Decentralization of Public Education: Does Everyone Benefit?

Evidence from Colombia

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LSE (Visitor 2013/2014)

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Decentralizing the public education service

Global trends

- Responsibility and power shifted to lower levels of government
- Especially in developing countries ⇒ to the municipal level

  Chile, Argentina, Bolivia, Brazil and Colombia
  India, Thailand, Vietnam and the Philippines
  South Africa, Senegal, Ethiopia and Uganda
  Ukraine, Serbia and Bulgaria

- Western countries ⇒ to the school level

Decentralizing the public education service

Heterogeneous Outcomes

- Heterogeneity across places (local authorities)
  - Bardhan and Mookherjee (JPE, 2005 ; EJ, 2006)
  - Galiani et al. (JPE, 2008)
  - Reinikka and Svensson (QJE, 2004)
- Heterogeneity across people (poors vs. elites; minorities vs. dominants)
  (Juetting et al. 2005; Tranchant 2010)

This Paper

- Look at the 2001 Colombian reform: decentralization of public service provision
- Focus on Education, look at outcomes in terms of quality (test scores) and efficiency (enrollment rates)
- Focus on heterogeneity of impact and distributional effects across the territory and across population strata

Decentralization of public education

Empirical challenges

"Many influential surveys have found that the empirical evidence of decentralization's effects on service delivery is weak, incomplete and often contradictory" *(Channa and Faguet, 2012)*

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  More autonomy to all local authorities
  $\Rightarrow$ cannot disentangle other macro shocks / dynamics

Decentralization of public education

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"Many influential surveys have found that the empirical evidence of decentralization's effects on service delivery is weak, incomplete and often contradictory" *(Channa and Faguet, 2012)*

- Typical case A)

  More autonomy to all local authorities
  $\Rightarrow$ cannot disentangle other macro shocks / dynamics

- Typical case B)

  More autonomy to well-performing local authorities
  $\Rightarrow$ cannot isolate the counterfactual

The Colombian Reform

Summary of events

- Law 715/2001⇒ Reform in public service provision (Health, Education, Other basic services)
- Aims: increasing efficiency of service delivery, decreasing inequality, spurring decentralization

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- Aims: increasing efficiency of service delivery, decreasing inequality, spurring decentralization
- Education:
  - municipalities with 100+ thousand inhabitants given autonomy over service managment and delivery
  - Municipalities with 100- thousand inhabitants put under the authority of the department (region)

