduate major or minor in their main teaching assignment field. The types of majors teachers have vary substantially by school level. High school teachers are far more likely to have degrees in traditional academic fields such as math or history (66%) than are middle school teachers (44%) or elementary school teachers (22%; Loeb & Reininger, 2004). Many teachers, however, also teach classes outside their primary teaching assignment—and they are much less likely to hold a major or minor in these areas. In 1999–2000, Ingersoll (2003) found that 38% of all 7th- to 12th-grade teachers who taught one or more math classes did not have either a major or a minor in math, math education, or related disciplines like engineering, statistics, or physics. A third of all 7th- to 12th-grade teachers who taught one or more English classes had neither a major or minor in English or related subjects such as literature, communications, speech, journalism, English education, or reading education. In science and social studies, the numbers were slightly lower. Approximately 28% of all 7th- to 12th-grade teachers who taught one or more science classes did not even have a minor in one of the sciences or in science education. Finally, roughly 25% of those who taught one or more social studies classes were without a minor in any of the social sciences, in public affairs, in social studies education, or in history (Ingersoll, 2003).

The No Child Left Behind (NCLB) Act of 2001 mandated that every student be taught by a “highly qualified” teacher by 2006. NCLB defines a highly qualified teacher as a fully state-certified teacher, who holds a bachelor’s degree and demonstrates competency in the core academic subject or subjects he or she teaches.⁶ In order to be fully state-certified, as per these standards, a teacher must obtain a certificate appropriate to his or her level of experience and must not be in a position where certification or licensure requirements are waived on an emergency, temporary, or provisional basis. The law provides states considerable flexibility in determining the exact criteria for certification within the broad framework laid out. States, for instance, are allowed to determine their own requirements for indicators of subject-matter competence. Twenty-five states require high school teachers to have a major in their primary subject area and to have passed a subject-matter exam. Six states require high school teachers to only have an undergraduate major in the area, while 18 other states require teachers to only pass a subject-matter test in their primary teaching field (Boyd, Goldhaber, et al., 2007). Note, however, that there is considerable variation in the level of knowledge that constitutes a major or that which is necessary for certification exams.

While there is much rhetoric around the importance of subject-matter competence on teacher effectiveness, to date most research does not show a strong relationship between teachers’ subject matter knowledge and student test-score gains. For example, in their study of New York City schools, Boyd et al. (2006) do not find a relationship

between teacher’s undergraduate degree and student performance. Similarly, using data from the San Diego Unified School District, Betts, Zau, and Rice (2003) find no clear link between a student’s rate of learning at the elementary level and the number of college courses completed by his/her teacher in a particular subject. This should not be taken as evidence that content knowledge is not important, but simply that it may not be the factor that most differentiates teachers’ effectiveness in the classroom, especially in the early grades.

There is some recent evidence that suggests it is not content knowledge per se, but pedagogical knowledge that is important for student learning. Hill, Rowan, and Ball (2005) find that pedagogical knowledge for teaching math is significantly associated with student achievement for first- and third-graders, after controlling for key student and teacher-level covariates. In high school, however, recent literature finds that even the more general measures of teacher content knowledge might be associated with learning. For instance, Clotfelter, Ladd, and Vigdor (2007b) find some evidence that teachers who obtained a masters’ degree while teaching add more value to student learning in high school than do teachers without masters’ degrees.

Teacher Ability: Test Scores and Selectivity of Undergraduate Institution While there is little evidence on the importance of content knowledge for student learning, there is some evidence that teachers with greater general knowledge and academic ability are more effective in the classroom. This relationship, however, appears weak.

Teachers, on average, score below the typical college graduate on standardized aptitude tests (see Corcoran et al., 2004; Hanushek & Pace, 1995; Bacolod, 2005). Focusing on the average alone, however, masks the fact that many teachers score well on standardized aptitude tests. In a study of more than 300,000 prospective teachers who took a Praxis test between 1994 and 1997, Gitomer, Latham, and Ziomek (1999) found that prospective teachers in academic subject areas had SAT/ACT scores that were comparable, if not better, than the larger college graduate population. At the same time, those seeking licenses in non-academic fields such as elementary education had much lower scores (Gitomer et al., 1999). The academic ability of teachers has also changed over time. More than 20% of young female teachers in the 1960s scored in the top 10% of their high-school graduating cohort. By 2000, this number had dropped to 11% (Corcoran et al., 2004). For men in the top two decile groups, the drop in the probability of entering teaching was comparatively lower. While 6.3% of men in the ninth and tenth deciles of their high school graduating cohort entered teaching in 1964, this figure had dropped to 3.8% in 2000.⁷ Bacolod’s (2005) findings complement this; she shows that among those with higher test scores, the predicted probability of entering alternative professions has increased dramatically.⁸

Students of teachers with higher test scores tend to learn slightly more as measured by test score performance than

other students. The relationship appears stronger in math than in reading. Using North Carolina data, Clotfelter et al. (2007a) find that teachers who had scored two or more standard deviations above the average boosted students test scores by 0.068 standard deviations while those who scored two or more below the average reduced achievement gains by 0.62 standard deviations.⁹ They conclude that having a teacher at either extreme of the test score distribution has a far bigger effect on student math achievement than having an average teacher. Using data on New York City school teachers, Boyd et al. (2006) find that teachers who passed the Liberal Arts and Sciences Test (LAST) state teacher-certification exam on their first attempt produced higher student math achievement than those who did not (Boyd, Lankford, et al., 2007). They find no effects for student ELA performance. Importantly, however, they find that higher scoring teachers on average have a greater effect on students with higher prior test scores. When teaching students with lower prior test scores, they tended to do no better and in some cases worse than lower scoring teachers.

Caveats It is important to emphasize that the findings from many of the studies cannot be treated as definitive, but only suggestive. Some of them fail to establish causality because they are unable to estimate the counterfactual, that is, what would happen in the absence of the particular intervention being studied. This happens for several reasons. First, it is not always clear what the counterfactual means. For instance, does it mean being taught by the average teacher in the district or by the least effective teacher? Second, even if one can establish the effect of a particular teacher on a group of students, it is not always possible to extrapolate those findings to an entirely different group of students (Murnane & Steele, 2007). It is also hard to disentangle contextual effects (such as school and classroom effects) from teacher effects in many studies. Since teachers choose where they wish to teach, it is likely that teacher assignment is related to student, classroom, and school characteristics. This makes it difficult to distinguish statistically between effects that are due to teachers per se, and those that are due to characteristics of the students' classroom, school, and district environment. Large longitudinal data sets that follow students over time and match them to their schools and teachers have substantially increased our ability to sort among possible causes for the relationships that we see.

