Efficiency in education achievements: a regional disparities analysis

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Workshop Efficiency in Education
Work Foundation- University, London 19-20 September 2014

Outline

- Research question
- Literature Review
- Methodology
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- Conclusions
- Further Investigations

Research question

- The objective of this study is twofold:

1. To investigate the comparative efficiency of the education system of regions within countries with significant heterogeneity in performance;
2. To investigate the effects of new variables on school performance (e.g. corruption at regional level as a proxy of disincentives to study);

- We will use Conditional DEA that allows to overcome the problems of the DEA two-step

Main Literature Review

- Daraio, C., & Simar, L. (2005). Introducing environmental variables in nonparametric frontier models: a probabilistic approach. *Journal of productivity analysis*, *24*(1), 93-121.

- De Witte, K., & Kortelainen, M. (2013). What explains the performance of students in a heterogeneous environment? Conditional efficiency estimation with continuous and discrete environmental variables. *Applied Economics*, *45*(17), 2401-2412.

- Checchi D., & Peragine (2010) Regional disparities and inequalities opportunities:the case of Italy. *Journal of Economic Inequality* 429-50

- Coco, G., & Lagravinese, R. (2014). Cronyism and education performance. *Economic Modelling*, *38*, 443-450.

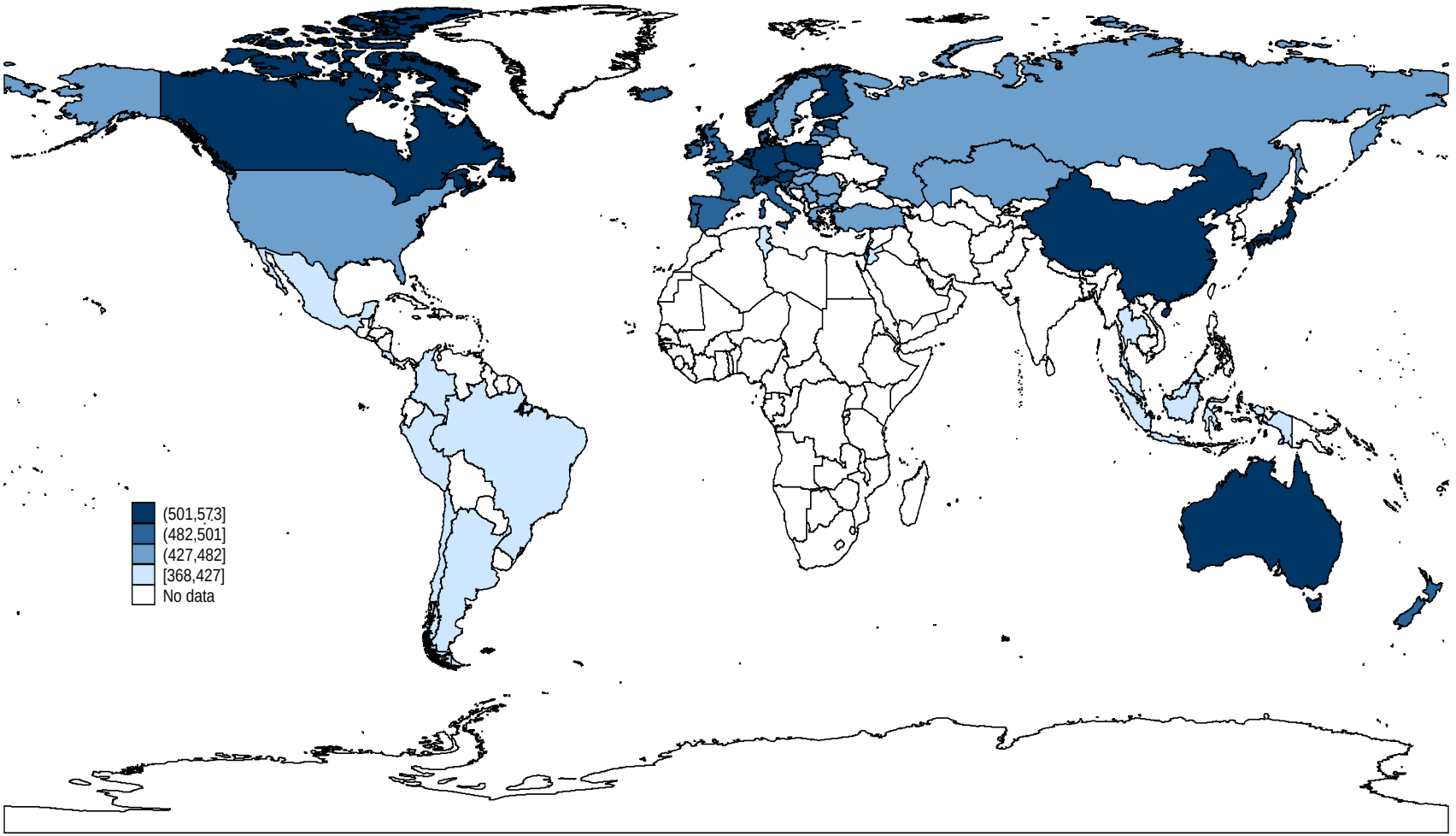
Methodology

- We use the order-m efficiency analysis, which has been introduced by Cazals et al. (2002) which includes external environmental factors that might influence the production function. (See Li and Racine, 2008)