The Colombian Reform

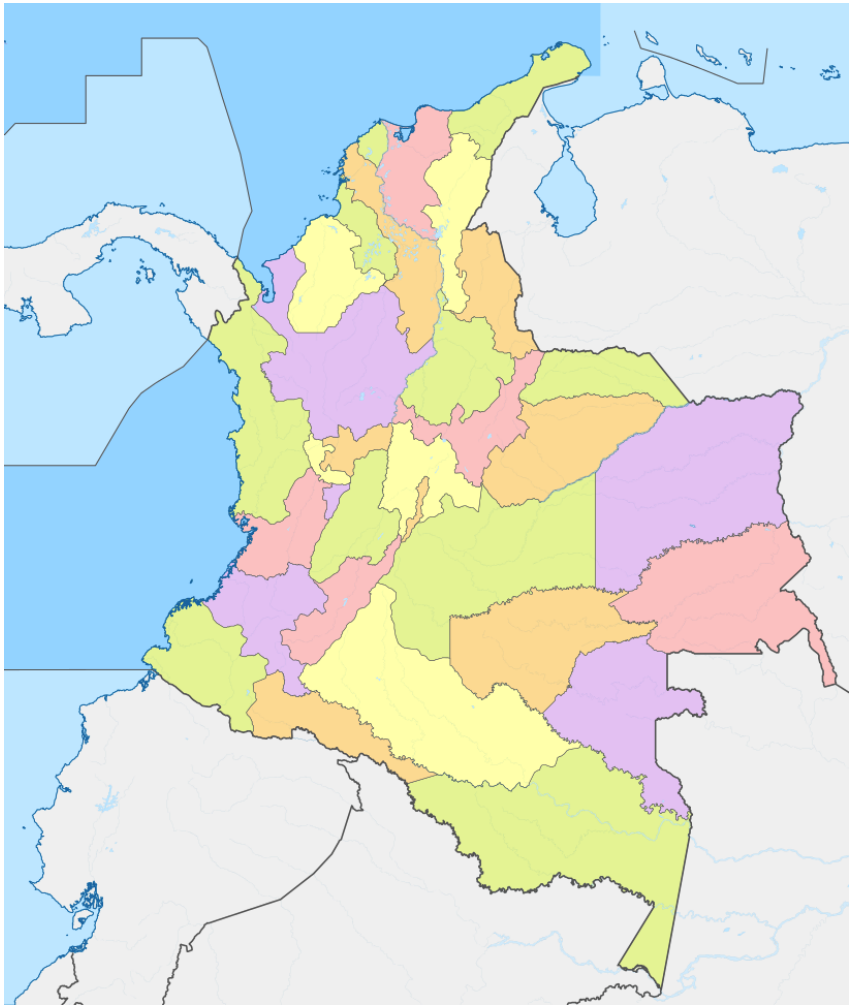
Preview of results

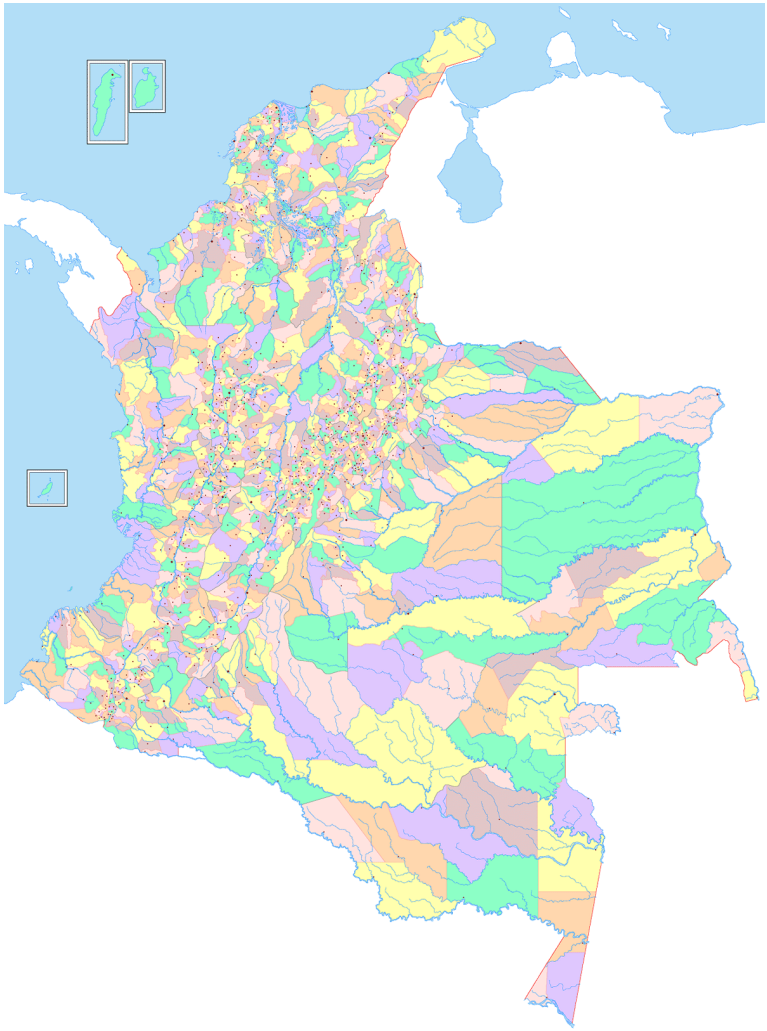
- Quality of education over the 10 years following the reform (standardized high school test scores)
  - Positive impact of autonomy for high-developed municipalities
  - Negative impact of autonomy for low-developed municipalities
- Gap increasing over time
- Magnitudes:
  +/- 0.15 student standard deviations over the 10 years
  +/- 0.3 looking at years 8,9 and 10 only

Outline

Outline

Local authorities in Colombia





Public Education in Colombia

- 11 years of schooling (9 compulsory and 2 optional)
- Public education enrollees are 83% of total

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- Public education enrollees are 83% of total
- 90% of total expenditure from Central Government transfers

The 2001 Reform

Before

Pre-reform situation (1993 - 2001):

- 80% of transfers to departments, 20% to municipalities
- both departments and municipalities have saying in management of education
- duplicity and overlap of competencies

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The 2001 Reform

After

After the reform (2002 onwards):

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The 2001 Reform

After

After the reform (2002 onwards):

- distinction between 'certified' and 'non certified' municipalities
- Certified municipalities manage education autonomously, and receive 100% of transfers to do so
- Non-certified municipalities have their education service managed by departments
  - (receive transfers for 4.4% of total cost, w. restrictions on use)

The 2001 Reform

The Certification cutoff

- Certified municipalities: 100,000+ inhabitants in 2002

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The 2001 Reform

The 40 Certified municipalities

1/3 of Colombia's population and pupil share

Data

Test Scores

- Colombia has long running tradition of standardized testing
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Test Scores

