

OXFORD REVIEW OF ECONOMIC POLICY, VOL. 20, NO. 2

DOI: 10.1093/oxrep/grh013

THE TEACHER LABOUR MARKET AND TEACHER QUALITY

ERIC EIDE

Brigham Young University

DAN GOLDHABER

University of Washington

DOMINIC BREWER

*RAND Corporation*¹

A growing body of empirical evidence shows teacher quality to be the most important schooling factor predicting students' learning gains. Unfortunately, US public schools face difficulties attracting the best and brightest college graduates. Over the last several decades there has been a notable shift in the occupational choices of prospective teachers. The most academically proficient college graduates were, in the 1960s, as likely to enter teaching as any other occupation. Today, however, teachers are disproportionately drawn from the lower end of the academic proficiency distribution. We explore these trends and speculate on the reasons for them. In particular, we focus on the roles of compensation structures and changes in the labour market in explaining the occupational decisions made by existing college graduates and what these foreshadow for the teacher work-force in the future.

I. INTRODUCTION

Improve the quality of teachers to increase student learning. It seems like a simple and direct course of action in the wake of the multitude of

studies documenting the relatively low national level of student academic performance over the last two decades, and empirical findings identifying teacher quality as the *single most important school variable* influencing student achievement.^{2,3}

¹ Kirsten Martens provided excellent research assistance. The authors thank two anonymous referees and the Editor for helpful comments. The views expressed in this article are solely those of the authors and do not necessarily reflect those of Brigham Young University, The University of Washington, or the RAND Corporation.

² For more information, see Hanushek (1986, 1997); Hedges *et al.* (1994); Hanushek *et al.* (2002); and Goldhaber (2002*b*).

³ Since most of the research on teacher quality uses data from the USA, this paper focuses on teacher quality in the USA, with studies based on other countries referenced where appropriate.

The practical implementation of this effort has proven to be much more problematic than its theoretical base. To date, school boards, teachers, and researchers have been unable to reach a consensus on a definition of high quality for teachers. Indeed, teacher quality is an oft-used, but ill-defined term. It has been understood to signify that teachers possess certain attributes and credentials (e.g. experience, degree level, certification, etc.), have mastered particular skills or standards (e.g. those developed by organizations such as the Interstate New Teacher Assessment and Support Consortium (INTASC)), or possess other less tangible qualities that make them effective.⁴

Many of these definitions suggest that teacher quality is an immutable characteristic; in fact, it is quite possible to imagine that a teacher who is highly effective in one setting is ineffective in another. Some teachers may do well in highly structured environments with explicit standards and accountability measures, while others have teaching styles that flourish in more flexible environments. The skills required to teach honour-track students effectively may be quite different from those necessary to educate students who are struggling in the classroom. For our purposes, we define teacher quality as a teacher's ability to produce growth in student achievement. However, accurately measuring teacher quality can present a variety of difficulties. Based on our definition, one could not hope to measure quality in the absence of actual teaching experience, which makes the definition somewhat unsatisfactory for addressing certain policy questions (e.g. which new teachers should schools select). In light of this, we discuss the teacher attributes that appear to be most highly correlated with teacher quality, and for exposition purposes we use the term 'teacher quality' to refer to teachers who possess those attributes.

While the focus of this paper is on teacher quality, we note that the trade-off between teacher quality and quantity has important policy implications. For example, is it a more efficient use of resources to raise teacher pay and increase teacher quality, or is

it better to hire more teachers of the same quality at the same or lower pay? These are important and difficult issues, not only conceptually but also empirically. The research literature on the relation between teacher pay and teacher quality, as well as the literature on the effects of class-size reduction (i.e. increasing teacher quantity) are both decidedly mixed.⁵ The one facet of this line of research, though, that is consistently robust is that teacher quality is the most important determinant of student achievement. Therefore, while we recognize the relevance of the trade-off between teacher quality and quantity, a thorough exploration of this issue is beyond the scope of this paper, and we focus primarily on the role of teacher quality on students and in the labour market.

In this paper, we use various measures of quality to assess the quality of the teacher work-force in the USA. We argue that there are reasons for concern, given what we know about the links between various teacher attributes and student achievement. In particular, the teacher work-force is lacking in the very teacher attribute most strongly predictive of teacher effectiveness: academic proficiency. We show evidence that there has been a precipitous decline in the academic proficiency of teachers over time, and that teachers today are less academically proficient than college graduates who enter other occupations. Finally, we discuss the role of the teacher labour market and, in particular, the salary structure in explaining these trends, and we speculate about whether some prominent reform efforts are likely to have much impact on the quality of the teacher work-force. The paper is organized as follows. In the next section we discuss the research linking teacher quality, and specific teacher characteristics, to student achievement, making the case that we ought to be concerned about the academic proficiency of the teacher work-force. In section III we trace changes in the academic qualifications of teachers over time, and show how they compare with other college graduates today. We highlight possible explanations for the teacher quality problem in section IV. In section V we focus on teacher policy reforms and speculate about their effects on

⁴ See Goldhaber and Anthony (2004) for a more detailed description of how teacher quality has been historically, or is currently, defined.

⁵ For evidence on these topics see Hanushek (1999) on class-size effects in the USA, Graddy and Stevens (2004) and Dearden *et al.* (2002) on class-size effects in the UK, Hanushek *et al.* (1999) on teacher pay and teacher quality, and Goldhaber (2002b) on teacher quality and student achievement.

the teacher work-force, and in section VI we offer some conclusions and suggest avenues of additional study.

II. RESEARCH ON TEACHER QUALITY

(i) Total Contribution of Teachers to Student Learning

Contemporary analyses have increasingly revealed the critical role teacher quality plays in explaining student achievement. Most studies, including the now famous *Equality of Educational Opportunity* (the Coleman Report) (Coleman *et al.*, 1966), show that schooling characteristics, including measures of teacher quality, are less important than family-background factors in influencing student outcomes. However, among school-related components, recent research has identified teacher quality as the *single most important determinant of student achievement*.⁶

The availability of new datasets that link students and teachers and track both over time has permitted researchers to estimate the overall contribution of teachers to increases in student learning. Recent studies in Tennessee (Sanders and Rivers, 1996; Wright *et al.*, 1997; Sanders *et al.*, 1997) and Texas (Hanushek *et al.*, 2002) suggest that the impact of teacher quality swamps that of any other school factor, and that there is a wide range of effectiveness among teachers. Goldhaber *et al.* (1999) and Hanushek *et al.* (2002), for example, both estimate that teacher quality accounts for approximately 8 per cent of the total variation in student achievement. And the impact on students of having a high-rather than a low-quality teacher can be profound. Hanushek (1992) finds that, all else equal, a student with a very high-quality teacher will achieve a learning gain of 1.5 grade-level equivalents, while a student with a low-quality teacher achieves a gain of only 0.5 grade-level equivalents, suggesting that the quality of a teacher can make the difference of a full year's learning growth. Sanders and Rivers (1996) find teachers who are in the lowest quintile of effectiveness produce average student learning gains of roughly 14 percentile points in a year, while the

most effective (top quintile) teachers were found to produce gains that averaged 52 percentile points.

