



Does Test-Based Teacher Recruitment Work in the Developing World? Experimental Evidence from Ecuador

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I. Introduction

- Latin America (LA) significantly increased enrolment in last decades, but learning outcomes still substantially lower than in high-income and other middle-income economies (PISA.)
- To improve school quality → some LA countries (e.g. Colombia, Ecuador, Mexico, Peru) implemented **new teacher recruitment policies** → **teacher candidates must pass national skill, content knowledge and classroom practice tests** before they compete for tenure at public schools.
- In high-income economies, teacher skill and content knowledge test scores → widely-used as a signal of teacher quality for recruitment.
- Mixed evidence regarding the effectiveness of teacher test scores as **predictors of future quality** (Angrist and Guryan 2008; Boyd et al. 2008; Clotfelter, Ladd, and Vigdor 2007; Goldhaber 2007; Goldhaber and Anthony 2007; Goldhaber, Gratz, and Theobald 2017; Harris and Sass 2007; 2011; Kane, Rockoff, and Staiger 2008; Rockoff et al. 2011).

I. Introduction

- We evaluate whether teachers who passed national entrance tests and were tenured by Ecuador's new recruitment policy (test-screened tenured teachers) have positive effects on kindergarten language and math learning outcomes.
 - We link unique administrative teacher recruitment records to rich experimental data of the “Closing Gaps” project...
 - ...where approximately 15.000 kindergarten children were randomly assigned to their teachers, starting in 2012-2013 school year.
 - Potential bias caused by matching of teachers to students is no concern.

I. Introduction

- **Our results show that kindergarten children randomly-assigned to test-screened tenured teachers have significantly higher end-of-year test scores in language and math.**
- We contribute to teacher quality research in developing countries and to recent personnel policy studies:
 1. First experimental estimations in a Latin-American country.
 2. Confirmed positive learning effects associated with teacher skill, subject knowledge and classroom practices, but also new evidence of connection with teacher job status (tenure).
 3. Potential effectiveness of test-screened tenured teachers in closing learning gaps.

I. Introduction

The remainder of this presentation:

II. Background and Evidence

III. Experimental Design and Data

IV. Estimation Strategy

V. Results

VI. Heterogeneous Effects and Robustness

VII. Conclusion

II. Background and Evidence

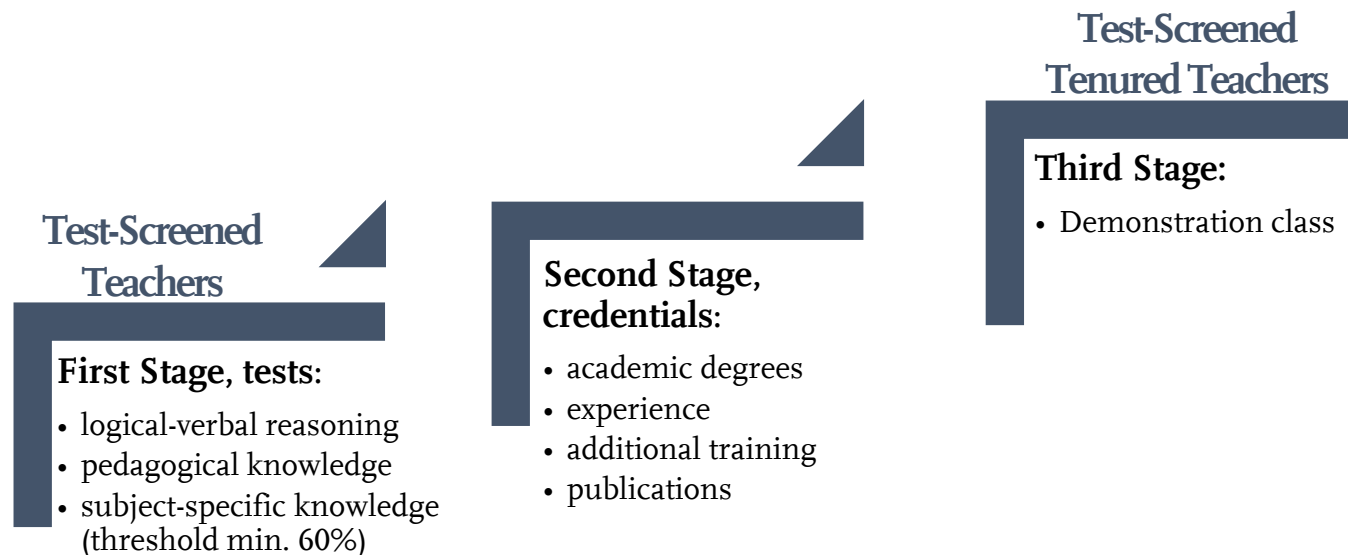
New Teacher Recruitment Policy in Ecuador