- Colombia has long running tradition of standardized testing
- ICFES: Governmental agency that administers tests across the country
- Saber 11: standardized high school test, all students after the 11th school year (41%)
- student-level data from 2000 to 2012; take municipal averages (for now)

Data

Municipal development

- Municipalities periodically evaluated and assigned scores (National Statistics Office and 'National Planning Department')
- Municipal Development Index
  - Main municipal development indicator up to 2013
  - Contains social variables (life quality in the municipality) and financial variables (municipal finance status)
  - Last pre-reform measure is 2001

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  - Contains social variables (life quality in the municipality) and financial variables (municipal finance status)
  - Last pre-reform measure is 2001
- Unsatisfied Basic Needs Indicator
  - Widely used poverty measure
  - Last pre-reform measure is 1993 (Census)
  - Use it here for robustness checks

Outline

Identification I

Sharp Regression Discontinuity Design

- Inhabitant count was the only criterion to determine certification
- $C_i = \mathbb{1}\{P_i > c\}$ with P_i = population (running v.), $c = 100\,000$
- $\tau = \mathbb{E}[Y_i(1) - Y_i(0)|P_i = c] = \mathbb{E}[Y_i(1)|P_i = c] - \mathbb{E}[Y_i(0)|P_i = c]$

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- Assumptions:
  - Unconfoundedness: $Y_i(0), Y_i(1) \perp C_i|P_i$
  - Smoothness: $\mathbb{E}[Y_i(0)|P_i = p]$ and $\mathbb{E}[Y_i(1)|P_i = p]$ continuous at least at $p = c$

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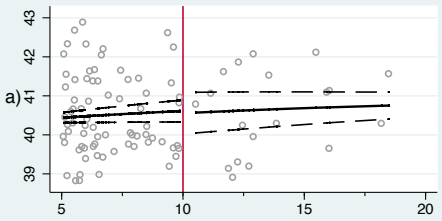
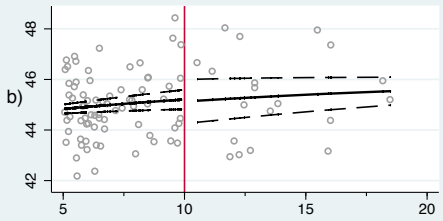
$$Y_i = \alpha + \tau^{RD} C_i + f(P_i) + \epsilon_i$$

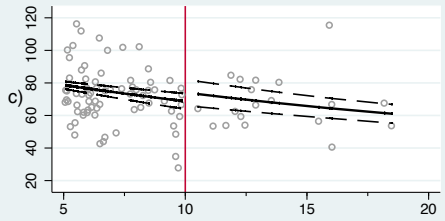
$$Y_i = \alpha + \tau_0^{RD} C_i + \tau_1^{RD} C_i * D_i + \beta D_i + f(P_i) + \epsilon_i$$

