

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

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Synopsis

Research consistently shows that teacher quality is a powerful determinant of student achievement gains, yet, urban school districts often struggle to staff their schools with qualified teachers. This problem seems to begin with teacher recruitment. In order to improve teacher recruitment, a popular intervention for urban school districts is raising teacher salaries to improve the school district's attractiveness within the local labor market. Yet little is known about the effectiveness of such interventions. In this study, the author investigates changes in teacher recruitment in one urban school district as a result of a salary increase. Studying a policy in the San Francisco Unified School District, the author shows that a differential salary increase can improve a school district's attractiveness within the local teacher labor market and increase both the size and quality of the teacher applicant pool, having the potential to increase the quality of new-hires.

Key Findings

- A salary increase in an urban school district can attract more applicants.
- The policy attracted applicants who would have only applied to higher-paying school districts in the absence of the salary increase.
- Improvements in the applicant pool can lead to an increase in the quality of new-hires.

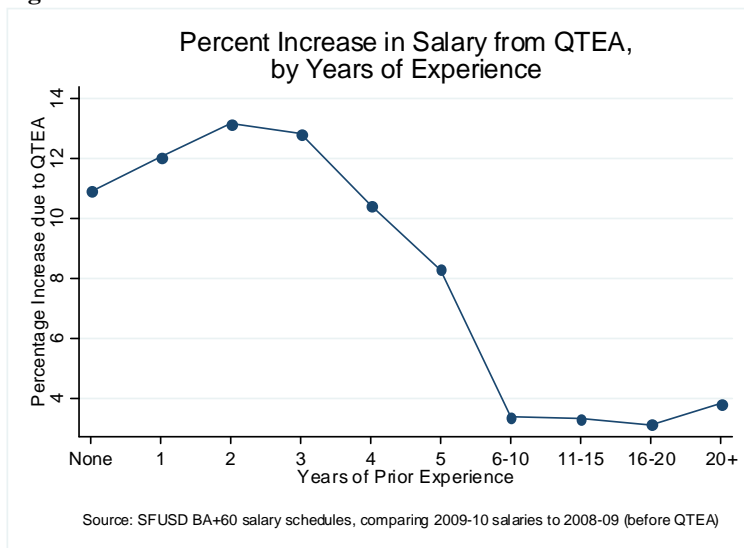
Background

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 qualified 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 problem seems to begin with teacher recruitment; districts that serve these students – particularly urban school districts – have a harder time recruiting qualified teachers than their suburban counterparts (Lankford, Loeb, & Wyckoff, 2002).

In order to improve teacher recruitment, a popular intervention for urban school districts is raising teacher salaries to improve the school district's attractiveness within the local labor market (Koppich & Rigby, 2009; Milanowski, 2002). Research has shown that large-scale changes in compensation can encourage people to enter the teaching workforce (e.g., Manski, 1987; Murnane, Singer, & Willett, 1989). However, there is little empirical work studying the effectiveness of compensation increases in recruiting high-quality teachers in urban districts.

To better understand the effect of compensation on improving teacher recruitment in an urban school district, this study explores how both the teacher applicant pool and the cohorts of new-hires improved after a teacher salary increase in the San Francisco Unified School District (SFUSD).ⁱ The Quality Teacher and Education Act (QTEA) of 2008 introduced a substantial overall salary increase targeted toward early-career teachers.ⁱⁱ 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 substantially less.ⁱⁱⁱ In this study, teachers are considered “targeted” by QTEA’s overall salary increases if they would have gained 6% or more as a result of the policy.

Figure 1.



