

Desarrollo Económico

Andrés Barrios Fernández

abarriosf@uandes.cl

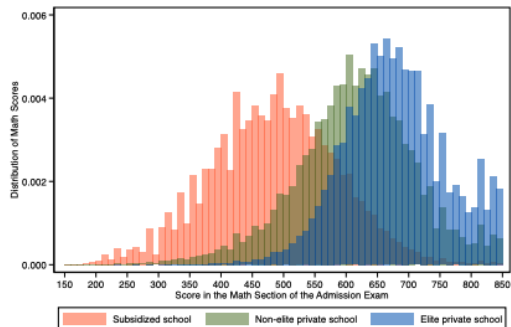
Universidad de los Andes

October 23, 2026

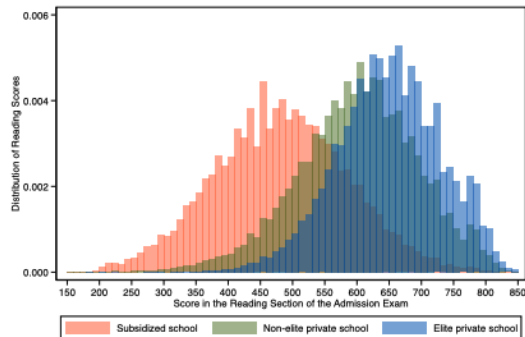
Retornos a la Educación

- Positivos y significativos (estadísticamente y económicamente).
- Esconden bastante heterogeneidad: calidad del match estudiante-institución.
 - Características de los estudiantes.
 - Características de las instituciones.
- Diferencias en trayectorias educativas:
 - **Habilidades.**
 - Acceso a crédito o financiamiento.
 - Fricciones de información y comportamiento.

Diferencias en capital humano al final de la educación secundaria

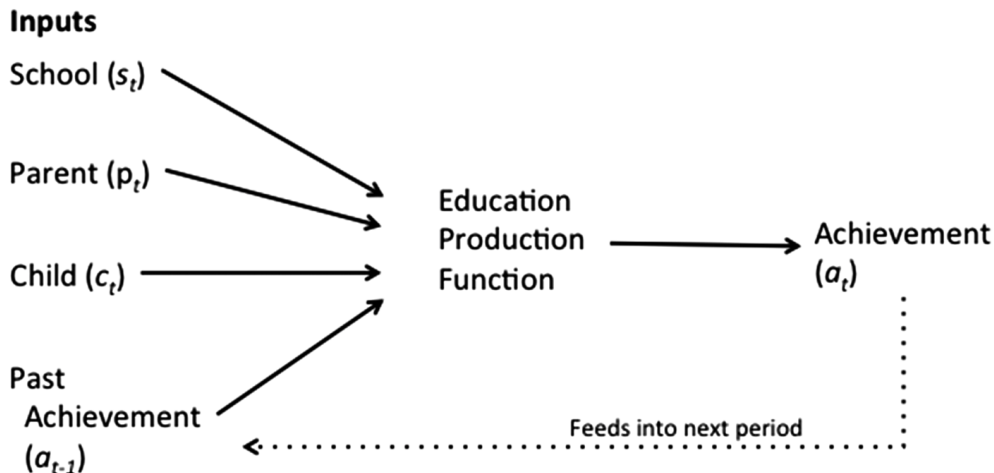


(a) Mathematics Scores



(b) Reading Scores

Calidad de la educación



Calidad de la educación

School resources:

- C. Kirabo Jackson, Rucker C. Johnson, Claudia Persico, The Effects of School Spending on Educational and Economic Outcomes: Evidence from School Finance Reforms , The Quarterly Journal of Economics, Volume 131, Issue 1, February 2016, Pages 157–218, <https://doi.org/10.1093/qje/qjv036>

Class size:

- Krueger, A. B., Whitmore, D. M. (2001). The Effect of Attending a Small Class in the Early Grades on College-Test Taking and Middle School Test Results: Evidence from Project STAR. The Economic Journal, 111(468), 1–28. <http://www.jstor.org/stable/2667840>.
- Hoxby, C. M. (2000). The Effects of Class Size on Student Achievement: New Evidence from Population Variation. The Quarterly Journal of Economics, 115(4), 1239–1285. <http://www.jstor.org/stable/2586924>
- Angrist, J. D., Lavy, V. (1999). Using Maimonides' rule to estimate the effect of class size on scholastic achievement. The Quarterly journal of economics, 114(2), 533-575.
- Angrist, J. D., Lavy, V., Leder-Luis, J., Shany, A. (2019). Maimonides' rule redux. American Economic Review: Insights, 1(3), 309-24.

Calidad de la educación

Instruction time:

- Andrés Barrios-Fernández, Giulia Bovini (2021). "It's time to learn: School institutions and returns to instruction time". *Economics of Education Review*, Volume 80, 102068, ISSN 0272-7757, <https://doi.org/10.1016/j.econedurev.2020.102068>.
- Goodman, J. (2014). Flaking out: Student absences and snow days as disruptions of instructional time (No. w20221). National Bureau of Economic Research.
- Esteban M. Aucejo, Teresa Foy Romano (2016). "Assessing the effect of school days and absences on test score performance", *Economics of Education Review*, Volume 55, Pages 70-87, ISSN 0272-7757, <https://doi.org/10.1016/j.econedurev.2016.08.007>.
- Victor Lavy, Do Differences in Schools' Instruction Time Explain International Achievement Gaps? Evidence from Developed and Developing Countries, *The Economic Journal*, Volume 125, Issue 588, November 2015, Pages F397–F424, <https://doi.org/10.1111/eoj.12233>

Teachers:

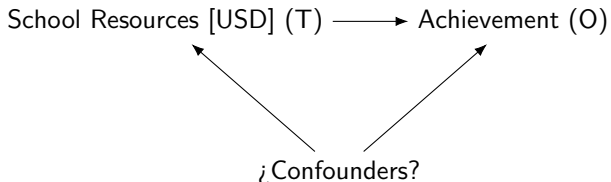
- Chetty, R., Friedman, J. N., Rockoff, J. E. (2014). Measuring the impacts of teachers I: Evaluating bias in teacher value-added estimates. *American economic review*, 104(9), 2593-2632.
- Chetty, R., Friedman, J. N., Rockoff, J. E. (2014). Measuring the impacts of teachers II: Teacher value-added and student outcomes in adulthood. *American economic review*, 104(9), 2633-79.

School Resources

Jackson, Johnson and Persico (2016)

School Spending and Educational and Economic Outcomes

¿Cuál es el efecto del gasto público en colegios en logro educativo de los estudiantes?



Este paper explota múltiples reformas al financiamiento escolar ordenadas por cortes de EE.UU. que afectaron a cohortes de estudiantes nacidas entre 1955 y 1985. Son capaces de seguirlos hasta 2011:

- Event studies (sort of diff-in-diff).
- IV (variation in exposure and intensity of reforms).

