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# LEARNING OUTCOMES AND SCHOOL'S EFFECTIVENESS IN LOWER SECONDARY EDUCATION: AN ANALYSIS FOR TUSCANY

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## 1. Introduction

**Objective** To provide the policy maker with a tool to compare schools' effectiveness

**Data sources** Invalsi data on students' achievement merged with administrative databases

**Methodology** Multilevel bivariate regression model

where *m* represents the subject (math or reading)

$$Y_{mij} = \gamma_{0m} \sum_{s=1}^{S} \gamma_{sm} X_{sij} + u_{mj} + e_{mij}$$

$$Var\,(\mathrm{e}) = \Sigma = \begin{pmatrix} \sigma_1^2 & \sigma_{12} \\ & \sigma_2^2 \end{pmatrix}, Var\,(\mathrm{u}) = \mathrm{r} = \begin{pmatrix} \tau_1^2 & \tau_{12} \\ & \tau_2^2 \end{pmatrix}$$

with e' = $(e_1, e_2)$ and u' = $(u_1, u_2)$, thus $Var\ (Y) = \Sigma + \mathrm{r}$

## 2. Construction of database

### Three initial databases were merged by Invalsi

- **Invalsi database** — Individual and class/school composition variables
- **+ Administrative databases on school resources** — MIUR (financial instructional human res.) Tuscan Register of school buildings (status)
- **+ IRPET database** — Contextual variables (socio-economic at municipal level)

After a cleaning process we have a database made up of 25,951 pupils nested in 357 schools

## 3. Variance decomposition

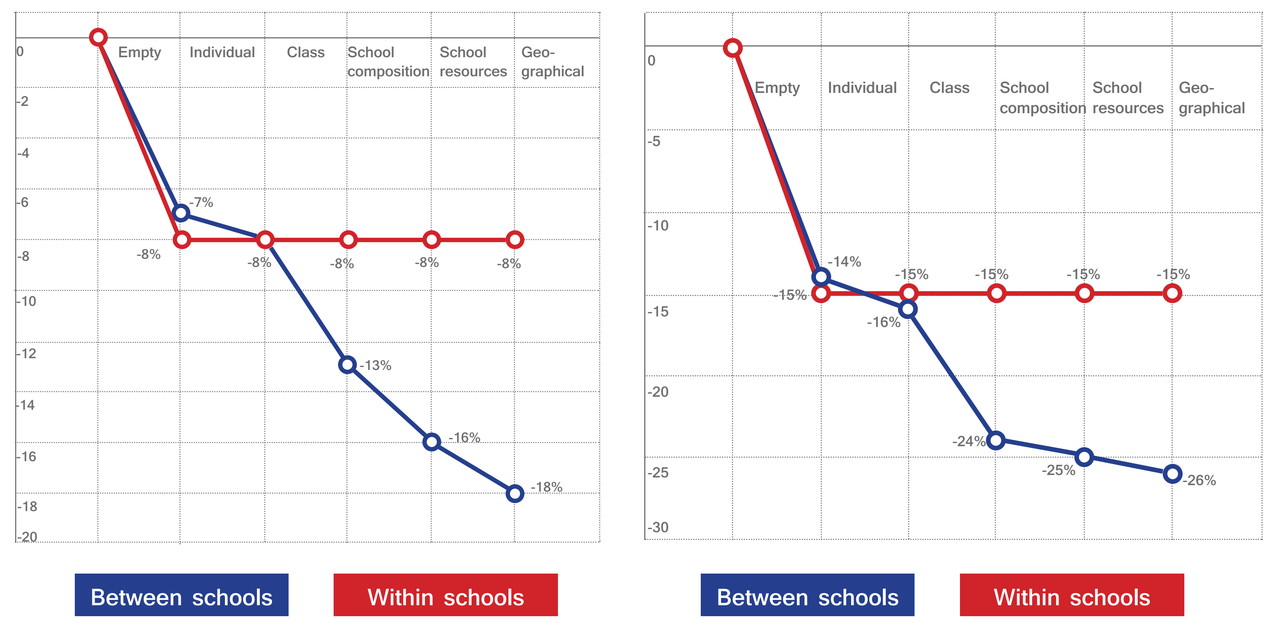
| | Between variance | Within variance | Total variance | % between over total |
|---|---|---|---|---|
| Math | 27.2 | 214.2 | 241.2 | 11.3% |
| Reading | 17.0 | 172.0 | 189.0 | 9.0% |