While teacher quality clearly is an important contributor to student learning, there is a far less clear picture as to which, if any, teacher characteristics predict teacher quality. Goldhaber *et al.* (1999), for instance, estimate that only about 3 per cent of the contribution teachers make towards explaining student achievement is associated with teacher credentials such as experience and degree level. The remaining 97 per cent was found to be associated with teacher qualities or behaviours that could not be separately isolated and identified. This raises the question of which, if any, observable teacher characteristics predict teacher effectiveness, a topic that is explored further in the next section.

(ii) Teacher Characteristics that Predict Quality

A long line of research, dating back to the Coleman Report (Coleman *et al.*, 1966) studies the impacts of schooling attributes on student achievement (Hanushek, 1987; Greenwald *et al.*, 1996). Much of this research on teachers has focused on two attributes: degree level and years of experience. The literally hundreds of educational productivity studies that include these teacher attributes reach different conclusions as to their importance. In a widely cited synthesis of many of these studies, Hanushek (1986) concludes that 'the results are startlingly consistent in finding no strong evidence that . . . teacher education, or teachers' years of experience have an expected positive effect on student achievement' (p. 1162). This conclusion has not gone unchallenged, as other reviews of the literature have reached quite contrary conclusions. Greenwald *et al.* (1996), for instance, reviewed a similar, though not identical, set of studies and they conclude: 'variables like teacher academic ability, teacher education, and teacher experience show very strong relations with student achievement' (p. 384).

What explains the divergent conclusions in the literature about the impacts of teachers' degree level and years of experience? Some of the differences can be explained by the weighting of the articles chosen for inclusion in the above reviews

⁶ See Hanushek (1986); Grissmer *et al.* (1994); Wright *et al.* (1997); Goldhaber *et al.* (1999).

(Krueger, 2003), and the methodologies researchers use in synthesizing sets of research articles. For example, Todd and Wolpin (2003) show that many of the econometric specifications used to estimate the relationships between schooling resources and student outcomes rely on strong theoretical assumptions, and the violation of these assumptions can lead to substantially biased coefficient estimates.⁷

It is also quite possible that specific teacher attributes may matter more in some contexts than others. For example, the value of gaining a year of experience at the beginning of one's teaching career is unlikely to be the same as the value of an additional year towards the end of one's career. Most educational production studies on years of teaching experience treat the effect of the gain between any two years as being the same. However, studies with more flexible econometric specifications, that allow the effect to vary, show that the typical teaching learning curve is steep and rises upwards until a peak is reached in a teacher's first couple of years (estimated to be year two for reading and year three for maths) and then decreases slightly or plateaus after that (Murnane, 1975). Recent studies that do allow for a non-linear relationship between teacher experience and student achievement found convincing evidence that experience in the classroom does matter more early on in a teacher's career (Kain, 1995; Hanushek *et al.*, 2002).

The story with regard to teacher degree level is similarly nuanced. Some teacher degrees appear to matter, but only in specific contexts. In particular, the degree level appears to matter if it represents the level of training that teachers have in their subject, and if teachers are teaching older or more advanced students. For example, research by Goldhaber and Brewer (1997) on secondary-level students suggests that degrees in general do not predict teacher effectiveness, but degrees in maths and science do for teachers teaching in those subjects.⁸ Similarly, research by Monk and Rice (1994) on eighth grade students shows that in subjects where training appears to make a difference (e.g. maths), the impact

of subject-specific training depends on the context of the classes taught. They find that the number of maths courses taken by teachers while in college had an impact on students' achievement, but only when teachers are assigned to teach more advanced maths courses.⁹

So are there any teacher attributes that predict teacher quality on a more universal basis? We argue that a stronger case can be made for measures of teachers' academic performance or skill as predictors of teachers' effectiveness. Ehrenberg and Brewer (1995), in a re-analysis of data from the Coleman Report, find a positive relationship between teacher performance on a short test of verbal ability and student achievement gains. A study based on more recent data from the National Educational Longitudinal Survey of 1988 (NELS) reaches a similar conclusion based on a single question on the survey (Rowen *et al.*, 1997). Teachers who accurately answer the NELS maths quiz item show a 0.018 effect size on student achievement at schools with average-ability students. In addition, at schools that are one standard deviation below the mean for student ability there is a 0.063 effect size on student achievement when the teacher answers the maths quiz correctly.

Similar results were cited in several other studies. Ferguson (1991) finds a link between three teacher characteristics (and one classroom characteristic) and student performance on test scores in Texas. The characteristics were: teacher language score on the TECAT (Texas Examination of Current Administrators and Teachers), teacher experience, teacher master's degree status, and class size. Ferguson and Ladd (1996) find similar results in Alabama, except that they find that teacher experience had no significant effect on student outcomes. Strauss and Sawyer (1986) find that a 1 per cent increase in teacher quality as measured by teacher test scores results in a 5 per cent decline in student failure rate on high-school competency exams. In 2001, Strauss and Vogt showed that hiring teachers with a greater general knowledge base has a very

⁷ It is possible to test empirically for model mis-specification, but only with certain data structures (Todd and Wolpin, 2003).

⁸ It is useful to note that selection bias should be accounted for when considering subject-matter training effectiveness. If the best teachers in a given subject leave the profession, then subject-matter training will likely appear less effective.

⁹ At the elementary level, by contrast, Eberts and Stone (1985), do not show a positive relationship between the number of maths courses taken by teachers and their fourth-grade students' achievement in maths.

large effect on composite measures of student achievement. Finally, Ehrenberg and Brewer (1994) find that students learn more from teachers who attended more selective undergraduate institutions.

For some perspective on how these results compare to the findings on teacher degree level and years of experience, it is useful to return to the Greenwald *et al.* (1996) review, cited above, that reaches the conclusion that degree and experience levels do matter for student achievement. They found statistically significant positive effects for teachers having masters degrees in 15 per cent of the cases reviewed (as opposed to a statistically significant negative effect in 13 per cent), and statistically significant positive effects for teacher experience in 29 per cent of the cases reviewed (as opposed to a statistically significant negative effect in 3 per cent of cases). There were far fewer studies that analysed the impact of teacher academic proficiency (they use the term ‘academic ability’) on student achievement, but they find a statistically significant positive relationship in about 50 per cent of the cases, a far higher ratio than for degree or experience level.

