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School human capital and teacher salary policies

Teacher
salary policies

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Abstract

Purpose – The purpose of this paper is to consider how the level and structure of teacher salaries affect student outcomes and the possibility of improving student achievement in the USA.

Design/methodology/approach – The analysis integrates an underlying economic model of the role of salaries in the teacher labor market with existing empirical results.

Findings – Much of the current policy discussion about teacher salaries is very unclear about how student outcomes will be affected by changing policies. The US is at a “bad equilibrium” where it cannot increase salaries for effective teachers without increasing salaries for ineffective teachers and thus it is stuck with a teaching corps that is harming both students and the future economic performance of the country. Dealing with problems of the productivity of schools must involve altering the structure of the single salary schedule for teachers.

Research limitations/implications – The discussion focusses exclusively on the US schooling system, although there are obvious parallels to systems in other countries.

Practical implications – The paper provides an overarching model of how the structure of salaries for teachers has broad implications of school outcomes.

Social implications – Improved long-run economic outcomes depend crucially on reforms that involve rewarding the most effective teachers but not the least effective.

Originality/value – The integrated approach to the consideration of teacher salaries provides a way of assessing the discordant policy discussions related to teacher salaries.

Keywords Human capital, Economic outcomes, Merit pay, Teacher evaluations, Teacher salaries

Paper type General review

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The Soviet Union was a communist country [...]. At first, many of the people thought this was a good idea. It seemed like a way to be sure that no one was poor. It turned out to be a terrible failure. In a communist country, people cannot start or own a business. People who work hard are paid the same as people who don't. In the end, the whole country was poor (Pelz, 2004, p. 154).

How do you suppose the typical elementary teacher in Washington State discusses this passage in her students' social studies book? Do you think there is any recognition of the irony introduced by the way teachers are paid? These issues turn out to be central to the entire discussion of teacher salaries.

Because teacher salaries are so central to most aspects of school reform and school improvement, it is important to consider the various dimensions and how they fit together. Doing something about teacher salaries is high on almost everybody's reform agenda, even though the proposed changes go in wildly divergent directions. And, in fact some discussions go on with participants not realizing that they actually disagree on policy.

One of the main strands of discussion notes that teacher salaries have fallen relative to salaries for other college-educated workers, particularly female college educated workers. The concern raised is that schools cannot attract a sufficiently high-quality teaching force without raising salaries. A second strand focusses on the pay to individual teachers and whether salaries match with performance. The concern raised is that salaries are not giving good signals to the best teachers.



These concerns are inextricably linked. Moreover, historical policies leave schools in the “bad equilibrium” – a situation where it is hard to improve in either dimension. The bad equilibrium in turn is not only harming the strong teachers but also doing real damage to US society and to the economy.

The issue of teacher salaries is not just a side issue to the larger school policy discussions. It is impossible to ignore the productivity problem in education: The USA has continuously spent more on schools, but student achievement has not improved. This issue, which is at times labeled as the spending inefficiency problem, is most closely related to the fact that what teachers are paid is unrelated to their effectiveness.

The structure of salaries is also related to professionalism. There are persistent calls for making teaching more of a profession. Many definitions exist for what makes a profession. Some interpret this as paying teachers the same as accountants. Alternatively, the key elements can be uncovered from observing characteristics of highly respected professions such as medicine, law, and accountants. Their jobs involve considerable autonomy but accompanied by a willingness to be held responsible and rewarded for their performance. Moving to this version of professionalism could have dramatic results, not the least of which is the possibility of elevating the status of the teacher.

Does teacher quality matter?

Before any consideration of teacher salary is undertaken, it is essential to understand the role of teachers in determining student outcomes. Some have asserted that the only thing that really matters with regard to student outcomes is the family and that teachers and schools exert a relatively small influence on achievement[1]. If so, it would not make all that much difference how teachers are paid. But it is not so.

All research shows that families are extraordinarily important for student achievement. This is widely recognized, and underscores the fact that existing achievement gaps – by income and by race – cannot be looked upon as a simple reflection of differences in school or teacher quality. At the same time, the opposite is also not true: The importance of the family-achievement relationship does not mean that schools and teachers are unimportant. To the contrary, the evidence suggest teachers are the potential solution for the achievement challenges facing the USA.

The most direct way to see the potential impact of teachers is to look at differences in the growth of student achievement across teachers. It is natural to define good teachers as those who consistently obtain high learning growth from students, while poor teachers are those who consistently produce low learning growth. This idea is loosely the underpinning of analyses of teacher value-added, which uses statistical methods to separate the impact of teachers on student achievement from that of families, peers, and other factors. Teacher value-added analysis has been controversial, particularly when used for evaluation of teachers. These issues related to use are discussed below, while here we focus on what such estimates say about the variation in teacher effectiveness – a less controversial issue.

There now are a substantial number of studies that indicate clearly how much difference can come to a student based on teacher assignment[2]. And the differences in teacher quality are startling.

In one study, teachers near the top of the quality distribution got an entire year’s worth of additional learning out of their students during a single academic year compared to those near the bottom (Hanushek, 1992). That is, a good teacher will get a gain of 1.5 grade level equivalents while a bad teacher will get a 0.5 gain. Importantly, this analysis considered kids just from minority and poor inner-city families, indicating

that family background is not fate and that good teachers can overcome deficits that might come from poorer learning conditions in the home.