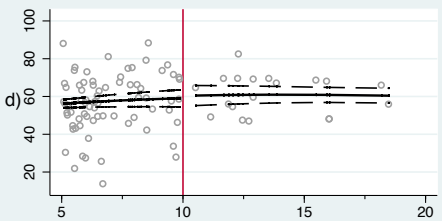
Identification I

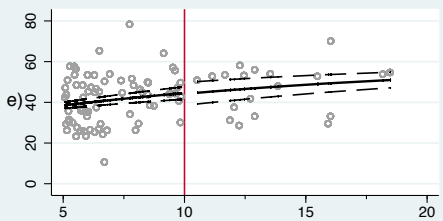
Smoothness

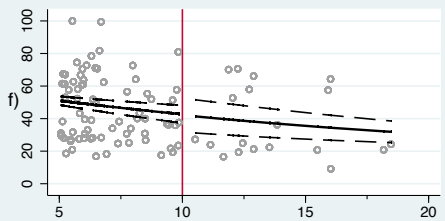


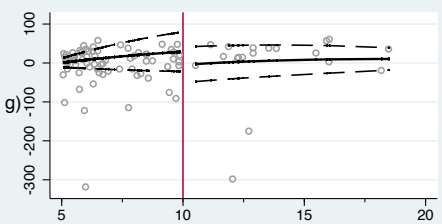


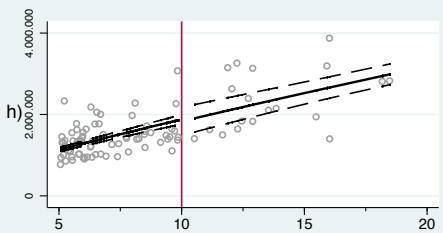


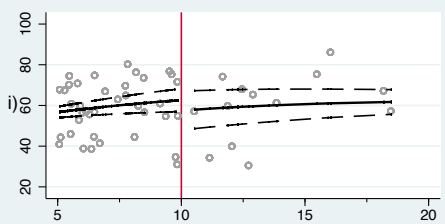


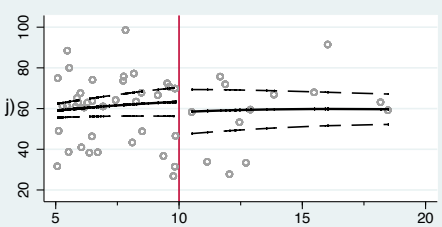












a) Municipal Maths score average 2001 (value); b) Municipal Spanish Language score average 2001 (value); c) Gross primary school coverage 2001 (percent); d) Gross secondary school coverage 2001 (percent); e) Municipal Development Index 2001 (value); f) Unsatisfied Basic Needs indicator 1993 (value); g) Share of saved municipal current revenues (percent); h) Central Govt. transfers for education 2001 (1,000s of Pesos); i) Transparency index 2005 (value); j) Visibility and accountability index 2005 (value).

RD Results

Mathematics

Table: Saber 11 Mathematics test scores

	(1) All	(2) Bottom 25%	(3) Bottom 50%	(4) Top 50%	(5) Top 25%	(6) Interaction
Certified	0.167	-1.580	0.399	0.729	2.201**	-2.542***
	(0.63)	(0.99)	(0.94)	(0.87)	(0.86)	(0.56)
Certif.*MDI'01 perc.						0.037***
						(0.01)
MDI'01 percentile						0.023***
						(0.00)
.						
F(Population)	Yes	Yes	Yes	Yes	Yes	Yes
N	7,572	6,536	7,100	472	275	7,561
R-sq.	0.013	0.003	0.003	0.011	0.050	0.084

Standard errors clustered by municipality in parentheses
* p<.10 ** p<.05 *** p<.01

RD Results

Spanish Language

Table: Saber 11 Language test scores

	(1) All	(2) Bottom 25%	(3) Bottom 50%	(4) Top 50%	(5) Top 25%	(6) Interaction
Certified	0.073	-1.553	0.319	0.521	1.810	-2.428***
	(0.66)	(1.00)	(0.94)	(0.90)	(1.14)	(0.66)
Certif.*MDI'01 perc.						0.035***
						(0.01)
MDI'01 percentile						0.031***
						(0.00)
.						
F(Population)	Yes	Yes	Yes	Yes	Yes	Yes
N	7,572	6,536	7,100	472	275	7,561
R-sq.	0.018	0.003	0.004	0.011	0.035	0.123

Standard errors clustered by municipality in parentheses
* p<.10 ** p<.05 *** p<.01

RD Results

As time passes (High-Developed)

Table: Over-time dynamics (High-developed 25%)

	Mathematics			Spanish Language		
	(1) Post 2004	(2) Post 2007	(3) Post 2010	(4) Post 2004	(5) Post 2007	(6) Post 2010
Certified	2.366**	3.004***	3.802**	1.636	1.359	1.922
	(0.92)	(1.06)	(1.52)	(1.09)	(1.04)	(1.29)
.						
F(Population)	Yes	Yes	Yes	Yes	Yes	Yes
N	225	150	75	225	150	75
R-sq.	0.069	0.137	0.199	0.038	0.126	0.137

Standard errors clustered by municipality in parentheses
* p<.10 ** p<.05 *** p<.01

RD Results

As time passes (Low-Developed)

Table: Over-time dynamics (Low-developed 25%)

	Mathematics			Spanish Language		
	(1) Post 2004	(2) Post 2007	(3) Post 2010	(4) Post 2004	(5) Post 2007	(6) Post 2010
Certified	-1.800	-2.233*	-3.170**	-1.468	-1.607	-2.030*
	(1.12)	(1.29)	(1.60)	(1.02)	(1.06)	(1.12)
.						
F(Population)	Yes	Yes	Yes	Yes	Yes	Yes
N	5,344	3,609	1,809	5,344	3,609	1,809
R-sq.	0.003	0.005	0.007	0.003	0.004	0.007

Standard errors clustered by municipality in parentheses
* p<.10 ** p<.05 *** p<.01

RD Results

As time passes (Interaction term)