While measures of academic proficiency are obviously limited measures of teacher quality, they do appear to represent the best easily quantifiable predictor of how effective a teacher will be in the classroom. Thus, in the following section we focus on how teachers’ measured academic proficiency has changed over time, and how it compares to that of other professionals.

III. THE ACADEMIC QUALIFICATIONS OF TEACHERS

(i) Changes Over Time

The majority of teachers are, and historically have been, women. For example, since the widespread formalization of kindergarten to grade 12 schooling in the 1930s, the teacher work-force has consistently been comprised of over 65 per cent women (Pulliam, 1982). However, the type of women who

opt to enter the teacher labour market has changed dramatically over time as the role of women in the labour force has evolved.¹⁰ Prior to the 1960s and 1970s, women were excluded from many occupations outside of the teaching profession. This represented a *de-facto* subsidy of education as teaching was one of few occupations that granted entrance to talented women who wished to participate in the labour force. In addition to the increase in opportunities for women in other fields, beginning in the 1980s women saw a decline in teacher salaries in relation to the salaries that they could earn in other fields. In 1975 women earned, on average, 35 per cent more by teaching than by working in other fields, but by 1992 that difference had shrunk to 10 per cent (Turner, 1998).

Today schools are forced to compete with other occupations to attract talented employees and the effects of this competition (discussed in greater detail in the following section) are evident. For example, 45–50 per cent of white females born in the 1940s who entered the teaching profession scored above the eightieth percentile, compared with only about 15 per cent of those born in the mid-1960s (Bacolod, 2001). In the mid- to late 1960s, college graduates with high intelligence quotient (IQ) scores (i.e. those scoring 130) were about as likely to enter teaching as those with substantially lower IQ scores (i.e. those with scores of 100), but by 1980 graduates with lower scores were four times as likely to enter teaching than higher scoring graduates (Murnane *et al.*, 1991). And the decline appears to have continued since that period. Boyd *et al.* (2001) find that less than 10 per cent of teachers failed either of the two commonly used teaching entrance exams in New York State in 1985, but the failure rate rose to over 20 per cent of teachers by 1999.

(ii) Teachers Versus Other College Graduates Today

The decline over time in academic performance of those entering teaching has resulted in a teacher work-force today that compares unfavourably, at least based on selected measures of academic

¹⁰ Since females make up the majority of the teacher work-force, most of the research on teacher quality has focused on females. A study by Lakdawalla (2001), reports some evidence of gender differences in teacher-quality trends. Using relative wages as a measure for teacher quality, Lakdawalla found that from the 1900 birth cohort to the 1955 birth cohort the wages of male school teachers—adjusted for experience and weeks worked—declined by about 23 percentage points relative to college-educated workers. The decline for females was even more pronounced, at 50 percentage points.

performance, to college graduates who enter other occupations. In fact, those who do well academically are disinclined to make decisions necessary to enter the teacher work-force, they are less likely to choose teaching as an occupation, and if they become a teacher they are more likely to leave the teaching profession.

The mean verbal Scholastic Aptitude Test (also known as the SAT, it is a national college entrance exam) scores of those high-school seniors who indicate an intention to major in education (= 409/800), are significantly lower than those intending to major in the social sciences (= 438/800), in the arts and humanities (= 452/800), and the physical sciences (= 500/800), while in college (US Department of Education, 1997). Weaver (1983) finds that the average prospective education major had a verbal SAT score that placed him or her at the 37th percentile of those who took the SAT test in 1972.

Intention may not be strongly related to the major individuals actually end up pursuing while in college, but evidence on those enrolled in different majors paints a similar picture. Education majors have college entrance exam scores (the SAT or American College Testing Assessment (ACT)) that are roughly twice as likely to place them in the bottom quartile of the exam distribution than in the top quartile (*Condition of Education* report by the US Department of Education, 2001). Furthermore, while in college, education majors are far more likely to take remedial maths and English courses than are non-education majors (US Department of Education, 1996). For example, 15 per cent of education majors report taking at least one remedial maths course as compared with 12 per cent of non-education majors, and the corresponding figures for remedial English are 13 per cent and 7 per cent.

One measure of intention to teach is whether or not individuals opt to take a licensure exam required for entrance into the teacher labour force. Gitomer and Latham (1999) linked SAT and ACT score data with data from more than 300,000 prospective teachers who took the licensure exam, Praxis II (a widely used teacher admission exam administered throughout the nation by Educational Testing Service).

They found that only maths and science teachers had higher mean maths SAT scores than the college

graduate average. Teachers of all other fields, including English, social studies, art and music, physical education, and special education, had mean maths scores below the college graduate average. The distribution for mean verbal SAT yielded the same trend but to a lesser extent: teachers licensed in maths, social studies, foreign language, science, and English had mean verbal SAT scores above the college average, but all other teachers, including the average score of elementary education teachers, had scores below average college graduate scores.

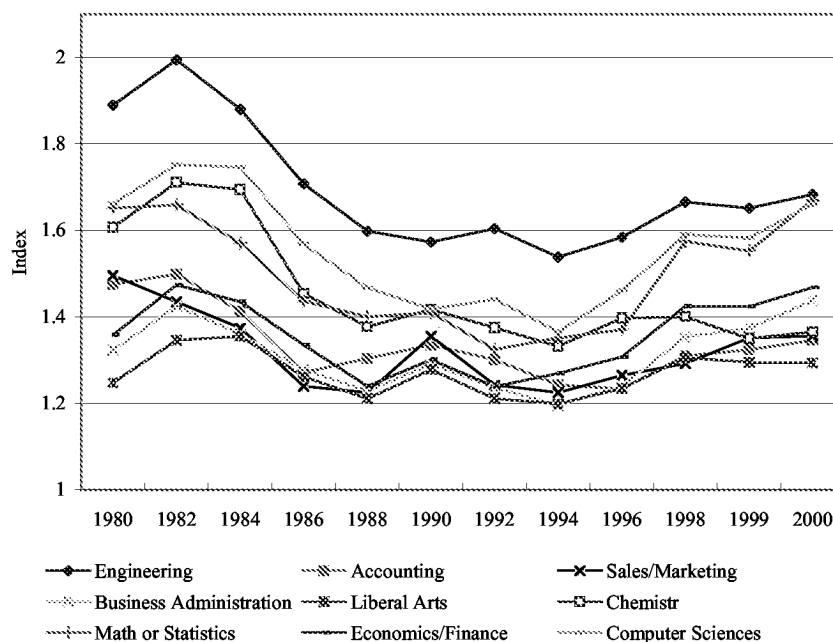
Given the above findings, it is not surprising that there exists a statistically significant negative relationship between measures of academic performance and the decision, among college graduates, to become a teacher (Manski, 1987; Hanushek and Pace, 1995; Vegas *et al.*, 2001; Podgursky *et al.*, 2003). And, as Goldhaber and Liu (2003) report, based on the cohort of 1992/3 college graduates, public school teachers have average combined verbal and maths SAT scores (= 946/1600), that are substantially lower than the average combined scores of college graduates who opt to pursue a non-teaching career (= 1,003/1,600).