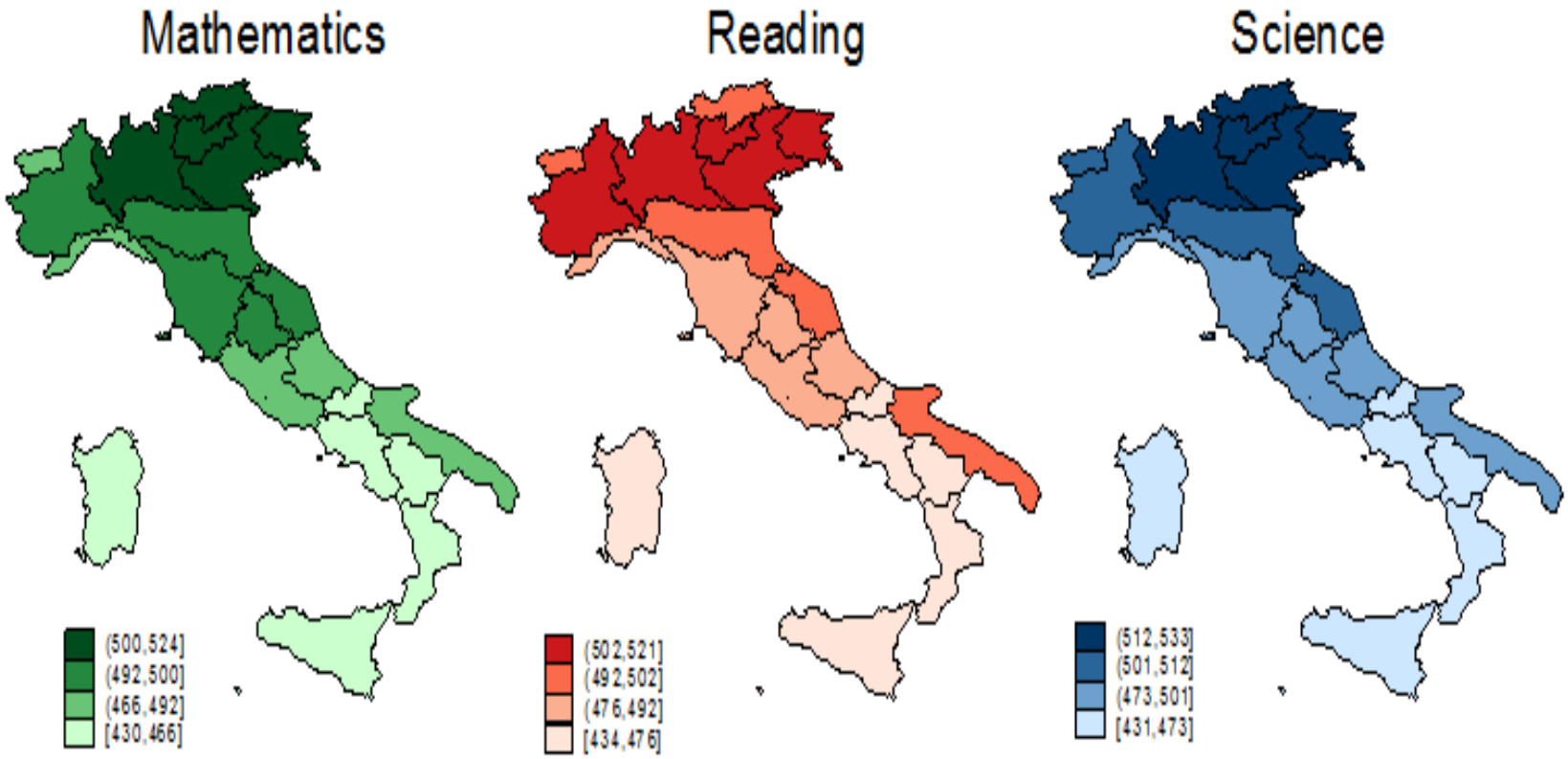
- There are 3 advantage respect DEA two stage:

1) The dependent variable is based on estimated ratio of conditional and unconditional ratio of order m efficiency score. It is not restricted to interval (e.g. 0-1)
2) The ratio can be different for small sample. There is scarce variability for large sample.
3) It does not assume separability between exogenous variables and input/output variables