- Ecuador is a South American middle-income country.
- **The Ecuadorian education system: initial education** (pre-kindergarten), **general basic education** (one year of kindergarten, six of primary school, three of lower secondary education), and **high school** (three years).
- Major education reforms between 2006 and 2017 particularly targeted the teaching profession → prestige and quality progressively declined (since the 1970s) due to the lack of academic standards and drastic decreases in wages.

II. Background and Evidence

New Teacher Recruitment Policy in Ecuador

- Since November 2007, teacher candidates required to pass national entrance tests → then allowed to participate in merit based competitions for tenured positions at public schools.
- Testing and recruitment processes were centrally managed by Ecuador's Ministry of Education (2007-2012).



II. Background and Evidence

New Teacher Recruitment Policy in Ecuador

- Permanent teacher vacancies had to be filled by test-screened tenured teachers.
- Local education authorities allowed to hire teachers who had not undergone the process temporarily with fixed-term contracts.
- **Between 2007 and 2012:**
 - ✓ **34.000** new permanent teacher positions opened.
 - ✓ **320.000** teacher candidates registered for entrance tests.
 - ✓ **21.200** teacher candidates passed tests.
 - ✓ **18.820** successful candidates granted a tenure.
- Economic incentives: monthly entry wage for a new tenured teacher from US\$291 in 2006 to US\$396 in 2010 and to US\$775 in 2011.

II. Background and Evidence

Previous Policy Evaluations

- **Scarce evidence on the effects of mandatory certification tests and competitive teacher recruitment on learning outcomes in LA:**
 - **Mexico** → positive significant effect on math and language test scores at the school level (Estrada, 2019.)
 - **Colombia** → modest positive and significant effect on national high school exit exam at the school level (Brutti & Sánchez, 2017.)
 - **Ecuador** →
 - No evidence that teachers with higher test-scores on the national competitions were more effective (Cruz-Aguayo, Ibararán & Schady, 2017.)
 - Teachers who passed national entry tests and won a tenured position had positive significant effects on reading achievement for students living in poverty (Araujo, 2019.)
- Potential bias caused by matching of students to teachers.

III. Experimental Design and Data

“Closing Gaps” Project Data

- Starting in 2011, the IDB and Ecuador’s Ministry of Education implemented the “Closing Gaps” project:
 - Random sample of 204 public schools from the coastal region.
 - All children enrolled for kindergarten (approx. 15.000) were ordered by their last and first names and **randomly assigned to their teachers and classrooms**, starting in the 2012-2013 school year.
 - High compliance: only 1.7% of children found in classrooms other than those to which they had been assigned.
 - Rich data on child, family and teacher characteristics, including cognitive skills (WAIS-III), personality (Big Five personality traits), and classroom practices (CLASS).
- We merged the “Closing Gaps” data with unique administrative information on teacher recruitment processes.

III. Experimental Design and Data

Descriptive Statistics

	Mean	Sd.	Obs.
Children:			
Proportion female	0.49	0.50	14930
Proportion who attended preschool	0.56	0.50	14925
Age (months)	60.34	5.11	14841
TVIP	83.24	16.89	14187
Family:			
Parent's years of schooling	8.69	3.42	13275
Living standard indicator	3.33	1.38	13744

Note: This table reports means and standard deviations of the characteristics of kindergarten children and their families. TVIP stands for *Test de Vocabulario en Imágenes Peabody*, the Spanish version of the Peabody Picture Vocabulary Test (PPVT). The test was standardized to have a mean of 100 and the standard deviation of 15 at each age, based on a reference sample of Mexican and Puerto Rican children. Family living standard indicator aggregates the following households' characteristics: access to improved sanitation and safe drinking water, type of floor, roof and exterior walls material, and assets ownership.