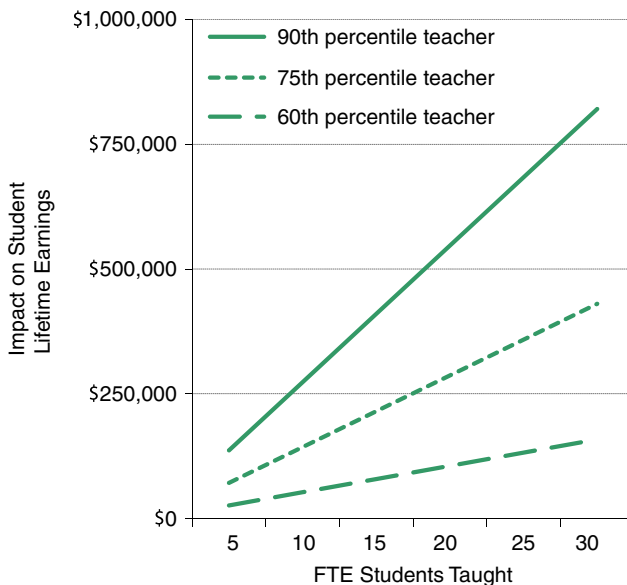
A second perspective comes from combining existing quantitative estimates of differences in teacher quality with achievement gaps by race or income. Having a good teacher as opposed to an average teacher for three to four years in a row would, by available estimates, close the achievement gap by income[3]. Closing the black-white achievement gap, which is a little larger than the average income gap, would take good teachers 3.5-5 years in a row. (These estimates of course bring up the issue of how such a string of good teachers can be engineered.)

But, perhaps the most salient perspective for the discussion of salaries is to calculate the impacts of effective teachers on the future earnings of students. A teacher who raises the achievement of a student will tend, other things being equal, to raise earnings throughout that student's work life. Using 2010 earnings, for example, a teacher in the 75th percentile would on average raise each student's lifetime income by somewhat more than \$14,300 when compared to the average teacher[4]. With a class of 25 students, this teacher would add \$358,000 in future income compared to an average teacher.

Figure 1 shows the total contribution of teachers at the 60th, 75th, and 90th percentile teachers compared to an average teacher and how this varies with the number of students taught[5]. Excellent teachers add over \$800,000 to the students in a class of 30. Even a teacher just above average at the 60th percentile would add over \$100,000 to a class of 20 students.

These are calculations for each school year. Each and every year throughout the career that these above average teachers are teaching adds hundreds of thousands of dollars to their students.

But, there is also the darker side. Below average teachers are subtracting from student earnings at a similar rate. The tenth percentile teacher, compared to an average



Source: Hanushek (2011)

Figure 1.
Impact on student lifetime incomes by class size and teacher effectiveness (compared to average teacher)

teacher, subtracts over a half million dollars per year for each 20 students she teaches. For the tenth, 25th, and 40th percentile teacher one simply has to put a minus sign in front of the values seen in Figure 1.

Using a different methodology, Chetty *et al.* (2014b) calculate similar magnitude of effects. They match estimates of the value-added of teachers in New York City to the subsequent income of their students as reported on tax returns after the students have entered the labor market. While difficult to compare precisely, these estimates of the economic impact of teachers are similar in magnitude to those reported in Figure 1.

From each of these different perspectives, the answer is the same: teachers have an enormous influence on students and on their future, making consideration of how to ensure high-quality teachers in the classroom a matter of considerable importance.

How are teachers paid?

The determination of teacher salaries, however, generally has nothing to do with the effectiveness of the teacher in the classroom or the incomes that they generate. The standard determination of a teacher's salary follows the single salary schedule. While there is some overall variation across districts, within a district no distinction is made between elementary teachers and high school teachers, between physical education teachers and physics teachers, or between highly effective and highly ineffective teachers[6].

Teachers are paid a base salary that is adjusted upwards to reflect years of teaching experience and graduate credits toward an advanced academic degree. This is simply a look-up table that is unrelated to the impact or to the scarcity of any teacher.

There is some intuition behind this schedule. After all, it is reasonable to presume that teachers get better with experience and that better academic preparation has a pay-off in the classroom. Unfortunately, the intuition is wrong. Extensive research has shown no relationship between graduate degrees and performance in the classroom, at least as measured by student achievement (see e.g. Goldhaber, 2002; Clotfelter *et al.*, 2010). Additionally, except for the first few years of teaching, performance does not systematically improve with more experience[7].

The unimportance of graduate degrees surprises many but is actually easily explained. First, these degrees are often obtained in part-time study while the teacher is actively working in the school. This is of course a tough task – holding down a demanding full-time job while also working toward an advanced degree. As such, one might surmise that many teachers are not really looking for a demanding and academically rigorous program of study. Fortunately for these teachers, there are accommodating education schools willing to fill the demand for low-effort master's degree with what turns out to be a very profitable set of degree offerings for these colleges. Second, a very popular course of study is educational administration – a degree that may be useful if the teacher ever wants to move into administration but that has limited value for classroom teaching. In other words degrees are often unrelated to subject matter knowledge.

