The Effect of High Dismissal Protection on Bureaucratic Turnover and Productivity

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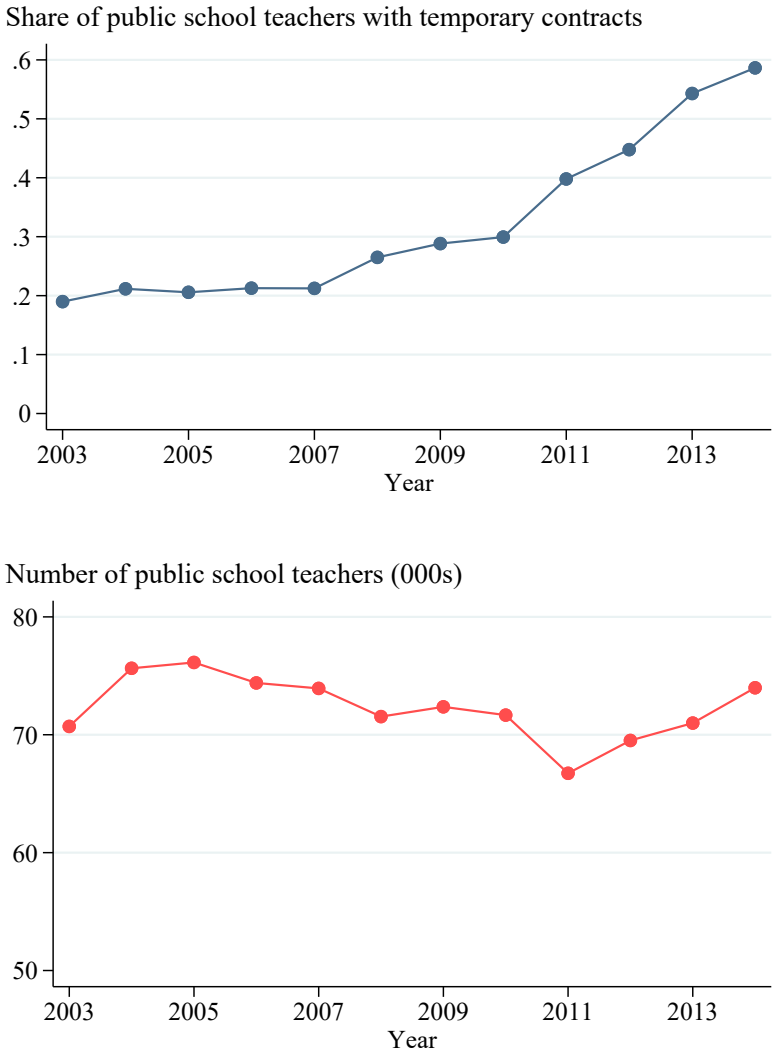
ONLINE APPENDIX

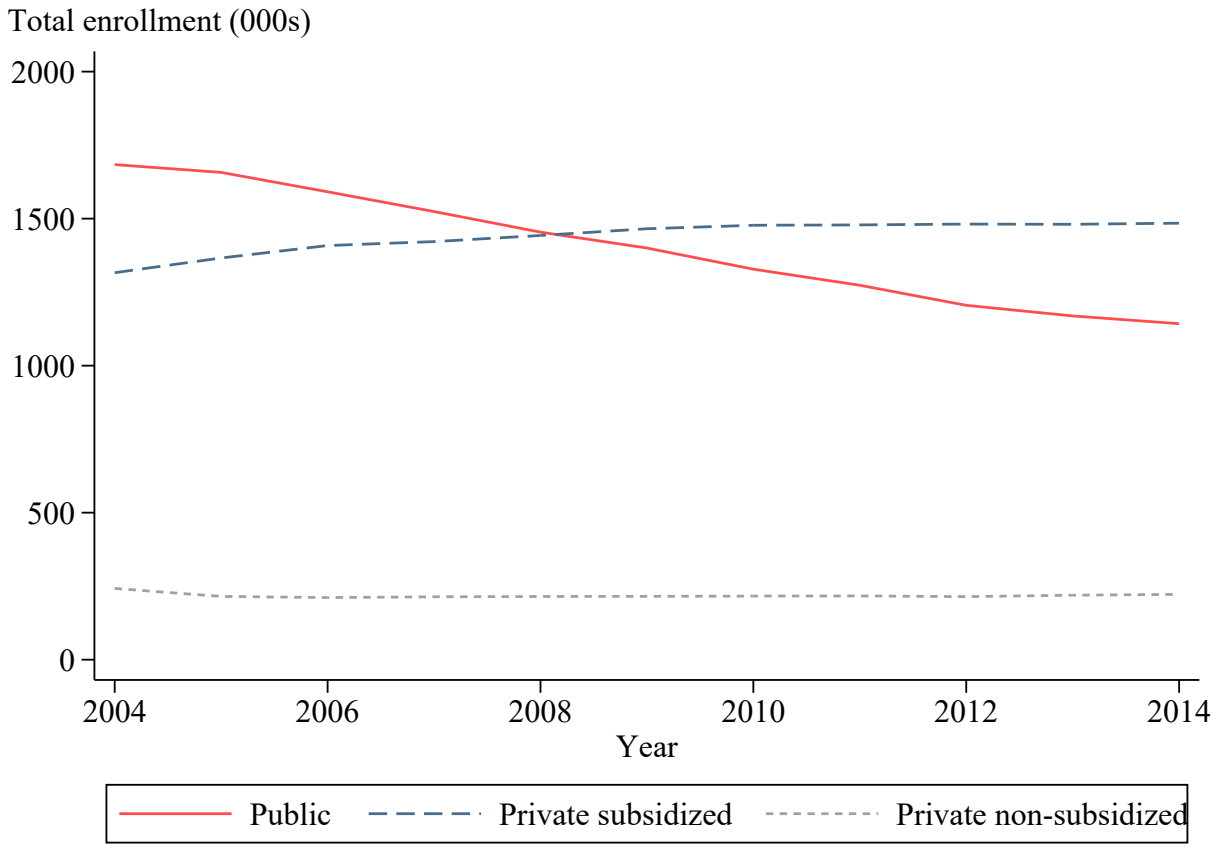
Appendix A Appendix Figures and Tables

Figure A.1: Evolution of Share of K-12 Teachers with Permanent Contracts and Total Number of K-12 Teachers in Public Schools



