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Does it pay to pay teachers more? Evidence from Texas☆

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ABSTRACT

This study presents robust evidence on the relationship between teacher pay and turnover using detailed panel data from Texas. While controlling for changes in district and local labor market characteristics, I estimate an overall turnover elasticity of −1.4 and show that the effect is largest for inexperienced teachers, declines with experience, and disappears around 19 years of experience. Combining these results with what we know about the relationship between teacher value-added and experience, I show that paying teachers more improves student achievement through higher retention rates. The results also suggest that adopting a flat salary schedule may be a cheap way to improve student performance. I find no evidence that pay effects vary by the teacher's gender or subject taught.

1. Introduction

Important questions that continually confront education policy makers are how much should we pay teachers and how should we shape the teacher salary schedule. Conventional wisdom suggests that paying teachers more will likely improve student outcomes by attracting and retaining better teachers or by influencing current teachers' effort choices. While the potential for a relationship between teacher pay and student achievement exists, current research fails to make a strong connection. The focus of this research is to provide evidence on this relationship so that policy makers can make better decisions regarding the level of teacher pay and the shape of the pay schedule.

Prior studies of the relationship between teacher pay and student outcomes often show null or even negative effects (Hanushek, 1997, 2003). For example, in surveys of the literature prior to 1995, Hanushek (2003,1997) reports that of 119 estimates of the relationship between teacher pay and student performance only 20% are positive and statistically significant, while 7% are negative and 73% are insignificant. A more recent study by Loeb & Page (2000) might provide the best evidence of a relationship between student performance, as measured by dropout rates and college enrollment, and teacher pay. However, even their estimates are likely biased since they cannot control for all time-varying district or state characteristics that may be correlated with changes in teacher pay.

A major reason for a lack of strong evidence in this area stems from the fact that estimating the direct causal link between district salary schedules and student achievement is challenging. First, one must control for changes in district characteristics that may be correlated with changes in student achievement and changes in the salary schedule. This is difficult even when one has access to panel data, since many time-varying district characteristics are unobserved, such as parental support and comprehensive measures of student quality. Second, a change in teacher pay today is likely to influence student outcomes in current and future periods. For example, raising teacher pay may have an immediate impact on the quality of the school, but it is not clear whether that effect will show immediately in student outcomes or if the effect will appear 10 years into the future, as Loeb & Page (2000) model it. If the positive effects of pay increases do not reveal themselves until several years into the future, the task of adequately controlling for changes in district-level characteristics in the periods between a pay increase and the time that the pay increase manifests itself becomes even more difficult.

To avoid the difficulties inherent in making a direct link between teacher pay and student achievement, this study adopts an alternative approach. I link teacher pay to teacher experience, which is known to be related to student achievement. Several studies show that experienced teachers are more productive in terms of raising student achievement in a given school year (Harris and Sass 2011; Papay and Kraft, 2011; Rockoff, 2004). Uncovering the link between teacher pay and experience is the final hurdle researchers must overcome to make a connection between teacher pay and student achievement.

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To make a connection between teacher pay and experience, I focus on how pay can be used to retain more teachers which can increase average teacher experience over time. To do so, I estimate the relationship between teacher pay and teacher turnover using a large panel data set from Texas. I find that increasing teacher pay is effective in retaining teachers who would have otherwise been replaced by relatively inexperienced teachers. The implication is that increasing teacher pay raises average teacher experience in a district.

This study is not the first to investigate the relationship between teacher pay and turnover; however, no prior study makes a clean causal connection between base pay increases and teacher turnover rates. Most prior studies in this area are likely biased because they do not control for time-varying or fixed district characteristics and labor market conditions that could be correlated with teacher pay (Dolton and von der Klaauw, 1995, 1999; Murnane et al., 1989; Murnane et al., 1990; Hanushek et al., 2004; Imazeki, 2005; Rickman and Parker, 1990; Clotfelter et al., 2011; Podgursky et al., 2004). One important empirical result presented here suggests that models that do not control for all time-varying characteristics produce overestimates of the effect of teacher pay on turnover. This may occur because improvements in district working conditions tend to coincide with increases in teacher pay.

Clotfelter et al. (2008) employ a more rigorous empirical design, which controls for time-varying school, district, and labor market characteristics. However, they estimate the effect of a bonus pay program that rewards teachers for working in low-income schools. It is not clear that the results of their study are the same as we would expect to observe for a change in base salaries in a typical school district.

Overall, the current evidence of a relationship between teacher pay and turnover is too weak to inform policy regarding changes in the salary schedule. To better inform policy, we need a study that provides more robust and detailed estimates of the base pay effect. In particular, given what we know about the relationship between student performance and teacher experience, if we uncover how pay effects vary with teacher experience, we can better understand how changes in teacher pay may be related to student performance.