Today over half of all US teachers have a master's degree or higher, and these earn about 20 percent higher salaries. Thus, roughly 10 percent of aggregate teacher salaries go toward advanced degrees – degrees that on average have no influence of performance in the classroom[8].

Similarly, about one-quarter of all salaries go toward experience bonuses for those with three or more years of experience. But, again, this added experience on average has no influence of performance in the classroom.

Undoubtedly, more experienced teachers have other roles in schools outside of their own classrooms. For example, if there is peer learning, more experienced teachers may have important impacts on other teachers, although Jackson and Bruegmann (2009) suggest that this relates still directly to the classroom effectiveness of the teacher.

An important implication of the way teachers are paid is that differences in salaries across teachers are unrelated to the effectiveness of the teacher. A highly paid teacher may or may not be good in the classroom, and similarly for a low-paid teacher.

The US productivity challenge

With that backdrop, it is useful to look at the productivity challenge of the US schooling system. For a long time the USA has been concerned about how students, and by implication how schools, are doing. Starting with the Sputnik launch in the 1950s, where the Soviet system seemed to surpass the USA in engineering skills, there has been almost continuous national attention to the need to improve US schools.

The clearest manifestation of this is seen in calls to increase the investments in schools – calls that have echoed through statehouses across the nation for the last half century. And, until the 2008 recession hit, these calls resulted in rapidly increasing expenditures for US schools.

Between 1960 and 2007, expenditure per pupil more than quadrupled after allowing for inflation (US Department of Education, 2014). This steady increase in funding has come in just the ways commonly advocated – lowered pupil-teacher ratios, increased experience of teachers, and more educated teachers.

Yet, there was little commensurate improvement in student achievement. Since 1970, the National Assessment of Educational Progress (NAEP) has tracked reading and math performance of US 17-year-olds over time. The central finding is that performance in 2013 for both math and reading is virtually the same as that recorded in 1970[9].

This somewhat jarring set of facts – dramatic increases in spending accompanied by unchanged student outcomes – has been the subject of considerable controversy. Often discussed under the somewhat misleading title “Does money matter?”, a vast literature has developed, and there are varying interpretations of the relationship between spending and achievement[10]. One simple explanation of the aggregate phenomenon, however, is that advanced degrees and more experience do not make for more effective teachers even if they do push up salary costs. Thus, the things that underlie expenditure increases are things mostly unrelated to student performance.

Some hypothesize instead that the flat performance reflects increasingly tough student challenges that have just been offset by the increased spending on schools. Unfortunately, that does not align with the facts. While the US student population has increasingly been made up by children from single parent households and immigrants with limited English proficiency, it has also had more educated parents and smaller families, factors that would lead students to be better prepared for school (see Hanushek, 2006). While difficult to judge precisely, the best interpretation is that overall changes in outside of school factors have had relatively small net impacts on trends in achievement. Instead it comes back to poor use of the added resources that have gone into schools.

This productivity challenge that shows up in the aggregate statistics is also seen within each of the states. It is no secret that some school districts spend their money better than others. One can easily find groups of districts with the same student demographics and with the same expenditure levels producing very different levels of student achievement (see Hanushek and Lindseth, 2009). This is exactly the story as

seen for the nation as a whole. Many districts are spending more than they need to spend, based on what other districts show is possible – a situation that economists would simply call inefficiency in the operation of schools.

If large portions of spending are unrelated to effectiveness, it should not be surprising to find considerable wasted funds. Getting more productivity out of school spending is increasingly the subject of attention in the states, in part because of the changing fiscal realities of states.

The new fiscal reality of schools

Until recently, limited policy attention focussed on productivity in schools. Virtually all attention went to the flat performance of students and the need to improve. The historic policy thrust has been “performance is flat so we have to spend more.” This stands in somewhat interesting contrast to healthcare where the prevailing argument in the USA has been “even though spending has led to improved health outcomes, we need to spend less.”

The situation today is changing. The recession of 2008 was a rude shock to state and local governments, and especially to schools. Coming off a century of continuous growth in spending per pupil, districts were slow to adjust to the possibility that the revenue collapse might actually put them on a more perilous spending path.

The federal government stimulus package, designed to get the macroeconomy moving again, provided a bridge that cushioned lost state revenue. The funds did not cover all lost revenue and were explicitly a temporary fix. To the extent that they thought about it, most US states and districts implicitly presumed that, as the stimulus funds were phased out, their own funds would return. For that reason, in many states, the initial response after the stimulus money stopped flowing was largely to try to do what had been done before the recession and to wait out the storm.

However, state and local revenues continue to be slow to recover, and states have found themselves facing deficits (many of which are illegal, according to state constitutions). Given overall state demands, a number of states are dealing with deficits by allowing school spending to fall. Moreover, most projections suggest that general fiscal pressures on schools are likely to last for some time.

The budgetary changes are dramatic: 11 states are spending less per pupil in 2013 than in 2008 without adjusting for inflation (US Bureau of the Census, 2015). If adjusted for inflation, 32 states have seen a fall in spending over this period including seven states where spending in real terms fell by more than 10 percent.

A first response has been to continue resisting any spending decreases, generally arguing that schools should be exempt from fiscal shocks. For some, this resistance has included going to court (e.g. in New Jersey, Kansas, and Texas) to argue that reduced funding violates established state constitutional spending requirements[11]. Nonetheless, a majority of the states have simply fought out their funding battles in their legislatures – with few states returning to the spending growth of the past.