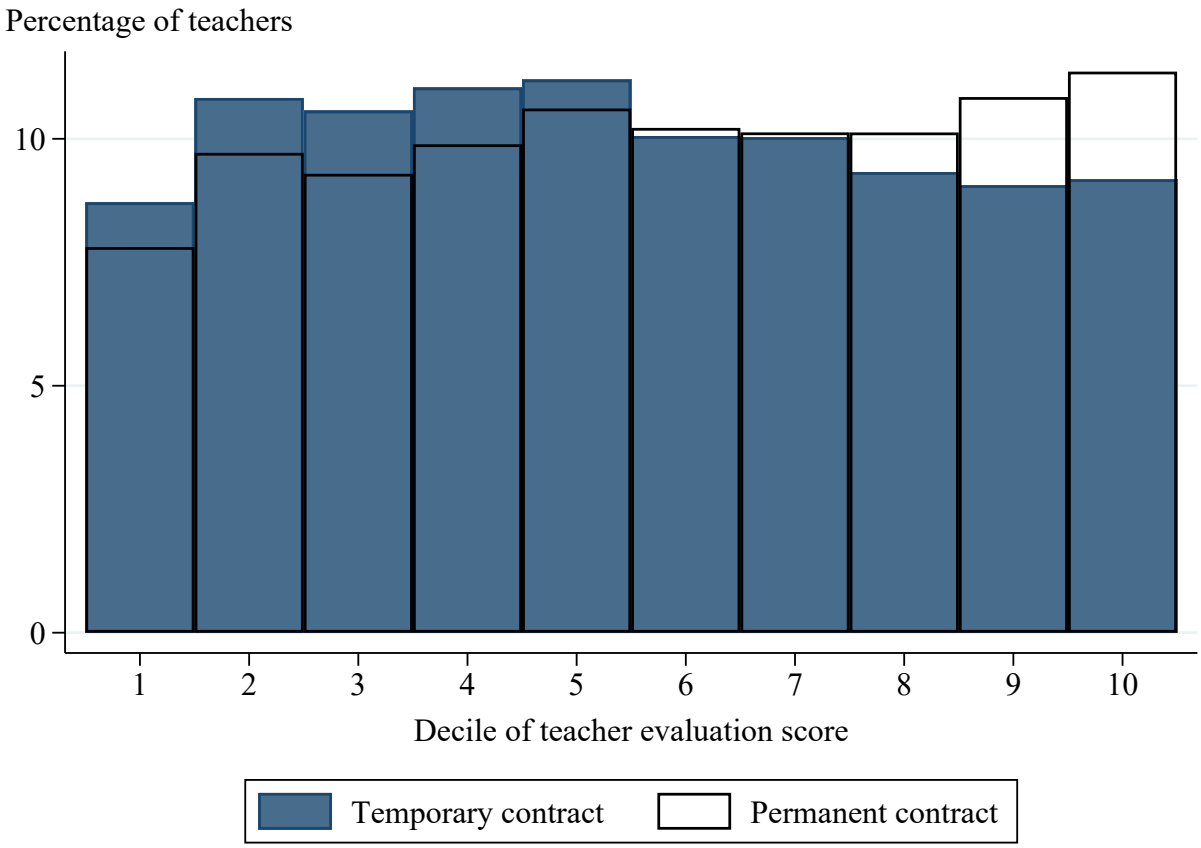
Notes: The top figure shows the share of K-12 teachers in public schools that had a temporary contract, and the bottom figure shows the number of K-12 teachers employed in public schools in each year, regardless of their contract type.

Figure A.2: Evolution of Enrollment in K-12 in Public and Private Schools



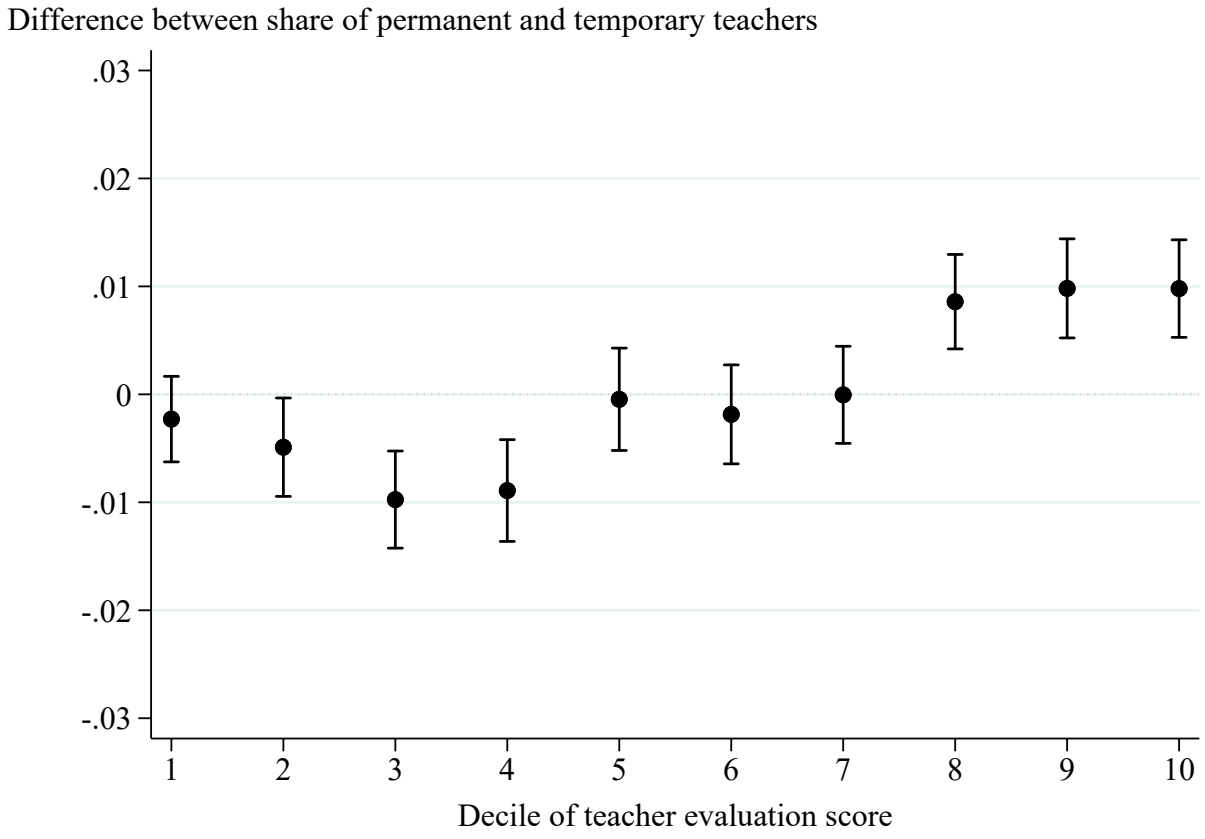
Notes: This figure shows the total number of students enrolled in K-12 by school type.