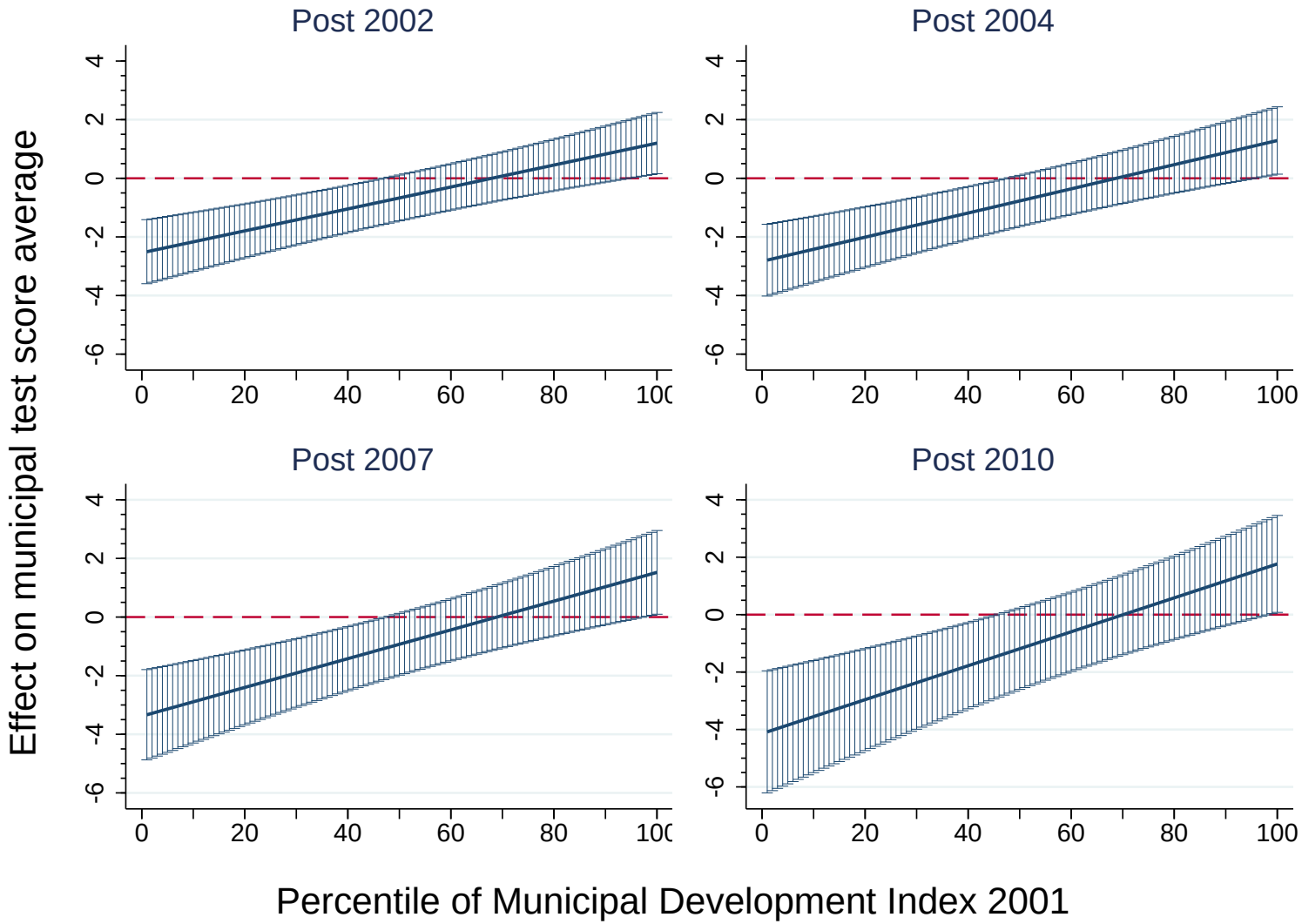
Table: Over-time dynamics (Interaction term)

	Mathematics			Spanish Language		
	(1) Post 2004	(2) Post 2007	(3) Post 2010	(4) Post 2004	(5) Post 2007	(6) Post 2010
Certified	-2.833***	-3.382***	-4.142***	-2.354***	-2.549***	-3.190***
	(0.63)	(0.79)	(1.09)	(0.68)	(0.68)	(0.83)
Certif.*MDI'01 perc.	0.041***	0.049***	0.059***	0.035***	0.038***	0.044***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
MDI'01 percentile	0.025***	0.030***	0.040***	0.031***	0.029***	0.037***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
.						
F(Population)	Yes	Yes	Yes	Yes	Yes	Yes
N	6,181	4,172	2,091	6,181	4,172	2,091
R-sq.	0.091	0.125	0.197	0.115	0.162	0.246

Standard errors clustered by municipality in parentheses
* p<.10 ** p<.05 *** p<.01