Finally, research shows that the teachers who quit the profession tend to be more academically proficient than those who remain in it (Schlechty and Vance, 1981; Murnane *et al.*, 1991; Hanushek and Pace, 1995). Murnane *et al.* (1991) found that teachers in North Carolina with high test scores were less likely to continue teaching than teachers with lower scores, which held true even for teachers who had been in the field for 10 years. They also found that, within the field of teaching, chemistry and physics teachers stayed for the shortest amount of time, while elementary school teachers stayed for the longest. Put simply, at every stage along the career of potential or actual teachers, teaching loses those individuals who demonstrate strong academic abilities. We explore some potential explanations for these observed trends in the following section.

IV. EVOLUTION OF TEACHER QUALITY: WHY TEACHER QUALITY IS WHAT IT IS TODAY

To understand why prospective and current teachers make the career decisions that they do we must

Figure 1
Ratio of Starting Salaries in Several Occupations to Those in Teaching



understand the choices made by those individuals who consider teaching a viable option but pursue a different opportunity. Clearly, teacher salary is a major determinant in attracting and retaining teachers. However, even when adjustments are made to the teacher's work schedule (multiplied by 6/5 to compensate for annual differences), teacher salaries tend to be lower than those of many other professions. For example, in 2002 the average annual salary for teachers was around \$53,000, compared to \$55,000 for accountants, \$72,000 for programmer/analysts, \$78,000 for engineers, and \$90,000 for attorneys (AFT, 2003).

This is also reflected in Figure 1, which shows the ratios of starting salaries of a number of professional occupations relative to teaching. The ratios presented in Figure 1 show how the various occupations compare to teaching in terms of wages. A ratio equal to one indicates that the comparison occupation has the same salary as teaching. A ratio greater than one implies that the comparison occupation has a higher average salary. For example, a ratio of 1.5 means that the comparison occupation has a beginning salary that is 1.5 times greater than the beginning teacher salary. The graphs in Figure 1 indicate that starting salaries in other occupations are well above starting salaries for teaching, although the degree of disparity is not constant over time.

The ratios of starting salary demonstrate the relative attractiveness of teaching over time. Starting in 1980, the entry-level salaries of other occupations tend to be well above the starting salaries of teaching. Through the early to mid-1980s the ratios began to fall, indicating that teacher salaries became relatively more attractive in terms of starting wages. The time period 1988–96 is characterized by relatively stable ratios, suggesting that teaching was neither gaining nor losing substantial ground to the other occupations. After 1996 there is a general rise in the ratios, suggesting that starting teaching salaries began to fall behind the comparison occupations. This was a time period of rapid economic growth, particularly in technical occupations. The growth in salaries in these occupations was not matched by growth in teacher salaries.

A notable implication from Figure 1 is that the starting salary ratios, although generally following the same trend for various occupations, tend to rise or fall at different rates for different occupations. In particular, Figure 1 shows ratios in the late 1990s increasing more rapidly for occupations employing individuals with training in computer science, maths, and statistics compared to those with training in liberal arts or accounting. Thus, while teaching was becoming less financially attractive than employment in many other occupations, the *rate* at which

this was occurring was not uniform across occupations. This is consistent with research that suggests that individuals with different types of training (e.g. different college majors) receive different economic returns in the labour market (Grogger and Eide, 1995).

These changes in relative wages of non-teaching occupations have implications for the teacher labour market. An increase in the relative wages of non-teaching professions shifts the supply curve for teachers to the left. This in turn puts pressure on schools to raise wages and decrease teacher employment. However, teacher wages tend to be sticky owing to the single salary schedule, and a shift in the supply curve exacerbates any existing teacher shortage. This shortage increases the opportunity cost for both individuals considering teaching and current teachers and, all else equal, those individuals with other opportunities pursue those career paths instead.

This discussion demonstrates the role of relative teacher salary in determining the supply of teachers. In addition to their role in determining the overall supply of teachers in the labour market, relative teacher salary and non-teaching career options are also important determinants of the *type* of individuals who choose to enter teaching. That is, teacher salary and alternative labour-market options affect both the *quantity* and the *quality* of the teacher work-force.

A number of recent studies have investigated changes in teacher quality over time, which sheds light on how the quality of the current stock of teachers evolved. Since the teacher work-force has traditionally been composed mostly of females, most studies that address teacher-quality trends are based on how the labour-market opportunities for females have changed over time. A common assertion is that gender desegregation in the labour market has led to increased opportunities for high-ability females, and these new opportunities have resulted in fewer high-ability women pursuing a teaching career. Corcoran *et al.* (2002) set out to test this hypothesis by combining data from four longitudinal surveys of high-school students in the USA covering the years 1957–92 to examine how the likelihood of high-ability women (as measured by test performance) choosing a teaching career has changed over time.

A useful feature of the data used in this study is that they begin prior to 1970, which allows the authors to study the relationship between academic ability and choosing a teaching career over a time period when much of the gender desegregation of occupations was occurring. The authors use these data to examine the full distribution of teacher quality, rather than just the mean. They find that while there was a slight decline in *average* ability of female teachers over this time period, the probability that a *high*-ability female would choose a teaching career fell markedly. Whereas 20 per cent of all females in the top decile of their high-school class went into teaching in 1964, only 3.7 per cent of this group chose a teaching career in 1992. The likely reason for this result is that the highest ability females are the ones who would have the most to gain from the new labour-market opportunities.

Temin (2002) argues that the current labour market for teachers is characterized by multiple equilibria with respect to teacher pay and teacher quality. He suggests that the teacher labour market is stuck in a low pay–low quality equilibrium, which has resulted from widening opportunities over time for women in other professional fields. Prior to the gender desegregation that has occurred during recent decades, women of all ability levels were mostly relegated to teaching, but now high-ability women can pursue higher-paying careers outside of education. Until teacher pay rises enough to attract high-quality applicants, Temin maintains that the current low pay–low quality equilibrium will persist.