Figure A.3: Teacher Evaluation Scores by Type of Contract, 2010-2013



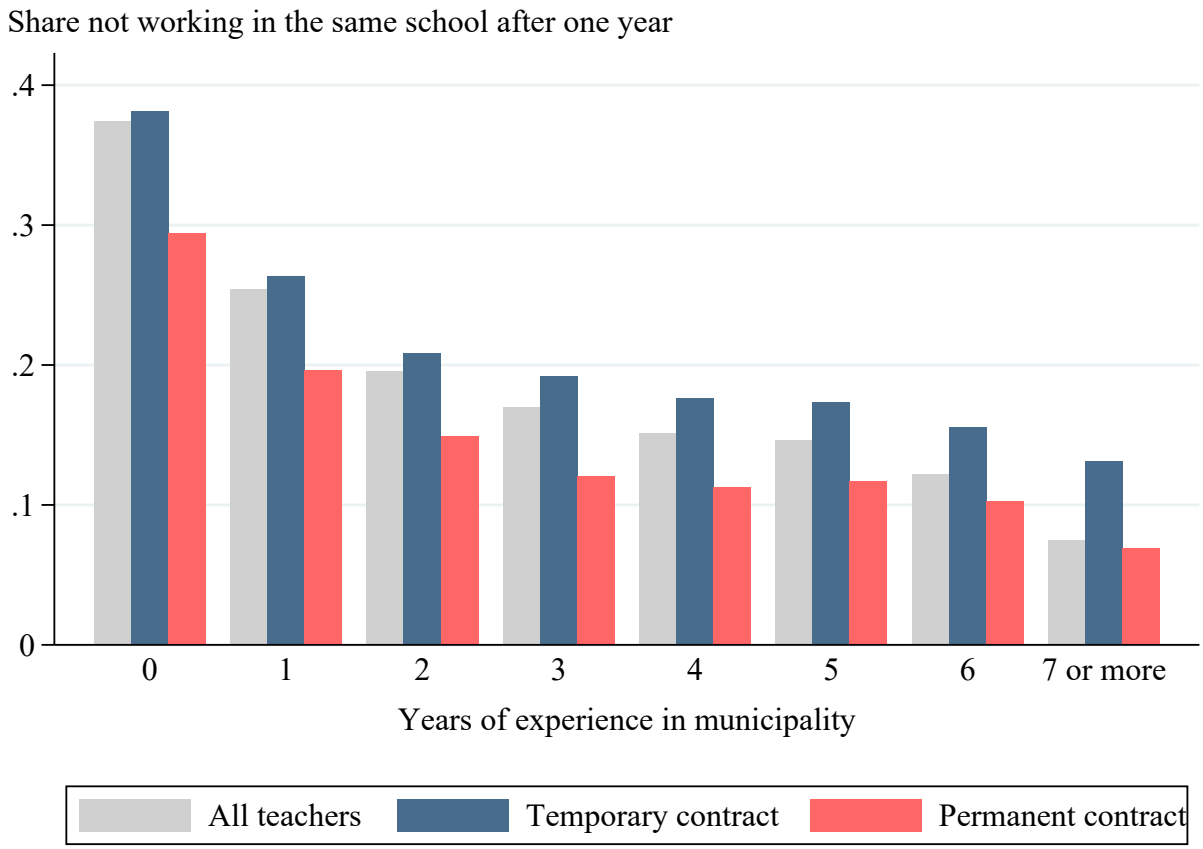
Notes: The sample is composed of teachers in 2010-2013 who were teaching 20 or more hours in a K-12 public school, were younger than age 55, and participated in a teaching evaluation. This figure plots the share of teachers in each decile of the teacher evaluation score, using the score in the first evaluation the teacher participated in. We split the sample by whether the teacher has a permanent or a temporary contract.

Figure A.4: Difference in Teacher Evaluation Scores Between Permanent and Temporary Teachers, 2010-2013



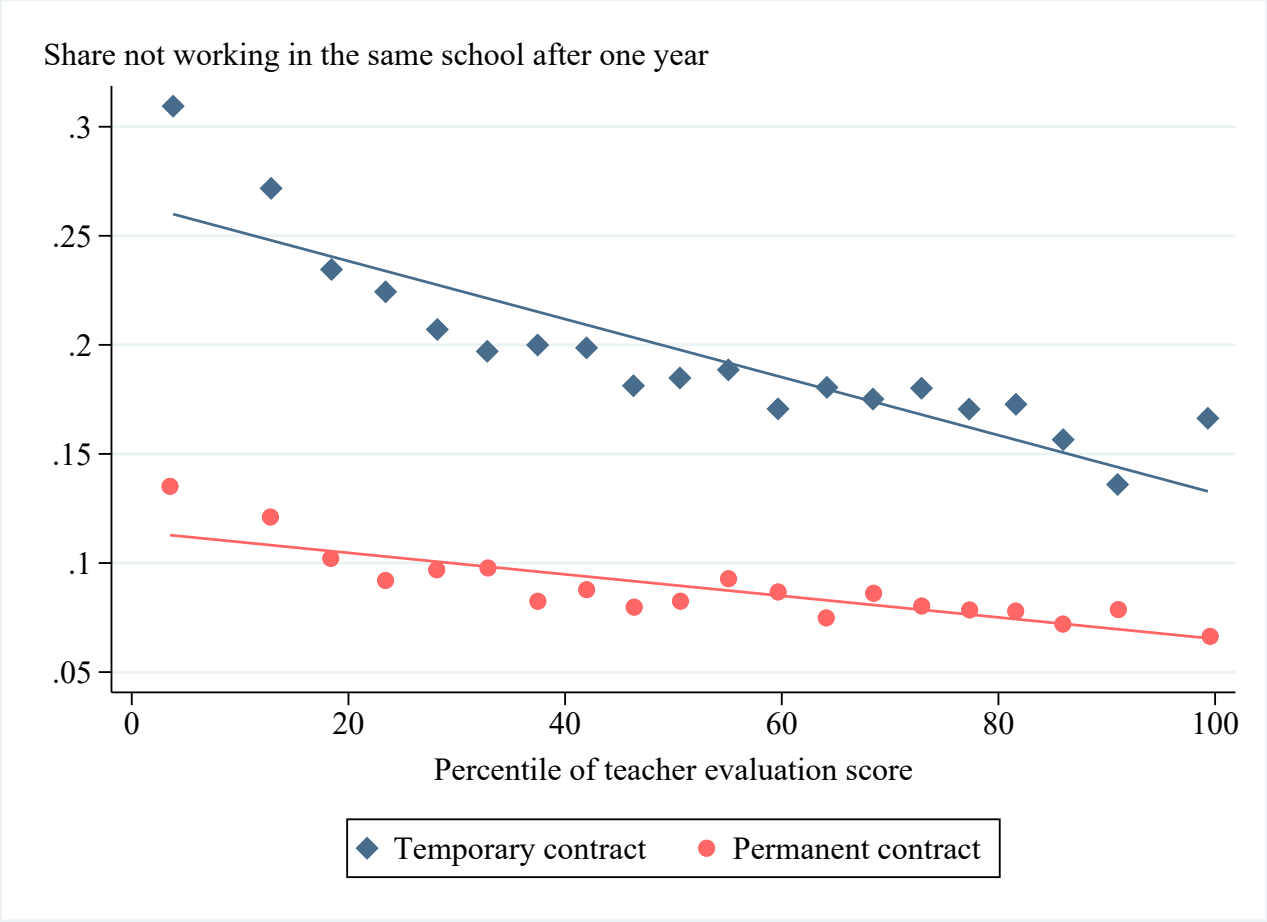
Notes: The sample is composed of teachers in 2010-2013 who were teaching 20 or more hours in a K-12 public school, were younger than age 55, and participated in a teaching evaluation. This figure plots the results of regressions in which the dependent variables are dummies for whether the teacher is in the corresponding decile in the teacher evaluation, using the score in the first evaluation the teacher participated in. The regressors are a dummy for whether the teacher has a permanent contract, municipality fixed effects, cohort fixed effects, and dummies for the total years of experience of the teacher. We plot the coefficient for the dummy of having a permanent contract, along with the 95 percent confidence interval.