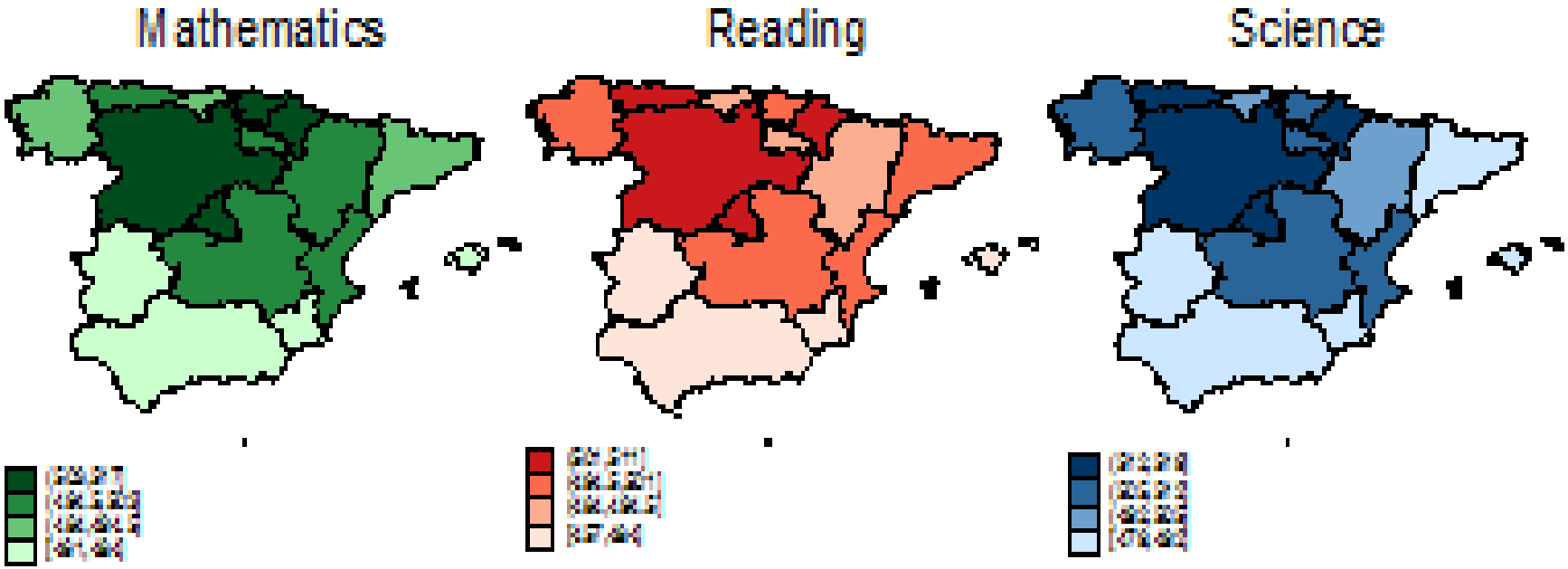
Map of PISA 2012 countries



Italy


Mathematics
(500,524]
(492,500]
(466,492]
[430,466]
Reading
(502,521]
(492,502]
(476,492]
[434,476]
Science
(512,533]
(501,512]
(473,501]
[431,473]

Spain



List of Variables

- Input: Total time (sum) devoted to maths, reading, and science
- Output:
  - Test score maths
  - Test score reading
  - Test score science
- Exogenous model 1 (with north/south dummy):
  - Grade (Grade compared to modal grade in country)
  - Education of mother (level at ISCED)
  - Education of father (level at ISCED)
  - Number of books at home (1=0-10; 2=11-25; 3=26-100; 4=101-200; 5=201-500; 6=500+)
  - Country of birth (1=Country of test; 2=Other country)
  - Language at home (code of language spoken at home)
  - Have your own room (1=yes; 2=no)
  - Family structure (1=Single parent; 2=Two parents; 3=Other)
  - Immigrant status (1=Native; 2=Second-Generation; 3=First-Generation)
  - North/south dummy (1=North; 0=South)
- Exogenous model 2 (excluded north/south dummy):
  - Regional corruption (Index)

