A. General Compensation Questions

What do we know about the relationship between student achievement and teachers' educational attainment and experience, which is the traditional way that teacher salaries are determined?

A large number of studies have examined the effects of teacher characteristics on student achievement, such as teacher experience, preparation, degrees earned, selectivity of college attended, certification, and test scores. Two of these characteristics are of particular interest to policymakers because traditional teacher compensation systems pay teachers according to years of teaching experience and highest degree earned. Goldhaber and Brewer (1998) note that rewards for additional experience and degrees can be substantial. For example, public school teachers with master's degrees earn an average of 11 percent more than they would earn if they held a bachelor's degree only. They earn 14 percent more for an education specialist's degree and 17 percent more for a doctorate. But does evidence suggest that teacher effectiveness consistently improves with each additional year of experience and each advanced degree?

The majority of studies conclude that teacher education and experience are not strong predictors of teacher effectiveness, as measured by student achievement gains. In one study of Chicago public school teachers, for example, Aaronson, Barrow, and Sander (2007) found that teacher characteristics, such as highest level of education, experience, credentials, and selectivity of the college that the teacher attended, could not explain 90 percent of the variance in teacher effects on student learning.

The preponderance of evidence suggests that teachers who have completed graduate degrees are not significantly more effective at increasing student learning than those with no more than a bachelor's degree. Rice (2003) reviewed five studies that examined student achievement in a wide variety of grades and subject areas and found that teachers with an advanced degree had no significant effect on student performance (Harnisch, 1987; Link & Ratledge, 1979; Monk, 1994; Murnane & Phillips, 1981; Summers & Wolfe, 1977). Clotfelter, Ladd, and Vigdor (2007a) also found that on average, elementary teachers who completed master's degrees were no more or no less effective than others at raising student achievement, with one exception. Elementary teachers with master's degrees appeared to be less effective, on average, than those without advanced degrees if they earned the degrees more than five years after they started teaching.

Only one study Rice examined found a significant relationship between teacher completion of a master's degree and student achievement, and the relationship was significant for black students only (Ehrenberg & Brewer, 1994).

Moreover, four more studies that she reviewed found a negative relationship between teacher completion of advanced degrees and student achievement. Murnane (1975), for example, found that having a master's degree had no significant effect on student reading scores in grades 2 and 3 and actually had a negative effect on mathematics scores. Eberts and Stone (1984) also found that grade 4 mathematics achievement was lower in the classrooms of teachers with higher degrees in mathematics. Kiesling (1984) found a negative relationship between teacher degree status and student reading performance in New York City. And Rowan, Correnti, and Miller (2002) found that students assigned to a teacher with a degree in mathematics actually performed worse than students whose teacher had no mathematics degree. A more recent meta-analysis of a larger number of studies also found no consistent relationship between holding a graduate degree and a teacher's ability to increase student learning gains (Aos, Miller, & Pennucci, 2007).

Holding some types of advanced degrees may have a positive effect on student achievement at the secondary level, however. Clotfelter, Ladd, and Vigdor (2007b) found that in contrast to findings that emerged from their earlier research on elementary school teachers, high school teachers who completed a master's degree were more effective at increasing student achievement than those without advanced degrees. Goldhaber and Brewer's (1997, 1998) analyses of the 1998 National Educational Longitudinal Study also revealed that high school students assigned to teachers who held master's degrees in mathematics made greater gains in mathematics achievement than students whose teachers did not have advanced degrees or who held advanced degrees in other subjects. Similarly, high school teachers with bachelor's degrees in science were also more effective at increasing student achievement in science than teachers who taught science but either had no degree or a bachelor's degree in a nonscience subject. Subject-specific degrees had no effect on student achievement in English or history, however.