Jackson, Johnson and Persico (2016)

School Spending and Educational and Economic Outcomes

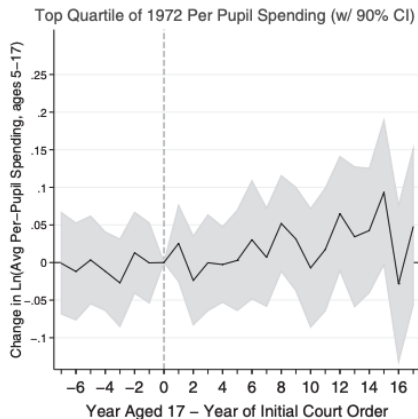


FIGURE I

The Effect of a Court-Ordered Reform on School-Age Per Pupil Spending by Prereform Spending Quartile

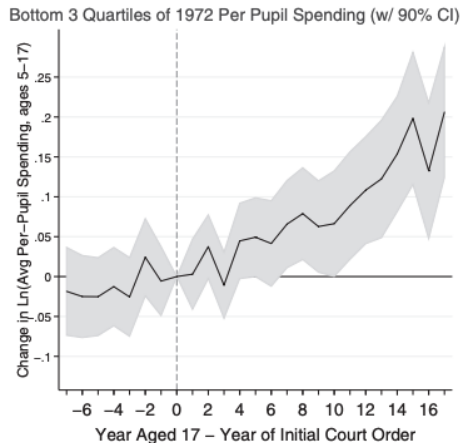


FIGURE I

Jackson, Johnson and Persico (2016)

School Spending and Educational and Economic Outcomes

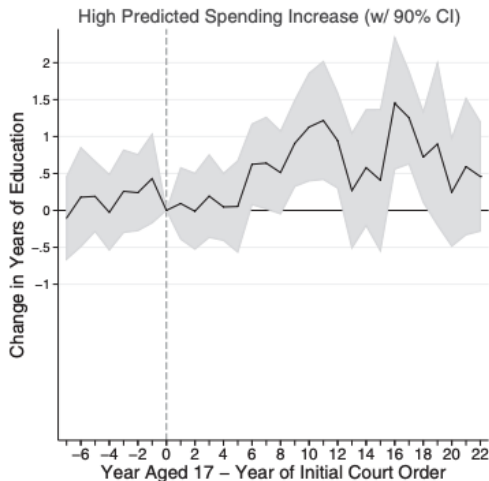


FIGURE III

Jackson, Johnson and Persico (2016)

School Spending and Educational and Economic Outcomes

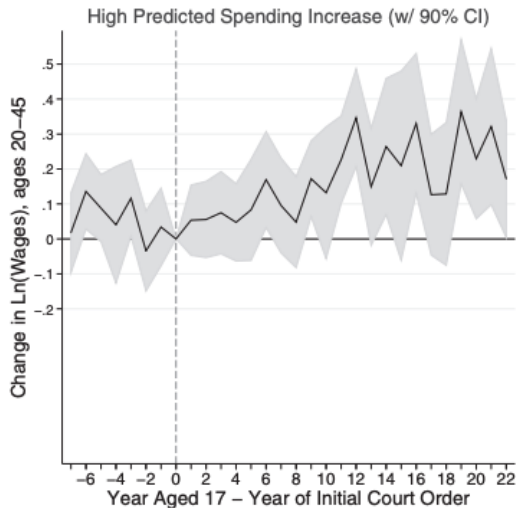
TABLE III
OLS VERSUS 2SLS ESTIMATES OF COURT-ORDERED SCHOOL FINANCE REFORM INDUCED EFFECTS OF PER PUPIL SPENDING ON EDUCATIONAL ATTAINMENT: BY CHILDHOOD POVERTY STATUS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable:							
	Years of Education				Prob(High School Graduate)			
	OLS	2SLS 1	2SLS 2		OLS	2SLS 1	2SLS 2	
$\ln(PPE_d)_{(age\ 5-17)}$	-0.0763 (0.1474)	3.1600*** (1.1327)	3.1488*** (0.7906)		0.0216 (0.0278)	0.5910** (0.2858)	0.7053*** (0.1436)	
$\ln(PPE_d)_{(age\ 5-17)} \times \text{low income}$				4.5899*** (1.2072)				0.9878*** (0.2744)
$\ln(PPE_d)_{(age\ 5-17)} \times \text{Nonpoor}$				0.7156 (1.3193)				0.2470 (0.1757)
Number of individuals	15,353	15,353	15,353	15,353	15,353	15,353	15,353	15,353
Number of childhood families	4,586	4,586	4,586	4,586	4,586	4,586	4,586	4,586
First-stage F-statistic	N/A	15.62	20.25	20.25	N/A	15.62	20.25	20.25

Notes. Robust standard errors in parentheses (clustered at school district level). *** $p < .01$, ** $p < .05$, * $p < .10$. Data: PSID geocode data (1968–2011), matched with childhood school and neighborhood characteristics. Analysis sample includes all PSID individuals born 1955–1985, followed into adulthood through 2011. Sampling weights are used so that the results are nationally representative. Models: the key treatment variable, $\ln(PPE_d)_{(age\ 5-17)}$, is the natural log of average school-age per pupil spending. All models include school district fixed effects, birth cohort fixed effects, and the additional controls listed below. 2SLS 1: the excluded instruments from the second stage are (number of years of exposure to a court-ordered SFR) and (number of years of exposure to a court-ordered SFR) $\times$ (quartile of the district in the state distribution of per pupil school spending in 1972). 2SLS 2: the excluded instruments from the second stage are (number of years of exposure to a court-ordered SFR) and (number of years of exposure to a court-ordered SFR) $\times$ (the quartile of the district in the distribution of $Spend_d$). Additional controls: childhood family characteristics (parental income/education/occupation, mother's marital status at child's birth, birth weight, gender). Also race $\times$ census division $\times$ birth cohort fixed effects; controls at the county-level for the timing of school desegregation by race, hospital desegregation $\times$ race, roll-out of community health centers, county expenditures on Head Start (at age four), food stamps, Medicaid, AFDC, UI, Title I (average during childhood years), timing of state-funded kindergarten intro and timing of tax limit policies; controls for 1960 county characteristics (poverty rate, percent black, education, percent urban, population size, percent voted for Strom Thurmond in 1948 presidential election * race (proxy for segregationist preferences)) each interacted with linear cohort trends. In models by childhood poverty status, all variables are interacted with childhood poverty status.

Jackson, Johnson and Persico (2016)

School Spending and Educational and Economic Outcomes



Jackson, Johnson and Persico (2016)

School Spending and Educational and Economic Outcomes

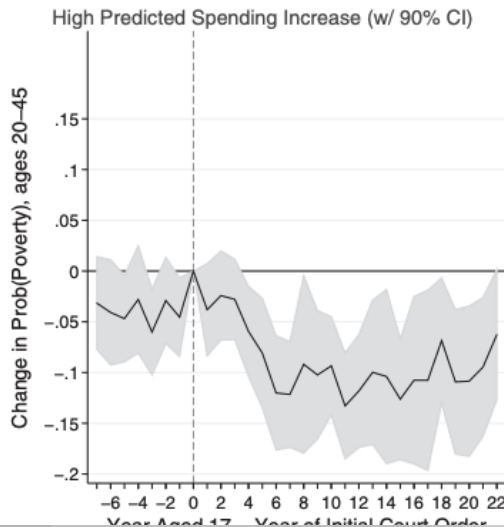
TABLE IV
OLS VERSUS 2SLS ESTIMATES OF COURT-ORDERED SCHOOL FINANCE REFORM INDUCED EFFECTS OF PER PUPIL SPENDING ON ADULT WAGES AND FAMILY INCOME: BY CHILDHOOD POVERTY STATUS (ALL ADULT OUTCOMES ARE MEASURED BETWEEN AGES 20–45)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable:							
	Ln(Wage), Ages 20–45				Ln(Family Income), Ages 20–45			
	OLS	2SLS 1	2SLS 2		OLS	2SLS 1	2SLS 2	
$\text{Ln}(PPE_d)_{(\text{age } 5-17)}$	−0.0480 (0.0654)	0.7076*** (0.2679)	0.7743*** (0.1959)		0.0128 (0.0617)	0.8705*** (0.3348)	0.9819*** (0.2849)	
$\text{Ln}(PPE_d)_{(\text{age } 5-17)} \times \text{Low income}$				0.9598*** (0.3003)				1.7146*** (0.3585)
$\text{Ln}(PPE_d)_{(\text{age } 5-17)} \times \text{Nonpoor}$				0.5525 (0.4461)				0.2021 (0.4223)
Number of person-year obs.	106,545	106,545	106,545	106,545	151,349	151,349	151,349	151,349
Number of individuals	13,183	13,183	13,183	13,183	14,730	14,730	14,730	14,730
Number of childhood families	4,454	4,454	4,454	4,454	4,588	4,588	4,588	4,588
First-stage <i>F</i> -statistic	N/A	15.62	20.25	20.25	N/A	15.62	20.25	20.25

