

Research Brief
**Salary Incentives and Teacher Quality:
The Effect of a District-Level Salary Increase on Teacher Retention**

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Synopsis

Teacher retention is an important goal for urban school districts. In an effort to improve teacher retention, one popular strategy is to raise teacher salaries, often in targeted areas. However, there is little evidence on whether salary increases can improve retention in urban schools and districts. Moreover, there is even less evidence on whether such salary incentives can be effective in retaining the most highly-effective teachers. Studying a policy in the San Francisco Unified School District, the author investigates whether teacher retention increased for those teachers targeted by salary increases. The author shows that teacher retention did increase in the time period, but that increases are most likely due to the economic downturn that occurred simultaneously. Teachers who were targeted for overall salary increases did not have a *differential* increase in retention rates, indicating that the increases in retention rates were driven by economic changes rather than by the policy.

Key Findings

- Teacher retention rates increased dramatically in the time period following the implementation of the salary increase.
- However, there was no differential increase in retention rates for teachers targeted by salary increases.
- The lack of observed effect is likely due to the dramatic increase in retention rates overall; there is particularly little room for improvement in the retention rates of highly-effective teachers, which reached over 90% after QTEA.

Background

Research consistently shows that teacher quality is a powerful determinant of student achievement gains (Chetty, et al., 2010; Rivkin, Hanushek, & Kain, 2005). Yet, urban school districts often struggle to staff their schools with highly effective teachers. The result is that low-performing, low-income, and/or minority students are more likely to have lower-quality teachers (Peske & Haycock, 2006). This disparity seems to begin with teacher recruitment but is exacerbated by teacher retention; urban school districts have a harder time recruiting teachers, and their retention rates are much lower than surrounding districts in the labor market (Lankford, Loeb, & Wyckoff, 2002).

Because of the known importance of high-quality teachers, urban school districts often strive to improve the retention of the most highly-effective teachers. In addition, it may also be beneficial for urban districts to improve the retention of all teachers in the workforce; there is research to

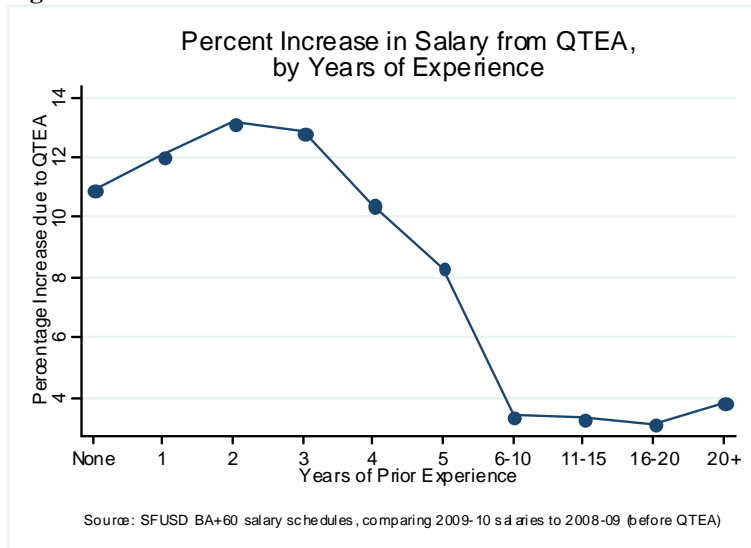
suggest that teacher turnover may have disruptive effects in schools, regardless of the kinds of teachers who leave (Guin, 2004; Ronfeldt, Lankford, Loeb, & Wyckoff, 2011).

While there are many ways to improve teacher retention, one popular strategy for urban school districts is to raise teacher salaries, often in targeted areas (Murphy & DeArmond, 2003; Prince, 2003; Strunk & Zeehandelaar, 2011). The theory behind such interventions is that raising teacher salaries will make difficult positions more attractive by providing a “compensating differential” for characteristics of the job that may be less desirable. Urban school districts are often considered more difficult places to work because of the working conditions, such as school facilities, location of the school, and student characteristics (see, for example, Boyd, Lankford, Loeb, & Wyckoff, 2005; Buckley, Schneider, & Shang, 2004; Scafidi, Sjoquist, & Stinebrickner, 2007). Because teachers make career choices based on a variety of preferences, including these working conditions and compensation, by introducing additional salary and bonuses, policy-makers hope to encourage teachers to trade off some more desirable characteristics of the job for this increased pay. In this way, such policies aim to encourage teachers to remain in their positions, thus improving teacher retention overall.

While there is evidence to suggest that teacher retention in general is improved by increases in compensation (e.g., Murnane, Singer, & Willett, 1989; Reed, Rueben, & Barbour, 2006), there is little evidence on whether salary increases can improve retention in urban school districts and in schools serving high proportions of minority and low-income students. Moreover, there is even less evidence on whether such salary incentives can be effective in retaining the most highly-effective teachers.

