TEACHER LAYOFFS, TEACHER QUALITY, AND STUDENT ACHIEVEMENT: EVIDENCE FROM A DISCRETIONARY LAYOFF POLICY
KRAFT (2015)

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INTRODUCTION: STUDY OBJECTIVE

INTRODUCTION: STUDY SPECIFICATIONS

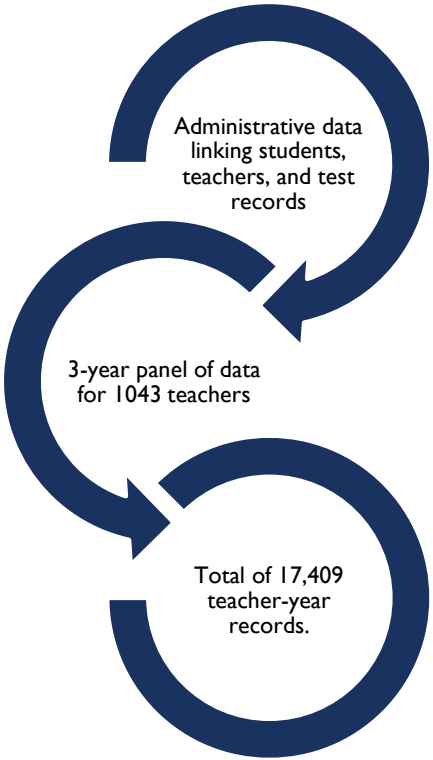
Quasi-experimental study/ Approximation to natural experiment

Compared students who entered a grade in which a teacher was laid off to the performance of students who entered a grade that did not experience a layoff.

LAYOFF CRITERIA

- Duplicative positions
- Enrollment trends
- Job performance
- Job qualifications
- Length of service

INTRODUCTION: DATA



Include covariates such as:

- Tenure
- Licensure status
- Licensure type (Math, science, special education, etc.)
- Seniority.

II. METHODS

Probability of being laid off

- Fit a series of logistic regressions that model the conditional probability of being laid off, (log odds) RIF, as a function of district RIF criteria for teacher j in year t.

$$Prob(RIF = 1 | RIF\_CRITERIA_{jt}) = \frac{1}{1 + e^{-(\gamma RIF\_CRITERIA_{jt})}}.$$

Differential effect of layoffs estimates across three measures:

Seniority

- Minimum of either the difference between the current academic year and teachers' district hire date or their level of salary experience credit.

Performance evaluation scores

- Constructed using principals' ratings of teachers on a statewide evaluation protocol (rolling average of evaluations).

Teacher's value-added scores

- Estimated by attempting to isolate a teacher's value added to her students' academic achievement on standardized tests for mathematics and English.

II. METHODS

- Fit a series of models where students' test scores (Ait) are a function of:

$$A_{it} = \alpha_g(f(A_{i,t-1})) + \phi LAYOFF_{gs,t-1} + \beta_c C_{gs,t-1} + \lambda X_{it} + \theta \bar{X}_{jt} + \omega_{gt} + \varphi_{st} + \psi_{sg} + \varepsilon_{it}.$$

- LAYOFF, dichotomous indicator for whether any classroom teachers were laid off in each grade of a school in the previous year
- C, a given average characteristic of the laid-off teachers
- Xit, vectors of controls for observable student characteristics
- Xjt, characteristics of a student's peers with the same teacher and grade-by-year fixed effects
- ωgt, school-by-year fixed effects
- φst, schoolwide year-specific shocks to student achievement

III. RESULTS

- Averages of teacher characteristics across RIFed teachers and non-RIFed teachers for the following:
  - A: full sample,
  - B: excluding returning retired teachers,
  - C: tenured teachers
- These results show that the teachers selected for layoffs were likely to be non-tenured teachers, teachers hired after the start of the school year, teachers with a licensure deficiency, and low-performing teachers