Lakdawalla (2001, 2002) examines the role of skill-biased technical change on the quality of teachers. He begins with the supposition that the knowledge used by skilled workers outside of teaching, such as doctors or engineers, is improving as a result of innovation. This would increase the productivity of skilled non-teachers, hence raising the price of skilled labour. He hypothesizes, however, that the general knowledge transmitted by schoolteachers, e.g. reading or arithmetic, remains largely unchanged in the face of this technological innovation and that the productivity of teachers remains constant as a result. Now schools must pay higher prices for skilled teachers, but they do not receive higher productivity in return. In this situation, Lakdawalla theorizes that schools will respond by lowering the quality of teachers relative to workers in other

professional occupations and raising the quantity of teachers employed. The relative quality of teachers falls precisely because the economy is sufficiently robust to drive up the demand for educated workers.

A study by Murnane *et al.* (1991) highlights the role of attrition from the teaching profession in determining the quality of the teacher labour force. Specifically, it is important to account for the quality of teachers who leave the teaching profession, as well as the quality of new teachers beginning their careers. The authors base their analysis on the career histories of teachers who started their careers in Michigan public schools between 1972 and 1975, and teachers who began teaching in North Carolina public schools between 1974 and 1978. Among the trends in teacher attrition they report are:

- teachers are most likely to leave teaching during their first few years on the job;
- controlling for school-district characteristics, white teachers are more likely to leave than black teachers;
- secondary-school teachers leave earlier than elementary-school teachers, with chemistry and physics teachers at the highest risk;
- teachers with the highest standardized test scores have much shorter careers than those with lower scores;
- the lowest-paid teachers leave most quickly.

These findings illustrate yet again that those teachers who have the highest opportunity cost outside of education are the most likely to leave teaching.

Two studies by Dolton and van der Klaauw (1995, 1999) demonstrate similar findings based on data from a UK survey undertaken in 1987 that represent a one-in-six national sample of all graduates from 1980. The authors use reduced-form hazard models to characterize teacher turnover. In general, these studies confirm the importance of teacher salaries and forgone earnings in the tenure and turnover decisions of UK teachers.

On a related topic, Brewer (1996) examined how the availability of administrative positions affects the propensity for teachers to quit their districts. Using data from 1975–90 from New York State, he

finds that male teachers are somewhat sensitive to expected administrative rewards, while female teachers do not respond to any administrative variables, consistent with fewer opportunities and lower monetary rewards for women in school administration.

To summarize, the quality of the teacher labour force is linked to the opportunities outside of teaching that are available to both prospective teachers and current teachers alike. Those who are the most academically able and highly skilled will have the highest salaries and best career opportunities outside teaching, which suggests that those who are in teaching are, on balance, the less academically able and lower skilled among college graduates. Any policies intended to improve teacher quality should consider the role of teacher salary in improving the quality of teachers.

V. POLICIES DESIGNED TO IMPROVE TEACHER QUALITY

There are three conceptually distinct teacher policy reform agendas designed to increase the quality of the teacher work-force: professionalization, deregulation, and pay structure reforms. These reform agendas, which we outline below, are not necessarily mutually exclusive, though they do conflict with one another in some ways.

(i) Professionalization

The professionalization argument is that teacher quality will only be enhanced if the profession develops a coherent set of standards for what new and experienced teachers ought to know and be able to do, ensures that individuals wishing to enter the teaching work-force are able to meet a basic set of competencies, and recognizes experienced teachers who demonstrate mastery of specific teaching skills. Teaching standards have been developed primarily by three educational organizations: the Interstate New Teacher Assessment and Support Consortium (INTASC), the National Council for the Accreditation of Teacher Education (NCATE), and the National Board for Professional Teaching Standards (NBPTS). INTASC has defined a set of standards for the preparation and licensure of new teachers; NCATE has defined a set of standards to

accredit teacher training programmes; and NBPTS has defined a set of standards for experienced teachers (National Research Council, 2001).

The professionalization argument relies heavily on the notion that the state (in the case of teachers it is states that determine the requirements necessary to enter the teacher labour market) should restrict individuals who fail to satisfy any licensure requirements from entering the teaching profession. A weakness of the professionalization argument is that there is little definitive evidence linking the standards defined by organizations such as INTASC, the training received at NCATE accredited schools, or teachers who have attained NBPTS certification with teacher quality, at least as measured by teachers' contribution to student achievement gains (Ballou, 2003). The literature linking licensure to student outcomes is mixed at best (Goldhaber and Brewer, 2000; Walsh, 2001), which is not terribly surprising since the standards for what new teachers should know are sufficiently unclear such that there is significant variation among the states in the specific requirements to enter teaching (Goldhaber, 2004*b*) and there is virtually no evidence on the possible impact of state requirements on the number or type of individuals who opt to pursue a career in teaching.¹¹ The economics of increasing the number of requirements is straightforward. All else equal, increases in licensure requirements increase the opportunity cost of becoming a teacher, and therefore should, all else equal, lead to a reduction in the number of individuals opting to pursue that profession. However, the net effect on teacher quality is ambiguous as it depends both on how changes in licensure requirements affect the potential teacher applicant pool and the hiring decisions of local school districts (Goldhaber, 2004*a*).

Certification of experienced teachers, which is voluntary, differs from licensure since it does not impose direct costs on anyone wishing to enter the profession.¹² The evidence on the efficacy of the certification of experienced teachers is only just beginning to emerge (Goldhaber and Anthony, 2004). But either type of professionalization of teaching—

changes in entry requirements or greater recognition of experienced teachers—would have only a minimum impact on the teacher work-force in the near term as most existing teachers would likely be unaffected by these changes.

(ii) Deregulation

The argument for deregulation of the teacher labour market in many ways mirrors the professionalization argument in the sense that it focuses on the link, or lack thereof, between specific teaching standards and the role of the state in determining who should be eligible to teach. Those arguing for deregulation of the teacher labour market make the case that there really are no set standards for teacher practice, and the skills that are necessary to be an effective teacher may be acquired in a variety of settings, therefore entry into the teaching profession should be granted to individuals whether or not they have completed traditional requirements for entry into the teaching professions (e.g. completed a traditional teacher preparation programme). Furthermore, an easing of restrictions on who is eligible to teach is thought to attract significant new individuals into the teacher applicant pool who would not be interested in teaching were it necessary to satisfy the standards laid out by organizations such as INTASC. Local school officials, who may be best suited to judge the quality of teacher applicants, would then have the opportunity to hire individuals who they would not have hired were the teacher labour market to have remained highly regulated.