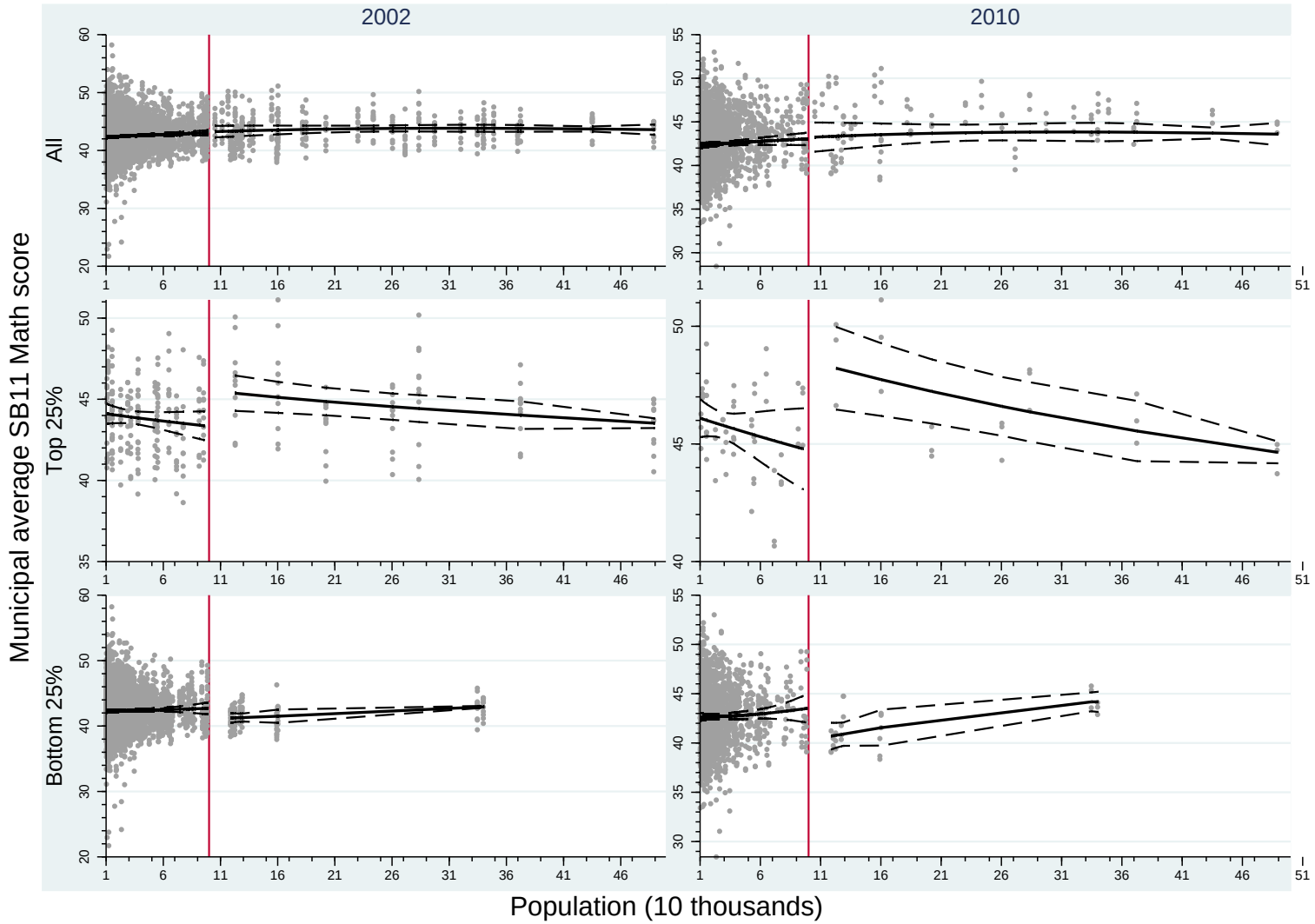
RD Results

As time passes - Marginal Effects (Math)



RD Results

Graphical Results (Math)



Robustness Checks

Different polynomials on the 2 sides (Math)

Table: Saber 11 Math scores - 2 polynomials

	(1) All	(2) Bottom 25%	(3) Bottom 50%	(4) Top 50%	(5) Top 25%	(6) Interaction
Certified	0.176	-2.259*	1.211	-0.307	3.065***	-2.267**
	(1.12)	(1.37)	(1.60)	(1.27)	(0.81)	(0.88)
Certif.*MDI'01 perc.						0.038***
						(0.01)
MDI'01 percentile						0.023***
						(0.00)
.						
F(Population)	Yes	Yes	Yes	Yes	Yes	Yes
N	7,572	6,536	7,100	472	275	7,561
R-sq.	0.013	0.003	0.004	0.028	0.073	0.084