	2009				2010			
	RIFed	Non-RIFed	Difference	*N*	RIFed	Non-RIFed	Difference	*N*
Panel A: All Teachers								
Experience	13.07	10.21	2.86***	8,918	5.60	11.03	−5.43***	8,491
Seniority	8.04	6.14	1.90***	8,918	1.87	6.98	−5.11***	8,491
Probationary teacher	0.842	0.421	0.421***	8,918	0.844	0.329	0.515***	8,491
Returning retired teacher	0.225	0.000	0.225***	8,918	0.003	0.001	0.002	8,491
Late hire	0.267	0.011	0.256***	8,918	0.419	0.009	0.410***	8,491
Licensure deficiency	0.162	0.038	0.124***	8,918	0.169	0.022	0.147***	8,491
Evaluation score: 1-year	−0.507	0.058	−0.565***	4,729	−1.211	0.055	−1.266***	8,038
Evaluation score	0.394	−0.016	−0.378***	7,837	−0.902	0.026	−0.928***	8,374
Math value-added score	−0.004	0.004	−0.008	1,847	−0.062	0.007	−0.069***	1,869
Reading value-added score	−0.005	0.004	−0.009	1,270	−0.014	0.001	−0.015+	1,897
Panel B: Excluding Returning Retired Teachers								
Evaluation score: 1-year	−0.864	0.058	−0.922***	4,600	−1.219	0.055	−1.274***	8,031
Evaluation score	−0.697	−0.016	−.681***	7,703	−0.909	0.025	−0.934***	8,362
Math value-added score	−0.025	0.004	−0.029*	1,821	−0.061	0.007	−0.068***	1,864
Reading value-added score	−0.013	0.004	−0.017*	1,261	−0.014	0.001	−0.015+	1,894
Panel C: Tenured Teachers								
Evaluation score: 1-year	−1.415	0.317	−1.732***	877	−1.440	0.152	−1.592***	5,270
Evaluation score	−0.867	0.115	−0.982***	3,911	−0.875	0.136	−1.011***	5,463
Math value-added score	−0.051	0.008	−0.059*	1,127	−0.120	0.008	−0.128**	1,326
Reading value-added score	−0.014	0.008	−0.022	661	−0.046	0.002	−0.048*	1,333

III. RESULTS

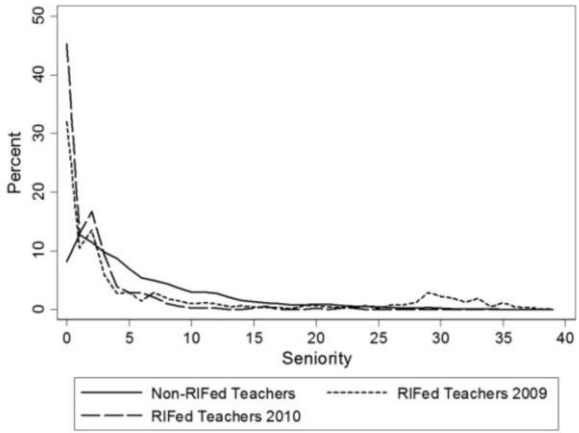
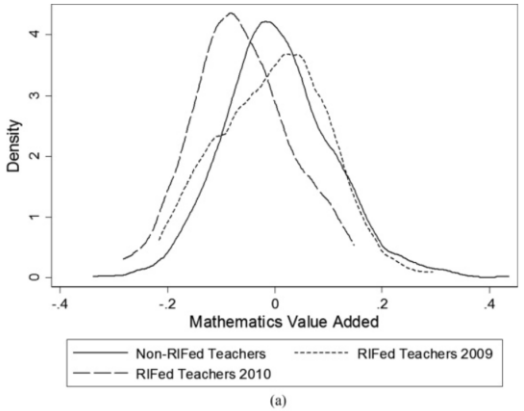


Figure 1. Distribution of CMS Teachers by Seniority for RIFed and Non-RIFed Teachers in 2009 and 2010.

