

# Equality of Opportunity in Academic Achievement in Latin America: An Investigation Employing PISA 2006- 2009

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# Motivation

Inequality is one economic situation without consensus among people.

Latin America is a continent with high inequality levels

Education is the source of economic resources for the people.

# Objective

We assess inequality of opportunity for educational achievement in Latin America following John Roemer's (1998) approach, working with simple partitions of the pupils' population (gender, or school type, or parental education) and combinations of them.

# Equality of Opportunities

- Inequality could be decomposed in morally unacceptable factors (circumstances beyond an individual's control like gender, race or socioeconomic origin etc.) and legitimate factors (different degrees of effort, autonomous choices etc.).
- Inequality of Opportunities is the fraction of inequality which is morally unacceptable.

# Literature

- Roemer (1998)
- Bourguignon *et al* (2007)
- Ferreira and Gignoux (2008)
- Lefranq *et al* (2009)
- Checchi and Peragine (2010)

# Metodology

- We follow Checchi and Peragine's (2010) non-parametric approach.
- This method consist on decompose gross inequality  $I(X)$  in:
  - Inequality due to circumstances (I. Opp.)
  - Inequality due to other factors ( effort, luck..)
- We estimate  $IO(X) = (I.Opp)/ I(X)$  by using GE indexes.

# Metodology (2)

- The set of circumstances used are:
  - Gender
  - Parents Schooling
  - **Type of School**
- We split the population according to these “types”.
- For estimations, we use each one and a combination of two of them.

# Data

- We use data collected by the OECD
  - PISA 2006: (347,000 students, 56,000 in Lat. A. )
  - PISA 2009: (390,000 students, 78,000 in Lat. A. )
- Subjects: Mathematics, Sciences and Reading
- The score is a plausible value with a mean of 500 and a Stdar. Dev. Of 100.