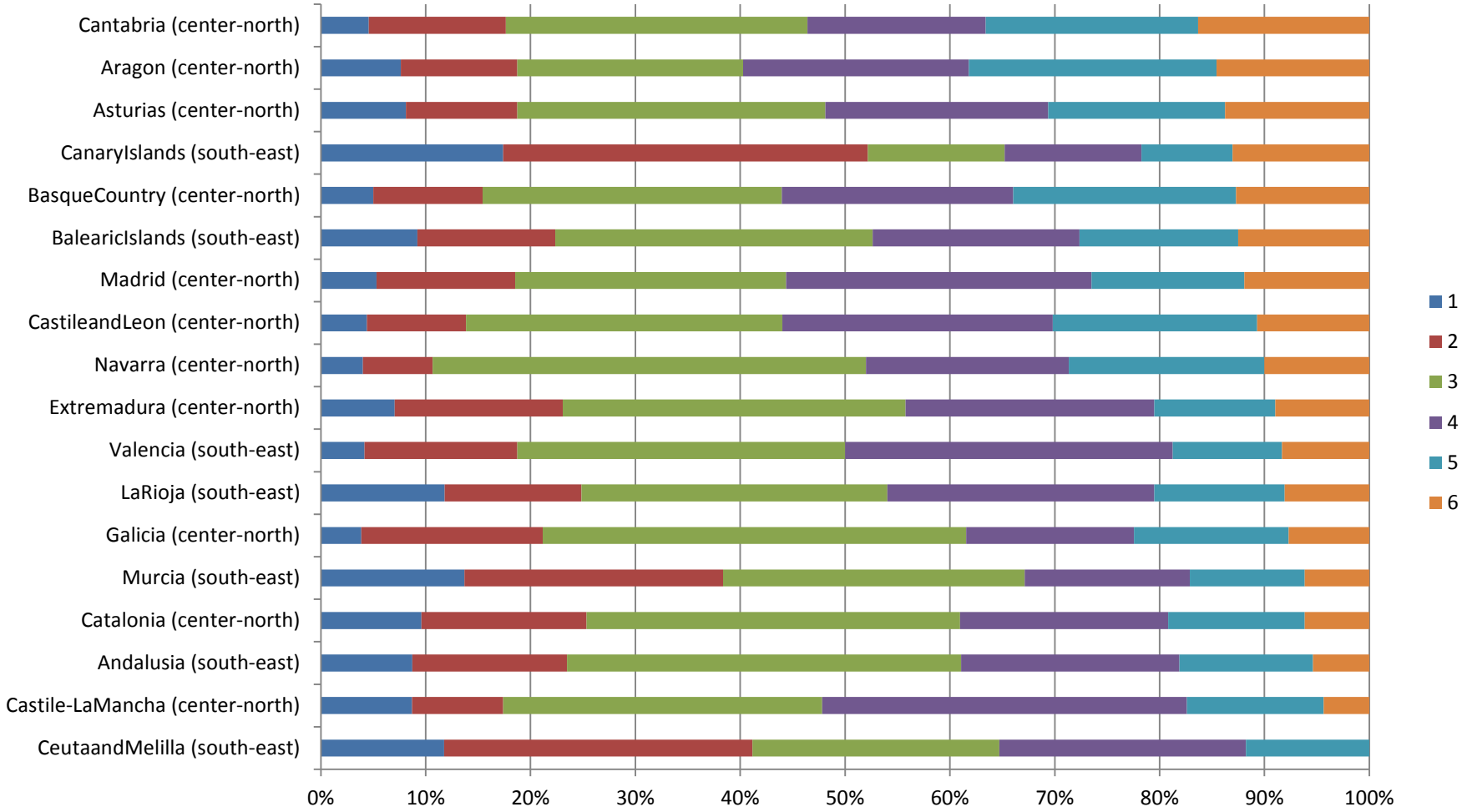
Descriptive statistics

	SPAIN		ITALY	
	mean	median	mean	median
edu_mother	3.9	4.0	3.8	4.0
edu_father	3.8	4.0	3.7	4.0
grade	9.6	10.0	9.8	10.0
own_room	1.1	1.0	1.3	1.0
immig	1.2	1.0	1.1	1.0
famstruc	1.9	2.0	1.9	2.0
country_birth	1.1	1.0	1.1	1.0
books_home	3.6	3.0	3.3	3.0
corrupt	0.6	0.7	-0.1	0.0
Observation	sample 2574 (10%) total 25313		sample 3182 (10%) total 31073	

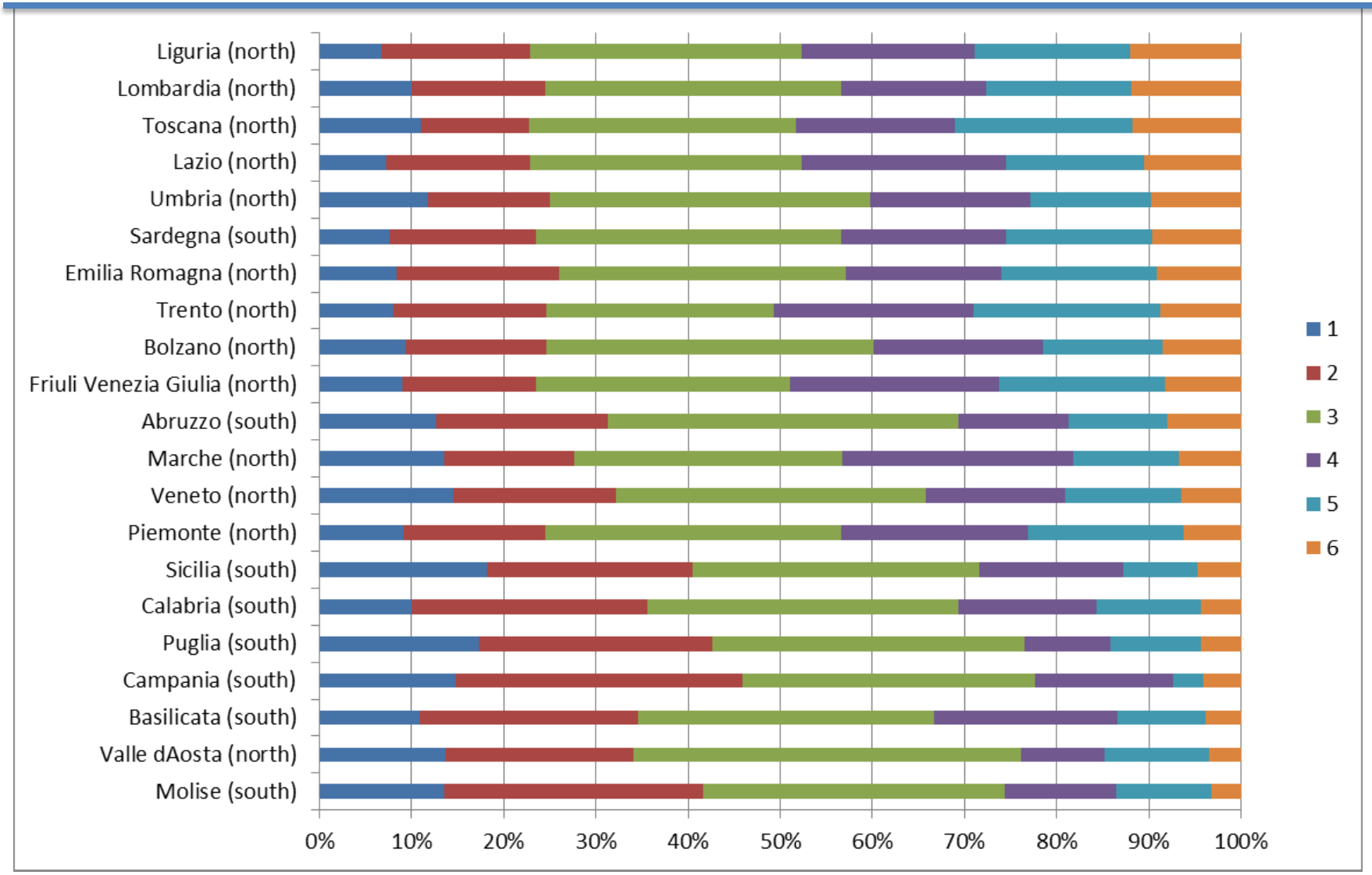
Frequencies: ITA/ESP (2)