Research does show that teachers become more skilled with experience (see Aos et al., 2007; Clotfelter, Ladd, & Vigdor, 2006, 2007a; Ferguson, 1991; Ferguson & Ladd, 1996; Gordon, Kane, & Staiger, 2006; Greenwald, Hedges, & Laine, 1996; Grissmer, Flanagan, Kawata, & Williamson, 2000; Hanushek & Rivkin, 2004; Hanushek, Kain, & Rivkin, 1998; Hanushek, Kain, O'Brien, & Rivkin, 2005; Harris & Sass, 2007; Kane, Rockoff, & Staiger, 2006; Murnane, 1975; Murnane & Phillips, 1981; Nye, Konstantopoulos, & Hedges, 2004; Rice, 2003; Rivers & Sanders, 2002; Rowan et al., 2002; Wayne & Youngs, 2003). The preponderance of evidence suggests, however, that teacher experience matters most during the first several years of a teacher's career.

How long teacher performance continues to improve is a point of contention among researchers. Hanushek et al. (2005), for example, contend that experience matters only in the first year of teaching. By their estimates, "having a first year teacher on average is roughly equivalent to having a teacher a half standard deviation down in the quality distribution" (p. 18). An analysis of state data on the National Assessment of Educational Progress conducted by Grissmer et al. (2000) revealed positive effects on student achievement in states with

large proportions of teachers who had at least two years of experience but no evidence that additional years of experience were associated with higher achievement. Gordon et al. (2006) found large gains in teacher effectiveness between the first and second year of teaching, much smaller gains between the second and third year, and no substantial improvement after the third year in the classroom. Murnane (1975) found that teacher effectiveness improves rapidly over the first three years of teaching and reaches its highest point between the third and fifth year, but found no substantial improvement after the fifth year. Ferguson (1991) and Ferguson and Ladd (1996) also found no experience effects for elementary teachers beyond the first five years in the classroom. A number of other studies also conclude that teacher experience effects are largely concentrated in the early years (e.g., Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2005; Hanushek & Rivkin, 2007; Rivkin, Hanushek, & Kain, 2005; Rockoff, 2004).

In contrast, a small number of studies suggest that teacher experience effects may be evident for a longer period of time. Murnane and Phillips (1981) found that experience had a significant positive effect on elementary student achievement among teachers during their first seven years of teaching. Ferguson (1991) found that at the high school level, Texas students taught by teachers with more than nine years of experience had significantly higher test scores than students whose teachers had five to nine years of experience. Rivers and Sanders (2002) report that "current TVAAS research suggests that teachers' effectiveness increases dramatically each year during the first ten years of teaching" (p. 22). In the most extreme cases, Clotfelter et al. (2006, 2007a) found evidence of growing teacher effectiveness up to 20 or more years in their analyses of North Carolina teacher data, although more than half of the gain in teacher effectiveness occurred during the first few years of teaching.

In sum, the current compensation method for many teachers assumes that teachers who have graduate degrees and more teaching experience are more effective—and, therefore, should automatically be paid more—than teachers with no advanced degrees and less teaching experience. Evidence suggests, however, that these factors do not consistently relate to student performance, with the exception of initial levels of experience and the possible exception of some advanced degrees at the secondary level, particularly subject-specific degrees in mathematics and science. A small number of studies indicate that holding a subject-specific degree predicts student achievement in high school mathematics and science but not in other subjects.

Research clearly demonstrates that there is a relationship between teacher experience and student achievement, but the preponderance of evidence suggests that the most significant improvements in teacher effectiveness occur during the first few years in the classroom. Moreover, only a portion of the large gains in average teacher effectiveness after Year 1 may be due to on-the-job learning (Hanushek et al., 2005). Average teacher effectiveness also increases, in part, because beginning teachers who are not successful often leave the profession after their first year. Some evidence suggests that at the high school level, there may be sustained experience effects that last longer.

These findings indicate that there is little empirical support for compensation policies that automatically reward teachers for additional degrees and experience. Compensation systems that include measures of teachers' ability to increase student learning gains will likely be a more effective way to identify and reward top performers and ultimately improve teacher quality.

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