This leads back to the simple question by some: is not it possible that forced spending reductions will make the education system more efficient? Since there is spending in many districts that is not contributing much to student learning, is not it possible simply to squeeze out this inefficiency by cutting the funding to schools and thus push schools into being more productive?

Although there are not definitive answers to that question, the response is most likely no.

If school districts had a line item in their budgets for “waste, fraud, and abuse,” easy answers for dealing with the budget pressures would exist. Unfortunately, one cannot readily find such itemized inefficiency.

While some attention has gone to the costs of various management functions, ranging from finance operations and procurement, to safety and security, to transportation, this is unlikely to solve long-term fiscal problems, since each is a relatively small budget item (Council of Great City Schools, 2012). The big money still resides in instructional personnel, meaning mainly administrators and teachers. Salary and benefits funding for instructional employees represents the largest spending area in the typical district, bringing to mind the old Willie Sutton adage about robbing banks “because that’s where the money is”[12].

If interested in productivity – which is the direct comparison of outcomes and costs – it is necessary to go much deeper into the salary-outcome relationship. First, teachers and principals have the largest impact on student performance, implying leverage on the achievement side of the productivity equation. Second, teacher pay based on degrees and experience is unrelated to teacher effectiveness, implying leverage on the cost side of the productivity equation. Addressing issues of productivity and inefficiency almost certainly demands addressing the fact that salaries, and by implication, total compensation paid by schools, are unrelated to student outcomes.

Dealing with either side of this productivity equation has no historic precedent, and districts are unlikely to focus on these issues just because funding is cut. Partly because of existing state labor and education laws, these issues are often not on the table even in times of fiscal stress. Yet, that is not the full story, because even when these constraints are not binding, there has been little systematic movement toward rationalizing instructional spending and performance by districts.

A number of states have started to move forward by reconsidering teacher tenure and at least eliminating the pure LIFO – last in, first out – rules for reductions in the teaching force that are designed to protect more-experienced teachers during layoffs. Wisconsin got the bulk of the publicity for its actions on this front, but Colorado, Florida, Indiana, Oklahoma, and others have also opened the way for decisions more closely related to teacher performance (National Council on Teacher Quality, 2014). These states have taken the first steps of reducing teacher-tenure guarantees and calling for better evaluations of teachers and administrators.

Changes in tenure and LIFO policies have also been related to the courts. In 2013, a district court in Los Angeles ruled that state laws relative to time to tenure, to dismissal of teachers, and to LIFO were unconstitutional under the California constitution[13]. While this ruling in *Vergara v. California* is being appealed (in 2015), similar court cases have also begun in other states.

Nonetheless, there is considerable inertia in local districts. There are contracts that restrict action. There is resistance from teachers’ unions. There is little experience or political will to change.

The only way that productivity will be significantly improved is by strengthening the relationship between salaries and performance. Figure 1 underscores the fact that the best teachers are dramatically underpaid while the worst are dramatically overpaid. Efficient policies imply paying significantly more to the best teachers – not just giving small, temporary bonuses for student achievement – in order to keep them in the classroom longer. At the other end of the performance spectrum, the pay of the worst teachers cannot be reduced enough, and they simply must be replaced in the

classroom. The impact of the small numbers of unacceptably ineffective teachers, as discussed below, is disproportionately large and represents a huge drain on both achievement and finances.

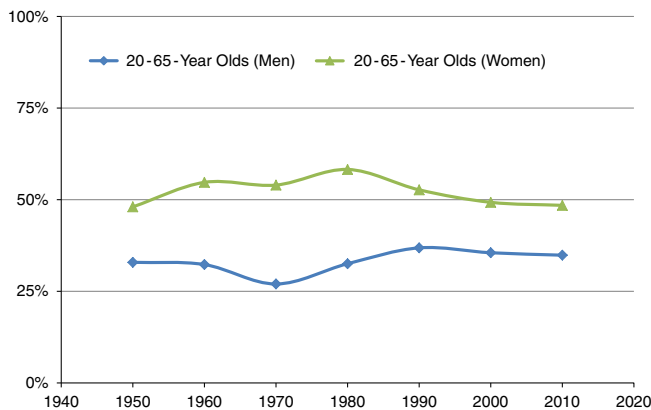
These are not things that happen easily or automatically. Just cutting school budgets is unlikely to lead districts to a new, more efficient place. Left to their own devices, districts are much more likely to do what they have always done, but on a somewhat restricted scale. This path will lead neither to more efficiency nor to better results – and in fact could significantly harm students.

The other side of the coin

Teacher salary discussions nonetheless often go in a different direction. The general discussion is that average teacher salaries have slid relative to other wages in the economy and that this has been especially true for women. The discussions of history point to a period in the past when educated women had few occupational choices, being largely found in teaching or nursing. As the labor market opened for women, those with the highest achievement increasingly went into a broad array of occupations, leaving schools with a different slice of the working population.