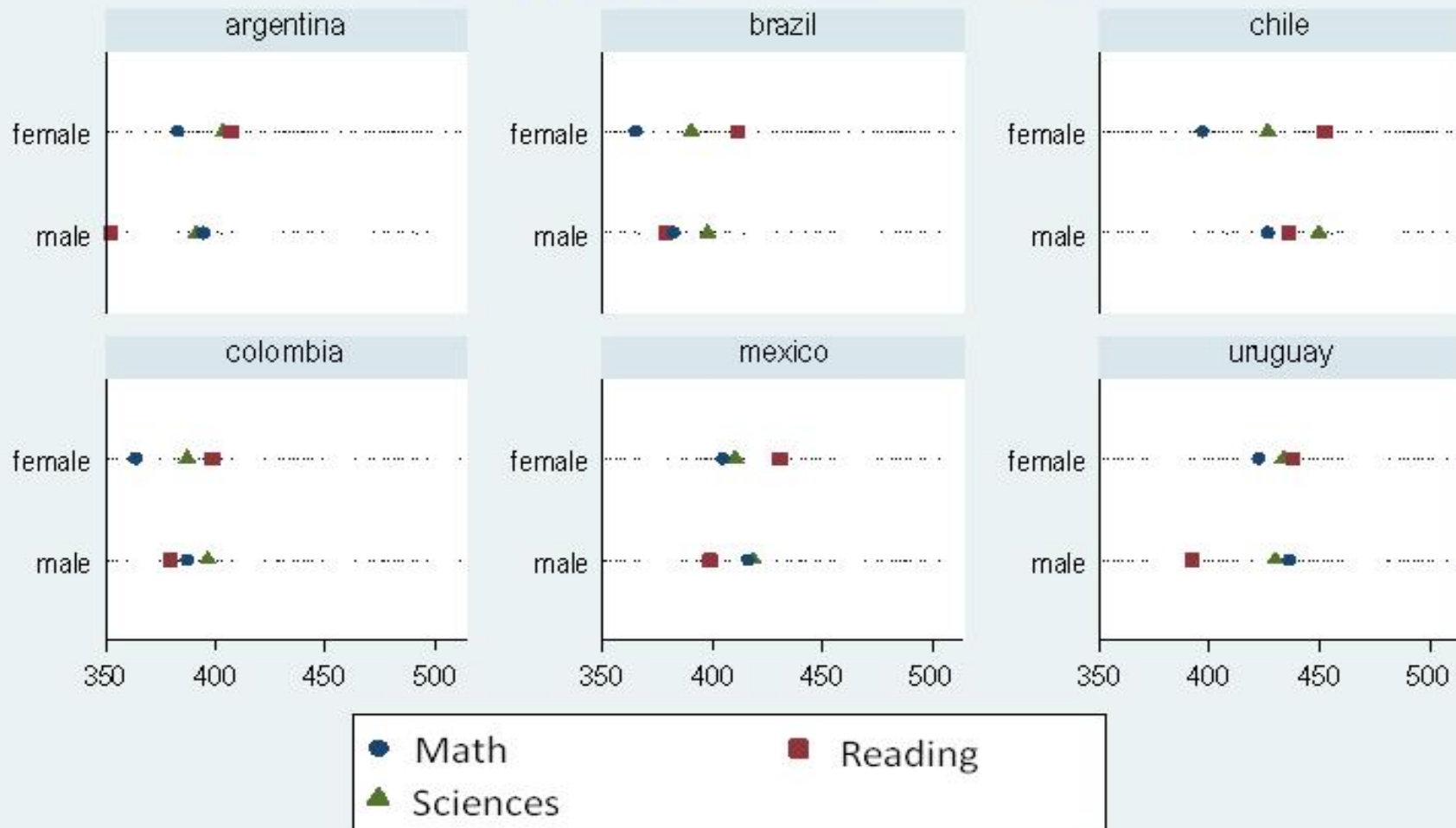
# Descriptives

Average  
Scores.

		Sciences						
		ARG	BRA	CHI	COL	MEX	URU	OECD
2006		391	390	<b>438</b>	<b>388</b>	410	428	500
		(6,1)	(2,8)	(4,3)	(3,4)	(2,7)	(2,7)	(0,5)
2009		<b>401</b>	405	<b>447</b>	402	416	427	501
		(4,6)	(2,4)	(2,9)	(3,6)	(1,8)	(2,6)	(0,8)
		Reading						
2006		374	393	<b>442</b>	<b>385</b>	410	413	492
		(7,2)	(3,7)	(5,0)	(5,1)	(3,1)	(3,4)	(0,6)
2009		398	<b>412</b>	<b>449</b>	413	425	426	493
		(4,6)	(2,7)	(3,1)	(3,7)	(2,0)	(2,6)	(0,5)
		Mathematics						
2006		381	<b>369</b>	411	<b>370</b>	405	<b>427</b>	498
		(6,2)	(2,9)	(4,6)	(3,8)	(2,9)	(2,6)	(0,5)
2009		388	386	421	381	419	427	496
		(4,1)	(2,4)	(3,1)	(3,2)	(1,8)	(2,6)	(0,5)

# Descriptives

## Average Scores by Gender PISA 2006



# Limitations

- PISA databases only lets us to provide an estimation of Inequality of Opportunities conditional to:
  - a. Pupils staying in the educational system
  - b. Pupils not having repeated too many grades.

## Limitations (2)

- The proportion of each countries' cohort which was represented by PISA samples, were:
  - (i) 2006: Argentina (79), Brazil (55), Chile (78), Colombia (60), Mexico (54) and Uruguay (69);
  - (ii) 2009: Argentina (69), Brazil (63), Chile (85), Colombia (59), Mexico (61) and Uruguay (63).

# Results

- The Index:
  - GE(0) is path-independent (Foster and Shneyrow, 2000) and closer to Roemer's proposal of intolerance with respect to between-groups inequality. It is not scale and translation invariant.
  - GE(2) would have the opposite advantages and drawbacks (cf. Ferreira and Gignoux, 2008).
- We use both as an exercise of robustness.

# Results- ( % Ineq. Opp 2006).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MATH	Gross	I	II	III	A	B	C
ARG	0,037	9,41	<b>0,60</b>	16,58	9,99	20,74	17,48
BRA	0,031	11,21	0,90	19,02	12,32	24,70	19,90
CHI	0,022	19,70	3,00	7,89	22,02	23,79	10,97
COL	0,029	<b>8,17</b>	1,65	5,73	<b>9,90</b>	<b>13,20</b>	7,23
MEX	0,021	13,18	0,46	<b>4,68</b>	13,58	14,94	<b>5,28</b>
URU	0,027	13,58	0,60	9,81	14,25	18,00	10,50
SCIENCES							
ARG	0,034	10,69	0,43	17,45	11,18	21,80	17,48
BRA	0,026	9,07	0,16	17,97	9,18	22,15	18,32
CHI	0,021	17,34	1,68	8,03	18,58	21,44	9,90
COL	0,024	<b>6,89</b>	0,38	5,20	<b>7,45</b>	<b>11,50</b>	<b>5,86</b>
MEX	0,018	12,04	<b>0,32</b>	<b>4,64</b>	12,25	14,13	5,20
URU	0,024	11,75	<b>0,33</b>	10,15	12,24	16,54	10,55
READING							
ARG	0,067	<b>5,53</b>	7,82	17,01	15,70	21,35	23,44
BRA	0,034	7,67	3,81	14,58	12,51	18,88	18,10
CHI	0,028	14,24	<b>1,18</b>	6,77	15,80	18,21	8,33
COL	0,042	5,97	2,01	<b>2,91</b>	<b>8,08</b>	<b>12,12</b>	<b>5,18</b>
MEX	0,028	12,08	3,59	5,05	15,91	14,56	8,39
URU	0,049	10,58	5,39	10,99	17,07	16,86	16,10