Notes. Robust standard errors in parentheses (clustered at school district level). *** $p < .01$, ** $p < .05$, * $p < .10$. Data: PSID geocode data (1968–2011), matched with childhood school and neighborhood characteristics. Analysis sample includes all PSID individuals born 1955–1985, followed into adulthood through 2011. Sampling weights are used so that the results are nationally representative. Models: the key treatment variable, $\text{Ln}(PPE_d)_{(\text{age } 5-17)}$, is the natural log of average school-age per pupil spending. All models include school district fixed effects, birth cohort fixed effects, and the additional controls listed below. 2SLS 1: the excluded instruments from the second stage are (number of years of exposure to a court-ordered SFR) and (number of years of exposure to a court-ordered SFR) $\times$ (quartile of the district in the state distribution of per pupil school spending in 1972). 2SLS 2: the excluded instruments from the second stage are (number of years of exposure to a court-ordered SFR) and (number of years of exposure to a court-ordered SFR) $\times$ (quartile of the district in the distribution of Spend_d). Additional controls: childhood family characteristics (parental income/education/occupation, mother's marital status at child's birth, birth weight, gender). Also race $\times$ census division $\times$ birth cohort fixed effects; controls at the county level for the timing of school desegregation by race, hospital desegregation $\times$ race, roll-out of community health centers, county expenditures on Head Start (at age four), food stamps, Medicaid, AFDC, UI, Title I (average during childhood years), timing of state-funded kindergarten intro and timing of tax limit policies; controls for 1960 county characteristics (poverty rate, percent black, education, percent urban, population size, percent voted for Strom Thurmond in 1948 presidential election * race (proxy for segregationist preferences)) each interacted with linear cohort trends. In models by childhood poverty status, all variables are interacted with childhood poverty status.

Jackson, Johnson and Persico (2016)

School Spending and Educational and Economic Outcomes



Jackson, Johnson and Persico (2016)

School Spending and Educational and Economic Outcomes

TABLE VI
EVIDENCE ON MECHANISMS (USING DATA FROM MULTIPLE SOURCES)

Dependent Variable	(1) Capital Spending Per Pupil	(2) Instructional Spending Per Pupil	(3) Services Spending Per Pupil	(4) Other Spending Per Pupil	(5) Students per Teacher	(6) Students per Guidance Counselor	(7) Students per Admin	(8) Length of School Year	(9) Teacher Base Salary
Source of Data	INDFIN	Common Core Data			Common Core Data			School and Staffing Survey	
Years Outcome Available	Annually 1972 - 2010	Annually 1987-2010			Annually 1987-2010			1987, 1990, 1993, 1999, 2003, 2007, 2011	
Spending	0.106*** (0.0268)	0.668*** (0.0665)	0.408*** (0.0457)	-0.0598*** (0.0149)					
Ln(per pupil spending)					-7.017*** (0.750)	-513.2*** (104.6)	-275.3*** (74.71)	13.56** (5.343)	10,764*** (2,505)
Observations	498,708	260,290	260,290	260,290	293,544	200,474	222,951	23,807	23,587
Number of districts	17,849	16,094	16,094	16,094	16,172	13,802	15,012	7,011	6,938
Mean of dep. var.	828.4	6,213	3,508	428.6	12.14	411.3	243.3	179	26,331

Notes: Robust standard errors in parentheses (clustered at school district level). *** $p < .01$, ** $p < .05$, * $p < .1$. Models: Results are based on 2SLS/IV models that include school district fixed effects; controls for 1960 county characteristics (poverty rate, percent black, education, percent urban, population size) each interacted with linear time trends. The excluded instruments from the second stage are (the number of years of exposure to a court-ordered SFR) and (the number of years of exposure to a court-ordered SFR) $\times$ (the quartile of the district in the distribution of $Spend_{it}$). All models yield first-stage F -statistics greater than 20.

Jackson, Johnson and Persico (2016)

School Spending and Educational and Economic Outcomes

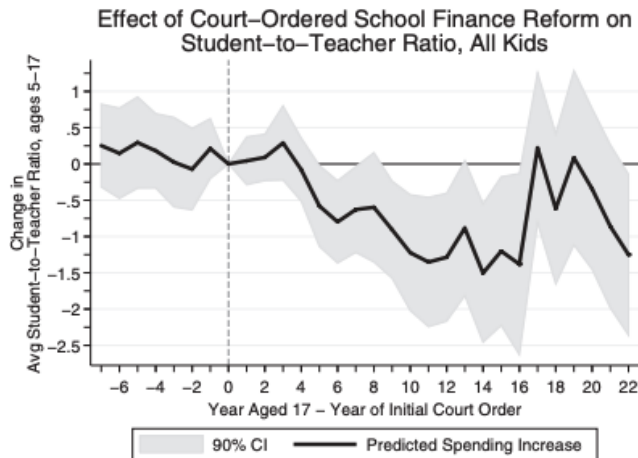


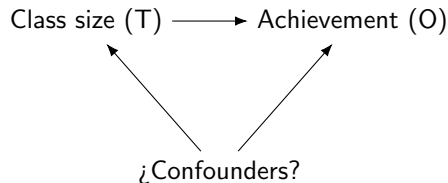
FIGURE VI

Class Size

Krueger and Whitmore (2001)

Effects of attending a small class in early grades

¿Cuál es el efecto del tamaño de las clases en las trayectorias educativas de los estudiantes?



Este paper explota la variación de STAR—un experimento implementado en Tennessee—a mediados de los 1980s en los primeros cuatro años escolares:

- Small (13-17 students)
- Regular (22-25 students)
- Regular with aide (22-25 students)
- Imperfect compliance!

Krueger and Whitmore (2001)

Effects of attending a small class in early grades

Table 1
Selected Population characteristics

	STAR (1)	Tennessee (2)	United States (3)
Percent minority students	33.1	23.5	31.0
Percent black students	31.7	22.6	16.1
Percent of children below poverty level	24.4	20.7	18.0
Percent of teachers with master's degree or higher	43.4	48.0	47.3
Average ACT score	19.2	19.8	21.0
Average 3rd grade enrollment across schools	89.1	69.5	67.1
Average current expenditures per student across schools	\$3,423	\$3,425	\$4,477

Notes: With the following exceptions, data are from the 1990 Common Core of Data (CCD) from the Department of Education. For comparability, the Project STAR characteristics were calculated from the CCD. (Nevertheless, the characteristics were very similar when calculated directly from Project STAR data.) Teacher education data are for 3rd grade teachers from Project STAR data, and for 1993–4 public elementary and secondary school teachers from the Digest of Education Statistics. Race and poverty statistics for the United States are from the Census Bureau. ACT scores for Tennessee and United States are from ACT, Inc.

