The Effect of Rigorous Teacher Evaluations on Workforce Quality
Part 1: Teacher Exits from HISD

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The Effective Teachers Initiative (ETI) aims to provide better information to principals about teacher effectiveness via more rigorous and comprehensive teacher evaluations. Prior to the ETI, ineffective teachers were slightly more likely to exit HISD than effective teachers and there was no difference in exit rates for ineffective teachers between high- and low-achieving schools. We find that the ETI significantly strengthened the negative correlation between teacher exit and quality at HISD. In particular, the ETI resulted in a large increase in the relative likelihood of district exit for low-performing teachers. Our findings for the district overall are driven by a disproportionate policy response at lower-achieving HISD schools, where there are large differences between the pre- and post-ETI periods in terms of how teacher exits align with teacher quality. On the whole, our results indicate that the ETI has improved the quality of the teaching workforce at HISD through its influence on workforce composition along the attrition margin. Moreover, the heterogeneous implementation across HISD schools that we document suggests the system has helped to equalize access to effective teachers at high- and low-achieving schools.

BACKGROUND

This study contributes to the thin but growing literature on how new, more-rigorous teacher evaluation systems influence the teaching workforce. We study the introduction of the new evaluation system at the Houston Independent School District (HISD). The new system is part of the Effective Teachers Initiative (ETI) at HISD that was initiated during the 2010-2011 school year. It was developed as part of a districtwide effort with input from various stakeholders, and teachers were first evaluated under the new system during the 2011-2012 school year. Like other emerging systems (e.g., Washington, DC and Tennessee), HISD teachers receive a “combined measure” rating that depends on an evaluation of various aspects of their performance. Teachers’ ratings during the first year under the new system depended on evaluations of instructional practice and meeting professional expectations. In the second year, 2012-2013, student achievement metrics were formally incorporated into teachers’ overall ratings.

RESEARCH QUESTIONS

We aim to understand how the introduction of the new teacher evaluation
system at HISD has influenced teacher attrition, with a particular focus on the relationship between teacher quality and district exit.

DATA AND METHODS

Data
We use measures of quality that are available for HISD teachers before and after the initiation of the ETI. In the next subsection we describe our quality measures in detail, but in short, our measures are constructed based on teachers’ annual EVAAS® scores in math, which have been available for eligible HISD teachers since well before the ETI was implemented. We also perform a parallel analysis using teachers with reading EVAAS® scores and obtain similar results, which are omitted from this report for brevity but available upon request.

We restrict our analysis to teachers with EVAAS® scores in grades 3-8.

We use a data panel of HISD teachers starting with teachers working during the 2007-2008 school year and up through teachers working during the 2012-2013 school year (for whom we code exit outcomes using data from 2013-2014).

Measures

- **Dependent Variable**

  The results that we present below are based on models of single-year teacher exits. In each year $t$, we identify an “exit” as occurring whenever a teacher with a math EVAAS® score in grades 3-8 in that year is not observed working in any capacity at HISD in year $t+1$. This definition is not necessarily synonymous with a permanent exit, as some teachers leave and return later. The reason we use single-year exit measures, despite this limitation, is that it allows us to use as much post-ETI data as possible for our evaluation. For example, if we defined teacher exits using a 2-year rule (i.e., a year-$t$ teacher is not coded as an exit unless she is not observed working in any capacity at HISD in years $t+1$ and $t+2$), it would require that we analyze one fewer year of data at the end of our panel.

  Although our single-year exit definition is likely to overstate permanent exit rates from HISD in any given year, it offers a consistent way to measure program impacts over time and facilitates our pre/post comparative analysis. In results omitted for brevity and available upon request, we verify that our findings are substantively similar if we switch to the two-year exit definition for comparable years.

- **Key Independent Variable**

  We construct and validate measures of teacher quality that are consistent throughout the pre- and post-ETI periods. Our approach for constructing the measures follows Chetty, Friedman, and Rockoff (2014a; also see Bacher-Hicks, Kane, and Staiger 2014). We relegate the technical details of the construction and validation of our quality measures to the academic paper. In short, our measures are built using information from teachers’ annual EVAAS® scores, but are more reliable measures of quality than the single-year EVAAS® scores.

  We use the method developed by Chetty, Friedman, and Rockoff (2014a) to test the validity of our measures as forecast-unbiased predictors of student achievement. Our validity results affirm that our measures are forecast-unbiased and are consistent with validity results reported by Chetty, Friedman, and
Rockoff (2014a) and Bacher-Hicks, Kane, and Staiger (2014) for similar measures in different locales. The implication is that our measures of quality are strong and accurate forecasters of student achievement, which lends credence to our analysis employing these measures to examine the workforce-quality effects of the ETI via teacher attrition.