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I: Parents schooling  
 II: Gender  
 III: Type of school

$$A = I + II.$$

$$B = I + III$$

$$C = II + III$$

# Results- (% Ineq. Opp 2009).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MATH	Gross	I	II	III	A	B	C
ARG	0,029	11,22	<b>0,42</b>	13,24	11,90	20,62	14,11
BRA	0,021	<b>7,83</b>	1,10	19,59	<b>8,70</b>	22,94	20,94
CHI	0,018	13,49	1,47	6,58	15,22	16,56	8,34
COL	0,020	11,10	5,19	11,00	15,88	17,35	15,88
MEX	0,017	10,25	0,88	<b>3,52</b>	10,92	11,72	<b>4,37</b>
URU	0,023	17,03	0,64	13,90	17,64	22,36	14,45
SCIENCES							
ARG	0,032	11,17	0,64	16,37	12,09	23,27	16,93
BRA	0,021	<b>8,06</b>	<b>0,07</b>	18,45	<b>8,27</b>	22,23	18,60
CHI	0,017	10,36	0,23	6,34	10,80	13,68	6,76
COL	0,021	8,98	1,96	11,46	10,75	16,22	13,09
MEX	0,017	11,42	0,28	<b>4,03</b>	11,63	<b>12,97</b>	<b>4,40</b>
URU	0,026	17,45	0,23	13,78	18,07	22,45	13,98
READING							
ARG	0,038	10,07	4,90	17,02	15,16	22,68	19,85
BRA	0,026	<b>7,01</b>	3,20	16,42	11,04	20,04	19,32
CHI	0,017	11,78	3,05	8,28	14,84	16,15	10,77
COL	0,022	8,16	<b>0,35</b>	10,12	<b>9,21</b>	14,81	10,83
MEX	0,020	10,72	2,80	<b>4,05</b>	14,12	<b>12,55</b>	<b>6,73</b>
URU	0,027	16,55	5,80	14,47	23,83	22,51	20,28

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I: Parents schooling  
 II: Gender  
 III: Type of school

$$A = I + II.$$

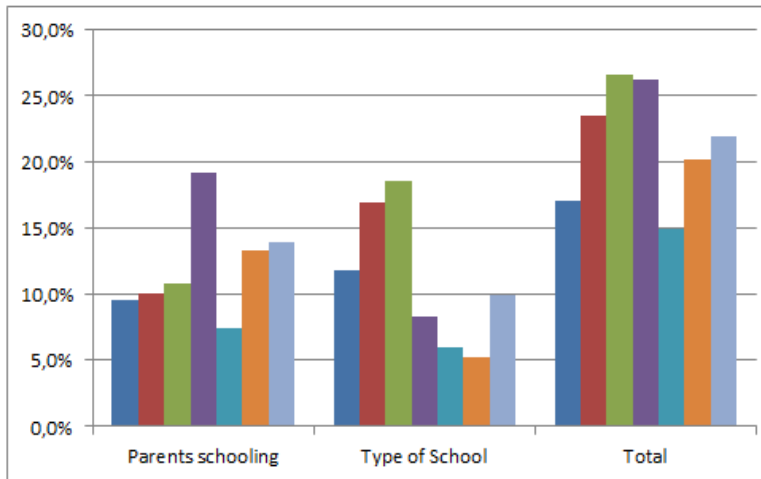
$$B = I + III$$

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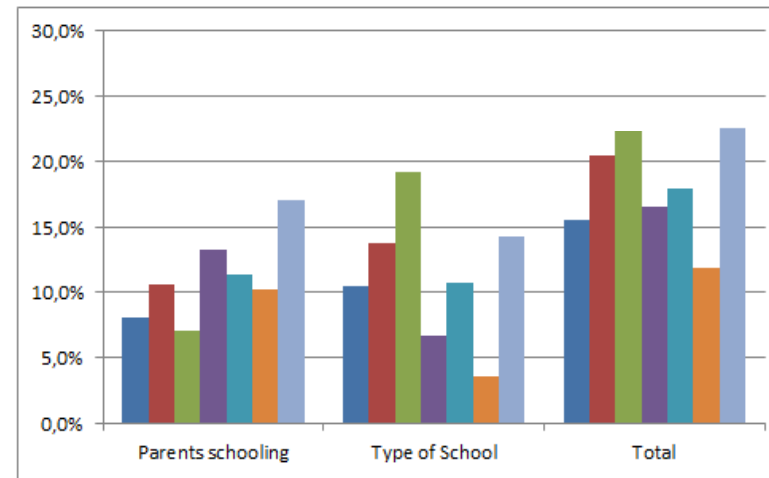
$$C = II + III$$