	Italy	Spain
Books at home		
0-10 books	11.3	7.1
11-25 books	18.6	13.4
26-100 books	32.2	30.8
101-200 books	17.1	21.6
201-500 books	13.3	16.5
More than 500 books	7.5	10.5
Family Structure		
Single parent	9.90	8.97
Two parents	89.60	90.21
Other	0.50	0.82
Immigration Status		
Native	93.1	90.2
Second-Generation	1.8	1.2
First-Generation	5.1	8.6
Country of Birth - Self		
Country of test	93.09	88.97
Other country	6.91	11.03

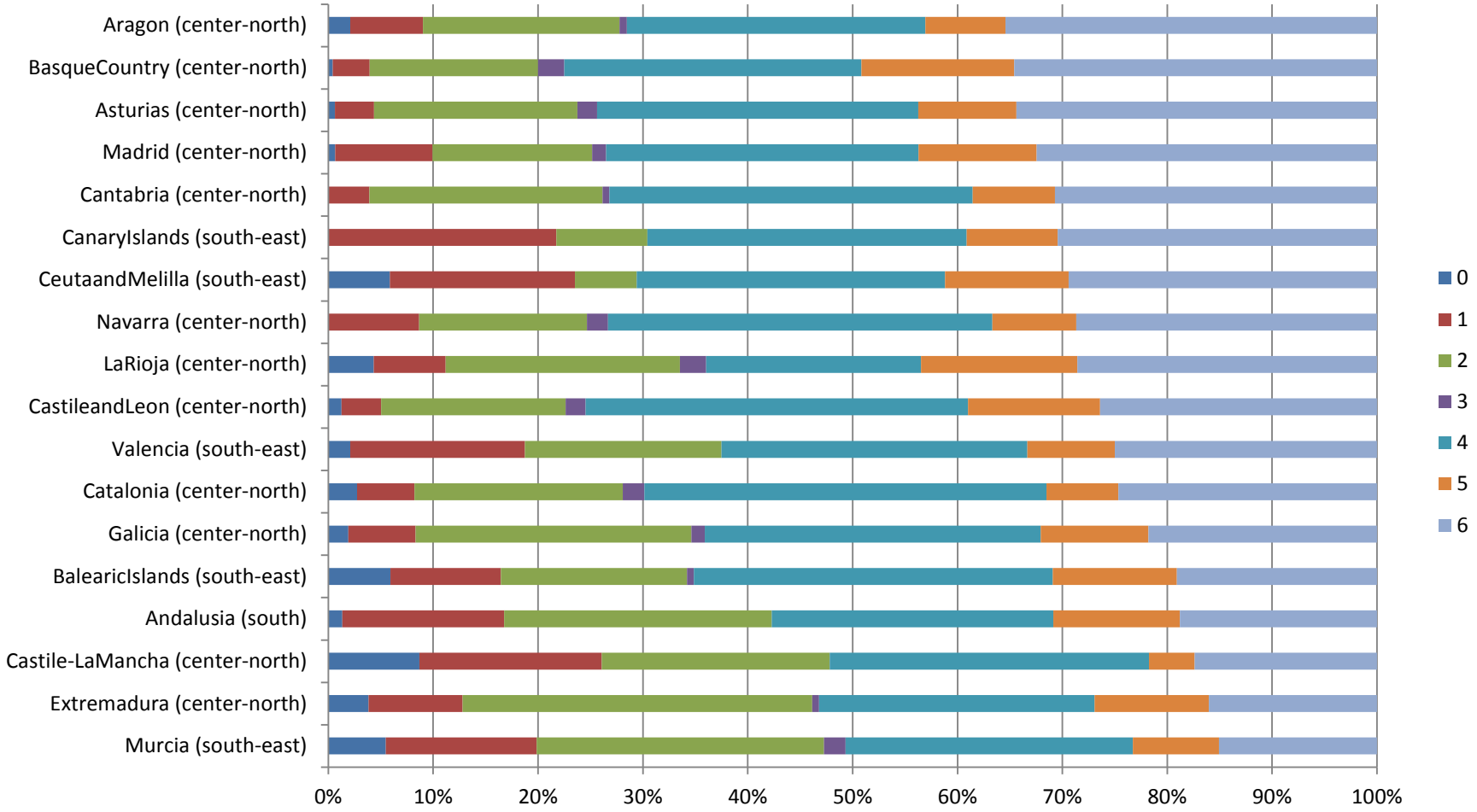
Regional disparities: books at home, Spain