Figure A.5: Teacher Turnover by Type of Contract and Experience, 2010-2013



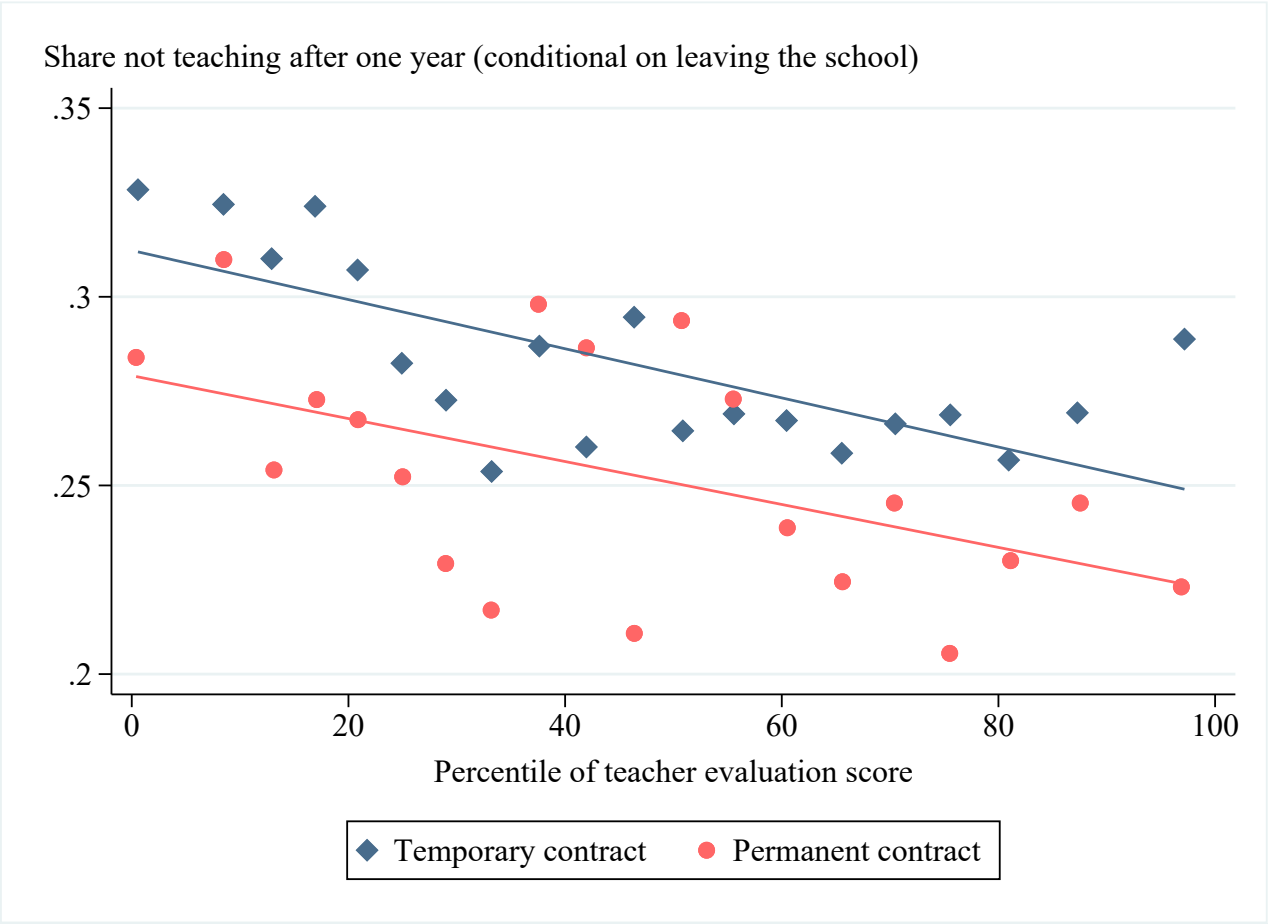
Notes: The sample is composed of teachers in 2010-2013 who were teaching 20 or more hours in a K-12 public school and were younger than age 55. This figure shows the share of teachers who were not working in the same school after one year, separated by total years of experience in the municipality. The grey bars show these figures for all teachers, the blue bars for teacher with a temporary contract, and the red bars for those with a permanent contract. We only consider that a teacher has accumulated a year of experience in a municipality if he/she works for 20 or more hours a week during that year.

Figure A.6: Teacher Turnover by Type of Contract and Teacher Evaluation Scores, 2010-2013



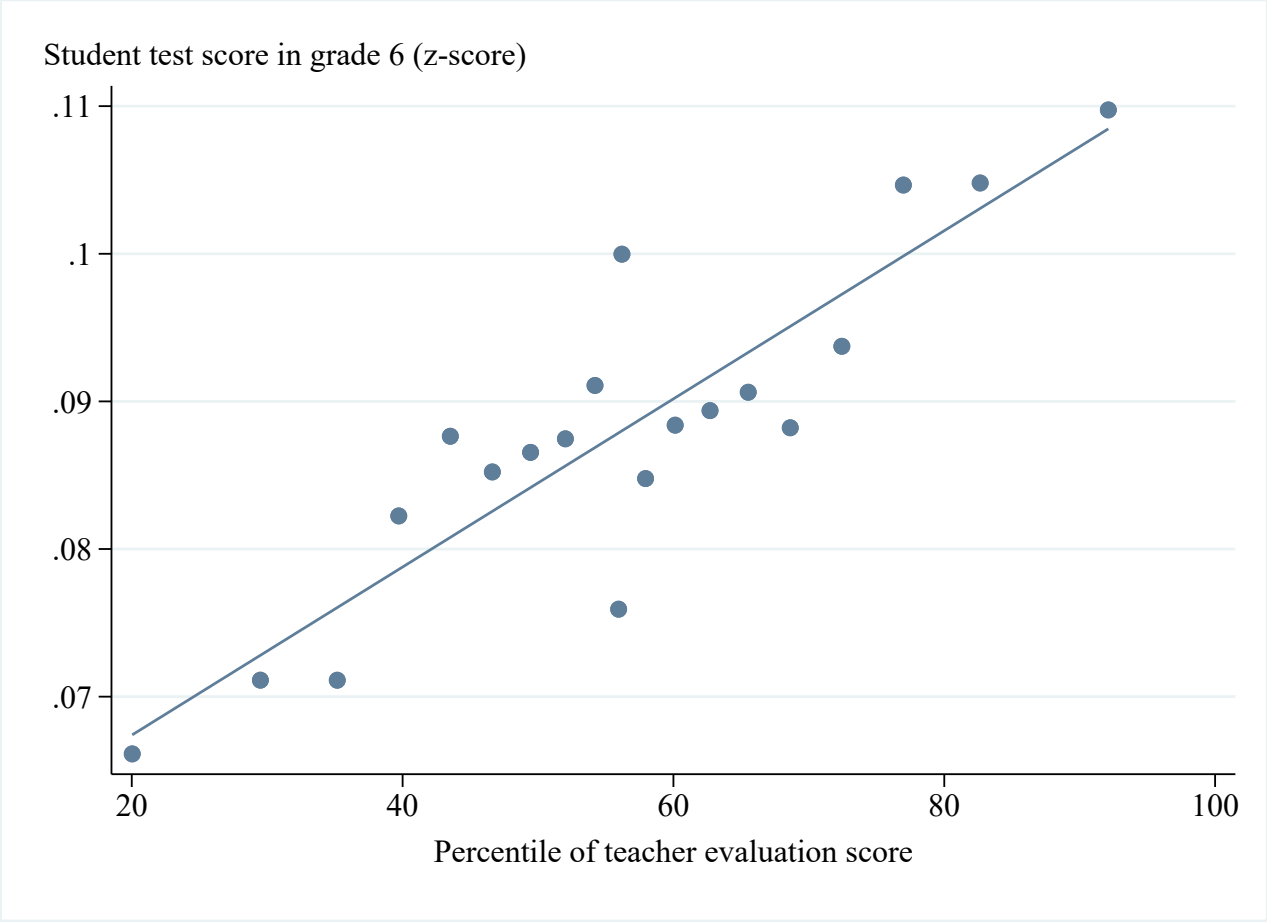
Notes: The sample is composed of teachers in 2010-2013 who were teaching 20 or more hours in a K-12 public school, were younger than age 55 and participated in a teaching evaluation. This figure plots the share of teachers who were not working in the same school after one year against the evaluation score percentile, using the score in the first evaluation the teacher participated in. We split the sample by whether the teacher has a permanent or a temporary contract. The lines plot the predicted values of a linear regression controlling for year and municipality fixed effects. The markers plot the average residuals (with the mean added back) of a regression of a dummy for whether the teacher is not in the same school after one year against year and municipality fixed effects. These means are computed for equal-sized bins of percentiles. This figure was constructed using the *binscatter* command.