Figure 2, however, gives a summary of salaries in teaching. It shows the percentage of men and women outside of teaching that earn less than the average teacher across time. The patterns are a bit different for men and women. Salaries actually rose compared to other jobs from 1950 to 1980 for women teachers, but then began a slide that brings teachers back in 2010 to roughly their 1950. For men, salaries fall relative to other jobs through 1970, rise until 1990, and then slide a little through 2010 – leaving men also close to comparable to the 1950 situation.

Note that directly comparing salaries of teachers and others is difficult because of different weeks and hours worked, because of the greater employment risks of people in the private sector, and because of different benefit packages (Podgursky and Tongrut, 2006). In the comparisons over time, it is plausible to think that the first two factors (working time and job certainty/tenure) have not changed all that much. This is not the case for benefits where the retirement and health care benefits in teaching have risen noticeably compared to those in other occupations. Nevertheless, the relative changes in benefits are insufficient to overcome the overall pattern of decline in relative salaries.



Source: Author calculations

Figure 2.
Percent of college
educated full-time
workers age 20-65
earning less than the
average teacher,
1950-2010

Some have suggested that the last two decades is a natural result of the competition for labor. Other parts of the economy have experienced rapid improvements in productivity that are labor saving and that allow them to pay higher salaries in order to attract top workers. In contrast, schools with their labor intensive technology have necessarily seen limited increases in productivity and thus face continued salary pressures as they try to compete with high productivity sectors. This theory – common in many policy debates – does not explain the last two decades[14].

The better explanation is simply that teacher salaries are not market driven but instead are politically set. They come from bargaining over contracts at the local level and from legislative actions at the state level. As an important local political process, everything, including the outcome of the bargaining, is very public.

It is difficult for politicians to say that they have just decided on large wage increases for teachers – that is, for all teachers, good or bad. Large increases, particularly when other workers are seeing much more modest increases, are difficult, but convincing the public that they should be meted out without regard for quality is especially problematic. It is simply politically difficult to pay appropriately large salaries to ensure that there are effective teachers or that there are teachers in shortage areas such as math and science if the same higher pay has to go to ineffective teachers or teachers in surplus areas such as elementary school teaching.

The idea behind increasing the level of teacher salaries is to expand the pool of potential teachers into the range of the best college graduates. The motivation behind such a plan comes in part from a sense that US teachers were historically of higher ability than teachers today and in part from arguments that some high-performing school systems such as Korea and Finland attract teachers from a higher place in the distribution of college graduates. Auguste *et al.* (2010) place heavy weight on their perception of the gap: Singapore, Korea, and Finland “recruit 100% of their new teacher corps from the top third of the academic cohort” while “the U.S. by contrast recruits most teachers from the bottom two-thirds of college classes.”

First, there is now data that put these statements into question[15]. Figure 3 shows how the measured math skills of the average teacher in various countries compare to the skills of all college graduates. Finland does indeed recruit teachers with the highest average achievement levels, but Korea does not. Moreover, US teachers are not systematically drawn from the bottom of the distribution.

But there is limited evidence – either from the USA or from abroad –about the efficacy of such a policy for improving the overall quality of the teaching force[16]. At the very least, it would take a very long period of time to bring about overall changes through overall salary increases, because it requires having college students change their plans, having school administrations make better hiring decisions, and having sufficient numbers of current teachers retire in order to change the character of the overall teacher force.

The single salary scale holds down the salaries of the most effective teachers – those that generate large additions to future incomes and productivity of their students. It also pays too much for ineffective teachers who lower the incomes and productivity of their students. This sets up incentives to keep people that should not be retained and to lose too many who should be retained (TNTP, 2012).

But merit pay has not worked

The argument about leaving the single salary schedule and moving toward salaries more aligned with teacher effectiveness invariably leads into a discussion of merit pay.

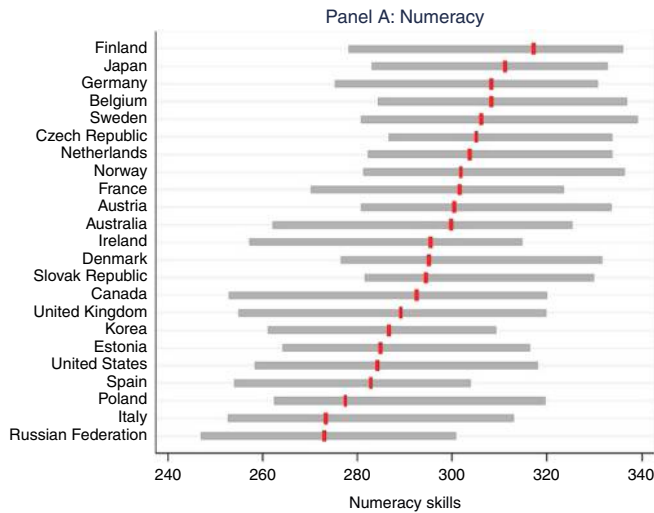


Figure 3.
Teacher cognitive skills (numeracy) relative to all graduates

Notes: Vertical bars indicate median cognitive skills of teachers in a country. Horizontal bars show the interval of cognitive skill levels of all college graduates (including teachers) between the 25th and 75th percentile

Source: Hanushek *et al.* (2014)

A large number of districts actually tried some form of bonuses designed to reward merit – and most abandoned them after a fairly short period of time (Cohen and Murnane, 1985, 1986). This historical evidence, repeated frequently, has led to the conventional statement that merit pay has been tried frequently, and it simply does not work.