**Analytic Strategy**

We construct difference-in-difference models to assess the impact of the new teacher evaluation system on the relationship between teacher exit and quality at HISD. The models take the following form:

\[
Y_{ist} = \delta_0 + X_{ist}\delta_1 + Q_{ist}\delta_2 + T_i\delta_3 + (Q_{ist} \times T_i)\delta_4 + \phi_s + \epsilon_{ist}
\] (1)

In equation (1), the outcome variable, \(Y_{ist}\), is an indicator variable equal to one if teacher \(i\) in school \(s\) in year \(t\) exited the district between years \(t\) and \(t+1\). The \(X\)-vector contains teacher characteristics including race, gender, experience, and education. Our findings are not affected substantively by whether or not the \(X\)-vector is included in the model, so we omit an extended discussion of these controls for brevity. \(Q_{ist}\) is our measure of teacher quality, constructed based on teachers’ annual EVAAS® scores per the previous section. In some variants of the model we include \(Q_{ist}\) as a linear scalar variable, and in others we divide teachers into quality quintiles and include a vector of indicator variables for the quintile assignments. \(T_i\) is a vector of year indicator variables, and the interaction between \(Q_{ist}\) and \(T_i\) captures changes over time in the relative relationship between teacher quality and exit. Finally, \(\phi_s\) is a vector of school fixed effects to allow for fixed school attributes that affect teacher attrition rates, and \(\epsilon_{ist}\) is the error term, which we cluster at the school level.\(^1\)

The vector \(\delta_4\) contains the difference-in-difference parameters of primary interest in our study. These parameters allow us to identify the effect of the policy on the relationship between teacher quality and exit as long as there are no pre-policy trends, which we verify to be the case. Specifically, if the entries in \(\delta_4\) are trending negative in the post-ETI period, it would imply that compared to the pre-ETI period, higher-quality teachers under the ETI are less likely to exit relative to lower-quality teachers.

The parameter vector \(\delta_3\) is also of interest. The parameters in this vector indicate changes to the overall HISD exit rate over time, spanning the pre- and post-ETI periods. It would be an overreach to attribute changes over time in the overall exit rate as indicated by \(\delta_3\) to the ETI policy itself because \(\delta_3\) is not cleanly identified in our study (\(\delta_3\) is identified from just a “single difference,” rather than a “difference-in-difference” as is \(\delta_4\)). However, despite some ambiguity in the interpretation, at the least the parameter vector \(\delta_3\) provides context for our quality-attrition findings by indicating the overall trend in the exit rate from HISD over time,

\(\text{We also extend the model shown in equation (1) to examine heterogeneity in policy implementation across high and low-achieving HISD schools. We do not show the heterogeneous effects model directly, but it is a straightforward extension of the model shown in equation (1). More details are available upon request.}\)
regardless of whether this trend can be causally attributed to the ETI.

**RESULTS**

Figure 1 shows the trend in the overall exit rate from HISD for teachers with EVAAS® scores in grades 3-8 in each year. Recall that an exit requires a teacher to leave the district entirely (i.e., a move to a non-tested grade and subject is not coded as an exit) and that our exit definition is based on a single-year measure.

The red line in the figure separates the pre- and post-ETI periods. Recall that the ETI was initiated during the 2010-2011 school year (in Figure 1 and all other figures, we denote school years by the spring year; e.g., 2010-2011 as “2011”). We see an increase in the exit rate at the conclusion of the initiation year, but note that teachers were not formally evaluated under the new system until the 2011-2012 school year. Again mentioning the caveat that the trend in district exits overall is not causally identified by our models (and therefore merely suggestive), a common theme in all of the charts is that changes in how personnel outcomes occur in the district are first observed at the conclusion of the initiation year (2010-2011).

Next, Figure 2 shows trends in exit rates for groups of teachers divided by quality. We divide teachers into three different groups based on their location in the distribution of teacher quality using our above-described, EVAAS®-based quality measure: bottom-quintile (lowest performing), middle quintiles (quintiles 2-3-4), and top-quintile (highest performing).

Two results are apparent from Figure 2. First, mirroring Figure 1, Figure 2 shows that exit rates overall at HISD have increased over the course of our data panel. Second – and the result that is best identified by our study – is that the initiation of the ETI resulted in a dramatic divergence in exit rates between low-performing and other teachers. In particular, the exit rate for bottom-quintile teachers jumped significantly from 2010 to 2011, and has remained high through 2013. The exit rates for middle and top quintile teachers have also risen during the ETI period, but by much less. On net, the divergence in exit rates between low-performing and other teachers has resulted in a significant increase in the negative correlation between teacher quality and district exit.

In Figures 3, 4 and 5, we examine heterogeneity in exit rates and the relationship between exit and quality across different types of schools. Paralleling our analysis of teachers, we divide HISD schools into three groups: bottom-quintile, middle quintiles, and top-quintile. The quintile assignments are based on each school’s placement in the distribution of average math and reading student achievement during the pre-ETI period. The purpose of examining these subgroups of schools is to understand if and how personnel decisions are being differentially made across schools that differ by the achievement level.

Figure 3 follows the same general format as Figure 2, but divides schools into groups based on average achievement instead of teachers. The figure shows differences in overall exit rates pre- and post-ETI by school type, without differentiating by teacher quality (yet). The results indicate that while exit rates went up for all three school groups, which is consistent with previous results, exit
rates increased by more at low-achieving schools than at other schools with the introduction of the ETI.