Krueger and Whitmore (2001)

Effects of attending a small class in early grades

Table 2
Examination of Random Assignment, Linear Probability Models

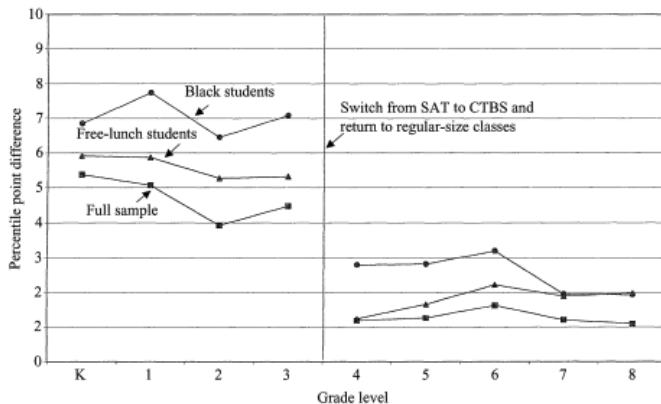
Dependent variable equals 1 for small classes

Explanatory variable	A: Students				B: Teachers			
	Means (SD)	(1)	(2)	(3)	Means (SD)	(4)	(5)	(6)
Intercept	—	0.255 (0.020)	0.311 (0.014)	0.278 (0.014)	—	0.461 (0.131)	0.446 (0.151)	0.463 (0.172)
White/Asian (1 = yes)	0.631 (0.483)	0.025 (0.010)	−0.006 (0.016)	−0.011 (0.016)	0.814 (0.389)	0.006 (0.035)	−0.017 (0.043)	−0.032 (0.053)
Female (1 = yes)	0.471 (0.499)	0.001 (0.008)	−0.003 (0.008)	0.000 (0.008)	0.988 (0.109)	−0.057 (0.126)	−0.015 (0.140)	−0.011 (0.164)
Free lunch (1 = yes)	0.547 (0.498)	−0.018 (0.009)	−0.008 (0.010)	−0.016 (0.010)	—	—	—	—
Master's degree or higher (1 = yes)	—	—	—	—	0.376 (0.485)	−0.047 (0.028)	−0.059 (0.031)	−0.069 (0.037)
Total experience	—	—	—	—	12.027 (8.323)	0.000 (0.002)	−0.000 (0.002)	−0.001 (0.002)
Entry-grade fixed effects	—	No	Yes	No	—	No	Yes	No
School fixed effects	—	No	Yes	No	—	No	Yes	No
School-by-entry-wave fixed effects	—	No	No	Yes	—	No	No	Yes
R-squared	—	0.00	0.03	0.08	—	0.00	0.02	0.04
P-value of significance of explanatory variables	—	0.000	0.837	0.450	—	0.560	0.392	0.380

Note: White standard errors in parentheses. The free lunch variable measures whether a student was on free or reduced-price lunch during his or her entry year. For columns 1–3, the mean dependent variable is 0.26 and sample size is 11,294. For columns 4–6, the mean dependent variable is 0.39 and sample size is 1,330. For teachers, entry-grade and entry-wave are the grade level they taught. Entry-grade fixed effects are three dummy variables indicating the grade the student first entered the programme.

Krueger and Whitmore (2001)

Effects of attending a small class in early grades

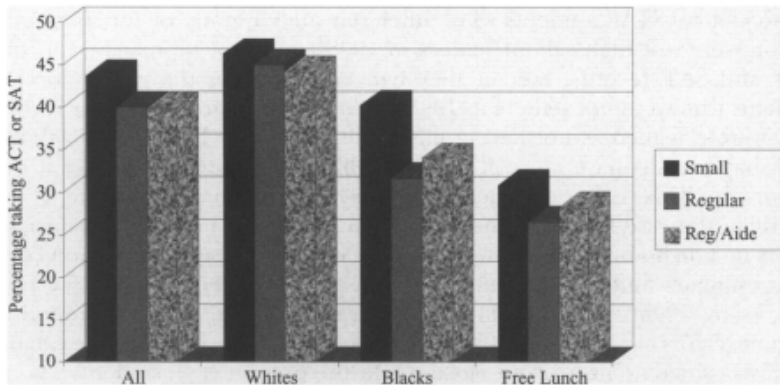


Note: Effect of class size after controlling for student's race, gender, free-lunch status and initial school-by-entry-wave fixed effects.

Fig. 1. *Small-Class Effect, K-8*

Krueger and Whitmore (2001)

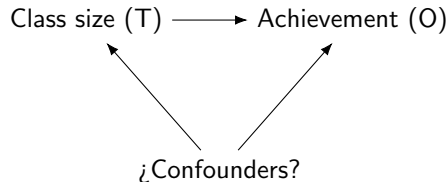
Effects of attending a small class in early grades



Hoxby (2000)

Effects of class size on student achievement

¿Cuál es el efecto del tamaño de las clases en el logro educativo de los estudiantes?



Este paper explota variación longitudinal en el tamaño de cohortes de estudiantes en distritos escolares específicos y reglas que limitan el número máximo de estudiantes por clase.

Hoxby (2000)

Effects of class size on student achievement

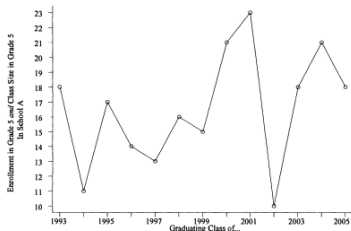


FIGURE I
Enrollment and Class Size in School A

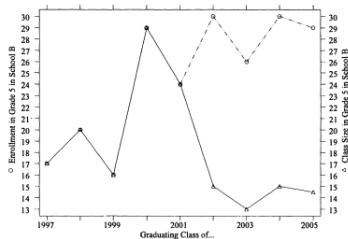


FIGURE II
Enrollment and Class Size in School B

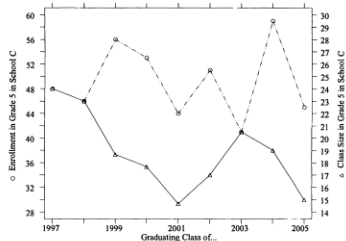


FIGURE III
Enrollment and Class Size in School C

Hoxby (2000)

Effects of class size on student achievement

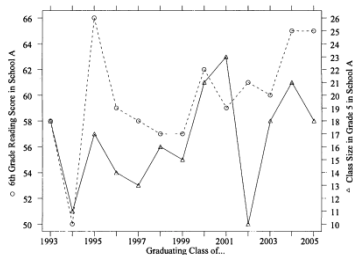


FIGURE IV
Class Size and Reading Scores in School A

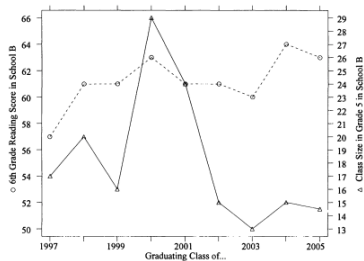


FIGURE V
Class Size and Reading Scores in School B

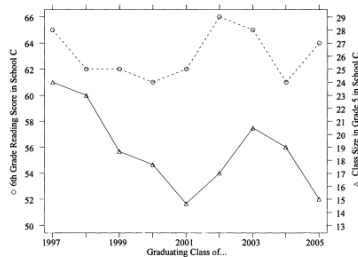


FIGURE VI
Class Size and Reading Scores in School C

Hoxby (2000)

Effects of class size on student achievement

TABLE IV
BASIC RESULTS FROM IDENTIFICATION METHOD 1: 2SLS ESTIMATES OF THE EFFECTS
OF CLASS SIZE ON STUDENT TEST SCORES
Each cell contains the estimate from a separate regression (with its standard
error in parentheses).