# Results

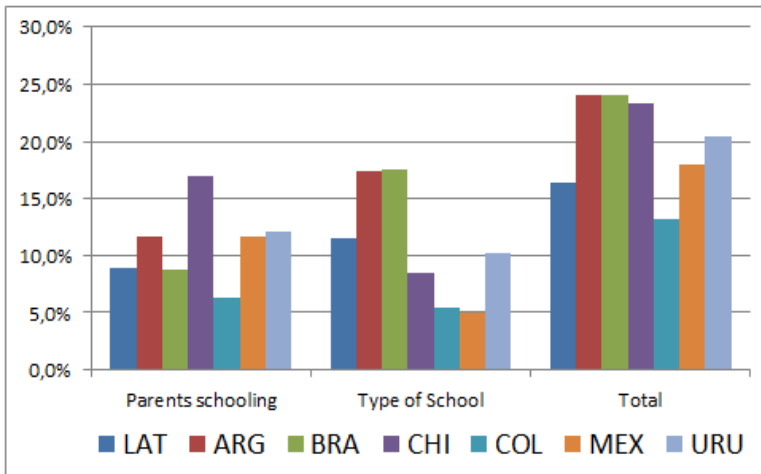
Math



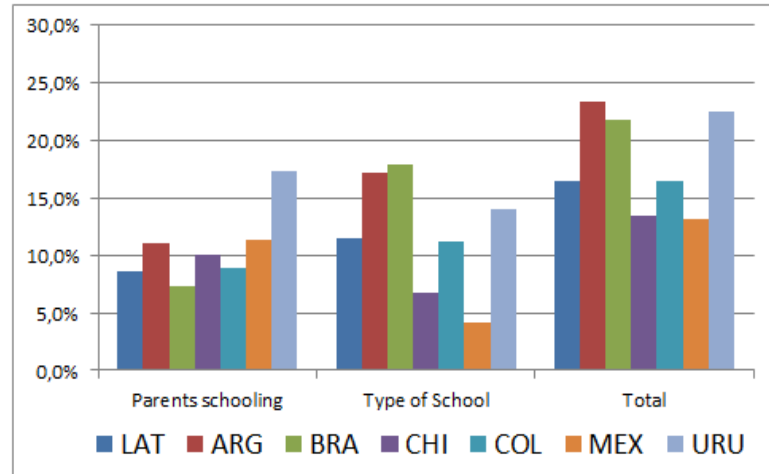
Math



Sciences



Sciences



2006

2009

# Robustness Checks

- Given that inequality measures are sensitive to sample-size and original distributions, two exercises were done:
  - Bootstrap
    - 300 replications using samples of 95%
  - GE (2) and Bootstrap
- Results remain for 2006 (rankings) but not in all the cases in 2009.

# Example: % Ineq Opp.

Type: P. Schooling + School

## MATHEMATICS

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2006					
		Boost (GE(0))		Boost (GE(2))	
<b>ARG</b>	20,74	20,72	3	23,99	3=
<b>BRA</b>	24,70	24,67	1	28,19	1=
<b>CHI</b>	23,79	23,83	2	25,12	2=
<b>COL</b>	13,20	13,16	6	14,56	6=
<b>MEX</b>	14,94	14,90	5	15,74	5=
<b>URU</b>	18,00	18,04	4	20,10	4=
2009					
<b>ARG</b>	20,62	20,68	3	26,63	1↑
<b>BRA</b>	22,94	22,90	1	23,35	3↓
<b>CHI</b>	16,56	16,59	5	16,79	4↑
<b>COL</b>	17,35	17,39	4	16,49	5↓
<b>MEX</b>	11,72	11,72	6	13,38	6=
<b>URU</b>	22,36	22,39	2	25,79	2=

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# Final Remarks

- Our approach is a lower bound estimation of Ineq. of Opportunities.
- Actual levels of unfair inequalities are not considerable.
- Inequality estimations could change in response of multiple factors.
- Having access to private education or “*charter schools*” could have a positive effect on reducing unfair equity.

Thank you.

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