The concern about deregulation is that individuals who do not satisfy traditional licensure requirements may lack the training necessary to teach competently in many settings (Darling-Hammond, 1990, 1996). And, while there is little evidence that the existence of traditional licensure requirements results in a higher-quality teacher work-force, there is little evidence that local school systems are very discerning of teacher quality when making hiring decisions (Ballou, 1996). The net effect of deregulation on the quality of the teacher work-force would ultimately depend on three interrelated issues: (i) the

¹¹ Furthermore, as some (Ballou and Podgursky, 1997) point out, private schools achieve better student achievement results with a much higher percentage of unlicensed teachers, though they also have very different student populations.

¹² The teaching profession tends to use the terms 'licensure' and 'certification' interchangeably, though licensure refers to the minimum requirements to enter a profession, and certification is the (usually voluntary) recognition of experienced teachers.

relationship between observable teacher attributes and student outcomes; (ii) how specific licensure provisions impact individuals' labour market decisions; and (iii) local school system selection of teachers through existing recruitment, screening, and hiring processes (Goldhaber, 2004a). And, sadly, there is simply not enough high-quality empirical evidence to judge the relative merits of the professionalization and deregulation issues, but they share another similarity in that deregulation would likely have only a small impact on the overall quality of the teacher work-force in the short run since this reform, like professionalization, would likely not affect existing teachers.

(iii) Pay Reforms

The third area of reform thought to influence teacher quality is teacher pay. While across-the-board increases in teacher compensation would make teaching a more attractive profession so that, in the long run, it would attract more able students into the profession, it would likely have little impact on teacher performance in the short run. Furthermore, while there is some evidence linking higher salaries to indirect measures of teacher quality—Figlio (1997) and Chambers (1998), for instance, report relationships between salaries and the selectivity of colleges from which teachers graduate—few studies find a direct link between the cross-sectional variation in teacher pay and any measures of student outcomes (Hanushek, 1986, 1997; Grissmer *et al.*, 2000). This may be because, in the overwhelming majority of school systems, teachers are paid according to the single salary schedule—that is, their pay is linked exclusively to their degree and experience levels. Significant increases in salary under this pay structure are likely to be quite costly (Ballou and Podgursky, 1995), and it is unlikely that they would lead to productivity changes of those already in the teacher labour market. For this reason, many advocate making teacher salaries more sensitive to conditions of supply and demand, and linking them more closely with measured productivity in the classroom.

There has for many years been experimentation with pay plans that are designed to tie compensation to productivity in the classroom or at the school level (often measured by students' test scores). In Dallas, Texas and Kentucky, for example, financial

awards are made to schools that exceed improvement goals in various academic subjects. A number of school systems have also experimented with merit pay plans over the last two decades. Alternative pay structures offer the potential to have a larger immediate impact on teacher quality than do either professionalization or deregulatory reforms because they, at least in theory, could affect both new teachers and existing teachers. To the degree that existing teachers are motivated by financial incentives to change their practices, we might expect to see an impact on students' learning. Unfortunately, though there has been significant experimentation with alternative pay structures, there is little quantitative evidence on the effect of this pay reform on students (Hatry *et al.*, 1994). Existing literature on the teacher labour market (Murnane and Cohen, 1986; Goldhaber, 2002a), and the public sector in general (Dixit, 2002) suggests that it is quite difficult to implement incentive systems that do not damage collegiality or lead to a too narrow focus on particular outcomes (e.g. student test scores). Furthermore, implementation of such pay incentive systems, or deviations from the single salary schedule in general, are difficult given staunch opposition of teachers' unions (Ballou and Podgursky, 1993).

VI. CONCLUSIONS

Research has consistently shown that teacher quality is the most important factor leading to improved student outcomes. Among the teacher characteristics that predict student success, the teacher's academic proficiency is perhaps the most important. However, the academic ability level of teachers has been falling over time, and currently is, by various measures of academic proficiency, below the level of other college graduates who enter non-teaching occupations.

A commonly held argument for this phenomenon is that the great majority of teachers are women, and as labour-market opportunities for women have improved, more and more women have chosen to enter occupations other than teaching. This is because women (and men), particularly those with strong academic skills, can find alternative occupations where they will receive a higher return on their skills.

At the heart of the issue is the disconnect between the way in which teacher compensation is structured and the way in which the labour market operates. Teachers face a single salary schedule that rewards years of experience and master's degrees, but not an individual teacher's productivity. The labour market for teachers does not respond to increases in the price of skill in the way in which non-teaching professions do, and the result is that the most highly skilled college graduates choose to enter occupations other than teaching. Moreover, the most highly skilled teachers are more likely to leave the teaching profession for other occupations.

There has been a substantial amount of research done on the issue of teacher quality, and there is much that we know about this topic. However,

many questions remain. Foremost among them is what the best way is to bridge the gap between the way in which teachers are compensated and the way in which the teacher labour market operates. Given stiff opposition from teachers' unions and other institutional barriers, any policy that moves towards a 'market-type' solution will be difficult to implement, and researchers should consider incentive schemes that will attract and retain high-quality teachers subject to these impediments. For example, are there non-monetary incentives that would sufficiently compensate high-quality teachers such that they would be willing to accept a lower salary than in a non-teaching occupation? If so, which ones work best? Future research should consider broadly what constitutes a high-quality teacher, and what types of compensation will attract and retain such high-quality teachers.