An important reason why it has been difficult to know the impact of many policy interventions is that large micro-education data sets gather very little information on the policy variables we are interested in. For instance, Figlio and Kenny (2006) explain that there has been little quantitative work linking teacher incentives to student performance because most data sets do not provide us the detail we need on school's personnel practices. Moreover, most data sets provide cross-sectional information. Cross-sectional studies, being specific to one time-period, are unable to capture *gains* in student achievement for a given cohort of students. As a result, they are not very helpful in

telling us how student achievement gains relate to specific characteristics of teachers. Comparing across cohorts is not a very effective method of understanding these gains since cohorts are likely to vary in measurable and unmeasurable characteristics. Value-added studies, in contrast, track the performance of individual students over time, thereby attempting to isolate the learning that a specific teacher adds to his or her students. They attempt to control for factors that are unrelated to a particular teacher's potential influence, such as student background characteristics (including past test scores), and classroom and school characteristics that likely impact a student's performance. How well this is done will determine whether we can glean any causal information from the study. As Murnane and Steele (2007) point out, the use of multi-year data on student achievement requires specifying statistical models that account for correlations between an individual student's test scores from any given year to the next. Such models make statistical assumptions about the constancy of teacher effects over time. Using different assumptions, one can generate different estimates of teacher effectiveness.

A final challenge stems from the lack of precise measures of teaching quality. As a result, we are left to look at measured attributes of teachers such as their years of teaching experience and their own test performance. To understand the effect of these measured attributes on student learning, quantitative work, including all the quantitative literature discussed in this paper, has primarily studied the average achievement gains of students on standardized tests in their classrooms. Relying entirely on student test scores to gauge the impact of a teacher on student learning is problematic. First, the test itself may not be the most precise instrument to capture all that a student has learned. Second, because we are interested in measuring students' achievement gains from one period to the next, it is important that the tests measure comparable content and scores be measured on comparable scales. Third, it is important that the tests measure content that a particular teacher has covered. This becomes difficult to ascertain in higher grades given the greater curricular differentiation among classrooms (Murnane & Steele, 2007).

Variation in Teacher Characteristics across Schools

The description of the teacher workforce above masks the substantial variation in teacher characteristics across schools and school districts. Nationwide, schools with the highest minority enrollment, largest low-income enrollments, and the most academically struggling students are also the ones most likely to have teachers with the weakest qualifications.

Certain features of the distribution of teachers stand out. First, there is greater variation in teacher credentials *within* individual cities than *across* cities. For instance, there are larger variations in teacher credentials, such as selectivity of undergraduate institution and average experience, among the schools in the Phoenix metropolitan area, than there

are between the metropolitan areas of Phoenix and Detroit (Loeb & Page, 2001).

This variation across schools within metropolitan areas is systematic. Schools with high minority enrollments also have higher proportions of teachers in their first 3 years of teaching, higher proportions of teachers with less than 10 years experience, and the lowest proportion of teachers with more than 20 years experience. They also have the lowest share of teachers with certification in their primary or secondary teaching assignment. In the New York City school district, for example, there are large differences in teacher characteristics across racial and income groups (Loeb & Reininger, 2004). As of 2000, 21% of non-White students had teachers who were not certified in any subject taught, compared to only 15% of White students. Twenty-six percent of non-White students had teachers who failed the general knowledge certification exam, compared to 16% of White students. Similarly, 22% of low-income students had teachers who were not certified in any subject they taught, compared to 17% of higher income students. Thirty percent of low-income students had teachers who failed the certification exam, compared to 21% of higher income students.

There is also some variation across community type. Approximately 50% of all school teachers work in suburban settings, with the other half evenly distributed between rural and urban areas. Teachers in these settings are similar in terms of gender, experience, and certification, yet fairly different when it comes to race, age, and educational attainment (Loeb & Reininger, 2004). Not surprisingly, non-White teachers more frequently teach in central cities than in urban fringe/large towns or rural/small towns. Fewer rural teachers hold masters degrees compared to teachers in urban and suburban settings (Strizek et al., 2006).

The choices individual teachers make with regard to job postings are influenced by multiple measured and unmeasured factors. The research literature has identified and assessed a number of these including wages and benefits, working conditions, entry requirements, and school location. These are believed to affect the *supply* decisions of teachers. They tell us whether college graduates will choose teaching as a profession, and if they make this choice, where they are likely to teach. The eventual outcome is, however, also influenced by factors originating from the school system, that is, from those who *demand* teachers. Important among these factors are district hiring practices, contracts, and bureaucratic features. We look at each in turn.

Wages A large literature suggests that teachers are more likely to choose teaching when starting wages are high relative to wages in other occupations (see Corcoran et al., 2004; Bacolod, 2005; Hanushek & Rivkin, 2006). Drawing upon multiple data sources, Bacolod (2005) finds that highly qualified teachers are especially sensitive to changes in relative wages. The lower teachers are paid relative to professionals, the less likely high-quality educated women are to choose teaching (see Corcoran et al., 2004). Ap-

proximately 16.5% of public school teachers who decided to move to another school between 2003–04 and 2004–05 reported having done so for better salary or benefits. For those who left teaching in 2004–05, nearly 15% cited salary related reasons (Marvel et al., 2007).

Teacher wages have increased dramatically over the last 40 years. Nevertheless, since the 1970s, they have fallen behind salaries in non-teaching jobs for individuals with similar qualifications. Lawyers, doctors, scientists, and engineers earn substantially more, as do managers and sales and financial service workers (Corcoran et al., 2004). The opportunity cost of becoming a teacher, in terms of salary forgone in alternative professions, is high. However, teachers may work fewer hours and fewer days, at least partially compensating for this forgone income.

In 2003–04, the average base salary of regular full-time teachers was \$44,400 per annum. Public school teachers on average earned considerably more than their private school counterparts, the former making \$44,500 on average and the latter \$31,700.¹⁰ Regular full-time teachers in rural/small towns had, on average, lower base salaries than their counterparts in urban fringe/large towns and central cities (Strizek et al., 2006).

Teachers' salaries increase with years of experience and additional education (Hanushek & Rivkin, 2006). The average salary of beginning teachers in 2004–05 was \$31,753 per annum. There is considerable variation across states, with new teachers making up to \$39,259 per annum in Connecticut and approximately \$24,872 per annum in North Dakota. If we look at all teachers, and not just new teachers, we find considerable statewide variation. Average teacher salaries are the highest in Connecticut at \$57,760 per annum and the lowest in South Dakota at \$34,039 (American Federation of Teachers, 2007). Much of this variation in salary mirrors variation in the wages of non-teaching college graduates and thus the differences in dollars overstate the differences in the relative wages (and thus appeal of teaching) across regions.

Within a state, there are differences across counties, and within counties, between districts. The within-county differences, compared with differences across states, more closely reflect differences in relative wages and thus in the appeal of teaching relative to other occupational choices. Thus, salaries can affect not only whether an individual chooses to become a teacher, but also where they choose to teach. In Florida, for instance, teachers with a bachelor's degree as their highest degree earned anywhere between \$32,283 and \$45,613 in 2005–06 depending on where they taught in the state (Florida Department of Education, 2006). In Santa Clara County in California, teachers with similar educational qualifications were paid \$66,652 per annum in Alum Rock Union Elementary school district during 2005–06, but \$80,041 per annum the same year in a neighboring district (California Department of Education).¹¹

A number of factors explain the variation in teacher salaries seen above. For example, districts with greater resources have more money to spend on teacher salaries.