This study contributes to the literature by providing the most robust and detailed estimates to date regarding the relationship between teacher pay and turnover. A large and detailed panel dataset allows this work to overcome many of the difficulties encountered by previous researchers. With this data I am able to estimate teacher pay effects while flexibly controlling for changes in district characteristics and changes in local labor markets.

I find strong evidence of a negative causal relationship between teacher pay and turnover. My estimates suggest that a 1% increase in teacher pay reduces teacher turnover by 0.16 percentage points. In terms of elasticity, this suggests that a 1% increase in teacher pay reduces the turnover rate by 1.4%. Further, this pay elasticity is largest (in absolute value) for less experienced teachers and begins to decrease rapidly after around 7–8 years of experience. The effect disappears for teachers with around 19 or more years of experience. I find no evidence that pay effects vary by the teacher's subject taught or gender.

Combining these results with our knowledge of the teacher experience–productivity profile, I show that increasing teacher pay improves student performance by retaining more teachers, which increases the average experience of teachers in the district. I also show that districts may improve student performance by adopting a flat salary schedule, but this result depends on strong assumptions about teacher selection and effort that have not been tested. In terms of size, I show small effects of paying higher teacher salaries, but I argue that these estimates are likely lower bounds on the pay effect since I focus on only the retention effects of a pay increase. Increasing teacher pay is also likely to improve student performance through mechanisms not considered in this study.

This work is organized as follows: Section 2 motivates the empirical model with a discussion of the theoretical links between teacher pay, turnover, and education quality; Section 3 describes the data; Section 4 presents the regression model and results; section 5 discusses implications of the results for district policy and student achievement; Section 6 concludes.

2. Conceptual framework

Increasing teacher pay is likely to affect education quality through turnover reduction (or retention), which is the focus of this study. We know that there is a dynamic component of teacher quality in that, on average, teachers improve with experience (Harris and Sass 2011; Papay and Kraft, 2011; Rockoff, 2004). Thus, retaining more teachers will help schools reap the benefit of teachers learning on the job. In addition to this retention effect, increasing teacher pay is likely to improve education quality by influencing teacher effort or by differentially attracting and retaining teachers from the high end of the fixed ability distribution.

With regard to effort, efficiency wage theory suggests that increases in teacher salaries can provide an incentive for teachers to exert more effort by increasing morale or increasing the penalty associated with effort-related job termination (Shapiro and Stiglitz, 1984; Akerlof, 1982). Pay induced increases in teacher effort could presumably lead to a number of changes in teacher behavior that are conducive to student learning, including: spending more time on lecture preparation, providing more and better student feedback, spending more time with students outside of class, or taking a more active role in mentoring students.

With regard to differential selection and retention, raising teacher pay at the district level could attract a larger pool of teacher candidates that are inherently better at teaching (high ability). This is likely to occur when high quality teachers tend to have higher earnings potential in other occupations or in other teaching jobs outside of the district. Under this condition, raising teacher pay in the district could make a teaching position in the district attractive enough to lure high ability teachers away from their high paying outside opportunities. Even if the school district is not able to identify ability in the hiring process, a random hire from the distribution of applicants after a pay raise is likely to be of higher quality than a random draw from previous distributions. The theoretical mechanism is similar for differential retention. Higher pay has the potential to retain more of the most able teachers if those teachers are more responsive to salary or if they have higher attrition rates.

This study focuses on the link from teacher pay to student achievement through its potential to retain a more experienced and productive teaching staff. The point of discussing alternative pathways is to highlight the possibility that increases in teacher pay may improve student achievement through mechanisms that are unrelated to teacher experience. Therefore, it is important to bear in mind that the teacher pay effects derived in this study are likely lower bounds on the overall impact of raising teacher pay on student achievement.

The Burdett (1978) on-the-job search model motivates this work's empirical specification of the relationship between teacher pay and turnover. In the on-the-job search model, the worker's turnover behavior is a consequence of two decisions. First, workers choose whether to search for an alternative occupation given their current wage and some knowledge of the distribution of outside job opportunities. In this phase, workers choose among three options: search for alternative employment while continuing the current occupation, quit the current occupation and search while unemployed, and do not search.

Here, the optimal strategy involves dual reservation wages which depend on the wage distribution of outside opportunities (local labor market conditions) and search costs (effort and monetary costs) (Burdett, 1978). The dual reservation wages create three decision regions. If the worker's current wage is higher than the highest reservation wage, then the optimal strategy is to forgo a search. If the worker's current wage is between the two reservation wages then the optimal strategy is to search while remaining employed. Finally, if the workers