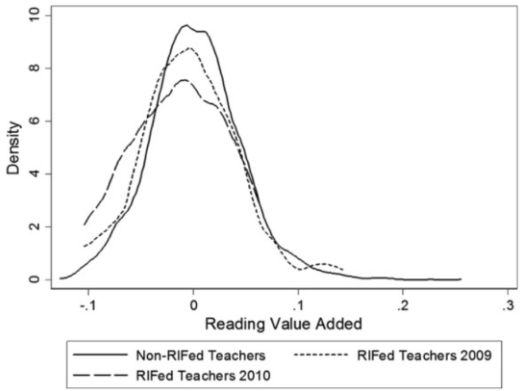
- The figure illustrates how layoffs were heavily concentrated among
  - 1. non-tenured teachers and
  - 2. teachers with 30+ years of seniority (for year 2009)
    - Due to nonrenewal of returning retired teachers (constituted over 21% of all RIFed in 2009)
    - Teachers collecting both salary and pension were first target for layoffs, despite the fact that they were more effective than average teachers
      - Average evaluation scores were ⅔ of s.d. higher

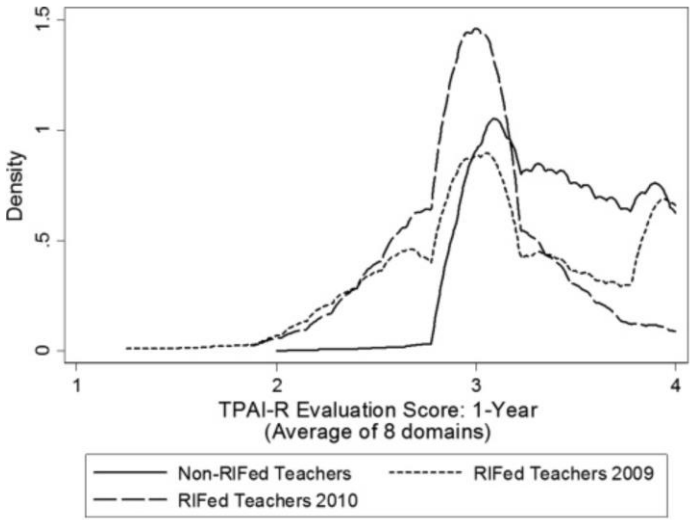
III. RESULTS

- RIFed teachers had lower value-added scores in math and reading compared to non-RIFed teachers
  - RIFed teachers in 2010 had significantly lower value-added scores than non-RIFed teachers
    - 0.068 SD lower in math
    - 0.015 SD lower in reading
- When returning retired teachers are excluded from the estimates (Table 1, panel B), or the sample is restricted to tenured teachers (panel C), the differences of value-added scores were even greater



(a)





- The figure suggests that evaluation scores were used to directly inform the layoff process
  - Only 4% of teachers with average rating or above were laid off;
  - while 58% of teachers below average rating were laid off
- So layoff selection did not operate based on value-added scores
- But it is not surprising given the weak-to-modest positive correlation between evaluation and value-added scores
  - Evaluation scores are correlated 0.27 and 0.19 with math and reading value-added scores

Table 3. The Relationship between Measures of RIF Criteria and the Probability of Being Laid Off

	Full Sample		Evaluation Score Sample		
	(1)	(2)	(3)	(4)	(5)
0 years seniority	0.222***	0.087***	0.176***	0.112***	0.040***
	(0.013)	(0.011)	(0.013)	(0.010)	(0.008)
1 year seniority	0.035***	0.038***	0.028***	0.009	0.016**
	(0.008)	(0.007)	(0.008)	(0.006)	(0.006)
2 years seniority	0.063***	0.065***	0.057***	0.040***	0.046***
	(0.009)	(0.008)	(0.009)	(0.007)	(0.007)
3 years seniority	0.022*	0.043***	0.017*	0.010	0.032***
	(0.009)	(0.009)	(0.008)	(0.007)	(0.008)
Retired teacher		0.890***			0.914***
		(0.018)			(0.012)
Late hire		0.398***			0.327***
		(0.029)			(0.030)
Licensure deficiency		0.065***			0.051***
		(0.010)			(0.009)
Evaluation score				−0.039***	−0.040***
				(0.003)	(0.003)
Licensure type fixed effects		Y			Y
Observations	17,409	17,409	16,211	16,211	16,211