III. Experimental Design and Data

Descriptive Statistics

	Full sample	Test-screened tenured teachers		
		YES	NO	Difference
Proportion female	0.99 (0.005)	0.96 (0.026)	0.99 (0.004)	-0.03 (0.026)
Proportion tenured	0.65 (0.023)	1.00 (.)	0.60 (0.025)	0.40*** (0.025)
Years of experience	14.74 (0.415)	12.84 (0.963)	15.01 (0.453)	-2.17** (1.064)
Years of education	17.15 (0.093)	17.46 (0.259)	17.11 (0.099)	0.36 (0.277)
University degree	0.99 (0.005)	1.00 (.)	0.99 (0.006)	0.01** (0.006)
Observations	430	54	376	.

Note: This table reports means and standard deviations of teacher characteristics for the full analyzed sample, as well as whether the teacher passed national entry tests and won a competition for tenure (test-screened tenured teacher) Standard errors in parentheses. * Significant at 0.1 level, ** significant at 0.05 level, *** significant at 0.01 level.

III. Experimental Design and Data

Descriptive Statistics

	Full sample	Test-screened tenured teachers		
		YES	NO	Difference
Cognitive skills	86.46 (0.459)	89.93 (1.324)	85.96 (0.485)	3.96*** (1.410)
Neuroticism	43.85 (0.324)	43.22 (0.925)	43.94 (0.346)	-0.73 (0.988)
Extraversion	45.65 (0.329)	48.55 (0.878)	45.24 (0.350)	3.31*** (0.946)
Openness	50.82 (0.325)	52.97 (0.887)	50.51 (0.347)	2.46** (0.953)
Agreeableness	48.22 (0.365)	50.63 (0.955)	47.87 (0.391)	2.76*** (1.032)
Conscientiousness	57.55 (0.393)	58.64 (0.951)	57.39 (0.428)	1.25 (1.043)
CLASS 2011-2012	3.48 (0.014)	3.50 (0.037)	3.48 (0.015)	0.02 (0.040)
Observations	430	54	376	.

Note: This table reports means and standard deviations of teacher characteristics for the full analyzed sample, as well as whether the teacher passed national entry tests and won a competition for tenure (test-screened tenured teacher) Standard errors in parentheses. * Significant at 0.1 level, ** significant at 0.05 level, *** significant at 0.01 level.

III. Experimental Design and Data

Validity, randomization test

	Test-screened tenured teachers
Children:	
Age (months)	-0.000 (0.000)
Gender	0.001 (0.003)
TVIP	0.000 (0.000)
Proportion who attended preschool	-0.005 (0.005)
Family:	
Parents' years of schooling	0.001** (0.001)
Living standard indicator	-0.000 (0.003)
Observations	12632
F	1.09
p	0.372

Note: OLS model estimated with cluster standard errors (in parentheses) at the school level and school fixed effects. * Significant at 0.1 level, ** significant at 0.05 level, *** significant at 0.01 level.

IV. Estimation Strategy

Test-screened tenured teachers

- We evaluate the effect of test-screened tenured teachers on learning outcomes by estimating (OLS):

$$Y_{ics} = \rho_0 + \alpha_s + \rho_1 test_tenured_{cs} + \rho_2 X_{ics} + \rho_3 \bar{X}_{ics} + \rho_4 C_{cs} + \rho_5 T_{cs} + \rho_6 P_{cs} + \rho_7 CLASS_{cs} + u_{ics}$$

- Y_{ics} is end-of-year test score language or math.
- $test_tenured_{cs}$ is a dummy variable indicating whether the student was assigned to a *test-screened tenured* teacher.
- α_s is a school fixed effect component.
- Successful random assigned to test-screened tenured teachers → additional controls (just for robustness and precision): vector of student and parent characteristics (X_{ics}), vector of classroom averages (\bar{X}_{ics}), indicator of class size (C_{cs}), vector of teacher observable characteristics (T_{cs}), vector of teacher cognitive ability and personality (P_{cs}) and indicator of teacher class practices ($CLASS_{cs}$.)