Figure A.7: Teachers Who Are Not Teaching after One Year (Conditional on Turnover) by Type of Contract and Teacher Evaluation Scores, 2010-2013



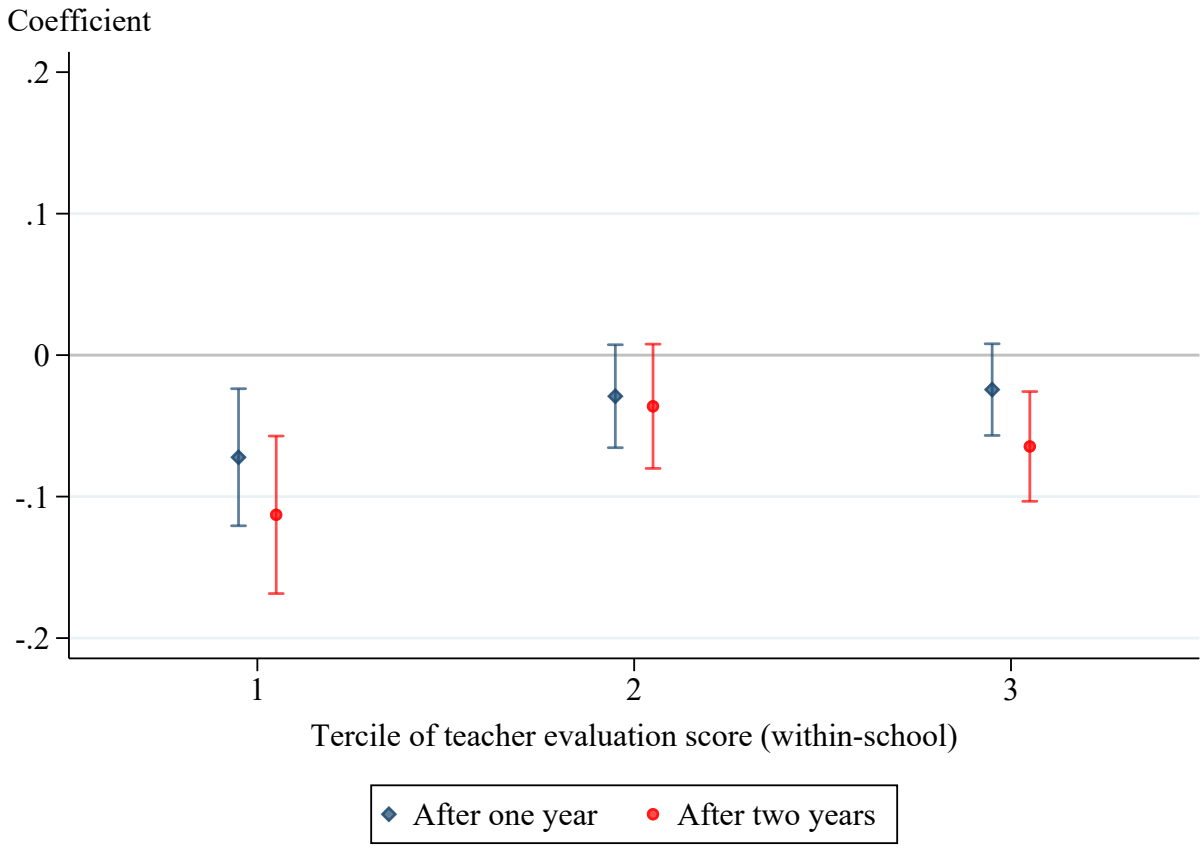
Notes: The sample is composed of teachers in 2010-2013 who were teaching 20 or more hours in a K-12 public school, were younger than age 55, participated in a teaching evaluation, and were not working in the same school in the following year. This figure plots the share of teachers who were not teaching after one year against the evaluation score percentile, using the score in the first evaluation the teacher participated in. We split the sample by whether the teacher has a permanent or a temporary contract. The lines plot the predicted values of a linear regression controlling for year and municipality fixed effects. The markers plot the average residuals (with the mean added back) of a regression of a dummy for whether the teacher is not teaching after one year against year and municipality fixed effects. These means are computed for equal-sized bins of percentiles. This figure was constructed using the *binscatter* command.

Figure A.8: Conditional Correlation between Student Test Scores and Teacher Evaluation Scores



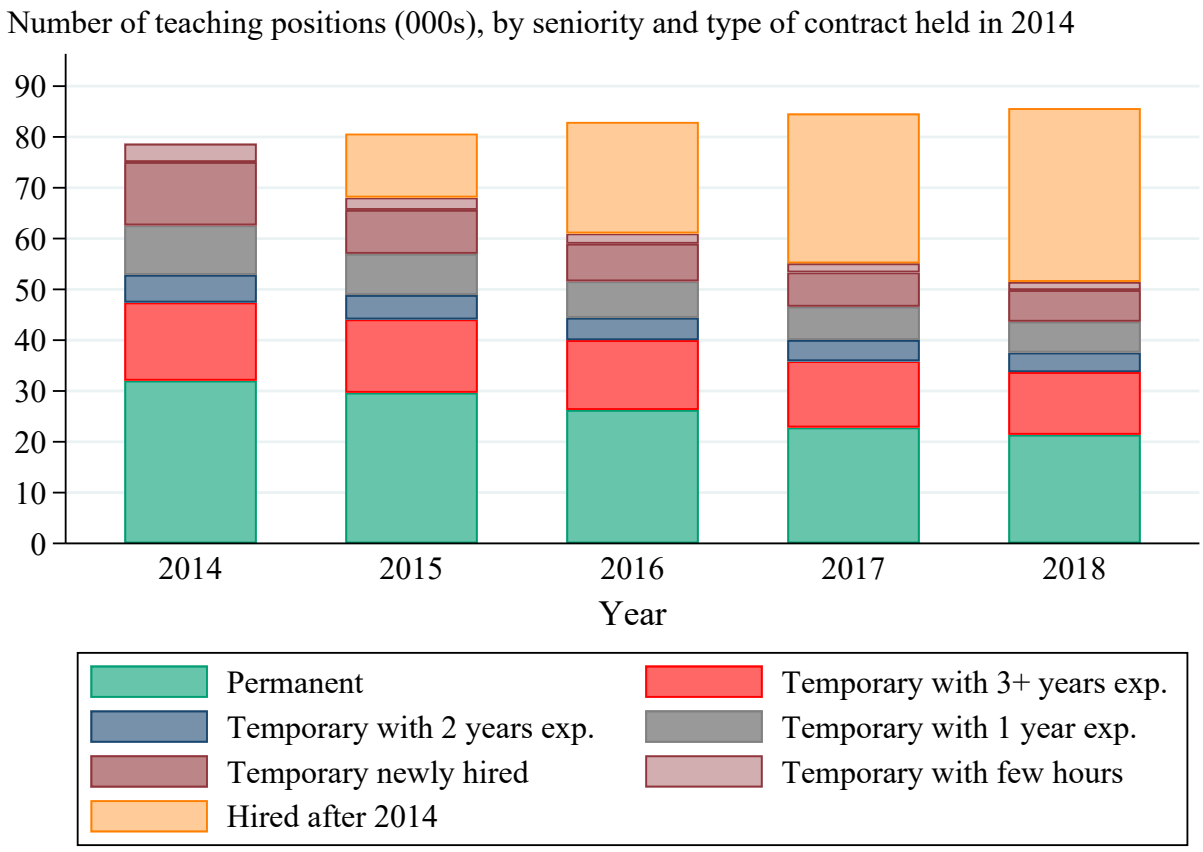
Notes: The sample is composed of 6th grade public school students in 2013-2015 who took both the math and literacy SIMCE test, have a 4th grade SIMCE score for both subjects, and have a teacher that was evaluated in both subjects. The line plots the predicted values of a linear regression where the dependent variable is the student's score in the math and literacy SIMCE evaluation (z-score) and the main regressor is the percentile in a nationwide teaching evaluation of their teacher in that subject. The regression controls for the student's score in that same subject in the 4th grade SIMCE evaluation, subject fixed effects, and student fixed effects. The markers plot the average residuals (with the mean added back) of this regression. These means are computed for equal-sized bins of percentiles. This figure was constructed using the *binscatter* command.