Robustness Checks

Different polynomials on the 2 sides (Language)

Table: Saber 11 Language scores - 2 polynomials

	(1) All	(2) Bottom 25%	(3) Bottom 50%	(4) Top 50%	(5) Top 25%	(6) Interaction
Certified	0.072	-3.602***	1.274	-0.432	2.379**	-2.043**
	(1.14)	(1.31)	(1.60)	(1.18)	(1.10)	(0.96)
Certif.*MDI'01 perc.						0.035***
						(0.01)
MDI'01 percentile						0.031***
						(0.00)
.						
F(Population)	Yes	Yes	Yes	Yes	Yes	Yes
N	7,572	6,536	7,100	472	275	7,561
R-sq.	0.018	0.003	0.004	0.029	0.073	0.124

Outline

Identification II

Local Linear Regression on a Discontinuity Sample

- Focus on a 'discontinuity sample' of municipalities (à la Angrist and Levy, QJE 1999)
- Around the 100,000 cutoff, certification is as good as randomly assigned

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Local Linear Regression on a Discontinuity Sample

- Focus on a 'discontinuity sample' of municipalities (à la Angrist and Levy, QJE 1999)
- Around the 100,000 cutoff, certification is as good as randomly assigned
- Fixed effects regression

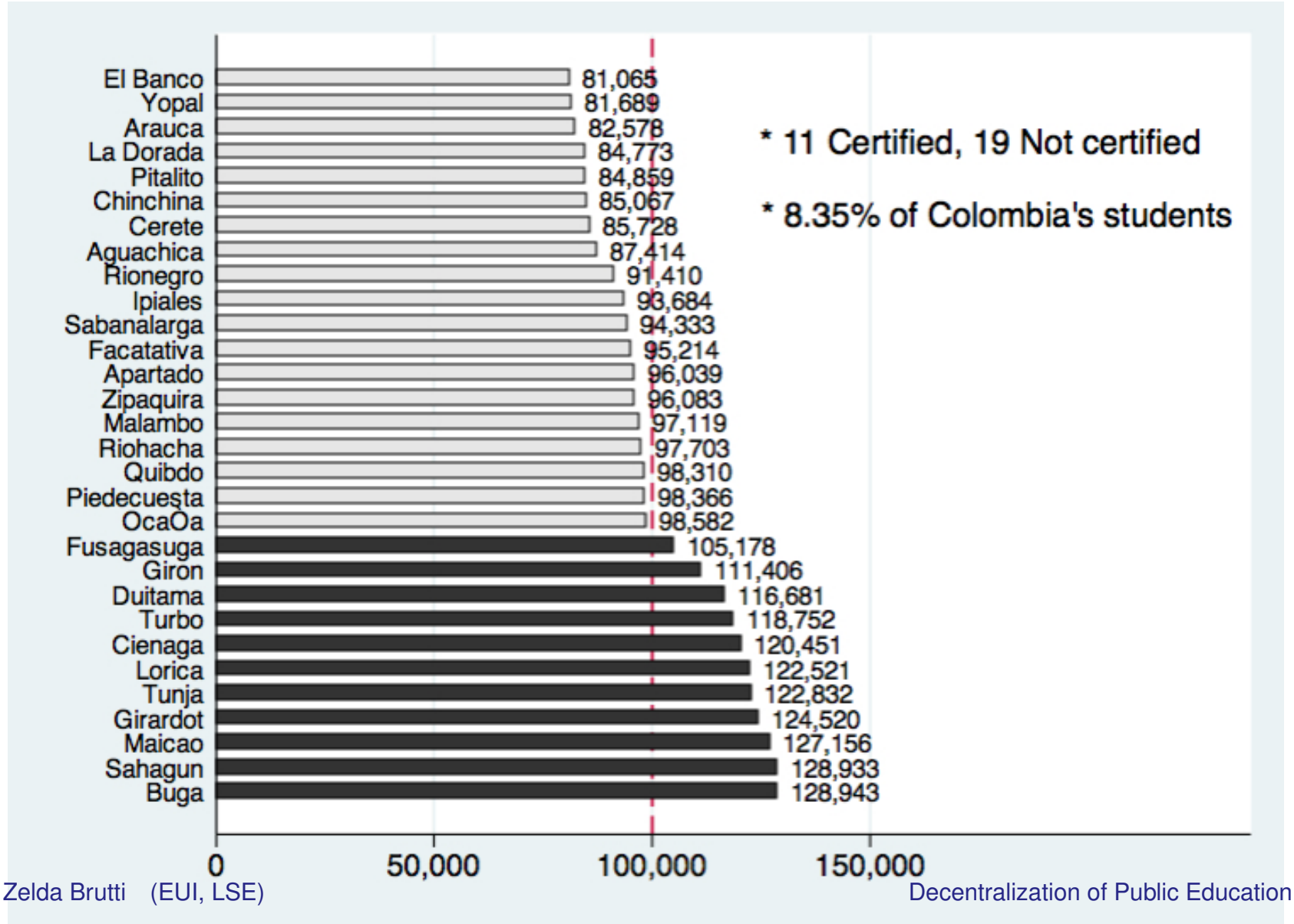
$$Y_{it} = \alpha + \tau^{LLR} C_{it} + \boldsymbol{\gamma M_i} + \boldsymbol{\delta T_t} + \epsilon_{it}$$