IV. Estimation Strategy

Test-screened tenured and contract Teachers

- In our comparison group: teachers tenured before 2007 by local authorities (45 percent), test-screened contract teachers who had not yet won a competition for tenure (12 percent), and contract teachers (30 percent.)
- **We estimate the effect of test-screened tenured, other tenured and test-screened contract teachers using an analogous specification:**

$$Y_{ics} = \rho_0 + \alpha_s + \rho_1 \text{Test_tenured}_{cs} + \rho_2 \text{Other_tenured}_{cs} \\ + \rho_3 \text{Test_contract}_{cs} + \rho_4 X_{ics} + \rho_5 \bar{X}_{ics} + \rho_6 C_{cs} + \rho_7 T_{cs} + \rho_8 P_{cs} \\ + \rho_9 \text{CLASS}_{cs} + u_{ics},$$

V. Results

Test-screened tenured teachers

	Language						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Test-screened tenured	0.105** (0.043)	0.102*** (0.038)	0.096** (0.038)	0.089** (0.039)	0.115*** (0.037)	0.115*** (0.038)	0.125*** (0.035)
School fixed effects	YES	YES	YES	YES	YES	YES	YES
Student controls	NO	YES	YES	YES	YES	YES	YES
Parent controls	NO	NO	YES	YES	YES	YES	YES
Classroom controls	NO	NO	NO	YES	YES	YES	YES
Teacher observable controls	NO	NO	NO	NO	YES	YES	YES
Teacher cognitive skills and personality traits	NO	NO	NO	NO	NO	YES	YES
Teacher class practices	NO	NO	NO	NO	NO	NO	YES
Observations	12632	12632	12632	12632	12632	12632	12632
R^2	0.149	0.433	0.440	0.440	0.441	0.442	0.442

Notes: Each column reports coefficients from OLS regressions estimated with cluster standard errors (in parentheses) at the school level. Columns (2)-(7) control for the following student characteristics: TVIP score, age, gender, attendance to preschool; parent characteristics: years of education and living standard conditions; classroom characteristics: class size, classroom averages of student and parent characteristics; teacher observable characteristics: gender, experience, years of education . * Significant at 0.1 level, ** significant at 0.05 level, *** significant at 0.01 level.

V. Results

Test-screened tenured teachers

	Math						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Test-screened tenured	0.085* (0.048)	0.086* (0.045)	0.080* (0.045)	0.068 (0.046)	0.093** (0.046)	0.086* (0.045)	0.099** (0.044)
School fixed effects	YES	YES	YES	YES	YES	YES	YES
Student controls	NO	YES	YES	YES	YES	YES	YES
Parent controls	NO	NO	YES	YES	YES	YES	YES
Classroom controls	NO	NO	NO	YES	YES	YES	YES
Teacher observable controls	NO	NO	NO	NO	YES	YES	YES
Teacher cognitive skills and personality traits	NO	NO	NO	NO	NO	YES	YES
Teacher class practices	NO	NO	NO	NO	NO	NO	YES
Observations	12632	12632	12632	12632	12632	12632	12632
R^2	0.123	0.303	0.309	0.309	0.310	0.310	0.311

Notes: Each column reports coefficients from OLS regressions estimated with cluster standard errors (in parentheses) at the school level. Columns (2)-(7) control for the following student characteristics: TVIP score, age, gender, attendance to preschool; parent characteristics: years of education and living standard conditions; classroom characteristics: class size, classroom averages of student and parent characteristics; teacher observable characteristics: gender, experience, years of education . * Significant at 0.1 level, ** significant at 0.05 level, *** significant at 0.01 level.