Alternatively, a district could have greater demand for teachers because of policy preferences for smaller class sizes or more skilled teachers; they may be willing to spend the money they have available on more teachers instead of potentially increasing the quality of their teachers by spending more on wages per teacher. Salaries could also be higher in one district than another because the region does not produce many teachers, or because the job opportunities for college graduates are very good in other fields and thus the district has to pay more to attract equally skilled individuals into teaching.

Non-Wage Job Characteristics Salaries are only one criterion influencing individuals' decisions about whether and where to teach. Non-wage job characteristics, including attributes of students, class size, school culture, facilities, teaching assignments, leadership, and safety, also affect teachers' choices and these characteristics often vary more dramatically across schools than do salaries.

Studies in Georgia, New York, and Texas all find that teacher mobility is heavily influenced by characteristics of the student body, especially race and achievement (Scafidi, Stinebrickner, & Sjoquist, 2003; Boyd, Lankford, Loeb, & Wyckoff, 2005; Hanushek et al., 2004). Georgia elementary teachers move from schools with higher proportions of minority students and from low-performing schools, but the latter appears to be explained by teacher preferences for fewer minority students. Texas and New York data, on the other hand, find that teachers prefer higher-achieving students even after controlling for student racial composition. Teachers, especially highly qualified teachers, are more likely to transfer or quit when teaching lower-achieving students. As further evidence of the weight some teachers put on student-body characteristics, when class size reduction in California increased the demand for teachers across the state, many teachers in schools with low-achieving

students switched to schools with higher-achieving students (Shields et al., 2001).

While student characteristics are important by themselves, teachers also choose schools with more high-achieving and wealthy students because these schools often offer other characteristics that teachers prefer, such as better facilities or more preparation time. A recent survey of teachers in California, Wisconsin, and New York found that schools serving large numbers of low-income students had a much higher incidence of inadequate facilities relative to other schools, evidence of vermin (cockroaches, mice, and rats) in school buildings; dirty, closed or inoperative student bathrooms; inadequate textbooks and science equipment; and higher personal expenditures by teachers to compensate for insufficient classroom materials and supplies (Carroll, Fulton, Abercrombie, & Yoon, 2004).

The 2004–05 TFS asked teachers who moved across schools and why they moved. Table 47.1 shows that approximately 38% of teachers reportedly moved to another school due to a better teaching assignment. Interview studies also reveal that new teachers resent teaching subjects they do not know, subjects requiring extensive class preparation, being split between two subjects, or teaching very large classes. While there is little evidence that these factors by themselves explain high turnover rates, it is likely that they cause stress and dissatisfaction, thereby precipitating teachers' transfers and resignations (Johnson, Berg, & Donaldson, 2005).

School leadership is another important factor in teachers' decision making. In the 2004–05 TFS, more than 37% of teachers indicated that this was an important factor in their decision to switch schools. Similarly, for teachers who left teaching altogether, Ingersoll and Smith (2003) found that of the 29% of leaving teachers who cited dissatisfaction as their reason for leaving, more than three-fourths linked their quitting to low salaries. However, the next two most important factors were student discipline problems and lack of support from the school administration.

Teacher peers also affect teachers' decisions. In a study of California schools, Shields et al. (2001) found that credentialed teachers complained of the lack of professionalism of those who were not credentialed and the resulting instructional burden they had to carry to compensate for the teaching inadequacies of their colleagues.

Differences across schools in non-wage attributes of the job will be particularly important when there is little variation in wage to compensate, as is the case in large urban districts in which all schools operate under the same salary schedule. Policies that attract effective administrators, increase preparation time, decrease class size, or provide funds to renovate facilities can improve working conditions and thus help to equalize the distribution of teachers across schools.

Location In addition to wages and working conditions, school location has a strong influence on the distribution of teachers. Research shows that most teachers prefer to

TABLE 47.1
Percentage of Public School Teacher Movers Who Rated Various Reasons as Very Important or Extremely Important in Their Decision to Move to Another School: 2004–05

Reason for Moving to Another School	Percentage of Teachers
Opportunity for a better teaching assignment (subject area/ grade)	38.1
Dissatisfaction with support from administrators at previous school	37.2
Dissatisfaction with workplace conditions at previous school	32.7
Higher job security	19.1
Dissatisfaction with changes in job description or responsibilities	18.3
Dissatisfaction with opportunities for professional development in previous school	12.8
Did not have enough autonomy over classroom at previous school	10.4

Source: Marvel et al. (2007).

teach close to where they grew up and in districts that are similar to the districts they attended as high school students. Of all public school teachers who chose to move from one school to another between 2003–04 and 2004–05, 26.2% cited closeness to home as a very or extremely important factor in their decision to move. Of those who left teaching, 11.2% cited changing residence as very or extremely important.

Sixty-one percent of teachers who entered public school teaching in New York state between 1999 and 2002 started teaching in a school district located within 15 miles of the district where they went to high school. Eighty-five percent entered teaching within 40 miles of their high school. Even when teachers go far away to college, they tend to come home to teach (Loeb & Reiningger, 2004). A recent study using the NELS 1988–2000 dataset and Common Core of Data finds that these results are consistent nationwide: teachers are indeed local. Further, in comparison to college graduates in nearly 40 other occupations, teachers were significantly more likely to live locally 8 years after high school graduation (Reiningger, 2006). Cannata (2007a) argues that teachers tend to sort themselves into schools that are socially proximal to them, in terms of race and class, and resemble the schools they attended as children. She finds that teacher candidates tend to have a clear notion of where they want to teach and where they do not, despite knowing little about these schools. Thus, she concludes, even though teacher candidates espouse preferences for specific school characteristics, such as beginning teacher support, the eventual decision on where to teach is based more on feelings of familiarity, comfort, and fit (Cannata, 2007b).

Teachers' preferences to teach close to home or in similar settings pose serious concerns for urban districts since these tend to be net importers of teachers. Urban areas do not produce as high a proportion of college graduates as suburban areas. Using schools with large minority enrollments and large percentages of students receiving free and reduced-price lunch as proxies for difficult-to-staff schools, Reiningger (2006) finds these schools produce significantly lower percentages of students earning bachelor's degrees—a prerequisite for teaching (Reiningger, 2006). As a result, schools in these regions need to attract teachers from other regions, for which they have to pay a premium to get equally qualified candidates. If they are unable to find qualified candidates, then they will be forced to hire from a less-qualified pool of applicants.

Entrance Requirements In addition to factors affecting the appeal of a particular job, such as wages, working conditions, and location, requirements for entry into teaching can also affect who goes into teaching and the distribution of teachers across schools. While teacher preparation and certification requirements could improve student outcomes by increasing skills and knowledge, they also impose costs on current teachers and would-be teachers for tuition and the opportunity cost of time. On the one hand, the willing-

ness to incur such costs might signal those who are likely to be more motivated to teach; on the other hand, the costs per se could be prohibitively high for some, decreasing the potential pool of talented applicants. Licensure exams play a role similar to certification. While they have the merit of establishing a floor on the measured knowledge teachers must have, if the tests are unable to effectively distinguish between better and worse candidates, or assess applicants on material unrelated to student learning, they may exclude teachers who might have been very effective in the classroom (see Boyd, Goldhaber, et al., 2007).