- Allowing for heterogeneity

$$Y_{it} = \alpha + \tau_0^{LLR} C_{it} + \tau_1^{LLR} C_{it} * D_i + \boldsymbol{\gamma M_i} + \boldsymbol{\delta T_t} + \epsilon_{it}$$

The sample

80,000 - 130,000 inhabitants



LLR Results

Mathematics

Table: Saber 11 Math scores

	Certification only		Municipal Dev. Ind.	
	(1)	(2)	(3)	(4)
	OLS	FE	OLS	FE
Certified	0.064	0.016	-7.074***	-3.666***
	(0.76)	(0.53)	(1.39)	(1.26)
Certified * MDI01			0.158***	0.081**
			(0.03)	(0.03)
.				
Time dummies	Yes	Yes	Yes	Yes
N	389	389	389	389
N groups		30		30
R-sq.	0.39	0.67	0.52	0.68

LLR Results

Spanish Language

Table: Saber 11 Language scores

	Certification only		Municipal Dev. Ind.	
	(1)	(2)	(3)	(4)
	OLS	FE	OLS	FE
Certified	-0.051	-0.006	-7.701***	-0.915
	(0.80)	(0.26)	(1.52)	(0.55)
Certified * MDI01			0.169***	0.020*
			(0.03)	(0.01)
.				
Time dummies	Yes	Yes	Yes	Yes
N	389	389	389	389
N groups		30		30
R-sq.	0.38	0.77	0.52	0.77

Standard errors clustered by municipality in parentheses

* p<.10 ** p<.05 *** p<.01

Robustness Checks

Common Trend Assumption

Table: Common trend (from 2000 to 2001)

	Mathematics		Spanish Language	
	(1)	(2)	(3)	(4)
Certified	-0.154	-0.526	-0.501	0.460
	(0.55)	(0.91)	(0.48)	(0.82)
Certif.*MDI'01 perc.		-0.002		-0.005
		(0.01)		(0.01)
MDI'01 percentile		0.013**		-0.009
		(0.00)		(0.01)
.				
F(Population)	Yes	Yes	Yes	Yes
N	390	390	390	390
R-sq.	0.08	0.22	0.28	0.40

Standard errors clustered by municipality in parentheses
* p<.10 ** p<.05 *** p<.01

Robustness Checks

Different Cutoffs for the Continuity Sample

Table: Different Sample Cutoffs

	90,000 - 120,000				65,000 - 145,000			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Mate	Mate	Lang	Lang	Mate	Mate	Lang	Lang
Certified	0.906	-6.303***	0.873	-10.119***	0.352	-2.972**	0.283	-7.192***
	(0.93)	(0.78)	(1.36)	(0.99)	(0.44)	(1.19)	(0.63)	(1.45)
Certified * MDI01		0.153***		0.233***		0.072**		0.162***
		(0.02)		(0.02)		(0.03)		(0.03)
.								
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	194	194	194	194	595	582	595	582
N groups	15	15			46	45		
R-sq.	0.68	0.69	0.35	0.49	0.61	0.62	0.40	0.49

Standard errors clustered by municipality in parentheses
* p<.10 ** p<.05 *** p<.01

Robustness Checks

- ✔ Explicitly controlling for population
- (✔) Development-specific time trends

Conclusions (so far)

Results on educational quality
(consistent across the two strategies):

- Average effect close to zero
- Positive impact of autonomous management of education for high-developed municipalities
- Negative impact for low-developed municipalities
- Gap between the two is intensifying over time

Outline

Next Steps

- Results on enrollment rates
- Channels
  - Staffing plans
    - Reshuffled during the transitional period (2003 - 2004)
    - Teacher pays and pensions: 86% of total expenditure
  - ...
- Heterogeneity across people
  - impact of reform on students by SES