In order to better understand the effect of compensation on improving teacher retention in an urban school district, this study explores how teacher retention was affected by compensation increases introduced by the Quality Teacher and Education Act (QTEA) of 2008 in the San Francisco Unified School District (SFUSD).ⁱ QTEA introduced a substantial overall salary increase that was targeted toward early-career teachers. As shown in Figure 1, teachers with five or fewer years of prior experience stood to gain an 8-13% salary increase as a result of QTEA, while those with six or more years of experience stood to gain significantly less.ⁱⁱ QTEA also provided a \$2,000 bonus for teaching in a hard-to-staff (HTS) school, and retention bonuses of \$2,500 after the 4th year of service in the district and \$3,000 after the 8th year of service.ⁱⁱⁱ

Figure 1.



If QTEA was effective in improving teacher retention, we would expect the retention rates to improve specifically for those teachers who were “targeted” by QTEA. To explore whether retention rates improved overall as a result of QTEA, and whether retention rates specifically improved for highly-effective teachers, the author asks the following research questions:

- To what extent did teacher retention improve for teachers targeted by QTEA’s:
 - Overall salary increases?
 - Retention bonuses?
 - Hard-to-staff school bonuses?
- Did the retention of highly-effective teachers improve after QTEA?

Data and Methods

To study changes in teacher retention, the author employs a dataset containing all SFUSD teachers linked to students and schools over the time period 2002-03 through 2010-11. Over the nine year time-frame, 6,024 unique individuals served as teachers in SFUSD, with a total of 25,291 teacher-year observations. From this dataset the author is able to observe whether teachers leave, stay, or transfer in each school year, to identify which QTEA salary incentives each teacher was targeted for, as well as to calculate a measure of “teacher quality” which estimates each teachers’ contribution to student achievement in each year.^{iv}

Because QTEA’s implementation corresponded with an economic downturn, a causal approach is needed to separate the effect of QTEA from other secular trends. QTEA was first implemented in the 2008-09 school year^v; in this year, unemployment rates in the Bay Area went from 5.6% to 9.6%. The scarcity of alternate employment opportunities, either in teaching or in other occupations, could have led to a change in teacher retention even in the absence of QTEA. Furthermore, as a result of state-level budget cuts, the district gave layoff notices to a record number of teachers during the same time period. These economic changes could simultaneously

increase retention (if there are fewer alternate job options) and decrease retention (if teachers are laid off).

Thus, to isolate the effect of each salary incentive, the author creates a sample of teachers who are arguably similar in the way they were affected by the economy (or other secular trends), but different in the way they were affected by QTEA. The author then isolates the “QTEA effect” on teacher retention using a difference-in-differences approach comparing the change in retention behavior of teachers who were “targeted” for salary increases to those who were not targeted.^{vi} In this way, even if the retention of all teachers is affected by the economy, as long as “non-targeted” teachers are affected in the same way as the targeted teachers, the changes in retention rates for “non-targeted” teachers represent the “secular trend,” or what happened as a result of the economy. To isolate QTEA’s true effect, the author differences out this trend from changes in “targeted” teachers’ retention rates. A separate comparison group is employed to study the effect of each compensation incentive:

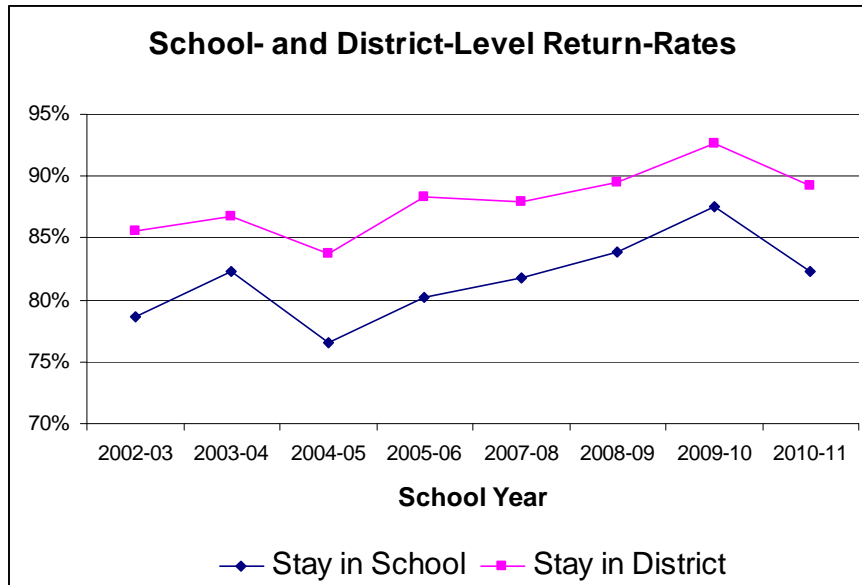
- *Overall salary increase:* Teachers are considered “targeted” by QTEA’s overall salary increases if they would have gained 6% or more in the following year (compared to the expected salary before QTEA) as a result of the policy. Because the salary increase introduced as a result of QTEA varies across teachers at different placements on the salary schedule, the implementation of QTEA can be thought of as a natural experiment. That is, any changes in retention outcomes for applicants who are “targeted” for the salary increases compared to those who were “non-targeted” can be attributed to QTEA. To ensure that the analysis compares teachers who would be similarly affected by the economy but differently affected by QTEA, the author excludes first and second year teachers and applicants with more than 15 years of teaching experience. This approach excludes less experienced teachers, who may be targeted by layoffs or could have particular trouble finding other employment, and more experienced teachers, whose retirement decisions may be affected by the economy.
- *Retention bonus:* Teachers in their 4th and 8th year of service are “targeted” for the retention bonus. However, it is difficult to identify the teachers who would have received the bonus after their 8th year with SFUSD’s administrative data.^{vii} For this reason, the author limits the sample to teachers with three to five years of service within SFUSD, as those with four years of service are targeted for the bonus, and individuals with three or five years of service within SFUSD should be similarly affected by the economy.
- *Hard-to-staff school bonus:* The author employs a matching strategy to create a comparison group of schools that are similar to the schools designated “hard-to-staff” in all ways except for the fact that some actually received the designation. Then, by comparing hard-to-staff schools to their matches, the author is able to isolate the effect of the bonus on teacher retention in hard-to-staff schools.

In the second research question, the author investigates whether retention rates of highly-effective teachers increased after the introduction of QTEA, again employing a difference-in-differences approach.^{viii} Specifically, the author investigates whether retention rates of highly-effective teachers in Math and/or English Language Arts increased after QTEA relative to less effective teachers.

Findings

A first look into the effect of QTEA on teacher retention in SFUSD is to observe return behavior for all teachers before and after implementation of the policy. Such an approach is not causal but describes how retention may have changed in the period after QTEA implementation. As shown in Figure 2, both within-school and district-level retention increased after the implementation of QTEA. A formal analysis indicates that after QTEA, a teachers' likelihood of staying in his or her school increases by a factor of 1.56 relative to leaving. Similarly, a teachers' likelihood of staying in the district but transferring schools increases by a factor of 1.32 relative to leaving. This is the pattern we would expect to see if QTEA has had an effect: teacher within-school retention improves, and those that are unhappy at their school site are more likely to transfer to another school within SFUSD rather than leave the district. As a descriptive analysis, this approach does not control for changes in the economy, which is why a causal analysis is needed.

Figure 2.



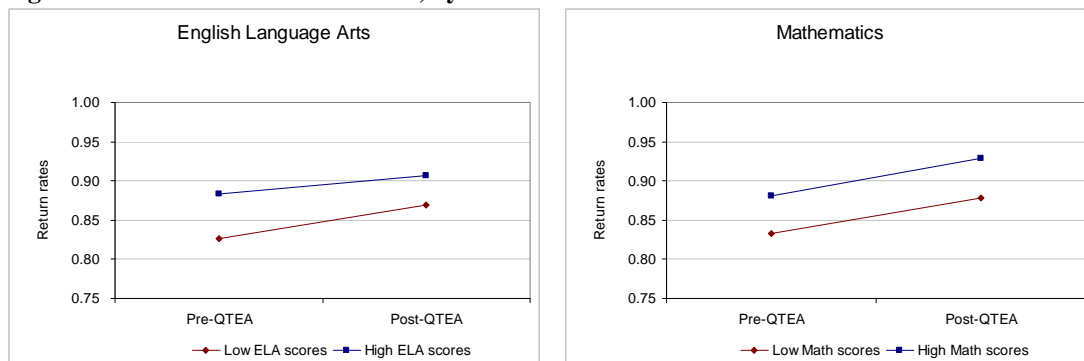
For causal interpretations, the author must isolate the QTEA effect by comparing the change in retention behavior for teachers who are “targeted” for each of the salary interventions compared to those who are not targeted. A differential increase in retention rates for “targeted” teachers compared to the overall trend would show that QTEA’s salary increases improved retention rates for the targeted teachers above the “economic effect” seen district-wide.

Unfortunately, the pattern of results in this causal analysis shows that QTEA had a minor (if any) effect; teachers targeted by QTEA’s salary increases did not have a differential increase in retention rates above the overall trend. Of many tests, the author identifies only two significant findings suggesting a “QTEA effect.” First, teachers targeted for overall salary increases had higher within-school retention rates *only* in the first full year of QTEA implementation (2009-10); the author estimates the within-school retention rate for teachers targeted by the overall salary increase to be 4.5 percentage points higher than it would have been in the absence of QTEA. Second, teachers targeted for the retention bonus had higher retention rates only in hard-

to-staff schools; the author estimates the within-school retention rate for 4th year teachers in hard-to-staff schools to be 14.5 percentage points higher than it would have been in the absence of QTEA.