V. Results

Test-screened tenured and contract teachers

	Language						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Test-screened tenured	0.169*** (0.050)	0.166*** (0.044)	0.159*** (0.045)	0.155*** (0.045)	0.157*** (0.044)	0.143*** (0.045)	0.148*** (0.043)
Other-tenured	0.097** (0.040)	0.093*** (0.035)	0.091** (0.035)	0.098*** (0.035)	0.078** (0.035)	0.058* (0.034)	0.047 (0.035)
Test-screened contract	-0.012 (0.061)	0.040 (0.054)	0.044 (0.054)	0.032 (0.056)	0.030 (0.055)	-0.013 (0.060)	-0.005 (0.061)
School fixed effects	YES	YES	YES	YES	YES	YES	YES
Student controls	NO	YES	YES	YES	YES	YES	YES
Parent controls	NO	NO	YES	YES	YES	YES	YES
Classroom controls	NO	NO	NO	YES	YES	YES	YES
Teacher observable controls	NO	NO	NO	NO	YES	YES	YES
Teacher cognitive skills and personality traits	NO	NO	NO	NO	NO	YES	YES
Teacher class practices	NO	NO	NO	NO	NO	NO	YES
Observations	12632	12632	12632	12632	12632	12632	12632
R ²	0.150	0.433	0.441	0.441	0.441	0.442	0.442

Notes: Each column reports coefficients from OLS regressions estimated with cluster standard errors (in parentheses) at the school level. Columns (2)-(7) control for the following student characteristics: TVIP score, age, gender, attendance to preschool; parent characteristics: years of education and living standard conditions; classroom characteristics: class size, classroom averages of student and parent characteristics; teacher observable characteristics: gender, experience, years of education . * Significant at 0.1 level, ** significant at 0.05 level, *** significant at 0.01 level.

V. Results

Test-screened tenured and contract teachers

	Math						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Test-screened tenured	0.155*** (0.057)	0.154*** (0.052)	0.147*** (0.052)	0.136** (0.052)	0.137** (0.053)	0.123** (0.052)	0.129** (0.051)
Other-tenured	0.105** (0.040)	0.100*** (0.036)	0.098*** (0.036)	0.100*** (0.036)	0.080** (0.038)	0.068* (0.038)	0.054 (0.038)
Test-screened contract	0.008 (0.061)	0.047 (0.053)	0.049 (0.053)	0.043 (0.055)	0.042 (0.054)	0.020 (0.058)	0.030 (0.059)
School fixed effects	YES	YES	YES	YES	YES	YES	YES
Student controls	NO	YES	YES	YES	YES	YES	YES
Parent controls	NO	NO	YES	YES	YES	YES	YES
Classroom controls	NO	NO	NO	YES	YES	YES	YES
Teacher observable controls	NO	NO	NO	NO	YES	YES	YES
Teacher cognitive skills and personality traits	NO	NO	NO	NO	NO	YES	YES
Teacher class practices	NO	NO	NO	NO	NO	NO	YES
Observations	12632	12632	12632	12632	12632	12632	12632
R ²	0.124	0.303	0.309	0.310	0.310	0.311	0.312

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VI. Heterogeneous Effects and Robustness

- **Heterogeneous effects:** the impact of test-screened tenured teachers on language learning is stronger for vulnerable children who:
 - Started the school year with lower TVIP scores.
 - Came from socioeconomically disadvantaged households.
- **Robustness check:** our results are robust to using the subsample of schools that have at least one treated kindergarten classroom (36 schools).

VII. Conclusion

- **Ecuadorian teachers who passed national entry tests and won merit-based competition for tenure have positive and significant effects on language learning in kindergarten (0.105 s.d. higher test scores.)**
- **It seems that these teachers also have positive effects on math learning in kindergarten (0.085 s.d. higher test scores.)**
- The sizes of these effects are substantial when compared with studies conducted in the U.S. (typical range 0.01 and 0.07 s.d.)
- We do not find similar effects for contract teachers who have passed entry tests but have not won a competition for tenure →
 - Differences in entrance test scores might be a relevant.
 - Positive association between tenure status and performance.



Thank you!

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