

# The Unintended Consequences of Merit-based Teacher Selection: Evidence from Large-scale Reform in Colombia

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# Motivation

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- ▶ Large disparities in educational outcomes.
- ▶ Policymakers implement reforms in an effort to improve educational outcomes.
- ▶ Teacher-hiring policies are determinant and constitute natural candidates. (Chetty et al., 2011; Hanushek and Woessmann, 2011; Rivkin et al., 2005).
- ▶ Teacher-hiring reforms may work well with good information on teacher quality.
- ▶ Many observable characteristics fail to predict teacher effectiveness Hanushek and Rivkin (2006); Rockoff et al. (2011).
- ▶ Hiring systems that heavily weight specific indicator/characteristic might backfire (Staiger and Rockoff, 2010).

# Research Question

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**Do merit-based hiring systems for public teachers always increase student learning?**

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**Do merit-based hiring systems for public teachers always increase student learning?**

- ▶ We study a teacher hiring reform in Colombia.
- ▶ The reform introduced a merit-based hiring system.
- ▶ Effects on teachers' characteristics and student's educational outcomes.
- ▶ We employ a difference-in-differences strategy comparing public and private students.
- ▶ Administrative data sets that cover the entire Colombian public teacher system.

# Preview of Results

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The merit-based system,

- ▶ Impact on teachers:
  - ▶ increased pre-college test scores for public teachers (screening measure of skills).
  - ▶ decreased overall stock of teacher experience.
  - ▶ no effect on other teacher characteristics.

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- ▶ Impact on students:
  - ▶ Reduced student performance on high school exit exams by 8 percent of a standard deviation.
  - ▶ Reduced the likelihood that students enroll and graduate from college by more than 10 percent.

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- ▶ Impact on students:
  - ▶ Reduced student performance on high school exit exams by 8 percent of a standard deviation.
  - ▶ Reduced the likelihood that students enroll and graduate from college by more than 10 percent.
- ▶ Implementation issues increased student exposure to novice teachers resulting in a decrease in learning.

# Outline

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1. Introduction

2. Background

3. Data

4. Results

4.1 Effects on Teachers'

4.2 Effects on Student Academic Achievement

4.3 Teaching Experience and Student Test Scores

5. Conclusions



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# The 2002 Reform

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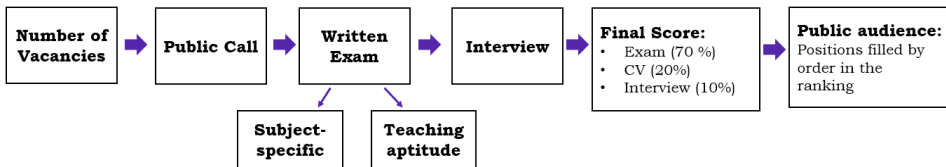
- ▶ The hiring system was modified to a fully centralized system → standard hiring procedures for all school districts.
- ▶ First wave of new teachers arrived in 2005.
- ▶ Two main changes:
  1. Merit-Based System: Hiring, tenure, and promotion subject to an evaluation process.
  2. Salaries increase (compared to previous system).
- ▶ Aim was to improve quality of public education by increasing the quality of the pool of applicants.

# Merit-Based System

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Teachers are constantly evaluated:

## ▶ Hiring:



## ▶ Tenure:

Four-month evaluation + annual evaluations by school principals. Teachers cannot fail 2 consecutive evaluations. Essentially no teachers failed.

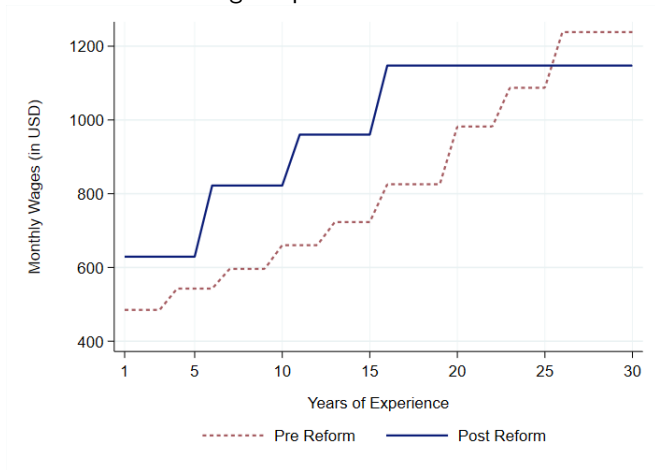
## ▶ Promotion:

Written exam for promotion (replaced in 2014 evaluation of class recording).