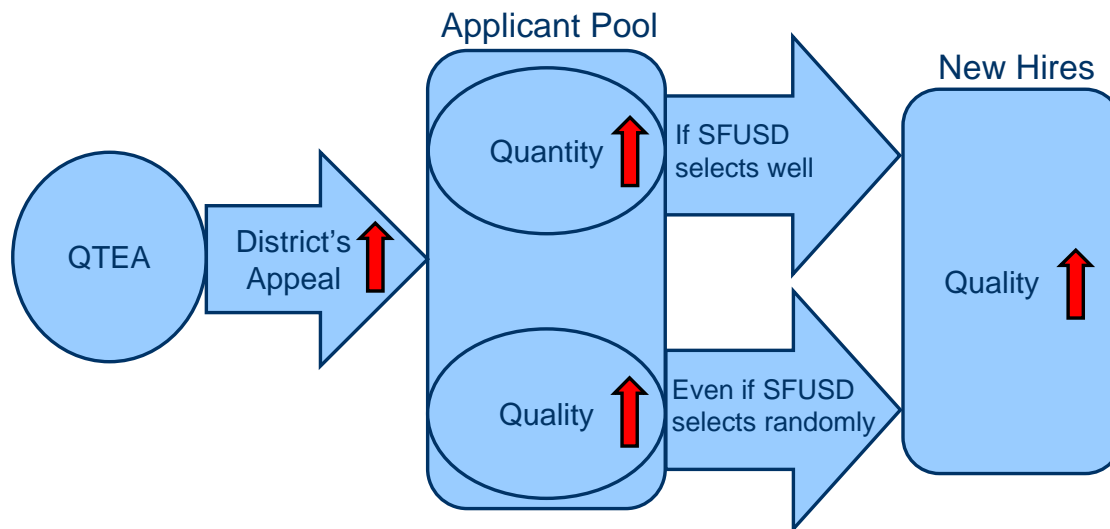
If QTEA was effective in attracting teacher applicants, we would expect those teachers who were targeted by QTEA to apply to SFUSD in larger numbers after the introduction of the policy. In addition, we would expect these targeted applicants to be those that have a preference for higher salary. Applicants most frequently apply to multiple districts simultaneously. Thus, we would expect that if applicants were drawn to SFUSD by QTEA’s higher salaries, the average salaries of the other districts they applied to would be higher than applicants before QTEA.

There is also theory to suggest that applicants who are attracted to higher salaries may also be higher quality candidates. The foundation of this theory is that workers, in general, want to be compensated for their quality and will seek out compensation that matches their abilities (Weiss, 1980). In teacher labor markets, workers are generally not compensated directly for their productivity; rather, the primary way for teachers to increase their compensation is to transfer districts, since there is dramatic variation in teacher salaries across districts even within the same labor market (Boyd, Lankford, Loeb, & Wyckoff, 2003). Thus it follows that high-quality teachers seeking to be compensated accordingly would be drawn to higher salary districts.

In this way, the author posits that the size and quality of the applicant pool could improve as a result of the salary increase. If either scenario is true, the quality of new-hires in the district should increase accordingly. First, if the *size* of the applicant pool increases, there would be more candidates in the pool, which should mean that the quality of new-hires should increase if the

district selects teachers well. Second, if the *quality* of the applicant pool increases, the quality of new-hires should increase even if the district hires teachers at random. This process is visualized in Figure 2.

Figure 2.



To explore possible improvements in the applicant pool and the cohorts of new-hires, the author asks the following research questions:

- Changes to the applicant pool
 - Did QTEA attract more applicants in targeted areas?
 - Did QTEA attract applicants from higher-paying school districts?
- Changes to the cohorts of new-hires
 - Did SFUSD hire more teachers in areas targeted by QTEA?
 - Did QTEA improve the quality of new-hires in SFUSD?

Data and Methods

QTEA implementation corresponded with an economic downturn, which could affect teacher recruitment even in the absence of the policy. QTEA was first implemented in the 2008-09 school year^{iv}; in this year, unemployment rates in the Bay Area went from 5.6% to 9.6%. The scarcity of jobs, either in teaching or in other occupations, could have led to a change in teacher recruitment without QTEA. Thus, in order to identify the effect of the policy on teacher recruitment in SFUSD, the empirical approach needs to separate the effect of QTEA from other secular trends.

In isolating the causal effect of QTEA, the basic goal is to identify applicants who are similarly affected by economic changes (or other secular trends) but differently affected by QTEA.^v Because some applicants stood to gain much more than others as a result of QTEA, QTEA's overall salary increases can be thought of as a natural experiment. If applicants in the "targeted" and "non-targeted" groups are similarly affected by economic changes, any changes in recruitment 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 groups are comparable, the author excludes first and second year teachers and applicants with more than 15 years of teaching experience from most analyses. This approach excludes less experienced teachers, who may have problems securing their first positions or may have been laid off from a previous position, and more experienced teachers, whose retirement decisions may be affected by the economy. In this way, since “non-targeted” applicants are affected in the same way as the “targeted” applicants, the changes in recruitment outcomes for “non-targeted” teachers represent the “secular trend,” or what happened as a result of the economy, and differential improvements for “targeted” teachers represent the “QTEA effect.” Different methods are employed for studying changes to the applicant pool and changes to the cohorts of new-hires.