Figure A.9: Impact of High Dismissal Protection on Teacher Turnover – Heterogeneous Effects by Teacher Evaluation Scores (Within-school Distribution)



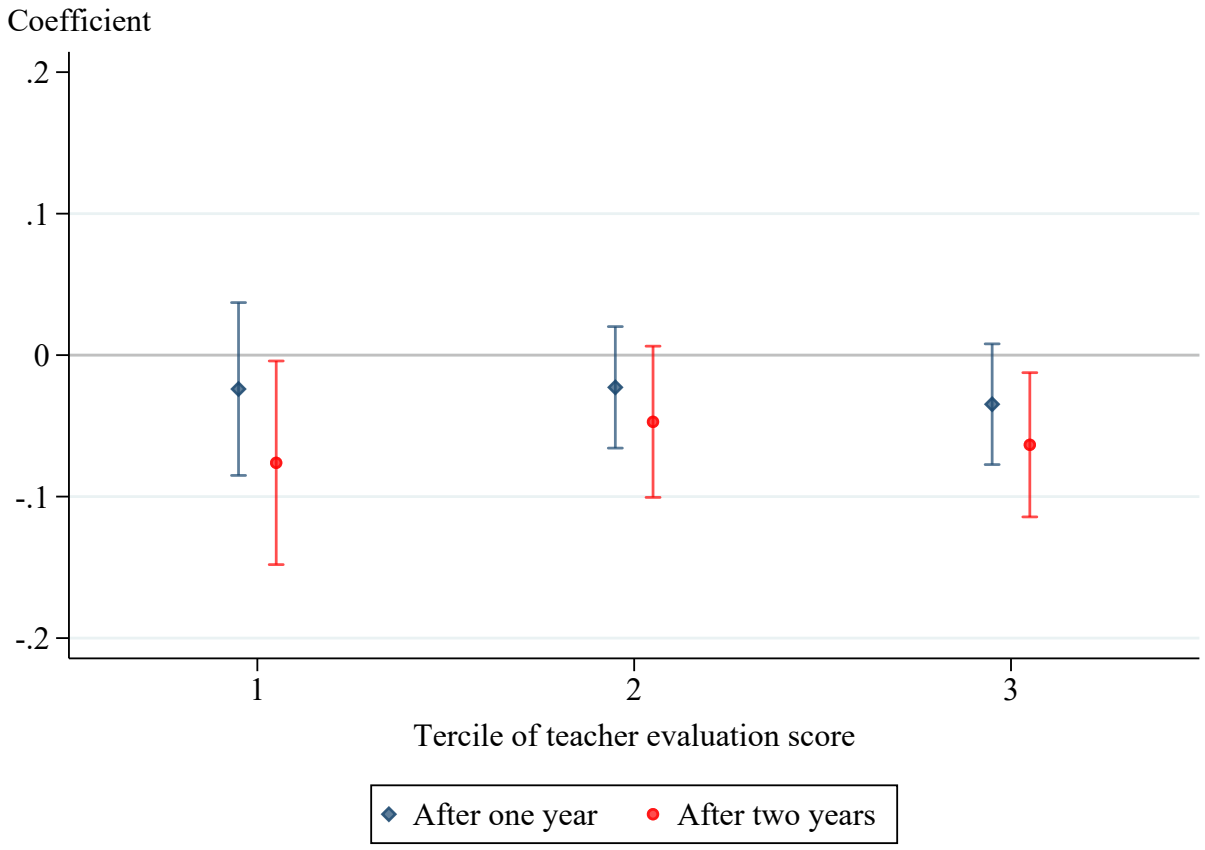
Notes: The sample is composed of teachers who were teaching 20 or more hours in a K-12 public school under a temporary contract in 2010–2014, were younger than age 55, participated in a teaching evaluation, and had two or three years of consecutive experience in the same municipality. This figure presents the main coefficients and 95 confidence intervals for the estimation of Equation (1) fully interacted with dummies for each tercile in the within-school distribution of teacher evaluation scores. The estimates where the dependent variable is measured after one year are presented with a diamond, and the estimates for two years after are depicted with a circle.

Figure A.10: Evolution in the Number of K-12 Public School Teaching Positions by Seniority and Type of Contract Held in 2014



Notes: This figure shows the number of K-12 public school teaching positions in 2014-2018. Teachers are categorized according to the seniority (the number of years of experience in their municipality) and type of contract they held in 2014.

Figure A.11: Impact of High Dismissal Protection on Teacher Turnover – Heterogeneous Effects by Teacher Evaluation Scores (Math and Language Teachers)



Notes: The sample is composed of math and language teachers who were teaching 20 or more hours in a K-12 public school under a temporary contract in 2010–2014, were younger than age 55, participated in a teaching evaluation, and had two or three years of consecutive experience in the same municipality. This figure presents the main coefficients and 95 confidence intervals for the estimation of Equation (1) fully interacted with dummies for each tercile in the distribution of teacher evaluation scores. The estimates where the dependent variable is measured after one year are presented with a diamond, and the estimates for two years after are depicted with a circle.