Being a novice teacher was associated with 22 percentage point higher probability of being laid off compared to tenured teachers

But drops to 2.2 and 6.3 percentage points for teachers with between 1-3 years of seniority

Foreign language and arts teachers have the highest probabilities of being laid off

	Full Sample		Evaluation Score Sample		
	(1)	(2)	(3)	(4)	(5)
Licensure Type					
Mathematics	0.035***	0.016**	0.035***	0.028***	0.013*
	(0.008)	(0.006)	(0.008)	(0.007)	(0.005)
English language arts	0.014**	0.007+	0.017**	0.022***	0.011*
	(0.005)	(0.004)	(0.006)	(0.006)	(0.005)
Science	0.017*	0.005	0.016*	0.010	0.002
	(0.007)	(0.005)	(0.008)	(0.007)	(0.005)
Social studies	0.013*	0.008+	0.012+	0.012+	0.009+
	(0.006)	(0.005)	(0.007)	(0.006)	(0.005)
Foreign language	0.060***	0.026**	0.061***	0.059***	0.026*
	(0.015)	(0.010)	(0.015)	(0.014)	(0.010)
Arts	0.024**	0.024**	0.028**	0.034***	0.032***
	(0.009)	(0.008)	(0.010)	(0.010)	(0.009)
Physical education	0.017+	0.016+	0.021*	0.030**	0.019+
	(0.010)	(0.009)	(0.011)	(0.011)	(0.010)
English as a second language	−0.002	0.001	−0.002	0.002	0.008
	(0.009)	(0.008)	(0.009)	(0.010)	(0.010)
Special education	−0.005	0.003	−0.002	0.000	0.006
	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)
Seniority (0–3 years)		Y			Y
Retired teacher		Y			Y
Late hire		Y			Y
Licensure deficiency		Y			Y
Evaluation score				Y	Y
Observations	17,409	17,409	16,211	16,211	16,211

III. DISCUSSIONS

- In addition to laying off untenured teachers, the school district focused on laying off returning-retired teachers, late-hired teachers, teachers with licensure deficiencies, and underperforming teachers.
- 58% of all teachers who received a "Below Standard" or "Unsatisfactory" rating on any of the eight evaluation rubrics were laid off
- District principals and admins appeared to have considered other factors such as teacher characteristics, or targeting highest-paid teachers
  - This questions the validity of objective and subjective measures of teacher effectiveness
- **When two models are compared simultaneously, measures of teacher effectiveness strictly dominate seniority as predictors of the effect of teacher layoffs on future achievement.**
- **Therefore, teacher experience matters. That is, experienced teachers, on average, make important contributions to education. However, performance measures are better indicators of likely effect of layoffs than seniority**

IV. DISCUSSIONS

Robustness tests and extensions

- One potential threat to identifying credible estimates is the possibility that students and their families responded strategically to layoffs by switching schools
- Student sorting on unobserved characteristics related to layoffs could bias results
- The author examines this potential threat by testing the sensitivity of the estimates to the inclusion of student fixed effects in place of prior achievement scores and student characteristics
- This, however, further restricts the estimates to within-student differences in achievement across time, greatly limiting the endogenous student selection process as a threat

Assumptions

- Estimating the correlation between principals' ability to mitigate the effect of layoffs and teachers' seniority or effectiveness is largely intractable (unobserved ability)

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