Changes to the applicant pool

To study the effect of QTEA on the applicant pool, the author combined surveys from applicants and teachers in 2008 and 2010 with SFUSD’s administrative data to build a dataset representing applicant cohorts from 2004-05 to 2010-11 (N = 1,611, representing 6,767). The questions asked on these surveys enable the author to identify the percentage increase in salary each applicant would have gained as a result of QTEA, as well as to calculate the average salary of the other districts applicants applied to.^{vi}

To study whether the size of the applicant pool increased as a result of QTEA, the author investigates whether the proportion of targeted teachers in the pool increased after QTEA. An increase in the proportion of targeted applicants after QTEA would suggest that the salary increase was effective in recruiting teachers in the targeted areas. Because targeted and non-targeted applicants differed only in how they were affected by the policy, if the proportion of targeted applicants increased relative to non-targeted applicants it shows that these applicants were drawn to the district by the QTEA salary increases.

To study whether applicants were drawn from higher salary districts after QTEA, the author compares the average salary of the other districts applied to (in addition to SFUSD) for cohorts before and after QTEA. An increase in the average salary of other districts applied to by the targeted group after QTEA would show that these applicants included SFUSD in their job search because they prefer districts with higher salaries and now consider SFUSD to be more competitive with higher-paying school districts. To separate the effect of QTEA from the effect of the economy, the author uses a *difference-in-differences* approach, comparing the difference in the average salaries of other districts applied to for targeted applicants before and after QTEA to the difference in the average salaries of other districts applied to for non-targeted applicants before and after QTEA. An increase for targeted applicants as compared to the trend represented by the non-targeted applicants represents the “QTEA effect.” As discussed above, an increase in the average salary of other districts applied to by the targeted group may also provide an indication that these targeted applicants are higher-quality.

Changes to the cohorts of new-hires

Following from the analysis of the applicant pool, the author investigates whether observed changes in the applicant pool resulted in improvements in the cohorts of new-hires after QTEA.

To do so, the author uses a dataset containing all SFUSD teachers linked to students and schools over the time period 2004-05 through 2010-11. The population of interest here is new-hires in each year (N = 2,456). From this dataset the author is able to identify the percentage increase in salary each new-hire would have gained as a result of QTEA, as well as to calculate a measure of “teacher quality” which estimates each teachers’ contribution to student achievement in each year.^{vii}

First, the author investigates whether there are more “targeted” new-hires after the introduction of QTEA. An increase in the proportion of new-hires in targeted areas would provide an indication that these targeted applicants are higher quality, since they were ultimately hired.

Second, the author investigates how the quality (as measured by each teachers’ contribution to student achievement) of new-hires increases after the introduction of QTEA. An increase in the quality of new-hires overall would provide evidence that QTEA had been effective in improving the size and/or quality of the applicant pool, since the overall quality of new-hires increased. Specifically, the author investigates whether the quality of new-hires (in their first year) in Math and English Language Arts is higher after QTEA than before. Due to complications in comparing the scores measuring teachers’ contribution to student achievement across years, the author compares the scores in each group to a stable reference group.^{viii}

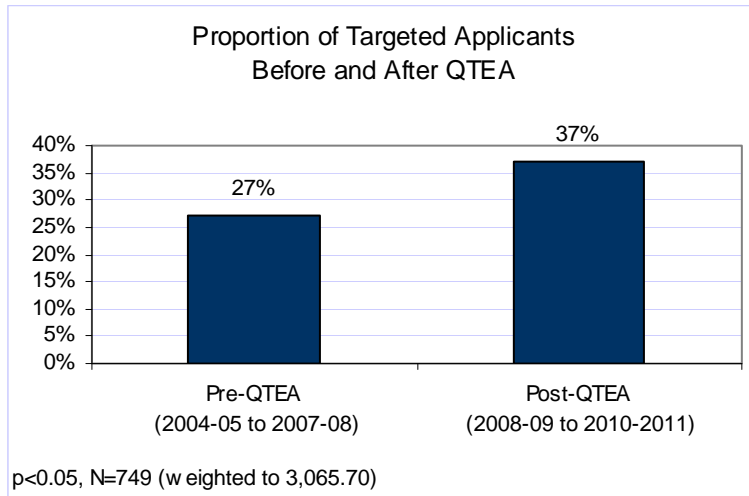
Unlike the analysis of QTEA’s changes to the applicant pool, here the author does not restrict the sample by teacher experience. As a result of a downturn in the economy, we might expect teachers with less experience to be in the applicant pool, which could inflate the estimate of the “QTEA effect” if they are included. However, more of these applicants in the pool does not mean that they would necessarily be hired, unless they were of higher quality. Thus, a higher proportion of targeted teachers in the pool of new-hires would indicate a QTEA effect, even if the least experienced teachers are included. Furthermore, an increase in overall quality of new-hires, would suggest a “QTEA effect” as well.