Dependent variable	Independent variable is the prediction of:	I	II	III	IV
		Class size is predicted using first stage regressions from			
		Column I of Table III	Column II of Table III	Column III of Table III	Column IV of Table III
fourth grade math score	log avg class size through grade 3	0.0664 (0.1069)	-0.0845 (0.1227)	0.1245 (0.2100)	0.2203 (0.1537)
fourth grade reading score	log avg class size through grade 3	-0.0736 (0.0759)	-0.1027 (0.0870)	-0.1513 (0.1643)	0.1260 (0.1084)
fourth grade writing score	log avg class size through grade 3	0.1364 (0.1085)	0.1871 (0.1214)	-0.0198 (0.1472)	0.0332 (0.1061)
sixth grade math score	log avg class size through grade 5	0.0496 (0.1367)	0.0394 (0.1578)	-0.0522 (0.1346)	0.2059 (0.1714)
sixth grade reading score	log avg class size through grade 5	-0.0174 (0.1247)	0.1288 (0.1462)	-0.0152 (0.1063)	0.0843 (0.1410)
sixth grade writing score	log avg class size through grade 5	0.0675 (0.1769)	0.0494 (0.2077)	-0.1384 (0.1166)	-0.1003 (0.1562)
fixed effects for each "school · expected number of classes in the grade" group		yes	yes		
fixed effects for each "district · expected number of classes in the grade" group				yes	yes
fixed effects for each cohort		yes	yes	yes	yes

Standard errors are correct for 2SLS. The regressions are weighted by the number of students over whom the dependent variable is averaged. In the school level regressions the number of observations is 3404 in fourth grade regressions, and 1150 in sixth grade regressions. In the district level regressions there are 1752 observations (see the notes to Table I). Predicted class size is computed using the first-stage regressions shown in Table III. The dependent variables are formed by dividing the average test score by the standard deviation of students' scores on that test in Connecticut. Thus, the coefficients show how test scores, measured in standard deviations, change with the log of class size.

Hoxby (2000)

Effects of class size on student achievement

TABLE VI
IV ESTIMATES OF THE EFFECT OF CLASS SIZE, GENERATED BY *CROSS-SECTION*
REGRESSION DISCONTINUITY
Each cell contains the estimate from a separate regression.

	I	II	III
	The predicted class size function is used:		
Dependent variable	In its entirety	Within 4 students of a discontinuity	Solely at the discontinuities
fourth grade math score	-0.0503 (0.0229)	-0.0972 (0.0593)	-0.0506 (0.1060)
fourth grade reading score	-0.0423 (0.0166)	-0.0856 (0.0454)	-0.0746 (0.0821)
fourth grade writing score	-0.0137 (0.0130)	-0.0082 (0.0321)	-0.0211 (0.0372)
sixth grade math score	-0.0922 (0.0496)	-0.0992 (0.0872)	0.0674 (0.1220)
sixth grade reading score	-0.1042 (0.0511)	-0.1496 (0.0992)	0.0250 (0.0796)
sixth grade writing score	-0.0301 (0.0241)	-0.0181 (0.0401)	0.0159 (0.0498)
number of observations in fourth grade regressions	1953	703	76
number of observations in sixth grade regressions	1011	374	36

The source is author's calculations based on the Connecticut data set. The regressions are weighted by the typical number of observations over which the dependent variable is averaged. The dependent variables are formed by dividing the average test score by the overall standard deviation of scores on that test in Connecticut. The independent variable is class size in most recent grade, instrumented by predicted class size. The equation contains a fixed effect for each cohort. The cross-section method treats the Connecticut data as though they were cross-section data and actual changes in the number of classes were not observed. The predicted class size function uses each district's maximum class size and the formula given by equation (9). See text for further explanation.

Hoxby (2000)

Effects of class size on student achievement

TABLE VII
ESTIMATES OF THE EFFECT OF CLASS SIZE, IDENTIFICATION METHOD 2
(WITHIN-SCHOOL REGRESSION DISCONTINUITY)
Each cell contains the estimate from a separate regression (with its standard error in parentheses).

Dependent variable	I Independent variable is change in class size (due to the addition or subtraction of a class) in the grade previous to the test, for the 2 adjacent cohorts	II Independent variable is change in class size (due to the addition or subtraction of classes) in the 3 grades previous to the test, for the 2 adjacent cohorts
Change in fourth grade math score between two adjacent cohorts in the same school	0.0844 (0.1001)	-0.0714 (0.1605)
Change in fourth grade reading score between two adjacent cohorts in the same school	0.0468 (0.0636)	-0.0540 (0.1396)
Change in fourth grade writing score between two adjacent cohorts in the same school	0.1731 (0.0976)	0.1602 (0.1568)
Change in sixth grade math score between two adjacent cohorts in the same school	0.0126 (0.0969)	-0.0207 (0.1588)
Change in sixth grade reading score between two adjacent cohorts in the same school	-0.0468 (0.0828)	0.0238 (0.1520)
Change in sixth grade writing score between two adjacent cohorts in the same school	0.1585 (0.1300)	0.1543 (0.1901)
number of observations in fourth grade regressions	147	117
number of observations in sixth grade regressions	108	86

The source is author's calculations based on the Connecticut data set. The regressions are weighted by the typical number of observations over which the dependent variable is averaged. The dependent variables are formed by dividing the average test score by the overall standard deviation of scores on that test in Connecticut. The within-district method exploits the fact that the Connecticut data are panel data and actual changes in the number of classes within a grade within a school are observed. The equation is estimated in first-differences: the change in scores between back-to-back cohorts is regressed on the change in class size, if that change in class size is the result of a small change in enrollment having triggered a maximum or minimum class size rule.

Instruction Time

Instruction Time

El tiempo de instrucción puede modificarse de distintas formas:

- Extender el día escolar (Barrios & Bovini, 2021)
- Extender el calendario escolar (Aucejo & Romano, 2016; Goodman, 2014)
- Redistribuir tiempo entre distintas materias (Lavy, 2015)

Cada alternativa envuelve desafíos diferentes...

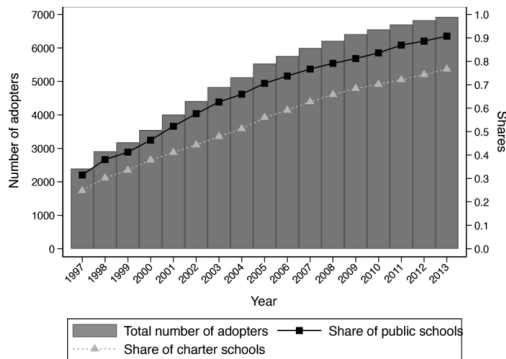
La efectividad de estas políticas depende crucialmente del uso alternativo del tiempo de los estudiantes (¿lectura ó televisión) y de su correcta implementación...

Barrios & Bovini (2021)

School Autonomy and Returns to Instruction Time

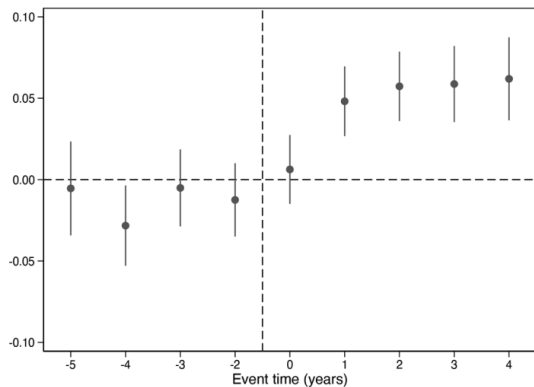
Este paper estudia la implementación de la Jornada Escolar Completa:

- Extensión de jornada escolar entre tercero básico y cuarto medio (33%).
- Incremento del *voucher* para financiar aumento en gastos operacionales.
- Fondos concursables para nueva infraestructura.