In studying changes in teacher retention by teacher quality, the author finds that teachers with high levels of contribution to student achievement (in both English Language Arts and Math) are more likely to return to their schools the next year than their less effective peers; return-rates of both groups increases after QTEA, but there is not a differential effect for the highly-effective teachers. As shown in Figure 3, in ELA, the within-school return rate for the less effective teachers increases from 83% to 87%, and for highly-effective teachers from 88% to 91%. In Math, the within-school return rate for less effective teachers goes from 83-88% and for highly-effective teachers from 88-93%.

Figure 3. Within-school return-rates, by teacher effectiveness



Conclusion

Taken together, these results indicate that QTEA’s salary increases did not have a differential effect on teacher retention for the targeted teachers or for highly-effective teachers. While overall retention did increase in the district in the time period after QTEA, teachers who were targeted for overall salary increases did not have a *differential* increase in retention rates. This indicates that the increases in retention rates were driven by economic changes rather than by QTEA.

The analyses presented here suggest that that the economic downturn corresponding with QTEA’s implementation limited the policy’s possible effect on teacher retention. After QTEA, teachers were nearly 50% more likely to stay in their schools than before. However, this is likely an economic effect, rather than a “QTEA effect,” since the majority of the author’s attempts to isolate a causal effect of QTEA’s salary incentives produced null results.

While the author was not able to detect a change in teacher retention as a result of QTEA at this time, these null findings should not be interpreted as an indication that compensation cannot affect improvements in teacher retention in an urban district. This study only assesses QTEA’s effect in its first two full years of implementation; during this time period, teacher retention increased dramatically as a result of economic downturn, leaving little ability for QTEA to have an effect. Furthermore, there is particularly little room for improvement in the retention rates of highly-effective teachers, which reached over 90% after QTEA.

There is reason to believe that QTEA could affect teacher retention once the economy improves; if teacher retention begins to decline again, teacher retention could once again become an important policy goal. However, at this time, teacher retention has not been affected by QTEA's changes to teacher compensation.

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ⁱ The full report can be found online at <http://cepa.stanford.edu/content/the-effect-of-a-district-level-salary-increase-on-teacher-retention>

ⁱⁱ The example provided in Figure 1 provides salary increases as a result of QTEA for the teachers on the salary schedule BA + 60 units of continuing education units.

ⁱⁱⁱ QTEA also introduced targeted incentives in particular subjects, a retention bonus of \$3,000 after the 8th year, and a number of initiatives in teacher support and accountability. For more detail on QTEA, see Hough (2009) or Hough, Loeb & Plank (2010).

^{iv} Such scores, while imperfect, are widely used in education for both accountability and research purposes, and are one of the only measures of teacher quality that can be calculated using existing data sources (McCaffrey, Koretz, Lockwood, & Hamilton, 2003).

^v In the 2008-09 school year, QTEA was only partially implemented. Teachers received only half the salary increase that would go into full effect in 2009-10 and every year thereafter for 20 years.

^{vi} The actual model employed is a multinomial logit model. The author is interested in understanding changes in the proportions of teachers who stayed in their school, transferred to another school in SFUSD, or left the district before and after QTEA. Because this outcome is categorical, a multinomial logit model is appropriate; in such a model, the probability of each occurrence is estimated relative to a base outcome (Long, 1997).

^{vii} For teachers identified as being in their 9th year of service (targeted for the bonus after their 8th year), 45% of them actually received the bonus in 2009-10, and 69% in 2010-11. (As a comparison, for teachers in their 5th year, 66% of those identified actually received the bonus in 2009-10, and 67% in 2010-11. While the accuracy of the identification of 9th year teachers improved in 2010-11, the match between teachers identified as being in their 9th year of service and those receiving the bonus is too low in 2009-10 to use them in analysis at this time. In the full report, they are included in a model specification.

^{viii} The author uses scores measuring teachers' contribution to student achievement to define teachers as either "highly-effective" or "less-effective", placing half of the teachers in each year, grade, and subject in each category. This strategy removes some of the variability in scores associated with teacher-by-year estimates of teacher's contribution to student achievement (Atteberry, 2011; Koedel & Betts, 2007; McCaffrey, Sass, Lockwood, & Mihaly, 2009), hopefully better identifying teachers who are more effective. The analytic sample for this question includes all teachers with such scores; 4,878 teachers in ELA, and 4,745 teachers in Math, with 50% of teachers in each subject in each effectiveness category.