This observation about merit pay is often accompanied by an explanation – teachers do not respond to such extrinsic incentives (Kohn, 1999). They are teachers because of their sense of mission, because of their love of children, and for a variety of intrinsic incentives. Moreover, paying teachers differently based on effectiveness or skills would be harmful, because teachers would be less likely to work together in the school.

Yet, at this point a real disconnect generally comes into the discussion. It is just as frequently argued, often by the same people, that one of the most significant problems of education is the low wages (described in part in Figure 2) that discourage many from entering teaching or from remaining in teaching. Indeed, some argue that the only way to be internationally competitive in US schools is to raise salaries to the top-third of all occupations (Auguste *et al.*, 2010), or at least to the level of some comparison professions such as law, medicine, and accounting. These latter arguments suggest that teachers are indeed motivated by money.

It is actually possible to reconcile these two arguments. First, the past observations about merit pay are not very relevant. Most of the historical experiments with merit pay have been relatively small annual bonuses, often linked to extra work as opposed to classroom effectiveness. And the constant antagonism of unions to any differentiation of salaries led to the fairly quick demise of these merit pay schemes. In part, there has in recent years been a substantial move toward various incentive schemes, although not centered on teacher effectiveness but on shortages (Podgursky and Springer, 2011).

Second, it appears that most current teachers are indeed working to do the best that they can. Offering a bonus for better performance to existing teachers has very little influence on what they do. Indeed offering larger bonuses just to existing teachers has been considered by an experiment done by Vanderbilt researchers and by experimentation in New York City – and both found that even larger bonuses do not lead to noticeably higher achievement (Podgursky and Springer, 2007, 2011).

Nonetheless, this is not a demonstration that salary policies have no effect on student outcomes. Both the level of salaries and the pattern of salaries across teachers affect who enters and who stays in teaching. Higher salaries and a greater relationship to performance would attract a different group of people into teaching. The award of higher salaries to those who are more effective in the classroom would almost certainly help to retain the best teachers. Indeed, the impact of salaries on selection into teaching is the key issue for those who think that performance pay is important.

One might say, just as is said in other occupations, if teachers are willing to work for the salary that is offered, they are not really being underpaid. But, the problem is that the low pay relative to their value to society too often fails to keep the effective teachers in the classroom and importantly fails to attract others who would also be in this highly effective group. Thus, the result is the “bad equilibrium” where just those people who are willing to enter and to stay in teaching when the pay is set at relatively low levels are attracted to teaching.

The zero option

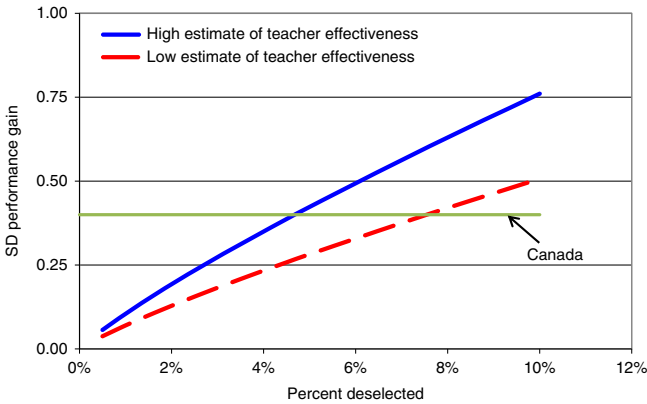
Designing a performance pay system that allows for enhanced pay to the more effective teachers is, however, insufficient by itself. Taking the current single salary schedule and paying bonuses, even substantial bonuses, to very effective teachers or to those in the shortage areas of math and science would tend to expand the supply of these people in teaching and to keep them in the classroom longer. But, it would do little to deal with ineffective teachers. These ineffective teachers already are content with the job and are willing to work for existing pay. They would not be induced to leave just because some other teachers were paid more.

The issue of the bottom ranks of teachers is not a trivial matter. The extension of Figure 1 to the bottom involved large aggregate harm to students in terms of future incomes. It turns out that the damage of the least effective teachers is truly substantial.

A set of calculations shows the impact of ineffective teachers in very vivid terms. Using the evidence described above about the differences between good and bad teachers, it is possible to estimate the impact of the bottom end on the overall achievement levels of US students.

Currently US students are not very competitive with those of other developed countries when measured by international assessments of math and science. In math performance as measured by the PISA tests for 15-year olds, US students fall below the average for developed countries (Organisation for Economic Co-operation and Development, 2013). The USA lags considerably behind a group of East Asian countries (Taiwan, Korea, Japan, Hong Kong, and Singapore). While many are unsurprised by that, most are shocked to find that students in Canada do significantly better than US students.

Here is where changing teacher quality, and specifically worrying about the most ineffective teachers, comes in. Figure 4 uses what is known about the existing distribution of teacher quality to infer what would happen to student achievement if a portion of the poorest teachers could be replaced with an average teacher. The figure



Source: Hanushek (2011)

Figure 4.
Impact on US scores
from replacing
bottom teachers with
an average teachers

highlights the fact that there is some uncertainty about exactly how much difference there is between teachers.