Table A.1: Descriptive Statistics – Permanent Teachers and Temporary Teachers Who Were Covered by the Reform

	Permanent			Temporary		
	Mean	SD	N	Mean	SD	N
Age	51.677	9.279	29,077	39.161	9.448	11,535
Female	0.654	0.476	29,077	0.738	0.440	11,535
Has an education degree	0.985	0.122	29,077	0.935	0.247	11,535
Rural school	0.233	0.423	29,077	0.244	0.430	11,535
Number of contract hours in municipality	38.008	5.654	29,077	37.644	5.833	11,535
Teaches primary school	0.713	0.453	29,077	0.765	0.424	11,535
Works in more than one school	0.097	0.297	29,077	0.090	0.286	11,535
Share students low SES	0.666	0.164	29,065	0.686	0.148	11,534
Was evaluated	0.904	0.295	29,077	0.848	0.359	11,535
Percentile in teaching evaluation	52.260	28.375	26,279	50.745	27.714	9,780

Notes: The sample is composed of K-12 public school teachers with a permanent contract and temporary teachers who were covered by the 2015 reform. The first three columns report statistics for permanent teachers, and the last three columns report the same for temporary teachers that were covered by the 2015 reform. All of these figures are measured in 2014.

Table A.2: Sample and Identifying Variation in Analysis on the Impact of High Dismissal Protection on Turnover

	Cohort				
	2010	2011	2012	2013	2014
	Entitled to dismissal protection in 2015?				
Experience in municipality by that year:					
Three consecutive years	✓	✓	✓	✓	✓
Two consecutive years	✓	✓	✓	✓	×

Notes: This table displays the cohorts used in our analysis on the impact of high dismissal protection on turnover, and whether teachers with two and three consecutive years of experience in each cohort were eligible for dismissal protection under the 2015 law if they were still working for the same municipality by mid-2014.

Table A.3: Impact of High Dismissal Protection on Teacher Turnover after Three and Four years

	After three years			After four years		
	Not in same school	Left public school system	In another public school	Not in same school	Left public school system	In another public school
Treated × I[c=2014]	-0.074***	-0.046***	-0.029***	-0.078***	-0.057***	-0.019*
	(0.013)	(0.009)	(0.011)	(0.013)	(0.010)	(0.011)
Treated	-0.026***	-0.022***	-0.004	-0.031***	-0.022***	-0.009*
	(0.006)	(0.005)	(0.005)	(0.006)	(0.004)	(0.005)
Observations	24,002	24,002	24,002	24,002	24,002	24,002
R^2	0.014	0.012	0.003	0.017	0.010	0.004
Dependent variable mean (control)	0.335	0.145	0.190	0.381	0.189	0.206

Notes: The sample is composed of teachers who were teaching 20 or more hours in a K-12 public school under a temporary contract in 2010–2014, were younger than age 55, and had two or three years of consecutive experience in the same municipality. The dependent variables in Columns 1 and 4 are dummies for whether the teacher was not teaching in the same school after three and four years, respectively. In Columns 2 and 5, the dependent variables are dummies for whether the teacher was not teaching in a public school after three and four years. In Columns 3 and 6, the dependent variables are dummies for whether the teacher was working in a different public school after three and four years. $Treated$ is a dummy for whether the teacher has three years of consecutive experience in that year, and $I[c = 2014]$ is a dummy for the 2014 cohort. The regressions also include cohort fixed effects. Standard errors clustered by teacher are in parentheses. The dependent variable mean reported shows the average value of the dependent variable for the sample of teachers that had two years of experience in 2014. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A.4: Impact of High Dismissal Protection on Teacher Turnover – Excluding the 2010 Cohort

	After one year			After two years		
	Not in same school	Left public school system	In another public school	Not in same school	Left public school system	In another public school
Treated × I[c=2014]	-0.033***	-0.024***	-0.010	-0.063***	-0.041***	-0.022**
	(0.011)	(0.007)	(0.008)	(0.012)	(0.009)	(0.010)
Treated	-0.019***	-0.016***	-0.003	-0.028***	-0.022***	-0.006
	(0.007)	(0.005)	(0.005)	(0.007)	(0.005)	(0.006)
Observations	20,561	20,561	20,561	20,561	20,561	20,561
R^2	0.007	0.006	0.002	0.012	0.009	0.002
Dependent variable mean (control)	0.163	0.076	0.087	0.267	0.120	0.147

Notes: The sample is composed of teachers who were teaching 20 or more hours in a K-12 public school under a temporary contract in 2011–2014, were younger than age 55, and had two or three years of consecutive experience in the same municipality. The dependent variables in Columns 1 and 4 are dummies for whether the teacher was not teaching in the same school after one and two years, respectively. In Columns 2 and 5, the dependent variables are dummies for whether the teacher was not teaching in a public school after one and two years. In Columns 3 and 6, the dependent variables are dummies for whether the teacher was working in a different public school after one and two years. $Treated$ is a dummy for whether the teacher has three years of consecutive experience in that year, and $I[c = 2014]$ is a dummy for the 2014 cohort. The regressions also include cohort fixed effects. Standard errors clustered by teacher are in parentheses. The dependent variable mean reported shows the average value of the dependent variable for the sample of teachers that had two years of experience in 2014. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A.5: Impact of High Dismissal Protection on Turnover — Placebo Exercises

	Not in same school	
	(1)	(2)
Three years × I[c=2014]	0.031	
	(0.033)	
Four years × I[c=2014]		0.015
		(0.015)
Observations	6,402	16,086
R^2	0.004	0.016
Dependent variable mean (control)	0.207	0.179
Sample: type of contract	Permanent	Temporary
Sample: years of experience	2-3	3-4

Notes: The sample in Column 1 is composed of teachers who were teaching 20 or more hours in a K-12 public school under a permanent contract in 2010–2014, were younger than age 55, and had two or three years of consecutive experience in the same municipality. The sample in Column 2 is composed of teachers who were teaching 20 or more hours in a K-12 public school under a temporary contract in 2010–2014, were younger than age 55, and had three or four years of consecutive experience in the same municipality. In both columns, the dependent variable is a dummy for whether the teacher was not working in the same school after two years. The regressors in Column 1 are a dummy for whether the teacher has three years of consecutive experience in that year (*Three years*), cohort fixed effects, and the interaction between *Three years* and a dummy for the 2014 cohort. The regressors in Column 2 are a dummy for whether the teacher has four years of consecutive experience in that year (*Four years*), cohort fixed effects, and the interaction between *Four years* and a dummy for the 2014 cohort. Standard errors clustered by teacher are in parentheses. The dependent variable mean reported shows the average value of the dependent variable for the sample of teachers that had two years of experience in 2014 (Column 1) and three years of experience in 2014 (Column 2). * significant at 10%; ** significant at 5%; *** significant at 1%

Table A.6: Impact of High Dismissal Protection on Test Scores – Robustness Checks

	Including students w/o lagged score		Dropped teachers with < 2 years of exp.		Sample with evaluated teachers	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated × 2015	-0.012	-0.002	-0.017	-0.017	-0.015	-0.006
	(0.016)	(0.018)	(0.016)	(0.020)	(0.017)	(0.020)
Treated	0.021**	0.026	0.025**	0.032	0.020*	0.027
	(0.010)	(0.020)	(0.010)	(0.022)	(0.011)	(0.021)
Lagged score			0.427***	0.417***	0.430***	0.420***
			(0.003)	(0.003)	(0.003)	(0.003)
Observations	470,628	470,620	342,018	341,978	319,588	319,558
R^2	0.806	0.827	0.834	0.853	0.834	0.852
Student FE	✓	✓	✓	✓	✓	✓
Teacher FE		✓		✓		✓