# Increase in Public Teachers Salaries

Salaries increased (assuming promotion every 5 years).

Wage-Experience Profiles



# Temporary Teachers

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- ▶ Not all vacancies are filled in time:
  1. Under-provision in low demand areas.
  2. Unexpected retirements and departures.
  
- ▶ Lists of eligible candidates are only updated after every public call.
  
- ▶ **Temporary teachers:** hired to cover unexpected vacancies:
  1. They do not need to pass the entry exam.
  2. Contracts do not specify length.
  3. Constitute between 12% - 20% of the public teacher stock.

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# Data

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We combine three administrative data sets:

1. Test Score Measures (2000-2019): High school exit exam of every student who obtained a diploma (*Saber 11*).
2. Census of Public Teachers (2007-2015): Census of around 400,000 public teachers with socio-demographic information, locations, hiring dates, etc. We create a retrospective longitudinal data set to build teachers' experience (*Anexo 3a*).
3. College Records (1998-2016): Census data of all students enrolled in college (*Spadies*).

We merge these to: (1) compute measures of teachers' skills; (2) compute student outcomes.

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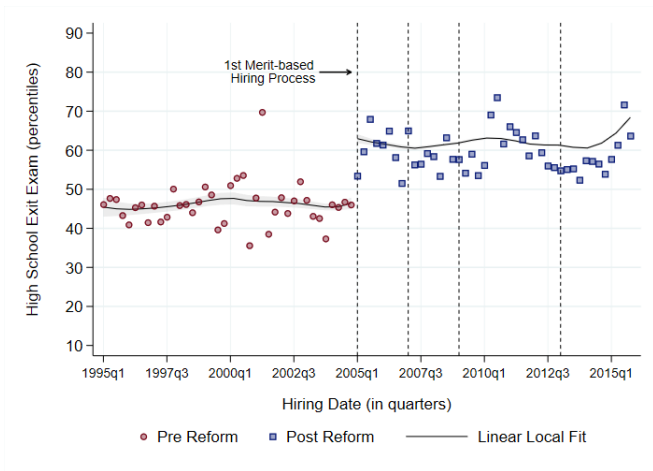
4.3 Teaching Experience and Student Test Scores

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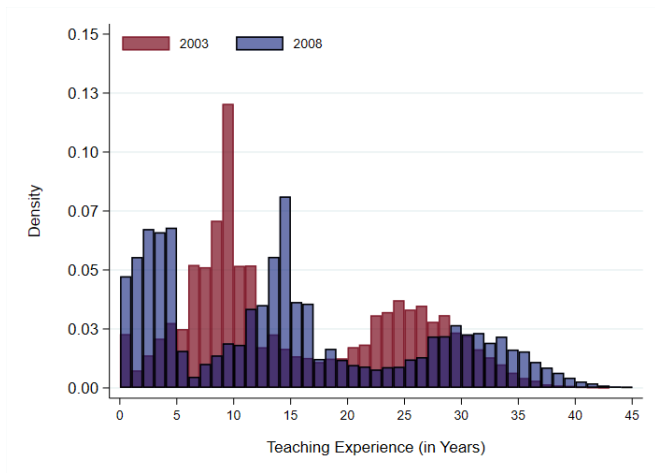
# Pre-College Test Scores of Public School Teachers

The reform increased pre-college test scores (measure of skills) of public teachers considerably.



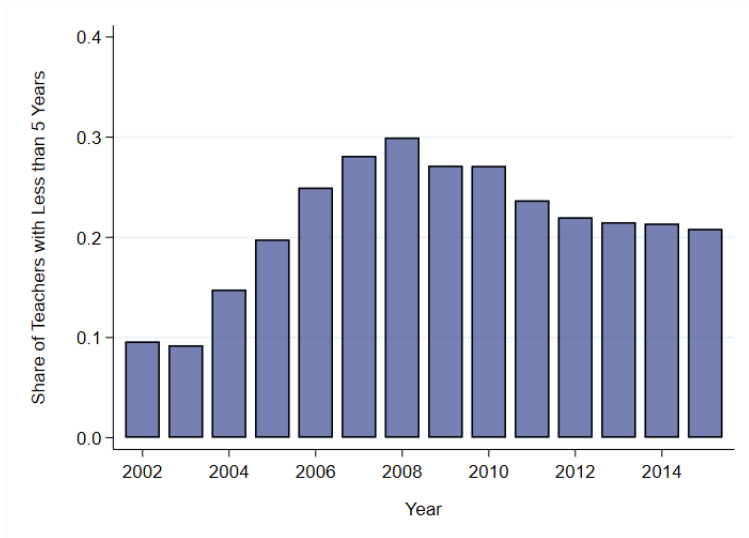
# Distribution of Teacher Experience

Big entrance of novice teachers (less than five years of experience).