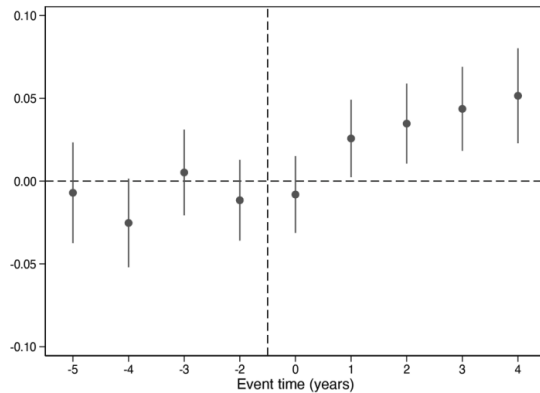


Barrios & Bovini (2021)

School Autonomy and Returns to Instruction Time



(a) Reading

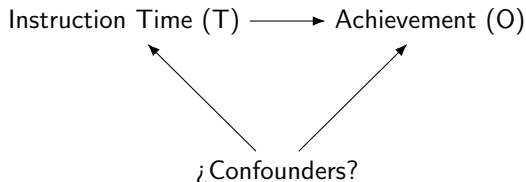


(b) Mathematics

Barrios & Bovini (2021)

School Autonomy and Returns to Instruction Time

Este paper resuelve los desafíos de identificación combinando una versión extendida de un *diff-in-diff* (TWFE) y variables instrumentales:



- Explota variación en el *timing* de adopción de la política.
- Para evitar *selection into schools* sólo utiliza incumbentes (i.e., estudiantes matriculados con anterioridad a la adopción de la política).
- Instrumenta exposición a la política con la exposición que un estudiante hubiese tenido en caso de permanecer en el mismo colegio en el que partió primero básico.

Barrios & Bovini (2021)

School Autonomy and Returns to Instruction Time

Table 6
Heterogeneous Effects of the FSD on Test Scores by School Type.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A - Reading						
<i>ExpFSD4</i>	0.019** (0.009)	0.017* (0.009)	0.033* (0.018)	0.031* (0.018)	0.035* (0.019)	0.037* (0.019)
<i>ExpFSD4</i> × no-fee charter	0.042** (0.019)	0.041** (0.020)	0.043** (0.020)	0.048** (0.020)	0.041* (0.024)	0.043* (0.024)
Kleibergen-Paap rk Wald F statistic	828.30	222.42	175.01	154.79	125.50	122.72
N. of students	377856	297759	297759	297171	297171	297171
Panel B - Mathematics						
<i>ExpFSD4</i>	0.012 (0.009)	0.015 (0.010)	0.022 (0.018)	0.020 (0.018)	0.023 (0.019)	0.025 (0.020)
<i>ExpFSD4</i> × no-fee charter	0.017 (0.021)	0.012 (0.022)	0.015 (0.021)	0.025 (0.021)	0.021 (0.024)	0.017 (0.025)
Kleibergen-Paap rk Wald F statistic	839.28	221.87	174.06	149.25	121.80	121.19
N. of students	377719	298573	298573	298573	298573	298573
Interactions with students' characteristics (grade 1)	No	Yes	Yes	Yes	Yes	Yes
Interactions with students' characteristics (grade 4)	No	No	Yes	Yes	Yes	Yes
Interactions with schools' characteristics	No	No	No	Yes	Yes	Yes
Interactions with teachers' characteristics (grade 1)	No	No	No	No	Yes	Yes
Interactions with teachers' characteristics (grade 4)	No	No	No	No	No	Yes
Student-level controls	Yes	Yes	Yes	Yes	Yes	Yes
School-level controls	Yes	Yes	Yes	Yes	Yes	Yes
Teacher-level controls	No	No	No	No	Yes	Yes
School fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Barrios & Bovini (2021)

School Autonomy and Returns to Instruction Time

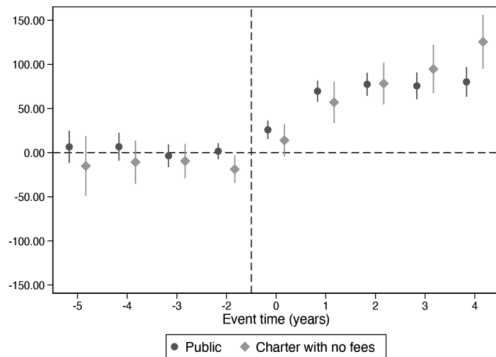
Table 6

Heterogeneous Effects of the FSD on Test Scores by School Type.

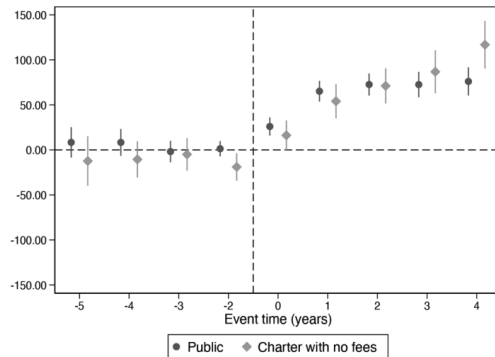
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A - Reading						
<i>ExpFSD4</i>	0.019** (0.009)	0.017* (0.009)	0.033* (0.018)	0.031* (0.018)	0.035* (0.019)	0.037* (0.019)
<i>ExpFSD4</i> × no-fee charter	0.042** (0.019)	0.041** (0.020)	0.043** (0.020)	0.048** (0.020)	0.041* (0.024)	0.043* (0.024)
Kleibergen-Paap rk Wald F statistic	828.30	222.42	175.01	154.79	125.50	122.72
N. of students	377856	297759	297759	297171	297171	297171
Panel B - Mathematics						
<i>ExpFSD4</i>	0.012 (0.009)	0.015 (0.010)	0.022 (0.018)	0.020 (0.018)	0.023 (0.019)	0.025 (0.020)
<i>ExpFSD4</i> × no-fee charter	0.017 (0.021)	0.012 (0.022)	0.015 (0.021)	0.025 (0.021)	0.021 (0.024)	0.017 (0.025)
Kleibergen-Paap rk Wald F statistic	839.28	221.87	174.06	149.25	121.80	121.19
N. of students	377719	298573	298573	298573	298573	298573
Interactions with students' characteristics (grade 1)	No	Yes	Yes	Yes	Yes	Yes
Interactions with students' characteristics (grade 4)	No	No	Yes	Yes	Yes	Yes
Interactions with schools' characteristics	No	No	No	Yes	Yes	Yes
Interactions with teachers' characteristics (grade 1)	No	No	No	No	Yes	Yes
Interactions with teachers' characteristics (grade 4)	No	No	No	No	No	Yes
Student-level controls	Yes	Yes	Yes	Yes	Yes	Yes
School-level controls	Yes	Yes	Yes	Yes	Yes	Yes
Teacher-level controls	No	No	No	No	Yes	Yes
School fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Barrios & Bovini (2021)