Next, Figures 4 and 5 contrast the change in the relationship between teacher quality and exit between low- and high-achieving schools (omitting middle-achieving schools). Specifically, these figures replicate Figure 2, but restrict the sample to include only low-achieving and high-achieving schools, respectively. Comparing the two figures highlights a clear contrast – there is a much stronger post-ETI emphasis on quality in low-achieving schools, compared to what is essentially no change in the relationship between quality and exit in high-achieving schools.

**DISCUSSION**

This policy brief documents how the new teacher evaluation system at HISD has influenced district attrition patterns, focusing on the relationship between exit and teacher quality. We show that in the post-ETI period, district exits are more closely related to teacher quality and that, in particular, low-performing teachers are much more likely to exit relative to their higher-performing peers. Policy activity thus far has been concentrated disproportionately at lower-achieving HISD schools.

Our reliance on a validated measure of quality throughout our analysis, which we show to be a forecast-unbiased predictor of student achievement (see the academic paper), implies that our findings have implications for workforce quality in a way that is directly relevant for student outcomes.

We also note that in unreported results omitted for brevity, we find that shifts in attrition patterns post-ETI align much more closely with our validated measures of quality than with teachers’ single-year EVAAS® scores, despite the fact that, unlike the single-year EVAAS® scores, our quality measures are not directly observed by HISD officials. This result is consistent with the interpretation that personnel decisions under the ETI are being made based on a totality of evidence that is superior to the single-year quality information embodied by annual EVAAS® scores, which is as would be intended from a combined-measure evaluation system.

Finally, this is the first of what will likely be several policy briefs that come out of this research project. Future policy briefs may address the following additional questions:

1. Have within-district mobility patterns changed as a result of the ETI, and if so, how?
2. Has the ETI caused changes in the rate of year-to-year improvement among continuing (i.e., non-exiting) HISD teachers?
3. How have recruiting practices changed at HISD under the ETI, and how have these changes influenced school staffing and student achievement?

We will also continue to update our analysis as new data become available and report any new insights that emerge from these data updates.
REFERENCES


This is an abbreviated version of a much longer research study that is being written for peer review. For additional information on the findings presented here, or to obtain the full peer-review version of the research contained in this brief when it becomes available, contact the Houston Education Research Consortium at 713-348-2802 or email herc@rice.edu.
Figure 1. Trend in the Overall Exit Rate from the District, 2008-2013, for Teachers with Math EVAAS® Scores in Grades 3-8.

Notes: Exits are defined using the single-year measure described in the text of the policy brief. School years are denoted by the spring year (e.g., “2010-2011” as “2011”).

Figure 2. Trends in District Exit Rates by Teacher Quality Quintile, 2008-2013, for Teachers with Math EVAAS® Scores in Grades 3-8.

Notes: See notes for Figure 1.

  Black bars: Exit rate for teachers in the bottom quintile of the distribution of teacher quality, based on our measure, in the relevant year.
  Clear bars: Exit rate for teachers in the middle three quality quintiles (2-3-4), based on our measure, in the relevant year.
  Gray bars: Exit rate for teachers in the top quintile of the distribution of teacher quality, based on our measure, in the relevant year.
Figure 3. Trends in Exit Rates by **School Type**, 2008-2013, for Teachers with Math EVAAS® Scores in Grades 3-8.

Notes: See notes for Figure 1. *Unlike in the other figures in this document, the bars in this chart are for groups of schools, not groups of teachers.*

- Blue bars: Exit rate from schools in the bottom quintile of the distribution of student achievement, as measured by average math and reading achievement during the pre-ETI period.
- Clear bars: Exit rate from schools in the middle quintiles of the distribution of student achievement (quintiles 2-3-4), as measured by average math and reading achievement during the pre-ETI period.
- Tan bars: Exit rate from schools in the top quintile of the distribution of student achievement, as measured by average math and reading achievement during the pre-ETI period.
Figure 4. Trends in Exit Rates by Teacher Quality Quintile, 2008-2013, for Teachers with Math EVAAS® Scores in Grades 3-8. Low-Achievement Schools Only.

Notes: See notes for Figure 1.
Black bars: Exit rate for teachers in the bottom quintile of the distribution of teacher quality, based on our measure, in the relevant year.
Clear bars: Exit rate for teachers in the middle three quality quintiles (2-3-4), based on our measure, in the relevant year.
Gray bars: Exit rate for teachers in the top quintile of the distribution of teacher quality, based on our measure, in the relevant year.

Figure 5. Trends in Exit Rates by Teacher Quality Quintile, 2008-2013, for Teachers with Math EVAAS® Scores in Grades 3-8. High-Achievement Schools Only.

Notes: See notes for Figure 1.
Black bars: Exit rate for teachers in the bottom quintile of the distribution of teacher quality, based on our measure, in the relevant year.
Clear bars: Exit rate for teachers in the middle three quality quintiles (2-3-4), based on our measure, in the relevant year.
Gray bars: Exit rate for teachers in the top quintile of the distribution of teacher quality, based on our measure, in the relevant year.