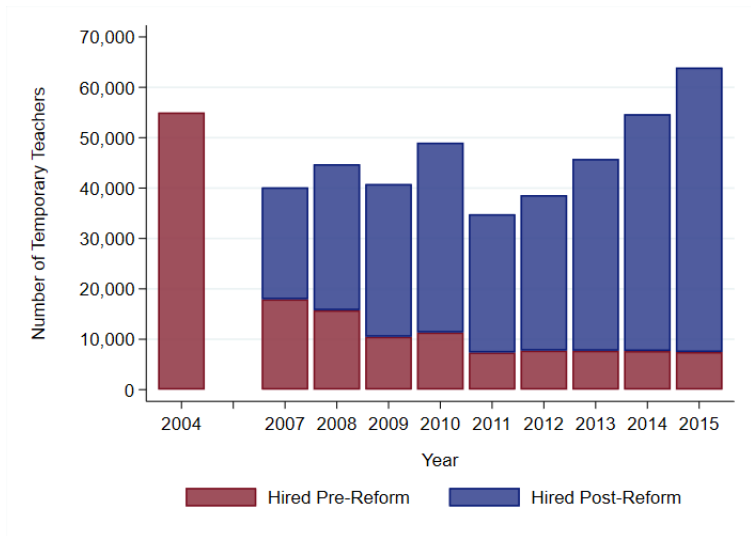
# Share of Novice Teachers

Share of novice teachers increased from 10% to 30%, and stabilized at around 20%.



# Stock of Temporary Teachers by Year

Temporary teachers with several years experience leave.



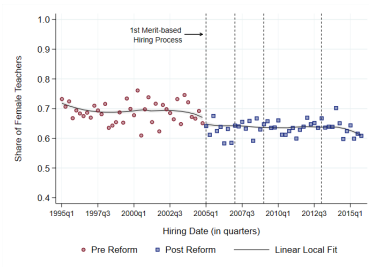
# Other public teachers' characteristics

Other public teacher characteristics were not affected by the reform.

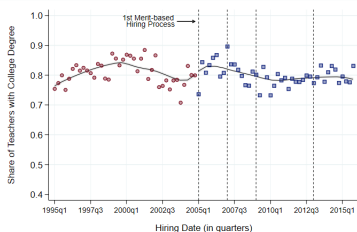
## Gender



## Age at Hiring



## College Degree



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# Empirical Strategy

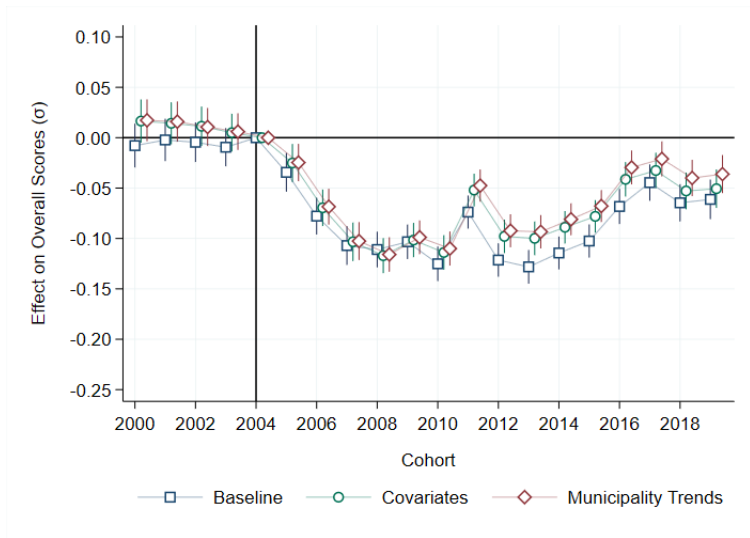
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- ▶ The 2002 reform increased teacher measures of skills but decreased experience.
- ▶ Student learning could have been affected.
- ▶ We test this by comparing test scores of public and private students:

$$Y_{ist} = \mu_t + \mu_s + \sum_{\tau \neq 2004}^T \delta_\tau \times 1[\tau = t] \times \text{Public}_s + X_i' \gamma + \varepsilon_{ist}$$