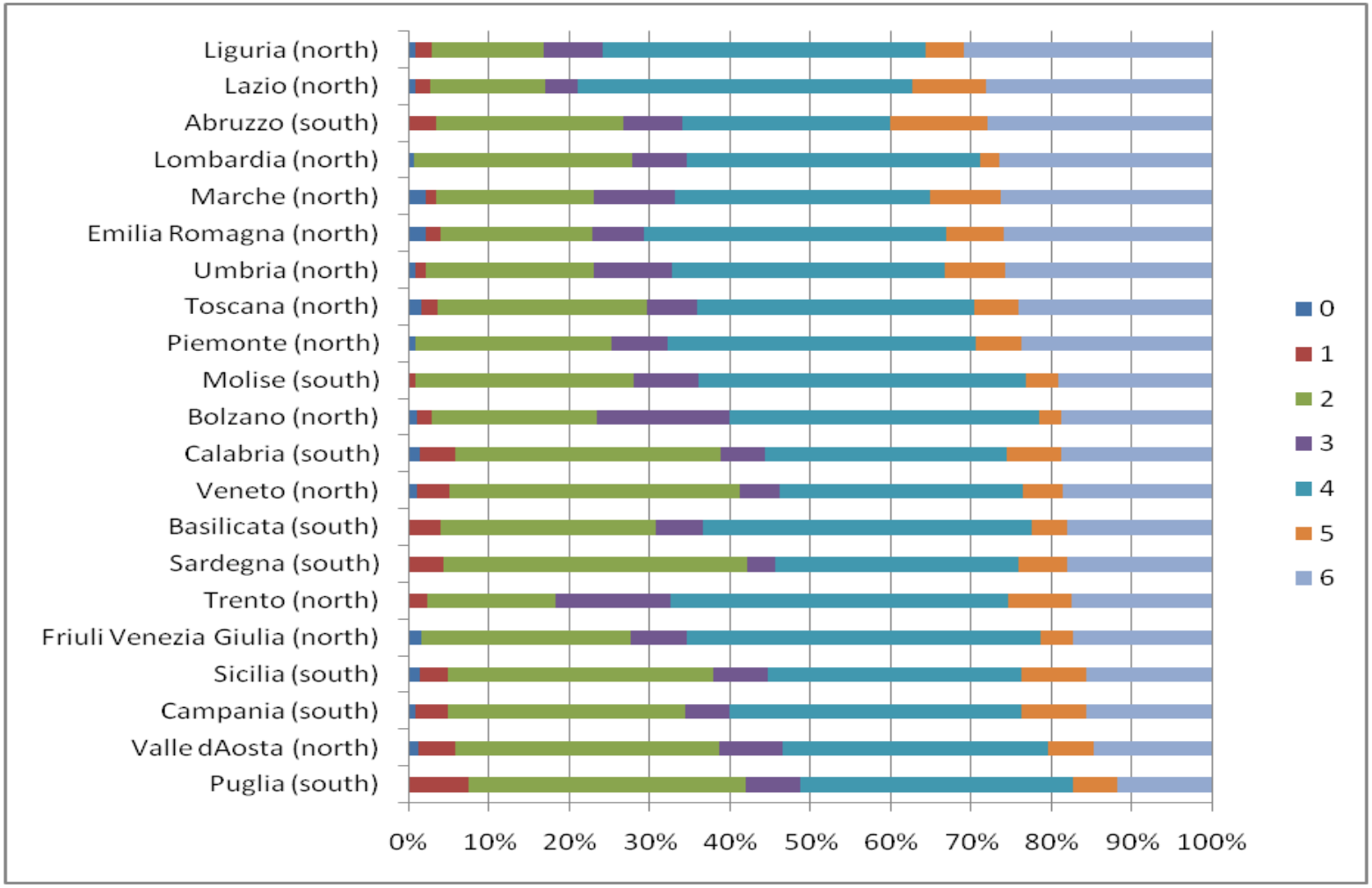
Regional disparities: books at home, ITA