The dashed line uses a conservative estimate that comes from taking a lower bound on how different teachers are. By this, replacing the bottom 8 percent of teachers with an average teacher would bring US achievement up to the level of Canada. Looking at a plausible upper bound on the effectiveness of teachers (as represented by the solid upper line) implies that replacing just 5 percent of the least effective teachers would bring US performance up to Canada – and replacing more to, say, 8 percent could move US students close to the top in the world.

The economic ramifications of such improvements over the long run are extraordinary. Past evidence shows that performance on international tests is closely related to long-term economic growth (Hanushek and Woessmann, 2015). Getting students to Canada would accelerate US long-run growth of GDP, and the gains would be extraordinary. Past history suggests that the rise in income would be equivalent to a rise in paychecks for all workers of 20 percent each year over the next 80 years. At an aggregate level, the gains would be large enough to completely eliminate the current fiscal problems that have so paralyzed the national government. The added GDP could also cover all spending on US K-12 schools.

Yet removing the worst teachers – the zero pay option – has historically proved virtually impossible. As discussed, tenure restrictions, policy that requires laying off just the most junior teachers in the case of reductions, and a variety of other labor laws and contract restrictions lead many to conclude this is infeasible. Reaching such a conclusion means that the nation is willing to accept huge economic losses, ones that endanger the future economic position of the USA (Hanushek *et al.*, 2013).

Recent actions of a number of states suggest reason for optimism. These actions actually deal with a variety of issues that all revolve around the evaluation and reward of teachers. For example, all states except California had unique student identifiers in 2011, and 35 had unique teacher identifiers that allowed linking teachers to students. Such data systems allow compiling data about student performance that can be linked to their teachers. Between 2009 and 2011, a total of 26 states moved to include evidence of student learning in teacher evaluations, and ten states mandated that student learning was the preponderant criterion in local evaluations (National Council on

Teacher Quality, 2014). This is not to say that student test scores should drive all evaluations, but they do give direct information about outcomes.

In teacher tenure decisions, there has also been considerable recent change. More and more states are moving to require evidence of teacher effectiveness and to extend the minimum number of years before tenure is granted. About a third of states also support differential pay in shortage subject areas and do not have regulatory language blocking differential pay. Similarly, about a third of states support differentially rewarding effective teachers (National Council on Teacher Quality, 2014).

There is further a new sense of forward movement at the local level. Perhaps the most dramatic story comes from Washington, DC. This district, by far the worst in the nation in terms of student outcomes, went through agonizing battles between Michele Rhee and the unions. But in 2009 a new contract that introduced both value-added and observational evaluations of teachers and that used them in personnel decisions was introduced. Some 1,000 teachers have received substantial increases in their base salaries because of continued top performance. But close to 500 teachers have been dismissed because of continued poor performance. The whole evaluation system is continually being developed and improved, but it has reached a level of acceptance that bodes well for the future. Importantly, there is credible evidence that the new personnel system has had positive impacts on student outcomes (Dee and Wyckoff, 2015).

Similarly, the Los Angeles Unified School District has moved to remove around 100 poorly performing teachers (Aron, 2013). While this remains small compared to the total number of teachers in Los Angeles, it is orders of magnitude larger than what was seen just a few years prior.

Evaluation of teacher effectiveness

A central issue revolves around developing reliable and acceptable evaluations of teachers. The teachers unions have argued that a system that makes any mistakes in evaluating teachers is unacceptable. Yet the current system, which generally provides few judgments about classroom effectiveness, can be thought of as consistently making mistakes. It is just that the cost of these mistakes is only borne by students and not by any teachers.

A key element of any teacher policy is having an evaluation system that can reliably identify more or less effective teachers. And indeed this has been a focus of much of the research and discussion about estimation of value-added models. The discussion of evaluation of individual teachers with value-added methodology has been extensive, and this line of research has helped to identify key elements of the estimation and use of such models¹⁷. Another line of research has considered alternative evaluation approaches (Jacob and Lefgren, 2008; Kane *et al.*, 2013). In related work, there has been a long-term investigation of whether principals and supervisors can accurately rate teachers on effectiveness, as measured by value-added performance (see Murnane, 1975; Armor *et al.*, 1976; Jacob and Lefgren, 2008; Kane *et al.*, 2013). And, finally, there is consideration of the overall impacts on achievement (Jacob *et al.*, 2010; Winters and Cowen, 2013).

Two points stand out from these discussions. First, it does matter how the evaluation is done in terms of the reliability and validity of any teacher assessments, but careful choices can produce evaluations within the norms applied in other industries. Second, while the analysis has focussed on quantitative value-added measures, virtually nobody believes that value-added measures should be exclusively used. Tests needed for judging value-added are available only for a limited subset of teachers, and they do not capture the range of influence of teachers. Currently more analysis of evaluation systems is needed, but it is starting to develop.

Teachers and leaders

The discussion here has focussed exclusively on teachers, but in many ways this is much too narrow. Principals and other building leaders have a clear impact on the working conditions of schools (Hanushek and Rivkin, 2007; Grissom and Loeb, 2011). And if principals are to be involved in the evaluation process, they must have incentives that are compatible with those for teachers. This topic clearly goes further than can be covered here. Yet, while the consideration of principals is not nearly as advanced as that for teachers, virtually all of the previous discussion applies to them.