Most part of the variance is at student-level, even though between-school variance is significantly different from zero

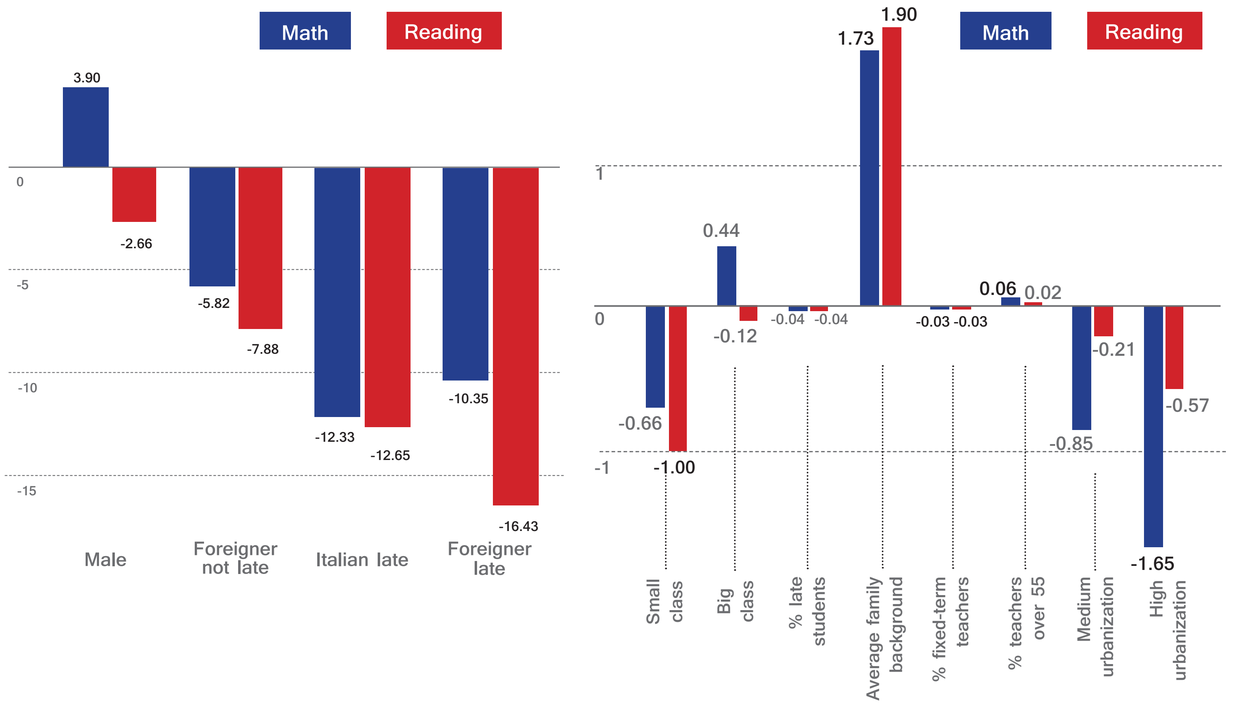
| | Correlation |
|---|---|
| Between test scores | 0.62 |
| Between schools residual | 0.74 |
| Between pupils residual | 0.61 |

The school effects for reading and math are very strongly correlated: unobserved factors at school level that determine math and reading scores are the same