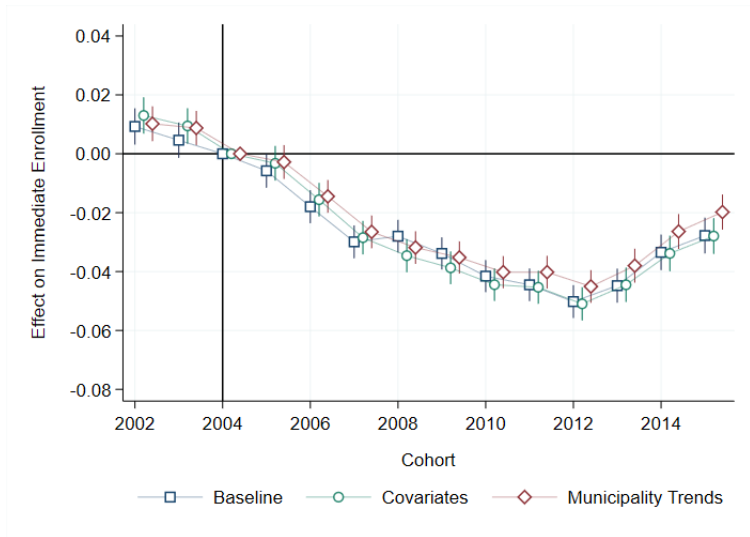
- ▶ Identifying assumption: traditional parallel trends (no variation in treatment timing, and no other policy that affected at the same time).

# Effect on Test Score Measures

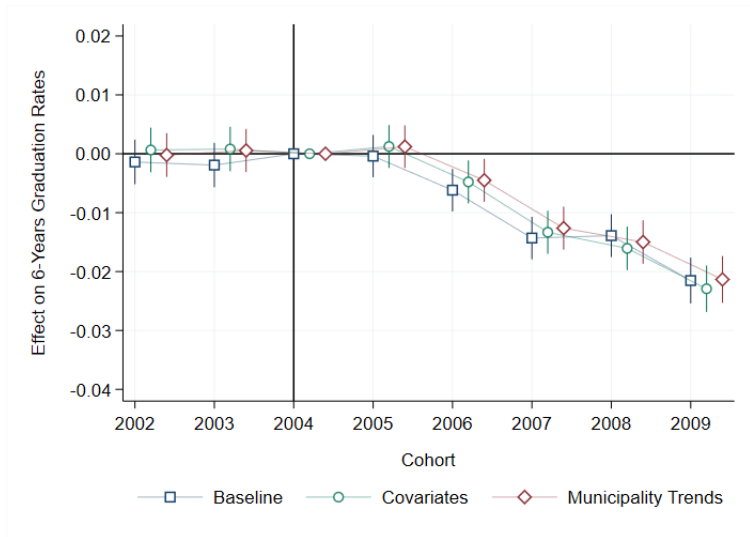




# Effect on College Enrolment



# Effect on College Graduation



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2. Background

3. Data

4. Results

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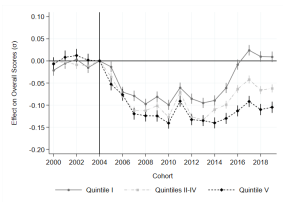
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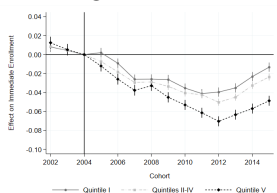
# Teaching Experience and Student Test Scores

- ▶ Can the decrease in teaching experience explain the decrease in student test scores?
- ▶ Stronger effects with higher initial share of novice teachers.

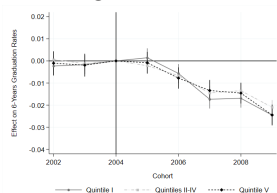
## Test Scores



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# Conclusions

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- ▶ We explore the effects of merit-based hiring systems on student outcomes.
- ▶ Analyse the effects of a sweeping reform to teacher hiring in 2002 in Colombia.
- ▶ Our results indicate that a system that heavily relies on evaluation, and jeopardizes teacher experience, can backfire.
- ▶ We estimate significant learning losses, and negative effects on college attendance and graduation.
- ▶ Our results raise concerns about the importance of ex post measures of teacher effectiveness.
- ▶ Open questions about how to implement teacher-hiring policies that foster student learning.