Conclusions

The urgency of putting the teaching corps on a better trajectory and of fixing US schools is not completely understood – a point highlighted by Joel Klein and Condoleeza Rice in their discussion of this as a national security issue (Klein *et al.*, 2012).

The message of existing evidence is that the current single salary structure of teacher pay is a fundamental problem. By divorcing pay from teacher performance and from effectiveness in the classroom, school spending will necessarily involve huge inefficiencies. Because salaries are such a large portion of total school spending, there is no consistent relationship between what is spent overall on schools and what it adds to student achievement. Just adding more spending in the schools will be no more likely to lead to gains in the achievement of future students than it did in the past – at least as long as salaries remain unrelated to teacher effectiveness.

The pattern of state policies toward effective teachers has changed dramatically in recent years. The future depends on whether the current changes are sustained and developed or whether policies revert to the past pattern of completely divorcing teacher salaries and effectiveness from policy discussions.

The disconnect between salary and performance makes it politically infeasible to raise the salaries of the best teachers to an appropriate level. The best teachers are woefully underpaid in comparison to the economic impact they have on their students. But the other half of that statement is that the worst teachers are woefully overpaid. The problem of attracting and retaining highly effective teachers will not be solved through increased salaries if it is necessary to give the same increased salaries to highly ineffective teachers. Running US schools in the Soviet tradition is not a recipe for future economic victories.

A new professionalization where teachers take responsibility for their performance and are rewarded for their performance could have dramatic results, ensuring high levels of performance by students and, by implication, the future economic health of the USA. There are many details that need to be added to this picture – ranging from the underlying evaluation system to the magnitude of salary differentials. But the debate has to be about the details, not the overall policy.

Notes

1. This conclusion was introduced in the Coleman Report (Coleman *et al.*, 1966) and has been continued by the finding that families are very important. The finding of the lack of importance of schools reflects the fact that common measures of differences among schools, as noted below, are not closely related to student achievement. More recent work has shown that the conclusion derives from poor measures of the differences among schools.
2. See the recent summary in Hanushek and Rivkin (2010).

3. These estimates rely on existing research into the value-added of teachers. As reviewed in Hanushek and Rivkin (2010), estimates of the impact of teachers are quite consistent across a variety of studies that present estimates from situations where tests are not used in teacher evaluations, i.e., in non-high stakes assessments of student progress.
4. The background of these calculations can be found in Hanushek (2011). All calculations of economic impacts are based on present values at the time of high school graduation where future incomes are discounted at 3 percent per year. In other words, the future path of individual incomes is weighted such that early labor market outcomes get considerably higher weights than later career estimates. The present value is a way of summarizing the entire stream of lifetime earnings and putting it in terms of current values of income.
5. Students taught for primary school teachers in self-contained classrooms would simply be the class size. For others, it would be in terms of full-time equivalents. That is, for a middle school math teachers teaching multiple sections of a class, the students taught would be the effective number of students if the teacher taught all subjects to a given group.
6. This situation, as discussed below, is changing, particularly with regard to teacher shortage areas such as math and science (Podgursky and Springer, 2011).
7. For a summary of evidence, see Rice (2013). Recently, however, Papay and Kraft (2015) argue that returns to experience may be seen over a longer period.
8. The salary differentials can be calculated directly from US Department of Education (2013), table 86.
9. Data on NAEP can be found at: <http://nces.ed.gov/nationsreportcard/>. Over this time periods there have been improvements in scores for the fourth and eighth grade tests in NAEP, but the improvements have not influenced the performance of students at graduation from secondary school.
10. A recent example of the debates is the analysis of the impact of court-ordered spending on achievement in Jackson *et al.* (2015) with the ensuing discussion culminating in <http://educationnext.org/not-right-ballpark/>. Earlier debates can be found in Burtless (1996), Hedges *et al.* (1994), and Mishel and Rothstein (2002).
11. For a general discussion of school finance court cases, see Hanushek and Lindseth (2009).
12. See https://en.wikipedia.org/wiki/Willie_Sutton (accessed July 3, 2015).
13. For a summary of the case and testimony along with the ruling, see <http://studentsmatter.org/our-case/vergara-v-california-case-summary/>
14. The economic outcomes of the competition of low productivity sectors (such as museums or orchestras) when competing with high-productivity sectors is often called “Baumol’s disease,” because it often entails rising costs to the low productivity sector (Baumol and Bowen (1965)). The theory is, however, incompatible with public education where rising salary costs have been accompanied by falling pupil-teacher ratios, i.e., by hiring more of the expensive resource.
15. Data on cognitive skills in various occupations come from the Program for the International Assessment of Adult Competencies (PIAAC), an international survey conducted in 2012. See www.oecd.org/site/piaac/
16. For a discussion of international comparisons along with the cross-country impact of teachers with different cognitive skills, see Hanushek *et al.* (2014).
17. For an overview, see Hanushek and Rivkin (2012). One prominent line of work has focused on possible instability of the estimates across subjects and across time; e.g., Braun (2005), McCaffrey *et al.* (2009), Haertel (2013), and Goldhaber *et al.* (2013). Another line has delved into bias in the estimates, largely through the sorting of students into classrooms; Rothstein (2010), Kane *et al.* (2013), and Chetty *et al.* (2014a).

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