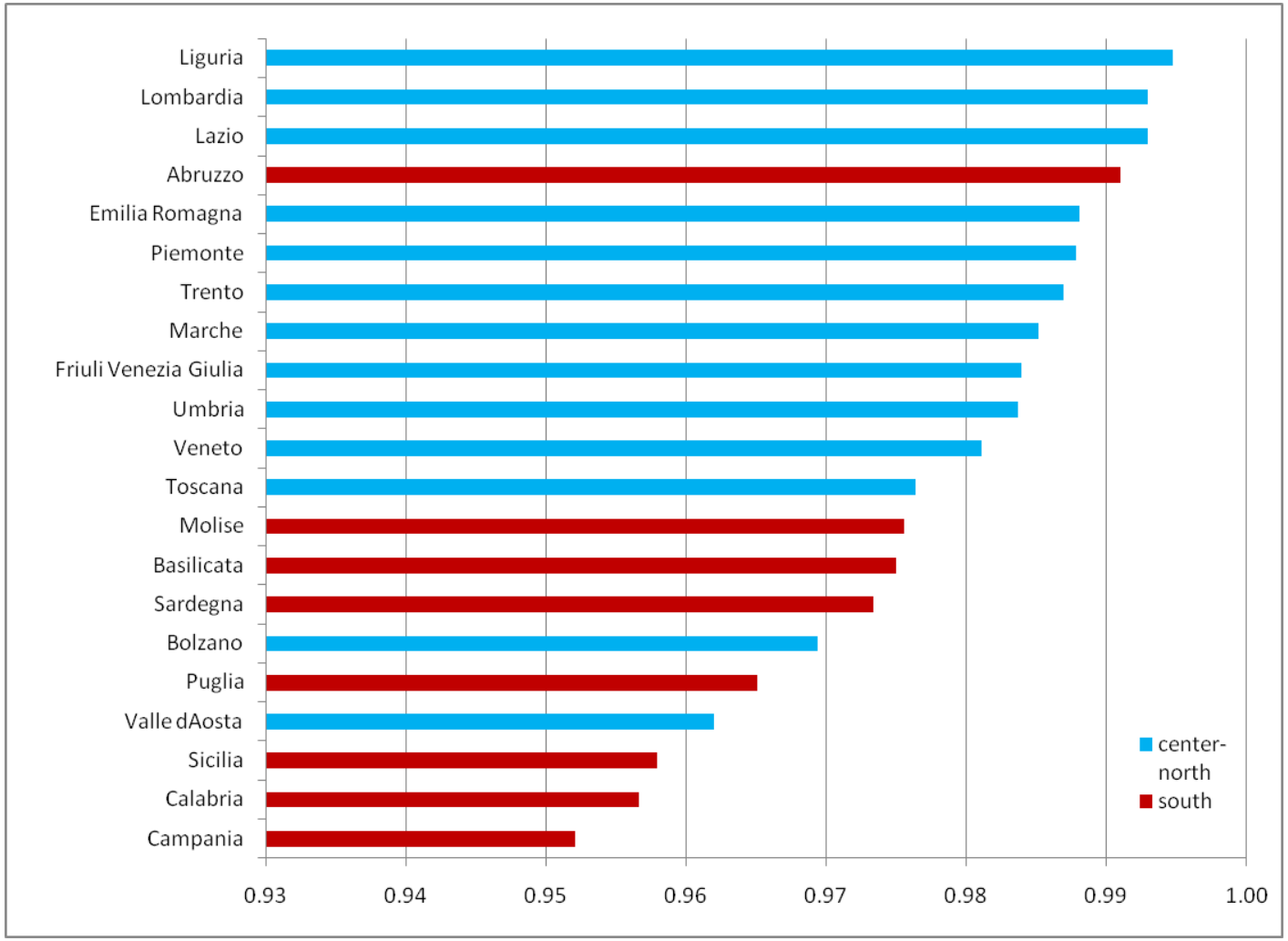
Level education Mother (Italy)