Notes: The sample is composed of 6th grade public school students in 2013-2015 who took both the math and literacy SIMCE test. In Columns 3-6, the sample is also restricted to students that have a 4th grade SIMCE score for both subjects. In Columns 3-4, we drop students who in one of the subjects have a teacher with less than two years of teaching experience. In Columns 5-6, we restrict the sample to students for whom both the math and language teachers were evaluated. The dependent variable is the student's score in the math or literacy SIMCE evaluation (z-score). *Treated* is a dummy for whether the student's teacher in that subject had a temporary contract and at least three years of consecutive experience (or at least four years of total experience) in that municipality the year before. We include this variable by itself, as well as interacted with *2015* (a dummy for the year 2015). *Lagged score* is the student's score in the same subject in the 4th grade SIMCE evaluation (z-score). The regressions also control for subject fixed effects and student fixed effects. When indicated, the regression controls for teacher fixed effects. Standard errors clustered at the teacher-year level are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A.7: Impact of High Dismissal Protection on Teacher Turnover (Math and Language Teachers)

	After one year			After two years		
	Not in same school	Left public school system	In another public school	Not in same school	Left public school system	In another public school
Treated × I[c=2014]	-0.026*	-0.022**	-0.004	-0.062***	-0.040***	-0.022
	(0.014)	(0.009)	(0.011)	(0.016)	(0.011)	(0.014)
Treated	-0.007	-0.010*	0.003	-0.009	-0.013**	0.004
	(0.008)	(0.006)	(0.006)	(0.008)	(0.006)	(0.007)
Observations	12,509	12,509	12,509	12,509	12,509	12,509
R^2	0.007	0.006	0.003	0.011	0.007	0.005
Dependent variable mean (control)	0.131	0.060	0.071	0.232	0.100	0.132

Notes: The sample is composed of math and language teachers who were teaching 20 or more hours in a K-12 public school under a temporary contract in 2010–2014, were younger than age 55, and had two or three years of consecutive experience in the same municipality. The dependent variables in Columns 1 and 4 are dummies for whether the teacher was not teaching in the same school after one and two years, respectively. In Columns 2 and 5, the dependent variables are dummies for whether the teacher was not teaching in a public school after one and two years. In Columns 3 and 6, the dependent variables are dummies for whether the teacher was working in a different public school after one and two years. $Treated$ is a dummy for whether the teacher has three years of consecutive experience in that year, and $I[c = 2014]$ is a dummy for the 2014 cohort. The regressions also include cohort fixed effects. Standard errors clustered by teacher are in parentheses. The dependent variable mean reported shows the average value of the dependent variable for the sample of teachers that had two years of experience in 2014. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A.8: Impact of High Dismissal Protection on Teacher Characteristics

	Age	Female	Has education degree	Weekly hours teach.	Main role teacher	More than one school	Was evaluated	Evaluation score percentile
Treated × 2015	-0.532	-0.004	0.006	0.409	0.001	0.002	-0.041**	0.432
	(0.849)	(0.032)	(0.006)	(0.336)	(0.010)	(0.010)	(0.018)	(2.072)
Treated	-4.119***	0.027	0.002	0.108	0.008*	-0.006	0.122***	-2.341*
	(0.521)	(0.020)	(0.002)	(0.214)	(0.005)	(0.007)	(0.013)	(1.233)
Observations	390,574	390,574	390,574	390,574	390,574	390,574	390,574	347,366
R^2	0.588	0.588	0.514	0.710	0.726	0.540	0.571	0.611
Dependent variable mean (control)	45.220	0.718	0.994	38.575	0.966	0.011	0.908	56.192
Lagged scores, subject FE and student FE	✓	✓	✓	✓	✓	✓	✓	✓

Notes: The sample is composed of 6th grade public school students in 2013-2015 who took both the math and literacy SIMCE test, and have a 4th grade SIMCE score for both subjects. The dependent variable is the characteristic of their math or literacy teachers in that year indicated in the column header. *Treated* is a dummy for whether the student's teacher in that subject had a temporary contract and at least three years of consecutive experience (or at least four years of total experience) in that municipality the year before. We include this variable by itself, as well as interacted with *2015* (a dummy for the year 2015). We control for the student's score in the same subject in the 4th grade SIMCE evaluation, subject fixed effects and student fixed effects. Standard errors clustered at the teacher-year level are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A.9: Impact of High Dismissal Protection on Test Scores – Pretrends

	Test scores	
	(1)	(2)
Treated × 2015	-0.002	0.011
	(0.017)	(0.022)
Treated × 2014	0.028	0.032
	(0.019)	(0.020)
Treated	0.009	0.001
	(0.013)	(0.023)
Observations	416,946	416,896
R^2	0.833	0.852
Lagged scores and student FE	✓	✓
Teacher FE		✓

Notes: The sample is composed of 6th grade public school students in 2013-2015 who took both the math and literacy SIMCE test, and have a 4th grade SIMCE score for both subjects. The dependent variable is the student's score in the math or literacy SIMCE evaluation (z-score). *Treated* is a dummy for whether the student's teacher in that subject had a temporary contract and at least three years of consecutive experience (or at least four years of total experience) in that municipality the year before. We include this variable by itself, as well as interacted with *2015* (a dummy for the year 2015), and with a dummy for the year 2014. We also control for the student's score in the same subject in the 4th grade SIMCE evaluation, subject fixed effects, and student fixed effects. In Column 2, the regression controls for teacher fixed effects as well. Standard errors clustered at the teacher-year level are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A.10: Impact of High Dismissal Protection on Test Scores – Placebo Using 4th Grade Scores as Outcome

	Test scores	
	(1)	(2)
Treated × 2015	0.003	0.004
	(0.012)	(0.014)
Treated	0.002	0.006
	(0.007)	(0.016)
Observations	416,946	416,896
R^2	0.838	0.849
Student FE	✓	✓
Teacher FE		✓

Notes: The sample is composed of 6th grade public school students in 2013-2015 who took both the math and literacy SIMCE test, and have a 4th grade SIMCE score for both subjects. The dependent variable is the student's score in the math or literacy SIMCE evaluation in grade 4 (z-score). *Treated* is a dummy for whether the student's teacher in that subject had a temporary contract and at least three years of consecutive experience (or at least four years of total experience) in that municipality the year before. We include this variable by itself, as well as interacted with *2015* (a dummy for the year 2015). The regressions also control for subject fixed effects and student fixed effects. In Column 2, the regression controls for teacher fixed effects as well. Standard errors clustered at the teacher-year level are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

Appendix B Direct Measurement of Teacher Effort

Table B.1: Questions Used to Measure Teacher Effort

Source:	Student survey questionnaire, SIMCE 2014 and 2015.
Instructions:	For each statement, mark the alternative that best describes what your Language and Communication teacher does in class.
Questions:	The teacher reviews the homework assignments of all students. The teacher explains in class the correct answers to homework assignments. The teacher explains further when a student asks for it. The teacher explains a concept until all students understand it. The teacher explains in class the correct answers to exams. The teacher explains in class the correct answers to study guides and exercises that he/she distributes among students.
Response options:	1. Never 2. Almost never (A few times) 3. Many times 4. Always
Notes:	The 2014 questionnaire used the "2. Almost never" response option, while the 2014 questionnaire used "2. A few times".