Findings

Changes to the applicant pool

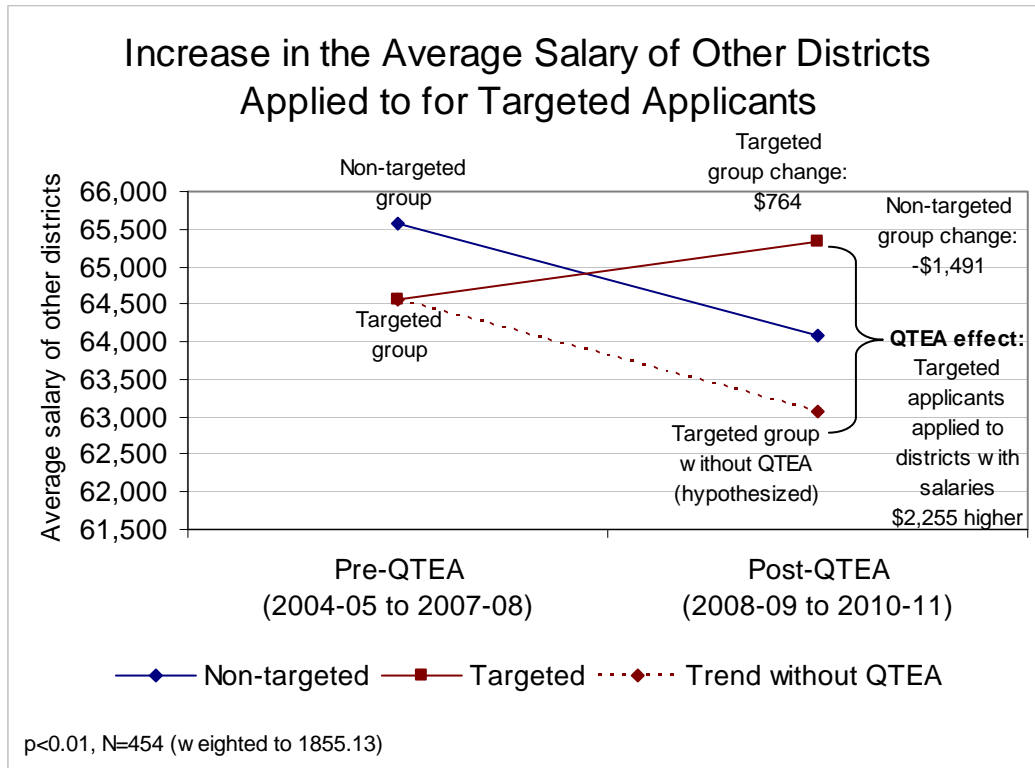
QTEA’s salary increase seems to have been effective in increasing the size of the applicant pool. As shown in Figure 3, before QTEA, 27% of the applicants were in the targeted group, whereas after QTEA, 37% of the applicants were in the targeted group. Because targeted and non-targeted applicants differed in how they were affected by the policy but not how they were affected by the economy, this increase in the proportion of targeted applicants relative to non-targeted applicants indicates that more applicants were drawn to the district by the QTEA salary increases.

Figure 3.



In addition, these “targeted” applicants seem to have been those who would have only applied to higher-paying school districts in the absence of QTEA. As shown in Figure 4, for the non-targeted group, the average salary of other districts applied to decreased after QTEA, likely due to the downturn in the economy. The targeted group applied to lower salary districts than the non-targeted group before QTEA; probably because they have slightly fewer years of teaching experience. However, for the targeted group, the average salary of other districts applied to increased after QTEA. The true “QTEA effect” is the difference between the targeted group’s actual average salary and the hypothesized outcome if QTEA had not been implemented. Thus, for targeted teachers, the average salaries of other districts applied to were \$2,255 higher than they would have been in the absence of QTEA. This increase in the average salary of other districts applied to by the targeted group after QTEA shows that these applicants included SFUSD in their job search because they prefer districts with higher salaries and now consider SFUSD to be more competitive with higher-paying school districts.