Until recently many schools, particularly those serving high concentrations of students in poverty, staffed their classrooms with uncertified teachers, despite the fact that in theory certification was required of all teachers. As an example, in New York City in 2000, 35% of teachers in the highest-poverty quartile of schools had failed the general knowledge certification exam the first time they took it and approximately half of all new teachers held a temporary license (were not certified to teach). As described above, NCLB changed the landscape, requiring that *all* students be taught by a "highly qualified" teacher by the end of the 2006–07 school year. At least partially as a result, between 2000 and 2005 there was a remarkable narrowing in the gap in teacher qualifications between high-poverty schools and low-poverty schools in New York City. By 2005, only some 10% of new teachers in the highest-poverty quartile had failed their certification exam on the first attempt (see Boyd, Lankford, Loeb, Rockoff, & Wyckoff, 2007).

Teacher Hiring Practices Factors that affect teachers' decisions are only one side of the story. Factors affecting demand for teachers are important as well. Teacher hiring practices, for example, explain part of why some schools and districts end up with better teachers than others. A recent study by the New Teacher Project in three large urban districts in the southwestern, midwestern, and eastern regions and one mid-sized urban district in the Midwest found that some schools that appeared difficult-to-staff did not have a problem *attracting* teachers, but they did have a problem when it came to actually *hiring* them. While there were between 5 to 20 times as many applicants as available positions in these districts, with up to 37% of the applicants in difficult-to-staff subjects such as math, science, special education, and English Language Learners, each of the districts failed to make offers until mid-to-late summer. By that time, many of the applicants (31–60%) had withdrawn their applications. Of those who had withdrawn, 50–70% cited late timelines as a major reason for taking another job. Furthermore, the study indicates that applicants who withdrew from the process were significantly better qualified than new hires in terms of the likelihood of having a higher undergraduate GPA, a degree in their teaching field, and completed educational coursework (Levin & Quinn, 2003). This suggests that districts with effective hiring practices such as aggressive recruitment strategies and spring job offers are likely to end up with higher quality

teaching staff even if initially faced with the same pool of applicants. These districts are able to recruit their top choices while other districts are left with teachers who could not find jobs elsewhere.

Principals also do not always have the information needed to accurately assess teacher quality and judge future performance. In a recent paper, Jacob and Lefgren (2005) argue that while principals are able to identify the best and the worst teachers in their schools, they are not able to identify where the rest fall in the ability distribution. Principals, according to this study, also discriminated systematically against male and untenured faculty (Jacob & Lefgren, 2005).

Liu and Johnson (2006) stress the importance of information-rich and timely hiring processes in improving the match between teachers, schools, and teaching assignments. In a survey of new teachers in California, Florida, Massachusetts, and Michigan, they found that the hiring process relied heavily on reviews of paper credentials and interviews. Importantly, schools and districts rarely observed a candidate's teaching. In much the same way, applicants rarely got much experience of the school to which they had applied. While most new teachers met with the school principal during the hiring process, very few interviewed with current teachers or met with students to get a feel of the school culture and requirements. As a result, new teachers in these states formed only a moderately accurate picture of what their job likely entailed, increasing the chances for job-related disappointments and turnover.

The timing of the hiring process might be the most severe impediment to information-rich hiring processes. Many new teachers are hired in summer, when school is not in session; teachers are unlikely to be available for interviews and classes cannot be observed in action. Further, Liu and Johnson (2006) found that approximately a third of new teachers in California and Florida were hired only after the school year had started, when principals were in a rush to fill a position, teachers were busy with their classes and there was little time for an informative hiring process. The combination of these factors underscores the difficulty—and necessity—of achieving effective hiring practices.

Bureaucratic Hurdles The problem of suboptimal staffing is driven, at least in part, by bureaucratic and contractual requirements. Three district-level policies may be particularly important: vacancy notification requirements, teachers' union transfer requirements, and late budget timetables and poor forecasting (Levin, Mulhern, & Schunck, 2005). Vacancy notification requirements allow resigning or retiring teachers to provide very late notice of when they intend to leave. In the study of hiring practices in four districts conducted by the New Teacher Project, three had a summer notification deadline or none at all, while one had a mid-May deadline. Late notification deadlines make it very difficult to know which posts will be available in September when the school year typically starts. Local laws and union contracts make it possible for experienced teachers to ask

for last-minute transfers. Further, many principals delay advertising vacancies for fear of being required to hire or transferring a teacher they do not want. Finally, late state budget deadlines lead to chronic budgetary uncertainties as a result of which administrators do not know which positions will be funded in their schools.¹²

Collective Bargaining Agreements Collective bargaining agreements also influence hiring and retention practices and may affect the distribution of teachers across schools. Rules in these contracts, for instance, often make it very difficult to fire tenured teachers even when they are performing poorly. To the extent that parents can exert power to have such teachers removed from their children's schools, they may be more likely to end up in schools serving students with the fewest available resources and the greatest needs. Similarly, the least effective teachers may end up in poorly performing schools if the administrators are less effective as well. The collective bargaining process may also distort the allocation of resources toward easily measured factors such as salary, with other important aspects of schooling such as working conditions, bearing the brunt. Since non-wage factors such as working conditions are important in determining whether high-quality teachers will come to teach in low-achieving and poor schools, this over-emphasis on pecuniary measures may be detrimental. Finally, policies tend to standardize across schools—salaries are just one example. If the needs of some schools are much greater than that of others, such standardization might put high-needs schools at a relative disadvantage.

In summary, the differences in teachers across schools are systematic and often striking. A variety of factors combine to create these differences. On the supply side, wages, working conditions, location, and entry requirements all contribute to the variation. On the demand side, hiring practices, bureaucratic hurdles, and collective bargaining practices are all important factors.

Teacher Mobility and Turnover

Once the decision to teach is made, the next question is where to teach. Differences in the characteristics of teachers across schools get determined, to a large extent, by teachers' initial choice of posting. From an aggregate nationwide perspective, the magnitude of teacher turnover is not very large. Between 2003–04 and 2004–05, for instance, 83.5% of teachers stayed in the same school, while only 8.1% transferred between schools and 8.4% left teaching (Marvel et al., 2007).¹³ From the perspective of the individual school that loses teachers, however, knowing that the magnitude of attrition nationally is very small in relative terms is of little consolation. For the school in question, not only is there the risk of losing a good teacher, the school's learning environment likely suffers as instructional continuity gets disrupted.

From Table 47.2 we see that while the percentage of those who move to another school (henceforth called mov-

TABLE 47.2
Percentage Distribution of Teacher Stayers, Movers, and Leavers in Public Schools^a

Year	Stayers (%)	Movers (%)	Leavers (%)
1991–92	87.6	7.3	5.1
1994–95	86.3	7.2	6.6
2000–01	84.9	7.7	7.4
2004–05	83.5	8.1	8.4

Note. ^aStayers are teachers who were teaching in the same school in the current school year as in the year before (base year). Movers are teachers who were still teaching in the current school year but had moved to a different school after the base year. Leavers are teachers who left the teaching profession after the base year. Note, this does not rule out the possibility of their re-entering teaching at a later date.
Source: Compiled from Marvel et al. (2007)

ers) has been fairly stable over the years, the percentage of those who stay on in a school (henceforth called stayers) has been decreasing gradually. Those who leave the teaching profession altogether (henceforth called leavers) has been rising steadily.