# Thank you!

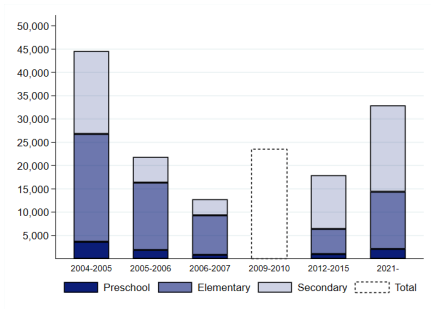
Comments & suggestions: [j.munoz@ieseg.fr](mailto:j.munoz@ieseg.fr)

[www.juansmunoz.com](http://www.juansmunoz.com)

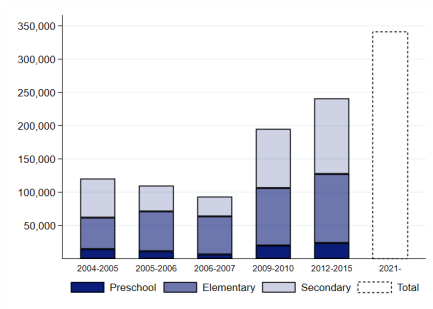


# Public Calls

## Teaching Vacancies

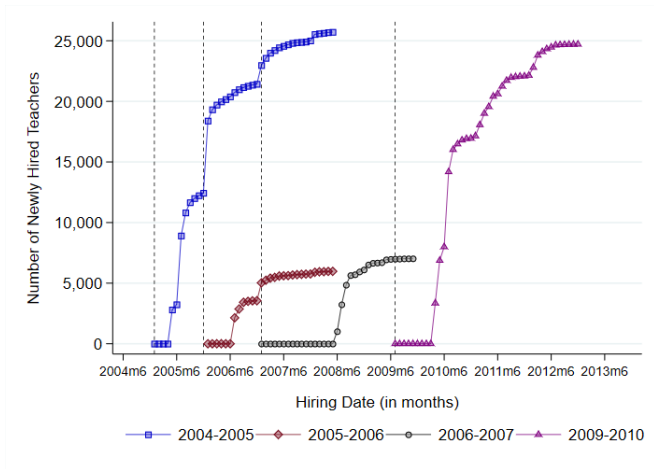


## Number of Applicants



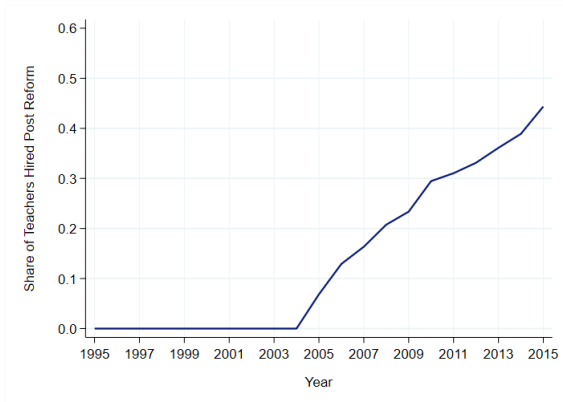


# Hiring Dates by Public Call



# Share of Teachers Under New Regulation

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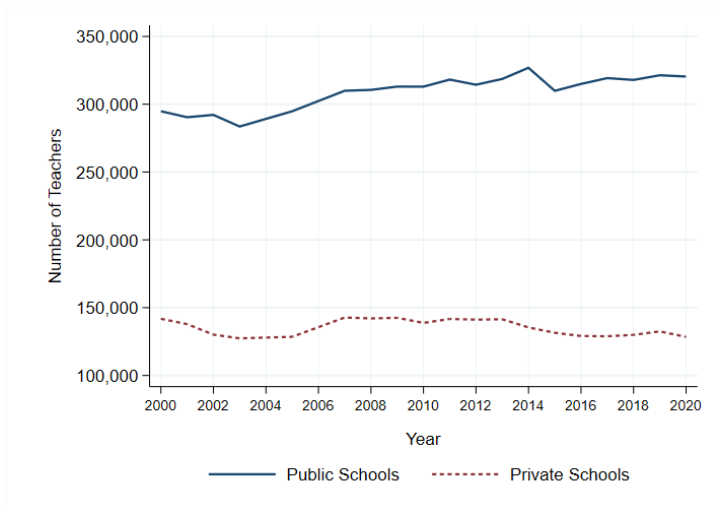
# Public VS Private Teachers (2008-2018)