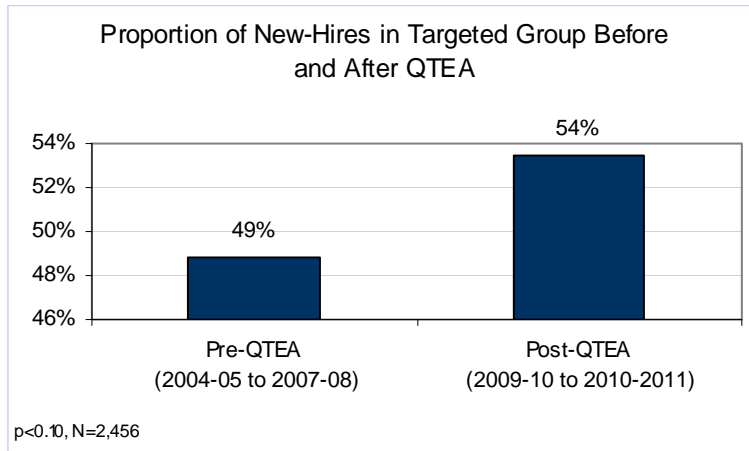
Figure 4.



Changes to the Cohorts of New-Hires

After the introduction of QTEA, the proportion of new-hires in the targeted group did in fact increase, but that there seems to have been a lagged effect. As shown in Figure 5, in the time period before QTEA implementation, 49% of the new-hires were in the targeted group, and in 2009-10 and beyond, 54% of the new-hires were in the targeted group. However, the proportion of new-hires is no different in the first (partial) year of implementation (2008-09) than it was prior to QTEA implementation. This increase in the proportion of new-hires in targeted areas provides an indication that these targeted applicants are higher quality, since they were ultimately hired.

Figure 5.



Building off these results, the author finds that the quality of new-hires increased after QTEA in ELA but not Mathematics. Because the model employed compares new-hires before and after QTEA to a stable reference group, the results of the model show both how the quality of new-hires differs from the reference group and how the quality of new hires changed after QTEA. New-hires generally have lower “quality” scores than teachers in the reference group; their scores are 0.45 of a standard deviation lower than teachers in the reference group. However, the quality of new-hires increased dramatically during the implementation of QTEA. For teachers hired in 2009-10, their “quality” scores were 0.34 of a standard deviation higher than teachers hired in the time period 2004-05 through 2007-08.^{ix} Again, it appears that this increase in quality is driven by an increase in the quality of new-hires in 2009-10 (rather than in 2008-09).

Conclusions

In this paper, the author explores both how the applicant pool changed as a result of QTEA and how the quality of new-hires changed as a result of changes to the applicant pool. The author shows that a differential salary increase can improve a school district’s attractiveness within the local teacher labor market and increase both the size and quality of the teacher applicant pool, and that such changes to the applicant pool have the potential to increase the quality of new-hires. Because this approach looks at both changes to the applicant pool and new-hires, taken as a whole, this investigation provides strong evidence that a district-level salary increase can have a positive effect on teacher recruitment in an urban school district.

The analyses presented here provide a first step in understanding the potential effect of policies like QTEA in improving the quality of the teacher workforce in urban school districts. The fact that the author is able to detect change in such a short time provides an indication that compensation increases, even of a relatively small size, can be used as a lever for redistributing teachers, which is particularly important given the substantially unequal sorting of teacher quality across schools and districts.

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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-recruitment>

ⁱⁱ QTEA also introduced targeted incentives in particular schools and subjects, retention bonuses, and a number of initiatives in teacher support and accountability. For more detail on QTEA, see Hough & Loeb (2009) or Hough, Loeb & Plank (2010).

ⁱⁱⁱ 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.

^{iv} 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.

^v Note: there were significant changes in recruitment policies at the district office corresponding with QTEA implementation. However, these changes affected all potential applicants (not those differentially affected by QTEA), so the methods detailed here control for such changes.

^{vi} Applicants listed all of the local school districts they applied to at the same time they applied to SFUSD. The average salary of other districts applied to was then calculated based on these applicant reports.

^{vii} 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).

^{viii} Note, scores measuring teachers' contribution to student achievement can only be calculated for new-hires in tested grades and subjects. Thus, approximately 20% of teachers have either a score in math or ELA in each year (N=400).

^{ix} Scores measuring teachers' contribution to student achievement could only be calculated for teachers through 2009-10, as data was not yet available to calculate the scores for the 2010-11 school year.