Characteristics of Movers and Leavers Younger teachers tend to leave a given school or teaching more frequently than older ones. Between 2003–04 and 2004–05, for instance, 14.7% of teachers under the age of 30 years had moved to another school, while 9% had left teaching altogether. For teachers between the ages of 40–49 years, on the other hand, only 7.1% had moved to another school and 5.3% had left teaching altogether.

According to TFS data, between 2003–04 and 2004–05, the category of teachers with *no* full-time teaching experience was the most likely to move out of a school as well as leave teaching altogether. For teachers with full-time teaching experience, those with 1–3 years of experience were both the most likely to move to another school as well as leave teaching altogether. The corresponding figures for teachers with more experience are lower; for instance, for teachers with 10–19 years of experience, 6.3% moved to another school, while 5.5% left teaching.

The difference by sex is not striking, although a larger percentage of female teachers left teaching altogether between 2003–04 and 2004–05. White teachers relative to Black and Hispanic teachers had the lowest percentage of movers and leavers for the same period. The data suggests that Hispanic teachers had the highest percentage of movers, while Black teachers had the highest percentage of leavers.

Not surprisingly, teachers whose base salary was \$30,000 per year or less were the most likely to move to another school or leave teaching compared to teachers who earned more. With regard to main teaching assignment, special education teachers were the most likely to switch schools as well as leave teaching between 2003–04 and 2004–05. This stands in contrast to the period between 1999–2000 and 2000–01 when special education teachers were among those least likely to leave teaching (though not among those less likely to move to another school).

Teachers who have a regular or standard certification

type are the least likely to move to another school or leave teaching altogether. Between 2003–04 and 2004–05, 7.2% of teachers who had a regular or standard certification type had switched schools, while 8.2% of them had left. Those with a provisional or temporary certification type were the most likely to move, while those who had none of the common types of certification were the most likely to leave.¹⁴

Better qualified teachers (but not necessarily more effective teachers) are also more likely to leave teaching, at least in some geographical regions. In New York City, for example, there are considerable differences between teachers who stay on in a particular school and those who transfer or quit (Loeb & Reininger, 2004). Those who stay on in a particular school have failed the certification exams twice as often as those transferring to another district (Boyd et al., 2005). Moreover, the latter are twice as likely to have attended a highly competitive college, and half as likely to have attended a less competitive college. New York City teachers who quit teaching in New York State are also substantially more qualified than those who remain in terms of their test scores. For example, 20% of new teachers in the top quartile on the general-knowledge certification exam left high-achieving schools after 1 year, while 34% of those in low-achieving schools left after 1 year. By contrast, 14% of bottom-quartile teachers left high-achieving schools after 1 year, and 17% left low-achieving schools.

More qualified teachers are also substantially more likely to leave schools having the lowest-achieving students. For example, of the new teachers hired in New York City's lowest-achieving schools in 1996–1998, 28% scored in the lowest quartile on the general-knowledge certification exam. Of those remaining in the same schools 5 years later, 44% had scores in the lowest quartile. In contrast, 22% of the new teachers in the higher-achieving schools were in the lowest quartile, which increased to only 24% for those remaining after 5 years.

Teacher mobility also varies by geographical region and community type. Turnover rates in the Northeast region of the country are lower than in other regions, and larger schools face fewer turnovers than do smaller schools. Urban areas tend to have a slightly higher turnover rate than suburban areas in general, but there are certain urban areas where the situation is particularly bad. For example, in New York City approximately 62% of teachers switch schools within 5 years compared to 54% in the suburbs. Thirty-five percent of New York City teachers leave teaching altogether within 5 years, compared with 25% of teachers in the suburbs (Boyd et al., 2005).

Turnover rates in schools with higher proportions of African American and Hispanic students are higher than in schools that are predominantly White. Scafidi et al. (2003) found that Georgia elementary teachers moved from schools with higher proportions of minority students and from low-performing schools, and that the latter is explained by teacher preferences for fewer minority students. Hanushek et al. (2004), using a similar model and Texas data, find

that teachers prefer higher-achieving students even after controlling for student racial composition.

Implications of Turnover Teacher turnover may affect student learning in several ways. First, in high-turnover schools, students may be more likely to have inexperienced teachers who we know are less effective, on average (Rockoff, 2003; Rivkin, Hanushek, & Kain, 2004; Kane, Rockoff, & Staiger, 2006). Second, high turnover creates instability in schools, making it more difficult to have coherent instruction. This instability may be particularly problematic when schools are trying to implement reforms, as the new teachers coming in each year are likely to repeat mistakes rather than improve upon implementation of reform. Third, high turnover can be costly in that it takes time and effort to continuously recruit teachers.

Transfer and quit behavior would be especially worrying if more effective teachers had higher attrition rates. This does not appear to be the case. Using data on a large urban school district in Texas, Hanushek and Rivkin (2006) find no conclusive evidence suggesting that more effective teachers, in terms of student test score gains, have higher exit rates. They find that those who exit are in fact less effective, on average, than non-movers, both in that district and in general. Further, those who move between schools within the same school district are, on average, less effective than those who do not. They go beyond average performances, and compare the quality distributions of teachers who either change schools or exit public schools to get a more nuanced picture of what is happening with teachers at the top and bottom end of this distribution.¹⁵ They find that the distribution of these teachers falls distinctly below the distribution of those who stay, indicating that at every level, it is the less effective teachers who are more likely to change schools or exit public schools.

Their finding is echoed in a recent study of new teachers in New York City schools (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2007). This study also found no reason to believe that those who exited were better than those who stayed. Specifically, they found that first-year teachers identified as being less effective in improving student test scores had higher attrition rates than those identified as more effective. They found that it was relatively ineffective teachers, on average, who transferred within New York City; again, however, averages mask important variation. For teachers transferring from a given low-performing school, the more effective ones tended to transfer to schools with fewer low-scoring and non-White students, exacerbating the inequities in teacher quality across schools.¹⁶

Policy Approaches

In the 2003–04 school year, 74% of all public schools had teaching vacancies. Of the schools with vacancies, 16.4% reported having to hire a less than fully-qualified teacher (see Strizek et al., 2006). Vacancies were highest in special education (67.4%), followed by English Language Arts

(57.1%) and then math (55.6%). In each, the shortages were most pronounced at the secondary level and in urban schools (versus suburban and rural schools). While only 8.1% of schools with vacancies in ELA found it very difficult or were not able to staff their schools, the numbers for special education and mathematics were much higher at 29.2% and 28.8%, respectively. This section looks at the impact of different supply-side and demand-side strategies that aim to improve teacher labor market outcomes.

Incentives As discussed previously, teachers' salaries are important in the decision to teach and the decision to stay in a particular school. Nearly 17% of teachers who moved from their base school between 2003–04 and 2004–05 reported better salary and benefits as being very or extremely important in their decision to change schools. Approximately 14% of those who left teaching in the same period cited salaries and benefits as being at least very important (Marvel et al., 2007).