	Public Teachers	Other Teachers	P-value
	(1)	(2)	(3)
Monthly Wages (in 2010 USD)	896.28	752.33	0.000
Hourly Wages (in 2010 USD)	6.59	4.57	0.000
Weekly Hours	30.34	38.88	0.000
Age	46.33	42.04	0.000
Years of Education	17.00	16.29	0.000
Female	0.64	0.64	0.693
Found job in open call	0.56	0.34	0.000
Tenure (Months)	199.62	123.82	0.000
Is part of a union	0.62	0.25	0.000
Satisfied with current contract	0.98	0.86	0.000

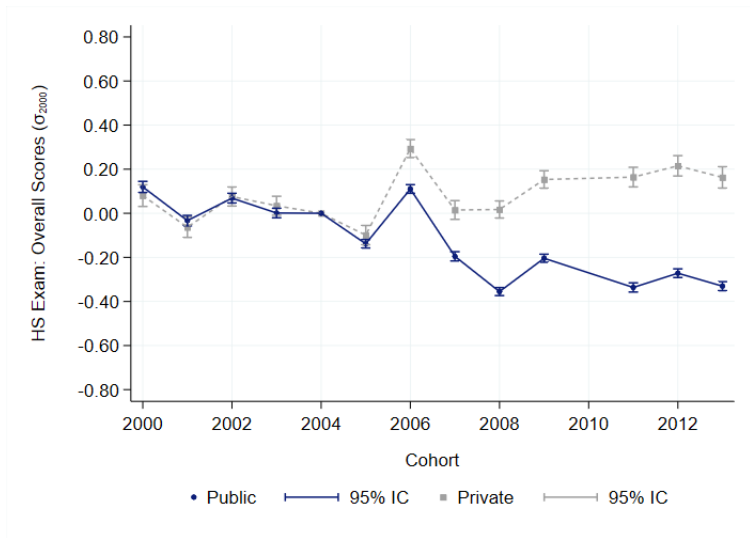
# Descriptive Statistics

	Public Schools		Private Schools	
	Mean	S.D.	Mean	S.D.
	(1)	(2)	(3)	(4)
<i>Student's Characteristics :</i>				
Age	18.09	3.28	18.36	4.29
Female	0.55	0.50	0.52	0.50
Working	0.10	0.30	0.12	0.32
<i>Family Background :</i>				
Socioeconomic Stratum	1.73	0.77	2.66	1.07
<i>Family Size :</i>				
1 or 2	0.05	0.22	0.07	0.25
3 or 4	0.41	0.49	0.52	0.50
5 or 6	0.39	0.49	0.33	0.47
7 or more	0.16	0.36	0.09	0.28
<i>Mother's Education :</i>				
None or Any Preschool	0.05	0.21	0.04	0.18
Any Elementary	0.40	0.49	0.20	0.40
Any High School	0.42	0.49	0.38	0.49
Any College	0.13	0.34	0.38	0.49
<i>School's Characteristics :</i>				
Urban	0.86	0.35	0.96	0.19
Main City	0.35	0.48	0.64	0.48
<i>Schooling Time :</i>				
Morning	0.55	0.50	0.33	0.47
Afternoon	0.21	0.41	0.07	0.25
Whole day	0.14	0.35	0.44	0.50
Weekends or Night	0.10	0.29	0.16	0.36
Observations	6,627,860		2,322,799	

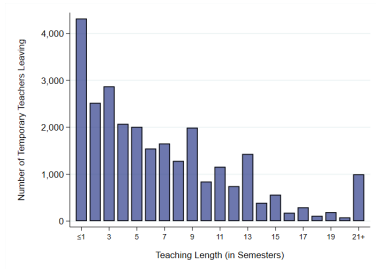
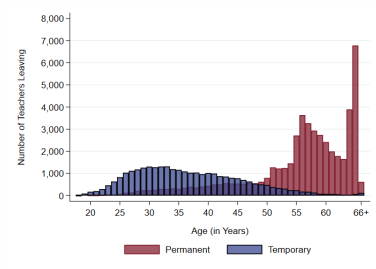
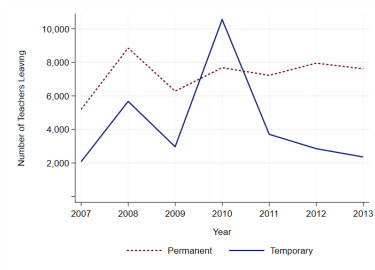
# Total Stock of Private and Public Teachers Does Not Change



# Constant Results in Private Schools



# Teachers Leaving Public School Positions



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