School Autonomy and Returns to Instruction Time



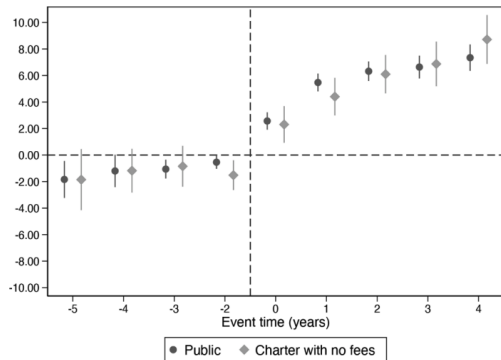
(a) Contract hours



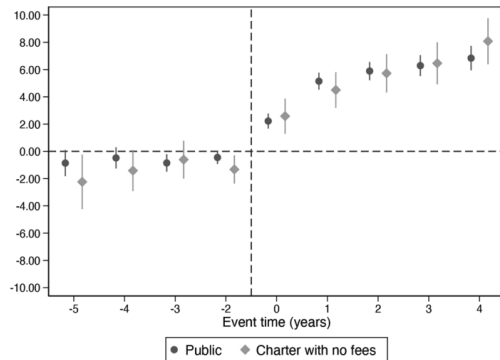
(b) Teaching hours

Barrios & Bovini (2021)

School Autonomy and Returns to Instruction Time



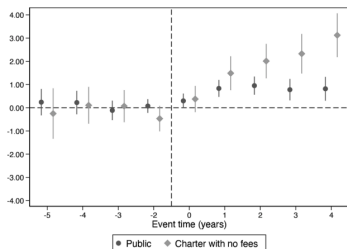
(c) Contract hours/n. of classes



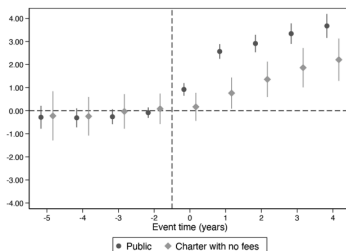
(d) Teaching hours/n. of classes

Barrios & Bovini (2021)

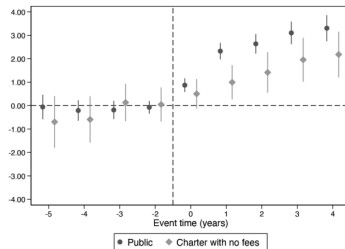
School Autonomy and Returns to Instruction Time



(a) Number of teachers



(b) Contract hours per teacher



(c) Teaching hours per teacher

Barrios & Bovini (2021)

School Autonomy and Returns to Instruction Time

Main take aways:

- El aumento en tiempo de instrucción generó una mejora en el rendimiento académico de los estudiantes.
- Sin embargo, este efecto se distribuyó de manera desigual: particulares subvencionados concentraron las ganancias.
- ¿Por qué?: Autonomía en contratación de profesores:
 - Colegios públicos y subvencionados aumentaron las horas de instrucción y las horas de contrato totales similarmente.
 - Colegios públicos lo hicieron aumentando la carga laboral de los profesores, mientras que los subvencionados lo hicieron aumentando el número de profesores.

Aucejo & Romano (2015)

Assessing the effect of school days and absences on test score performance

Este paper investiga cómo días adicionales de clase afectan el aprendizaje de los estudiantes:

- Días de clase antes de exámenes estandarizados (similares al SIMCE).
- Ausencias.

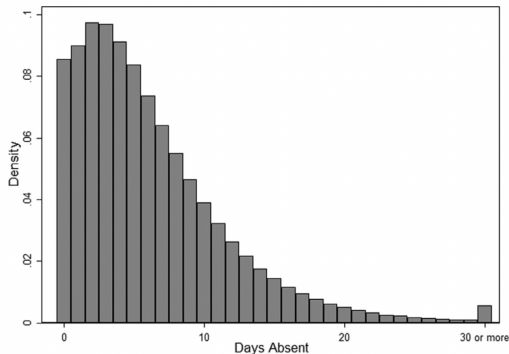


Fig. 1. Distribution of absences.

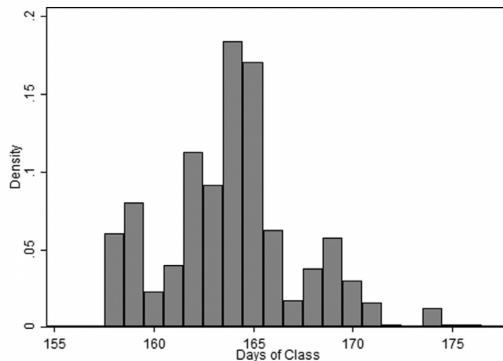
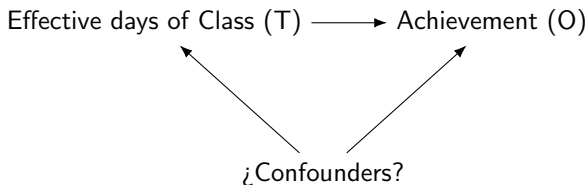


Fig. 2. Variation in days of class across schools.

Aucejo & Romano (2015)

Assessing the effect of school days and absences on test score performance

Este paper resuelve los desafíos de identificación utilizando un rico set de controles:



- Explota variación en el número efectivo de días de clase: ausencias y fecha exacta del examen.
- Aprovecha la estructura panel de los datos y controla por: efectos fijos individuales, efectos fijos por escuela.
- Controla además por características de los compañeros de clase.

Aucejo & Romano (2015)

Assessing the effect of school days and absences on test score performance

Table 3
Baseline regression.

	Math test score							Reading test score						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Days Absent	-0.0198*** (0.0001)	-0.0067*** (0.0002)	-0.0066*** (0.0002)	-0.0057*** (0.0002)	-0.0055*** (0.0002)	-0.0076*** (0.0001)	-0.0076*** (0.0001)	-0.0113*** (0.0001)	-0.0036*** (0.0002)	-0.0036*** (0.0002)	-0.0031*** (0.0002)	-0.0029*** (0.0003)	-0.0039*** (0.0001)	-0.0039*** (0.0001)
Days of Class	-0.0073*** (0.0003)	0.0001 (0.0003)	-0.0002 (0.0002)	0.0006** (0.0003)	0.0017*** (0.0005)	0.0011** (0.0003)	0.0015*** (0.0004)	-0.0051*** (0.0003)	0.0001 (0.0003)	-0.0001 (0.0003)	0.0001 (0.0003)	0.0008 (0.0007)	0.0017*** (0.0004)	0.0018*** (0.0003)
Student FE	No	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	No	No
School FE	No	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Teacher FE	No	No	No	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes
Controls	No	No	No	No	Yes	No	Yes	No	No	No	No	Yes	No	Yes
Lagged Student Score	No	No	No	No	No	Yes	Yes	No	No	No	No	No	Yes	Yes
N	1,302,037	1,302,037	1,301,254	1,248,497	814,127	878,586	814,128	1,302,037	1,302,037	1,301,254	1,248,497	814,127	878,586	814,128

Los días de clase antes del exámen no parecen importar mucho. Las ausencias, en cambio, parecen afectar de manera muy significativa los resultados de los estudiantes!

Lavy (2015)

Do Differences in Schools' Instruction Time Explain International Achievement Gaps?

Existen diferencias importantes en los resultados académicos de los estudiantes en distintos países (PISA, 2018):

Los países con los mejores resultados

China obtuvo los mejores resultados en las pruebas PISA con Beijing, Shanghai, Jiangsu y Zhejiang (BSJZ) como el mejor grupo de ciudades. A parte está Macao y Hong Kong, también en los primeros lugares.