Teachers' salaries can be increased in two ways: (a) across-the-board increases in salaries, and (b) targeted increases, for example, by focusing on difficult-to-staff schools and difficult-to-staff fields. The economic argument for increasing the pay of teachers already content to work in a given school is weak. Since it is unlikely that such schools will face staffing difficulties, it makes sense to target resources at teachers in difficult-to-staff schools and difficult-to-staff subject areas.

Many states and a large number of school districts are pursuing pay-related methods to recruit and retain highly qualified teachers. While retention bonuses are the most widely used of these methods, a few states offer housing incentives and a few offer signing bonuses to new teachers. Most of these policies are, however, not targeted at increasing the quality of the teaching force in shortage fields or in high-poverty or low-performing schools. Of the 35 states providing retention bonuses for teachers in 2003, only 5 targeted teachers in high-need schools.

The evidence on the effectiveness of pay-related incentives on retaining teachers and improving student performance is small and mixed. The Massachusetts Signing Bonus Program for New Teachers, which started in 1998, combined a national recruitment campaign, \$20,000 in signing bonuses, and a 7-week "fast-track" certification program, but met with limited success in its stated goals. Twenty percent of the first cohort of bonus recipients left teaching after 1 year, and more than 50% of its second cohort ended up *not* teaching where policy makers said they should—in 13 state-designated, high-need school districts (Fowler, 2001). In 2001, North Carolina began giving \$1,800 in annual bonuses to teachers in specific fields (math, science, and special education) for middle or high schools serving low-income or low-performing students. This program mildly increased the retention of teachers, but it also suffered from complicated eligibility requirements and implementation problems (Jacob, 2007).

Incentives can also directly target success, rewarding

teachers or schools that seem most effective. In a study of Dallas' school-based accountability program, where every member of the staff of the most effective schools was rewarded, Clotfelter and Ladd (1996) found that the pass rates of students in the city increased relative to five other large Texas cities. Figlio and Kenny (2006), using data from the National Education Longitudinal Survey and their own survey conducted in 2000, however, found that test scores were higher in schools that offered individual-level financial incentives but *not* in schools that offered indiscriminate merit pay. While they were able to demonstrate that students learned more in schools in which individual teachers received financial incentives as reward for superior performance, data limitations prevented them from making causal linkages from their findings.

Incentives can also take the form of reduced costs of entry into teaching. Teachers have traditionally entered teaching after taking courses in four broad areas—foundational courses, pedagogical courses, subject-matter knowledge courses, and field experiences—during either their undergraduate education or their master's program. Many states, in an attempt to reduce the cost of entry for college graduates interested in teaching, now allow them to take alternative route programs with fewer course requirements prior to beginning teaching. Forty-seven states and the District of Columbia have some form of alternative-route program to recruit, train, and certify teachers (Boyd, Lankford, et al., 2007). Many states rely heavily on alternative routes for teachers. New Jersey, Texas, and California, for instance, obtain more than a third of their new teachers from alternative routes (Boyd, Lankford, et al., 2007).

Alternative route programs typically allow teachers to enter the classroom by delaying or bypassing many of the requirements for entry that are part of traditional teacher preparation programs. These programs require teachers to be college graduates and approximately 80% of them require demonstration of subject matter knowledge by completing coursework, passing an exam, or some combination of the two. This apart, they vary greatly in requirements. ITeachTexas, a statewide alternative certification program in Texas, for instance, is a Web-based alternative certification program which does not require any onsite pre-service meetings. The New York City Teaching Fellows Program (NYCTF), on the other hand, requires an intensive onsite 7-week pre-service training session.

The most commonly studied alternative route program, Teach for America (TFA), is able to recruit teachers with stronger qualifications than those recruited through the traditional route. For instance, in 2003 TFA had 16,000 applicants, most from highly selective undergraduates, for 1,800 available slots, as a result of which it could be highly selective in terms of teacher qualifications—this is not true of all alternative route programs. Studies of the effectiveness of TFA teachers have found that these teachers are equally effective, or more effective, than other teachers in math, though the results for reading are not quite as positive. For instance, in a randomized evaluation of the program in 17

schools covering Chicago, Los Angeles, Houston, New Orleans, and the Mississippi Delta, researchers from Mathematics found that while the average TFA student increased his/her rank in math by 3 percentile points over the course of a year, the average non-TFA student did not register any change. In contrast, there was no difference between the average TFA and non-TFA student in reading gains, with both having registered an increase of a percentile. Note, TFA teachers in the sample differed from non-TFA teachers considerably in terms of selectivity of college, education-specific training, certification and experience (Decker, Mayer, & Glazerman, 2004). Similar, though not quite as positive, results hold for the New York City Teaching Fellows (NYCTF). Early estimates suggest that Teaching Fellows are less effective in their first year of teaching but that the differences in student achievement between NYCTF teachers and traditional route teachers diminish with experience (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2006). Both TFA and NYCTF include substantial recruiting efforts as well as efforts to continuously improve, making it difficult to generalize the findings to alternative route programs, many of which may be less selective and put less effort into quality. In a recent study of alternative certification programs, Humphrey and Wechsler (2005) find a great deal of variation both between and within alternative certification programs, leading them to question the worth of comparing different alternative certification programs. Further, the individuals who take up these programs have considerably different backgrounds, school placements, and learning outcomes, making comparisons across programs problematic.

Districts have also been trying out various strategies to recruit people into teaching, especially minorities and people who belong to difficult-to-staff neighborhoods. Typically, these involve partnerships between K-12 school districts and local colleges to encourage students to enter teaching or scholarship and loan forgiveness programs for candidates who commit to teaching for a certain period (Jacob, 2007). Broward County Public Schools in Florida, one of the five largest school districts in the United States, initiated the Urban Teacher Academy Project (UTAP) to address a major challenge that faced the district: the need for 13,000 new teachers over the next 10 years. The program recruits students when they are as young as 14 years old, grooms them in teaching techniques, classroom theory, and pairs them with teacher mentors. After high school, they move on to community colleges and universities for a 4-year, tuition-free teaching degree with a guaranteed job at the end. The program not only generates a larger number of teachers, but by drawing students from difficult-to-staff schools and minority areas, it also creates a teaching force that is unlikely to face culture shocks when it goes back to those schools to teach.¹⁷ Evidence on the success of these programs, in terms of student achievement and teacher quality and retention, remains sparse—a recent review of research by analysts at RAND and the Education Commission of the States (ECS) found very little research on the

impact of recruitment strategies employed in most states and districts (Jacob, 2007).