REFERENCES

- AFT (2003), *Survey & Analysis of Teacher Salary Trends*, available at <http://www.aft.org/research/salary/home.htm>
- Bacolod, M. (2001), 'The Role of Alternative Opportunities in the Female Labor Market in Teacher Supply and Quality: 1940–1990', unpublished paper, University of California Los Angeles, Department of Economics.
- Ballou, D. (1996), 'Do Public Schools Hire the Best Applicants?', *Quarterly Journal of Economics*, **111**(1), 97–133.
- (2003), 'Certifying Accomplished Teachers: A Critical Look at the National Board for Professional Teaching Standards', *Peabody Journal of Education*, **78**(4), 201–19.
- Podgursky, M. (1993), 'Teachers' Attitudes toward Merit Pay: Examining Conventional Wisdom', *Industrial and Labor Relations Review*, **47**(1), 50–61.
- (1995), 'Recruiting Smarter Teachers', *Journal of Human Resources*, **30**(2) 326–38.
- (1997), *Teacher Pay and Teacher Quality*, Kalamazoo, MI, Upjohn Institute for Employment Research.
- Boyd, D., Lankford, H., Loeb, S., and Wyckoff, J. (2002), 'Initial Matches, Transfers, and Quits: Career Decisions and the Disparities in Average Teacher Qualifications Across Schools', Working Paper, University of Albany, SUNY.
- Brewer, D. J. (1996), 'Career Paths and Quit Decisions: Evidence from Teaching', *Journal of Labor Economics*, **14**(2), 313–39.
- Chambers, J. G. (1998), 'Geographic Variations in Public Schools' Costs', Working Paper No. 98-04, US Department of Education, National Center for Education Statistics.
- Coleman, J. S., Campbell, E. Q., Hobson, C. J., McPartland, J., Mood, A. M., Weinfeld, F. D., and York, R. L. (1966), *Equality of Educational Opportunity*, Washington, DC, US Government Printing Office.
- Corcoran, S. P., Evans, W. N., et al. (2002), 'Changing Labor Market Opportunities for Women and the Quality of Teachers 1957–1992', Working Paper No. w9180, Cambridge, MA, National Bureau of Economic Research.
- Darling-Hammond, L. (1990), 'Teaching and Knowledge: Policy Issues Posed by Alternative Certification for Teachers', *Peabody Journal of Education*, **67**(3), 123–54.
- (1996), 'What Matters Most: A Competent Teacher for Every Child', *Phi Delta Kappan*, **78**(3), 193–201.
- Dearden, L., Javier, F., and Costas, M. (2002), 'The Effect of School Quality on Educational Attainment and Wages', *Review of Economics and Statistics*, **84**(1), 1–20.
- Dixit, A. (2002), 'Incentives and Organizations in the Public Sector: An Interpretative Review', *Journal of Human Resources*, **37**(4), 696–727.
- Dolton, P., and van der Klaauw, W. (1995), 'Leaving Teaching in the UK: A Duration Analysis', *The Economic Journal*, **105**(429), 431–44.

- Dolton, P., and van der Klaauw, W. (1999), 'The Turnover of Teachers: A Competing Risks Explanation', *Review of Economics and Statistics*, **81**(3), 543–52.
- Eberts, W., and Stone, J. A. (1985), *Unions and Public Schools: The Effect of Collective Bargaining on American Education*, Lexington, MA, Lexington Books.
- Ehrenberg, R. G., and Brewer, D. J. (1994), 'Do School and Teacher Characteristics Matter? Evidence from High School and Beyond', *Economics of Education Review*, **13**(1), 1–17.
- — (1995), 'Did Teachers' Verbal Ability and Race Matter in the 1960s? Coleman Revisited', *Economics of Education Review*, **14**(1), 1–21.
- Ferguson, R. F. (1991), 'Paying for Public Education: New Evidence on How and Why Money Matters', *Harvard Journal on Legislation*, **28**(2), 465–68.
- Ladd, H. F. (1996), 'How and Why Money Matters: An Analysis of Alabama Schools', in H. F. Ladd (ed.), *Holding Schools Accountable: Performance-Based Reform in Education*, Washington, DC, The Brookings Institution.
- Figlio, D. N. (1997), 'Teachers' Salaries and Teacher Quality', *Economic Letters*, **55**, 267–71.
- Gitomer, D., and Latham, A. S. (1999), 'The Academic Quality of Prospective Teachers: The Impact of Admissions and Licensure Testing', Teaching and Learning Research Report Series, Princeton, NJ, ETS.
- Goldhaber, D. D. (2002a), 'Teacher Quality and Teacher Pay Structure: What Do We Know, and What are the Options?', *Georgetown Public Policy Review*, **7**(2), 81–94.
- (2002b), 'The Mystery of Good Teaching', *Education Next*, **2**(1), 50–5.
- (2004a), 'Why Do We License Teachers?', in F. Hess, A. Rotherham, and K. Walsh (eds), *A Qualified Teacher in Every Classroom: Appraising Old Answers and New Ideas*, Cambridge, MA, Harvard Education Press, 81–100.
- (2004b), 'Teacher Licensure and Teacher Quality: How Licensure Policies Influence the Teacher Workforce', forthcoming in *Educational Policy*.
- Anthony, E. (2004), 'Can Teacher Quality Be Effectively Assessed?', Working Paper, University of Washington, Center on Reinventing Public Education.
- Brewer, D. J. (1997), 'Why Don't Schools and Teachers Seem to Matter? Assessing the Impact of Unobservables on Educational Productivity', *Journal of Human Resources*, **32**(3), 505–23.
- — (2000), 'Does Teacher Certification Matter? High School Teacher Certification Status and Student Achievement', *Educational Evaluation and Policy Analysis*, **22**(2), 129–45.
- Liu, A. Y.-H. (2003), 'Occupational Choices and the Academic Proficiency of the Teacher Workforce', in W. J. Fowler (ed.), *Developments in School Finance 2001–2002*, Washington, DC, National Center for Education Statistics, 53–75.
- Brewer, D. J., and Anderson, D. J. (1999), 'A Three-Way Error Components Analysis of Educational Productivity', *Education Economics*, **7**(3), 199–208.
- Graddy, K., and Stevens, M. (2004), 'The Impact of School Inputs on Student Performance: An Empirical Study of Private Schools in the United Kingdom', working paper, Oxford University.
- Greenwald, R., Hedges, L. V., and Laine, R. D. (1996), 'The Effect of School Resources on Student Achievement', *Review of Educational Research*, **66**(3), 361–96.
- Grissmer, D., Flanagan, A., Kawata, J., and Williamson, S. (2000), *Improving Student Achievement: What State NAEP Test Scores Tell Us*, Santa Monica, CA, RAND.
- Kirby, S., Berends, M., and Williamson, S. (1994), *Student Achievement and the Changing American Family*, Santa Monica, CA, RAND.
- Grogger, J., and Eide, E. (1995), 'Changes in College Skills and the Rise in the College Wage Premium', *Journal of Human Resources*, **30**(2), 280–310.
- Hanushek, E. A. (1986), 'The Impact of Differential Expenditures on School Performance', *Educational Researcher*, **18**, 45–51.
- (1987), 'The Trade-off Between Child Quantity and Quality: Some Empirical Evidence', Working Paper 97, University of Rochester Center for Economic Research.
- (1992), 'The Trade-off Between Child Quantity and Quality', *Journal of Political Economy*, **100**(1), 84–117.
- (1997), 'Assessing the Effects of School Resources on Student Performance: An Update', *Educational Evaluation and Policy Analysis*, **19**(2), 301–8.
- (1999), 'The Evidence on Class Size', in S. E. Mayer and P. Peterson (eds), *Earning and Learning: How Schools Matter*, Washington, DC, Brookings Institution, 131–68.
- Pace, R. R. (1995), 'Who Chooses to Teach (and Why)?', *Economics of Education Review*, **14**(2), 101–17.