Pais	Lectura	Matemáticas	Ciencias
 BSJZ (China)	555	591	590
 Singapur	549	569	551
 Macao (China)	525	558	544
 Hong Kong (China)	524	551	517
 Estonia	523	523	530
 Canadá	520	512	518
 Finlandia	520	507	522
 Irlanda	518	500	496
 Corea del sur	514	526	519
 Polonia	512	516	512

Los países con los resultados más bajos

Pais	Lectura	Matemáticas	Ciencias
 Bakú (Azerbaiyán)	389	430	398
 Kazajistán	387	423	397
 Georgia	380	398	383
 Panamá	377	353	365
 Indonesia	371	379	396
 Marruecos	359	368	377
 Líbano	353	393	384
 Kosovo	353	366	365
 República Dominicana	342	325	366
 Filipinas	340	353	357

PROMEDIO OCDE



487



489



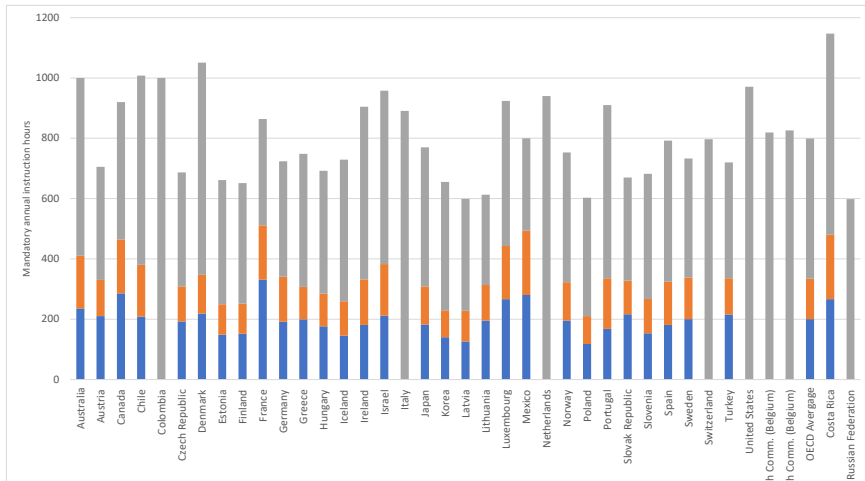
489

Pais	Lectura	Matemáticas	Ciencias
 EE.UU.	505	478	502
 Chile	452	417	444
 Uruguay	427	418	426
 Costa Rica	426	402	416
 México	420	409	419
 Brasil	413	384	404
 Colombia	412	391	413
 Argentina	402	379	404
 Perú	401	400	404
 Panamá	377	353	365
 Rep. Dominicana	342	325	336

Lavy (2015)

Do Differences in Schools' Instruction Time Explain International Achievement Gaps?

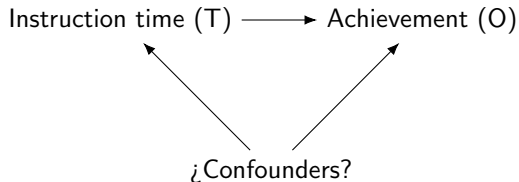
¿Qué parte de estas diferencias se explican por diferencias en tiempo de instrucción?



Lavy (2015)

Do Differences in Schools' Instruction Time Explain International Achievement Gaps?

¿Qué parte de estas diferencias se explican por diferencias en tiempo de instrucción?



- Explota variación en las horas de clase que tienen los estudiantes en distintos países y los resultados que ellos obtienen en PISA (2005).
- Para controlar por endogeneidad, controla por efectos fijos por país.
- En una especificación alternativa combina resultados de múltiples áreas—i.e., lenguaje, matemáticas y ciencias—e incluye efectos fijos por área y por individuo.

Lavy (2015)

Do Differences in Schools' Instruction Time Explain International Achievement Gaps?

Table 2
OLS Regressions of Standardised Test Scores on Instructional Time, OECD Sample

	Mathematics			Science			Reading		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>I. Continuous hours</i>									
Hours	0.217 (0.010)	0.280 (0.012)	0.244 (0.011)	0.262 (0.008)	0.384 (0.009)	0.339 (0.008)	0.046 (0.010)	0.154 (0.013)	0.125 (0.012)
<i>II. Categorical hours</i>									
2–3 hours	0.409 (0.082)	0.480 (0.073)	0.430 (0.067)	0.447 (0.026)	0.537 (0.028)	0.485 (0.025)	0.493 (0.104)	0.507 (0.085)	0.422 (0.077)
4 hours+	0.637 (0.082)	0.701 (0.074)	0.619 (0.068)	0.771 (0.030)	0.905 (0.032)	0.804 (0.030)	0.557 (0.104)	0.649 (0.087)	0.534 (0.078)
Country dummies		✓	✓		✓	✓		✓	✓
Individual characteristics			✓			✓			✓

Lavy (2015)

Do Differences in Schools' Instruction Time Explain International Achievement Gaps?

Table 3
Estimated Effect of Instructional Time on Standardised Test Scores, OECD Sample

	Whole sample		Sample divided by school admission policy			
	OLS	Student FE	Academic record is irrelevant		Academic record taken in to account	
			OLS	Student FE	OLS	Student FE
	(1)	(2)	(3)	(4)	(5)	(6)
I. Continuous hours						
Hours of instructional time	0.196 (0.007)	0.058 (0.004)	0.170 (0.009)	0.060 (0.005)	0.211 (0.017)	0.062 (0.009)
II. Categorical hours						
2–3 hours	0.469 (0.027)	0.063 (0.011)	0.432 (0.038)	0.075 (0.016)	0.558 (0.057)	0.065 (0.024)
4 hours+	0.679 (0.029)	0.124 (0.013)	0.627 (0.040)	0.141 (0.018)	0.737 (0.060)	0.131 (0.028)
Number of observations	460,734		266,769		86,370	
<i>(b) Mathematics + science</i>						
I. Continuous hours						
Hours of instructional time	0.255 (0.007)	0.071 (0.006)	0.218 (0.009)	0.086 (0.008)	0.276 (0.018)	0.076 (0.013)
II. Categorical hours						
2–3 hours	0.457 (0.026)	0.094 (0.015)	0.401 (0.035)	0.108 (0.026)	0.552 (0.051)	0.122 (0.034)
4 hours+	0.739 (0.028)	0.170 (0.018)	0.657 (0.037)	0.207 (0.028)	0.805 (0.056)	0.187 (0.041)
Number of observations	307,156		177,846		57,580	

Lavy (2015)

Do Differences in Schools' Instruction Time Explain International Achievement Gaps?

Table 8

Estimates of Effect of Instructional Time on Standardised Test Scores, Samples of Eastern European and Developing and Countries

	All	Boys	Girls	High parental education	Low parental education	Immigrant 1st Gen.	Immigrant 2nd Gen.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Eastern European Countries</i>							
OLS	0.382 (0.013)	0.389 (0.014)	0.372 (0.014)	0.412 (0.016)	0.334 (0.013)	0.263 (0.033)	0.357 (0.027)
Fixed effects	0.061 (0.006)	0.051 (0.006)	0.065 (0.006)	0.050 (0.007)	0.067 (0.006)	0.055 (0.021)	0.073 (0.019)
Number of observations	177,015	84,612	92,403	78,006	99,009	3,525	5,604
<i>Developing countries</i>							
OLS	0.366 (0.012)	0.382 (0.014)	0.352 (0.012)	0.433 (0.014)	0.296 (0.012)	0.581 (0.053)	0.515 (0.042)
Fixed effects	0.030 (0.008)	0.024 (0.009)	0.033 (0.009)	0.034 (0.009)	0.026 (0.009)	0.186 (0.047)	0.111 (0.039)
Number of observations	238,938	108,927	130,011	76,970	82,322	1,642	2,210

Desarrollo Económico

Andrés Barrios Fernández

abarriosf@uandes.cl

Universidad de los Andes

October 23, 2026