Regulating Entry Incentives are not the only way to influence the teaching workforce. One of the most common tools policy makers use to regulate the teaching profession is certification requirements. Most teachers in the United States are certified. For instance, in 1999–2000, 94.4% of public elementary and secondary teachers were certified in their main teaching assignment. In theory, certification keeps individuals who are likely to be poor teachers out of the classroom. The evidence on the effect of certification is, however, mixed. Recent studies in New York City and North Carolina found that students of certified teachers learned more, on average, than did students of uncertified teachers, though a similar study in Florida found no difference (Boyd et al., 2006; Goldhaber, 2007; Harris & Sass, 2006). Similarly, studies in New York and North Carolina found that teachers who passed their certification exam (the Liberal Art and Science Test in New York and the Praxis II in North Carolina) showed higher student achievement in math. For example, teachers who passed the Praxis II produce on-average student achievement gains that were in the range of 3 to 6% of a standard deviation higher (in math) than those who failed. Comparing the effect of this gain to that produced by experience, the study found that the average teacher who failed the test, were he/she allowed to teach regardless, would likely produce the same level of math achievement in his/her second or third year of teaching as a novice teacher who passed the test. The study also shows how test cut-off criteria can generate a number of false negatives (individuals who fail to pass the test but might have been high-quality teachers) and false positives (individuals who make the cut-off might turn out to be poor teachers), calling into question the signal value of certification tests (Goldhaber, 2007). Raising cut-off scores might also be detrimental if it reduces the supply and racial/ethnic diversity of the prospective teacher pool (Gitomer et al., 1999; Angrist & Guryan, 2004).

Supporting Teachers In addition to regulating teachers, policy makers and educational leaders can affect the teacher workforce through policies that support teachers' development. Surveys have found that the lack of support services ranks high in teachers' decisions to quit teaching (Jacob, 2007). Of teachers who changed schools between 1999–2000 and 2000–01, 33.4% of new teachers (1–3 years of experience) reported dissatisfaction with support from administrators as being very important in their decision to move. Almost 21% of those who left teaching over the same period reported dissatisfaction with job description or responsibilities as a very important factor in their decision to quit. Nearly 15% said that a very important reason for quitting was related to not feeling prepared to implement or not agreeing with new reform measures. Many districts have, as a consequence, adopted programs aimed at providing support, guidance, and orientation services

to elementary and secondary teachers as they begin their teaching career. The goal of these programs is to reduce teacher attrition by making teaching more manageable (Smith & Ingersoll, 2004).

Participation in induction programs increased during the nineties. In 1990–91, approximately 40% of new teachers had participated in a teacher induction program; by 1999–2000, 80% had participated in an induction program (Smith & Ingersoll, 2004). Induction programs typically involve meetings, informal classes for new teachers, and the formation of new-teacher peer support groups. Mentoring programs typically pair new teachers with experienced ones, although the details vary across programs. In a review of 10 studies on induction and mentoring programs, Ingersoll and Kralik (2004) find empirical support for the claim that induction programs for new teachers and, in particular, mentoring programs, have a positive impact on teachers' decision to stay in the same school and continue in the teaching profession. Using 1999–2000 SASS data, Smith and Ingersoll (2004) find that certain types of activities, such as having a mentor from the same field and having common planning time with other teachers on instruction, were more effective in reducing turnover than other types of activities such as the provision of seminars or classes for beginning teachers (Smith & Ingersoll, 2004). A study of 141 teachers in New Mexico who participated in a teacher mentoring program found that the attrition rate was only 4% annually compared with the statewide average rate of 9%. In an analysis of the Beginning Teacher Support and Assessment Program (BTSA), a mentorship program in California, Strong and Vilar (2005) found that in addition to reducing teacher attrition rates, the program resulted in aggregate reading scores for students of new teachers being comparable to those of mid-career teachers.

Professional development programs provide teachers with continuing education opportunities once they have joined the profession. These programs encompass traditional workshops, in-services, graduate coursework, school-based teacher study groups, mentoring relationships, and advanced credentials such as that provided by the National Board for Professional Teaching Standards (NBPTS). Of teachers who moved from one school to another between 2003–04 and 2004–05, nearly 13% reported dissatisfaction with opportunities for professional development in their previous school as a very important reason for their decision.

Unfortunately, the research literature does not provide a clear understanding of the extent to which professional development programs improve student achievement. While specific professional development programs have shown positive effects on student learning in randomized trials, there is considerable variation in the quality of professional development programs, and, on average, professional development programs do not appear to benefit students (Hill, 2007). Teacher self-reports of the quality of their own professional development experiences are not encouraging. In a recent study, only 20% of science teachers and 25% of math

teachers said that their professional development program had changed their teaching practices (Horizon, 2002).

Selective Retention According to an informal survey of the human resources departments in several large urban districts, less than 1% of the teaching workforce is dismissed each year (Jacob, 2007). Yet, selective dismissal or, similarly selective promotion, could affect the teacher workforce. In a recent study using data from New York City schools, Gordon, Kane, and Staiger (2006) argue that it is possible to predict the performance of a teacher in later years from student achievement scores in the first 2 years of teaching. On average, a teacher whose students make above average gains is likely to produce such gains in later years; similarly, a teacher who performs badly in the first 2 years is unlikely to improve dramatically. Making somewhat conservative assumptions about the costs of replacing ineffective teachers, they conclude that denying tenure to the bottom quarter of new teachers would substantially improve student achievement. This study, however, does not account for the potential change in teaching such a policy might facilitate, including a need to compensate teachers for the additional risk and the potential for undesirable narrowing or targeting of instruction (Gordon et al., 2006).

Looking Outside Traditional Public Schools Charter schools and private schools may offer insights into teachers' preferences and how to develop policies to attract and retain effective teachers. In a case study of 40 charter schools in Arizona which had completed their fifth year of operation in 1999–2000, Gifford, Phillips, and Ogle (2000) found that in general charter schools aimed to hire staff that had a philosophical connection with the school. They also sought less experienced teachers with the expectation that it would be easier to train and assimilate new teachers into the school environments. The literature more generally identifies three reasons teachers are attracted to charter schools. First, teachers perceive charter schools as offering increased freedom, flexibility, and empowerment (Finn, Manno, & Vanourek, 2000; Koppich, Holmes, & Plecki, 1998; Wohlstetter & Griffin, 1998); second, teachers want to work in schools that share similar educational philosophies (Finn et al., 2000; Hill et al., 2001; Koppich et al., 1998; Wohlstetter & Griffin, 1998); and third, teachers believe charter schools offer smaller classes (Finn et al., 2000). Nevertheless, Ballou and Podgursky (1998) found teacher turnover to be significantly higher in charter schools relative to public schools. A study conducted by NEA concluded that charter school teachers were dissatisfied with their salaries and the lack of job security (Koppich et al., 1998).

Private schools share characteristics with charters. Researchers have found that religious beliefs and moral training at Catholic schools contributes to a sense of community and common purpose that improves teacher efficacy and morale (Bryk, Lee, & Holland, 1993). This said, the percentage of private-school teachers leaving teaching since 1988–89 has remained consistently higher than the

percentage of public-school teachers leaving teaching. This higher attrition may be driven either by teachers' decisions to leave (e.g., because of relatively low wages) or by greater administrative flexibility to dismiss teachers. Ballou (1996) suggests that private schools are more successful in retaining the best of their new teachers because of greater flexibility in structuring pay, more supervision and mentoring of new teachers, and freedom to dismiss teachers for poor performance. This may well be true, but there is no research to date that verifies or contradicts this proposal.