- Hanushek, E. A., Kain, J. F., and Rivkin, S. G. (1999), 'Do Higher Salaries Buy Better Teachers?', Working Paper No. 7082, Cambridge, MA, National Bureau of Economic Research.
- — — (2002), 'Teachers, Schools, and Academic Achievement', Working Paper No. 6691, Cambridge, MA, National Bureau of Economic Research.
- Hatry, H. P., Greiner, J. M., and Ashford, B. G. (1994), *Issues and Case Studies in Teacher Incentive Plans*, Washington, DC, The Urban Institute Press.
- Hedges, L. V., Laine, R. D., and Greenwald, R. (1994), 'Does Money Matter? A Meta-Analysis of Studies of the Effects of Differential School Inputs on Student Outcomes', *Educational Researcher*, **23**(April), 5–14.
- Kain, J. (1995), 'Impact of Minority Suburbanization on the School Attendance and Achievement of Minority Children', Cambridge, MA, Harvard University, Department of Economics.
- Krueger, A. B. (2003), 'Economic Considerations and Class Size', *The Economic Journal*, **113**(February), F34–63.
- Lakdawalla, D. (2001), 'The Declining Quality of Teachers', Working Paper No. 8263, Cambridge, MA, National Bureau of Economic Research.
- (2002), 'Quantity over Quality', *Education Next*, **Fall**, 10–17.
- Lankford, H., and Wyckoff, J. (2001), 'Who Would be Left Behind by Enhanced Private School Choice?', *Journal of Urban Economics*, **50**(2), 288–312.
- Manski, C. F. (1987), 'Academic Ability, Earnings, and the Decision to Become a Teacher: Evidence from the National Longitudinal Study of the High School Class of 1972', in D. A. Wise (ed.), *Public Sector Payrolls*, Chicago, IL, University of Chicago Press, 291–316.
- Monk, D., and Rice, J. K. (1994), 'Multi-level Teacher Resource Effects on Pupil Performance in Secondary Mathematics and Science: The Role of Teacher Subject Matter Preparation', in R. G. Ehrenberg (ed.), *Contemporary Policy Issues: Choices and Consequences in Education*, Ithaca, NY, ILR Press.
- Murnane, R. J. (1975), *The Impact of School Resources on the Learning of Inner City Children*, Cambridge, MA, Balinger.
- Cohen, D. K. (1986), 'Merit Pay and the Evaluation Problem: Why Most Merit Pay Plans Fail and a Few Survive', *Harvard Educational Review*, **56**(1), 1–17.
- Singer, J., Willett, D., John, B., and Kemple, J. J. (1991), *Who Will Teach?: Policies that Matter*, Cambridge, MA, Harvard University Press.
- National Research Council (2001), *Testing Teacher Candidates: The Role of Licensure Tests in Improving Teacher Quality*, Committee on Assessment and Teacher Quality, Center for Education, Board on Testing and Assessment, Division on Behavioral and Social Sciences and Education, K. J. Mirchell *et al.* (eds), Washington DC, National Academy Press.
- Podgursky, M., Monroe, R., and Watson, D. (2003), 'Teacher Mobility, Pay, and Academic Quality', Working Paper Department of Economics, University of Missouri, Columbia.
- Pulliam, J. D. (1982), *History of Education in America*, 3rd edn, Columbus, OH, Charles E. E. Merrill.
- Rowen, B., Chiang, F. S., and Miller, R. J. (1997), 'Using Research on Employees' Performance to Study the Effects of Teachers on Students' Achievement', *Sociology of Education*, **70**(4), 256–84.
- Sanders, W. L., and Rivers, J. C. (1996), *Research Progress Report: Cumulative and Residual Effects of Teachers on Future Student Academic Achievement*, University of Tennessee Value-added Research and Assessment Center.
- Saxton, A. M., and Horn, S. P. (1997), 'The Tennessee Value-added Assessment System: A Quantitative Outcomes-based Approach to Educational Assessment', in J. Millman (ed.), *Grading Teachers, Grading Schools: Is Student Achievement a Valid Evaluation Measure?*, Thousand Oaks, CA, Corwin Press, 137–62.
- Schlechty, P. C., and Vance, V. S. (1981), 'Do Academically Able Teachers Leave Education? The North Carolina Case', *Phi Delta Kappan*, **63**, 106–12.
- Strauss, R. P., and Sawyer, E. A. (1986), 'Some New Evidence on Teacher and Student Competencies', *Economics of Education Review*, **5**(1), 41–8.
- Vogt, R. L. (2001), 'It's What You Know, Not How You Learned to Teach It: Evidence from a Study of the Effects of Knowledge and Pedagogy on Student Achievement', paper presented at the American Educational Finance Association, Cincinnati.
- Temin, P. (2002), 'Teacher Quality and the Future of America', NBER Working Paper 8898.
- Todd, P. E., and Wolpin, K. I. (2003), 'On the Specification and Estimation of the Production Function for Cognitive Achievement', *The Economic Journal*, **113**(February), F3–33.
- Turner, S. E. (1998), 'The Training of Teachers: The Changing Degree Output in the Area of Education', paper presented at the 1998 Association of Public Policy and Management Meeting.

- US Department of Education (1996), *Out of the Lecture Hall and Into the Classroom: 1992–93 College Graduates and Elementary/Secondary School Teaching*, NCES Report 96-899, Washington, DC, National Center for Education Statistics.
- (1997), *Indicator 34: Starting Salaries of College Graduates, Recent College Graduates Survey (1977–90) and 1993 Baccalaureate and Beyond Longitudinal Study, First Follow-up*, Washington, DC, National Center for Education Statistics.
- (2001), *Condition of Education, 2001*, NCES Report 2001072, Washington, DC, National Center for Education Statistics.
- Vegas, E., Murnane, R. J., *et al.* (2001), 'From High School to Teaching: Many Steps, Who Makes It?', *Teachers College Record*, **103**(3), 427–49.
- Walsh, K. C. (2001), *Teacher Certification Reconsidered: Stumbling for Quality*, Baltimore, MD, Abell Foundation.
- Weaver, T. W. (1983), *America's Teacher Quality Problem: Alternative for Reform*, New York, Praeger.
- Wright, P. S., Horn, S. P., and Sanders, W. L. (1997), 'Teacher and Classroom Context Effects on Student Achievement: Implications for Teacher Evaluation', *Journal of Personnel Evaluation in Education*, **11**(1), 57–67.