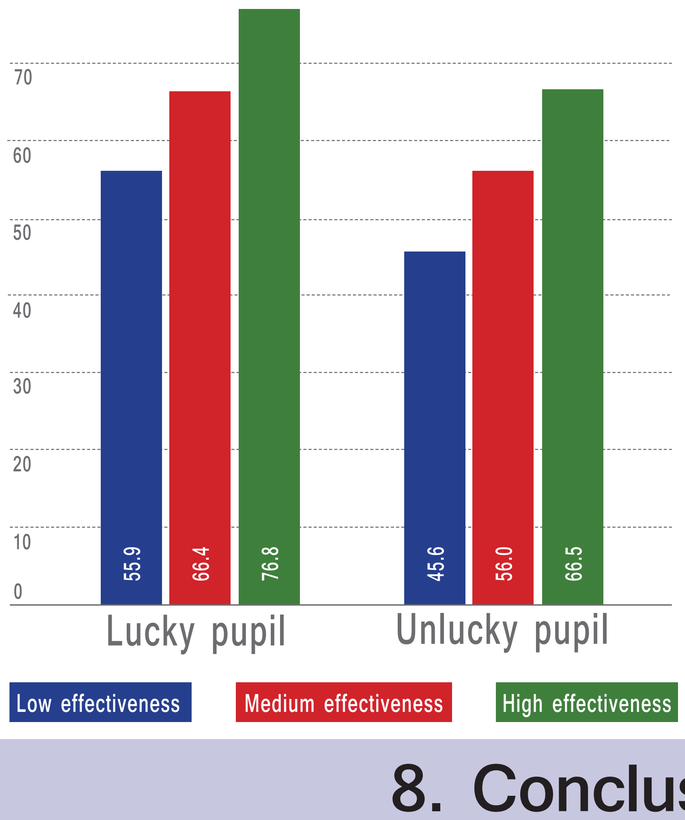
## 4. Variance reduction by pupil-level and school-level covariates




## 5. Test scores' determinants



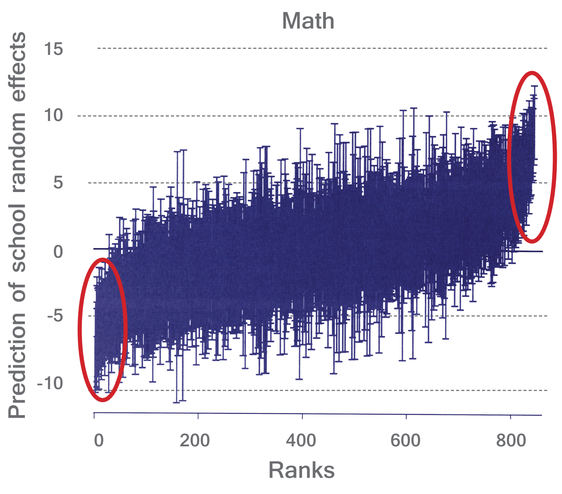

## 6. How important is school effectiveness?



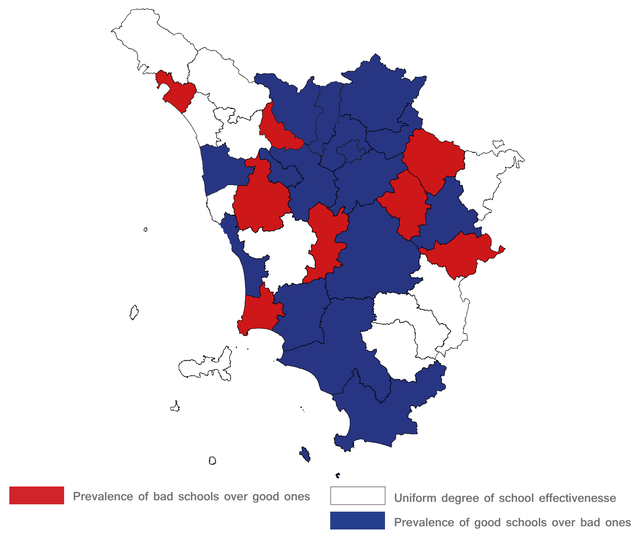

The same unluncky pupil attending a school with the same observable characteristics, may have a math score ranging from 45.6 to 66.5 according to school's effectiveness

## 7. School effectiveness

Empirical Bayes residuals
(endowed with 95% confidence bars)




Areas of Tuscany
by homogeneity of school effeciveness




## 8. Conclusions

- Individual characteristics are the main determinants of pupils' achievements
- However, since the first years of schooling, school can make the difference: about 10% of the variability in Math and Reading scores is explained by between schools differences
- A relevant amount of between-school variance is unexplained by observed factors
- We used this part of variance to proxy school's effectiveness
- Policy makers should use information on schools' effectiveness in order to identify good practices and to correct bad practices