Schools outside of the United States can also provide useful insights because of the great variation in approaches seen throughout the world. In a review of the research on teacher labor markets in developed countries, Ladd (2007), for instance, finds that in most developed countries teachers' relative pay is higher than in the United States. That being said, she finds no clear relationship across countries between teacher salaries and student achievement.

Conclusion

Teacher labor markets are huge and they are complex. Approximately 3.5 million adults teach in elementary and secondary schools in the United States. Teachers are a diverse group by any measure: gender, race, age, experience, academic achievement, preparation, or effectiveness at improving student test performance. They are also systematically distributed across schools, with the least experienced and least prepared often teaching in schools with the highest proportion of low-income, non-White, and academically struggling students.

The supply and demand model provides a simple framework for analyzing these markets. Wages and non-pecuniary job attributes combine to determine the supply of individuals interested in teaching in a given school, district, or state. A large body of research suggests that potential and current teachers respond to wage changes, although research on the degree of this response is inconclusive. Non-pecuniary aspects of teaching influencing teacher supply include working conditions, school location, and ease of entry into the occupation and the school. Feelings of success in the classroom also appear to be important for the retention of teachers already in the workforce.

The demand for teachers and the institutional constraints within which these demands are expressed also affect the teacher workforce. The number and characteristics of teachers demanded is a function of many factors including local preferences, ability and willingness to pay for teachers, the student population, teacher retirements, and attrition. Institutional constraints such as the skill and efficiency of hiring authorities, available information on the quality of individual teachers, budget timing, certification and licensure policies, tenure policies, and teacher contract provisions can all affect the ability of districts to recruit and retain effective teachers.

A wide variety of policies now aim to improve the teaching workforce and alleviate disparities in teachers'

knowledge and skills across schools. Direct incentives are one such policy approach. Higher wages targeted at difficult-to-staff schools, difficult-to-staff fields, or particularly effective teachers are all potential avenues for affecting teachers and teaching. Similarly, regulations governing who can enter teaching by establishing criteria for course-taking or test performance can change the teacher workforce. Further, policies targeted at teacher supports, through mentoring or professional development, can potentially increase retention and improve teaching if implemented well.

To date, the research on the effectiveness of different policy approaches is, however, sparse. Our inability to make convincing causal assessments is partly a consequence of the fact that policies and practices are rarely implemented in a manner that allows for rigorous impact evaluation. As a result, we have not learned very much from our experiences. Nevertheless, there are signs of change. Recent investments in policy innovations and evaluations combined with enhanced information collection may well increase our understanding of teacher labor markets, and our ability to improve teaching across all schools. We may soon know more about which teachers are effective; how preparation and continued professional development can increase teacher effectiveness; how instructional materials, curriculum, and instructional leadership and collaboration at the school site affect teaching; and how to design teachers' work life to increase the retention of the most effective teachers. With such knowledge, policies and practices could be improved, good policies expanded, and ineffective or detrimental ones abolished.

Notes

1. The Schools and Staffing Survey (SASS) is conducted by the United States Census Bureau and sponsored by the National Center for Education Statistics (NCES). It collects extensive data on U.S. public and private elementary and secondary schools, providing data on important aspects of teacher supply and demand, the qualifications of teachers and principals, and the working conditions in schools. SASS has been conducted five times: 1987–88, 1990–91, 1993–94, 1999–2000, and 2003–04. The most recent SASS, conducted in 2003–04, went out to approximately 5,400 public school districts, 13,300 schools, 13,300 principals, and 62,000 teachers. The Teacher Follow-up Survey (TFS) is a follow-up of a sample of the school teachers who participated in the previous year's SASS. The TFS sample includes teachers who continued to teach a year after the SASS data collection, teachers who had moved schools and teachers who had left teaching in the year the TFS was conducted. The 2004–05 TFS was completed by 7,429 current and former teachers. Of these, 2,864 were still teaching at the same school in 2004–05 as in the previous year; 1,912 were still teaching, but in a different school; and 2,653 had left the teaching profession.
2. The Federal Law enacted through the Education for All Handicapped Children Act in 1975 makes the provision of educational services to all mentally and physically handicapped children compulsory.
3. <http://nces.ed.gov/surveys/sass/das.asp>
4. The test score here is a centile ranking or standardized score based on the combined math and verbal portions of a standardized test administered to five cohorts of high school students. The content of these tests are similar to the ACT and SAT. See Corcoran et al. (2004) for more.
5. Bacolod points out that the results from her analysis on selectivity of undergraduate institution need to be interpreted in the light of two facts: (a) During the period under study, many universities curtailed undergraduate education programs, and (b) there is no empirically verified one-to-one link between majoring in education and becoming a teacher. Furthermore, while changes in female labor markets appear to be the major source of the decline in highly qualified women entering teaching, Bacolod points out the potential for additional explanations. For instance, women's admission to professional programs, their increased access to credit markets for loans to pursue skill acquisition and even access to the pill, as well as unionization in teaching and deunionization in non-teaching, and the general rise in skill returns might also explain the above pattern. See Bacolod (2005) for more.
6. The law defines core academic subjects as the following: English, reading or language arts, mathematics, science, foreign language, civics and government, economics, arts, history, and geography (P.L. 107-110 §9101.11). "Arts" as a subject was not further defined in the law.
7. Corcoran et al. (2004) point out that these results should be interpreted with caution since the sample for men was much smaller than that for women. Also, male teachers are much more likely to be secondary school teachers.
8. As mentioned previously, Bacolod notes certain problems in using data on the selectivity of undergraduate institutions. First, during the period under study, many institutions curtailed undergraduate education programs. Second, there is no one to one link between education majors actually becoming teachers.
9. From the early 1960s through the mid-1990s, all elementary school teachers in North Carolina were required to take either the Elementary Education or Early Childhood Education test. The former included material on curriculum, instruction, and assessment. Starting in the mid-1990s, teachers were required to take both that basic elementary test and one focusing on content. See Clotfelter et al. (2007a) for more.
10. The figure for public schools excludes charter schools.
11. California Department of Education: <http://www.ed-data.k12.ca.us/>. The educational qualification referred to above is a bachelor's degree and 60 Continuing Education units.
12. In 46 states, the fiscal deadline is not until June 30, and even then, states can get extensions. See Levin and Quinn (2003) and Jacob (2007).
13. New teachers are more likely to leave than more experienced ones. While this might be because teaching turns out to be somewhat more difficult than expected, it is important to note that data on recent college graduates show that young workers tend to switch jobs more, regardless of occupation.
14. A probationary certificate is issued after an individual completes all the regular certification requirements except the completion of the probationary period. A provisional certificate is issued to individuals who are still participating in what states call "alternative certification programs." Temporary certification requires some additional college coursework, student teaching, and/or passage of a test before regular certification can be awarded (Strizek et al., 2006).
15. They measure teacher quality by looking at value-added in terms of standardized average student test score gains.
16. A final point on transfer and quit behavior. Exit decisions could just as well be driven by an especially unruly class in a particular year or a personal emergency. In fact, approximately 21% of teachers who quit teaching between 2003–04 and 2004–05 cited family or personal reasons as being very important in their decision to quit (Marvel et al., 2007).
17. http://www.browardschools.com/press/release.asp?press_id=243

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