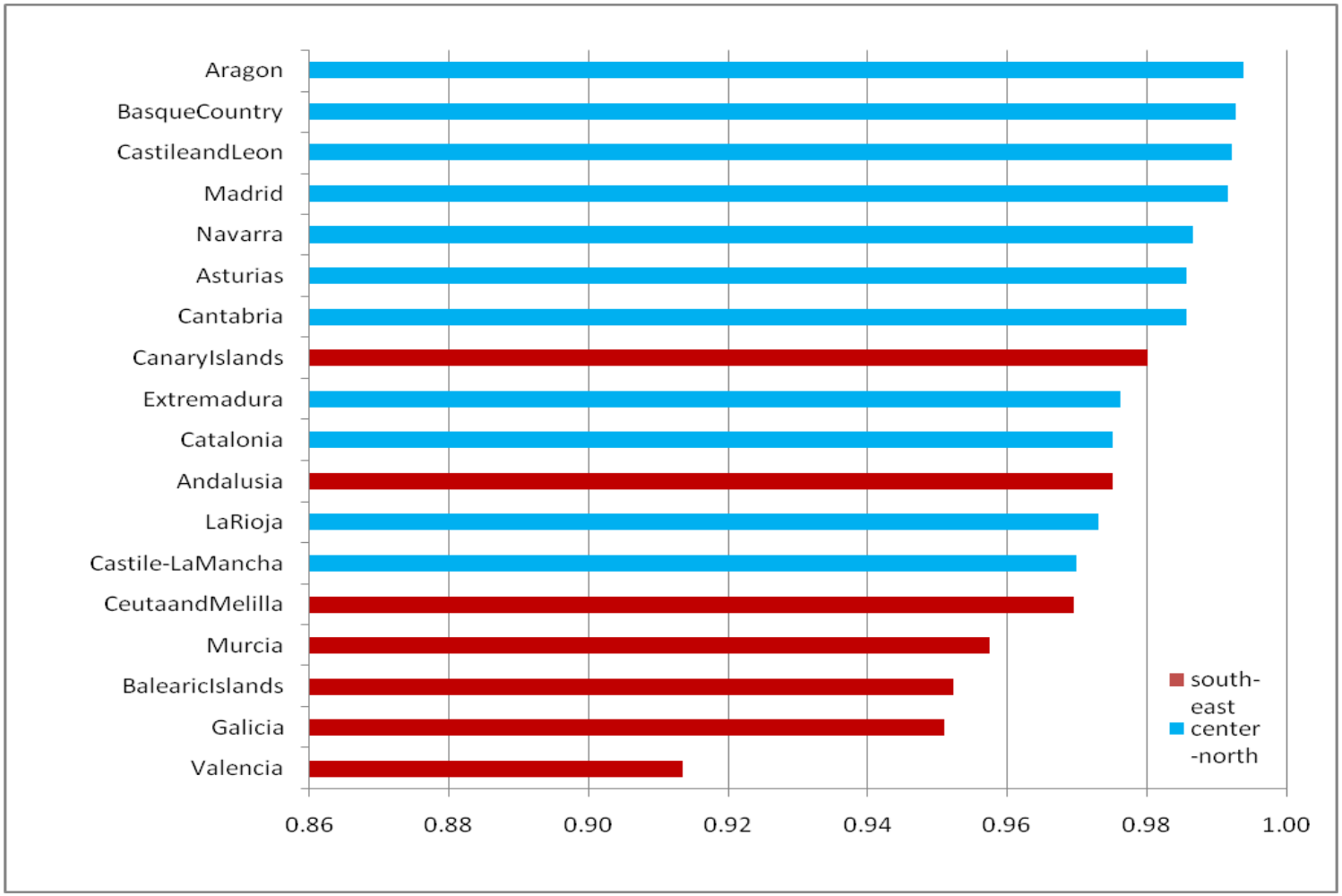
Level education Mother (Italy)



Efficiency ratio – Italy



Efficiency ratio – Spain



Results Model 1

	ITALY			SPAIN		
	p-value		Avg. Effect from partial plot	p-value		Avg. Effect from partial plot
grade	<0.01	***	Positive	<0.01	***	Positive
edu_mother	<0.01	***	Positive	<0.01	***	Positive
edu_father	<0.01	***	Positive	<0.01	***	Positive
north-south	<0.01	***	North > South	<0.01	***	Center-North> South East
native_language	<0.01	***	Italian > Other	0.93		Spanish > Other
own_room	<0.01	***	Yes > No	<0.01	***	Yes > No
immig	<0.01	***	Native > 1st gen. > 2nd gen.	<0.01	***	Native > 2nd gen. > 1st gen.
famstruc	<0.01	***	Two > Single > Other	<0.01	***	Single > Two > other
country_birth	<0.01	***	Italy > Other	<0.01	***	Spain > Other
books_home	<0.01	***	Positive	0.12		Positive

Results Model 2

	ITALY			SPAIN		
	p-value		Avg. Effect from partial plot	p-value		Avg. Effect from partial plot
grade	<0.01	***	Positive	<0.01	***	Positive
edu_mother	<0.01	***	Positive	<0.01	***	Positive
edu_father	<0.01	***	Positive	<0.01	***	Positive
native_language	0.06	.	Italian > Other	0.27		Spanish > Other
own_room	<0.01	***	Yes > No	<0.01	***	Yes > No
immig	<0.01	***	Native > 1st gen. > 2nd gen.	<0.01	***	Native > 2nd gen. > 1st gen.
famstruc	<0.01	***	Two > Other > Single	<0.01	***	Two > Other > Single
country_birth	<0.01	***	Italy > Other	<0.01	***	Spain > Other
books_home	<0.01	***	Positive	<0.01	***	Positive
corrupt	0.03	**	Positive	0.19		Positive

Conclusion

- In this work, we looked at the efficiency of regional education systems in countries with considerable economic and social heterogeneity.

- Even controlling for the usual socio-economic variables, the performance of southern regions in both countries is significantly worse. This entails the existence of inequality of opportunity between individuals of different areas of the countries, and the necessity of specific policies to meet this disadvantage.

- Corruption (as proxy of disincentives to study - especially in Italy), seems to explain partly the differences in performance.

- This result suggests that more expenditure may be insufficient to create more equal opportunities and improve the performance in disadvantaged regions. Improving transparency and accountability may, in certain areas, well be more important.

Further investigations

- Find better proxies for incentives to study at regional level
- Control for others regional variables (es. employment etc..)
- Extend the analysis to the rest of the countries where PISA data regionalised are available.
- Differentiate between countries federalised or not

Thanks

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