

# The future has early roots. Learning outcomes and school's effectiveness in Tuscany's primary education system

*E. CONTI* (\*), *S. DURANTI* (\*), *M. L. MAITINO* (\*),  
*C. RAMPICHINI* (\*\*), *N. SCICLONE* (\*)

(\*)



**IRPET**

Istituto Regionale  
Programmazione  
Economica della  
Toscana

(\*\*)



UNIVERSITÀ  
DEGLI STUDI  
FIRENZE

Workshop "Youth and their future: Work, Education and Health"

Salerno, October 17th-18th, 2013 - University of Salerno

## The future has early roots. Learning outcomes and school's effectiveness in Tuscany's primary education system

- **Objective:** to provide the policy maker with a tool to compare schools' effectiveness
- **Methodology:** multilevel regression model
- **Data sources:** Invalsi data on pupils' achievements merged with administrative databases
- **Main feature:** sub provincial detail
- **Basic outputs:** schools' rankings

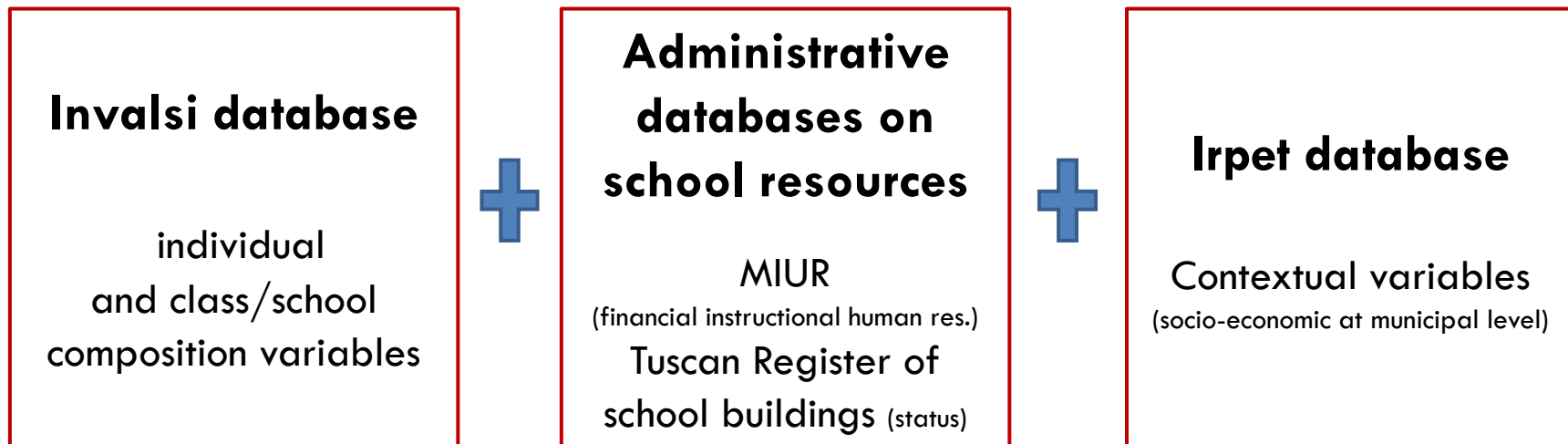
# Methodological approach

- **Methodology:** multilevel regression model
- **Use of multilevel model's results:**
  - Analysis of the relationship between the outcome and the explanatory variables
  - prediction of the outcome for a given student in a given school
  - ranking of schools according to their effectiveness
- **Specification:**

$$Y_{ij} = \alpha + \mathbf{b}'\mathbf{X}_{ij} + \mathbf{g}'\mathbf{W}_i + u_i + e_{ij}$$

# Construction of database

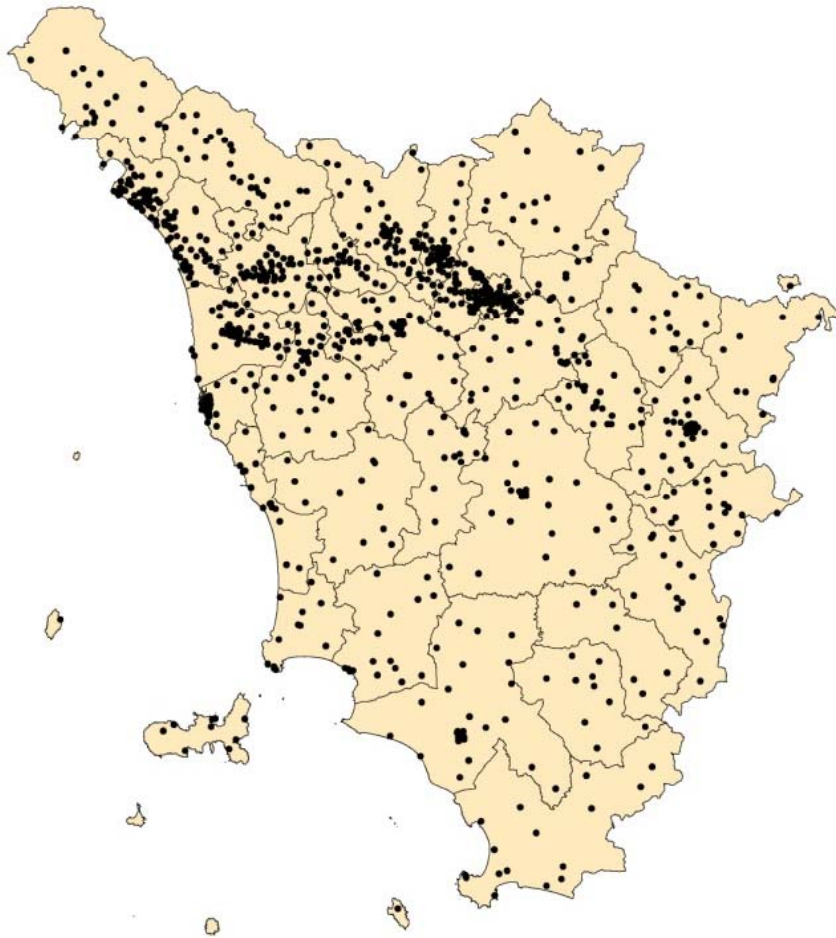
**Three initial databases were merged by Invalsi**



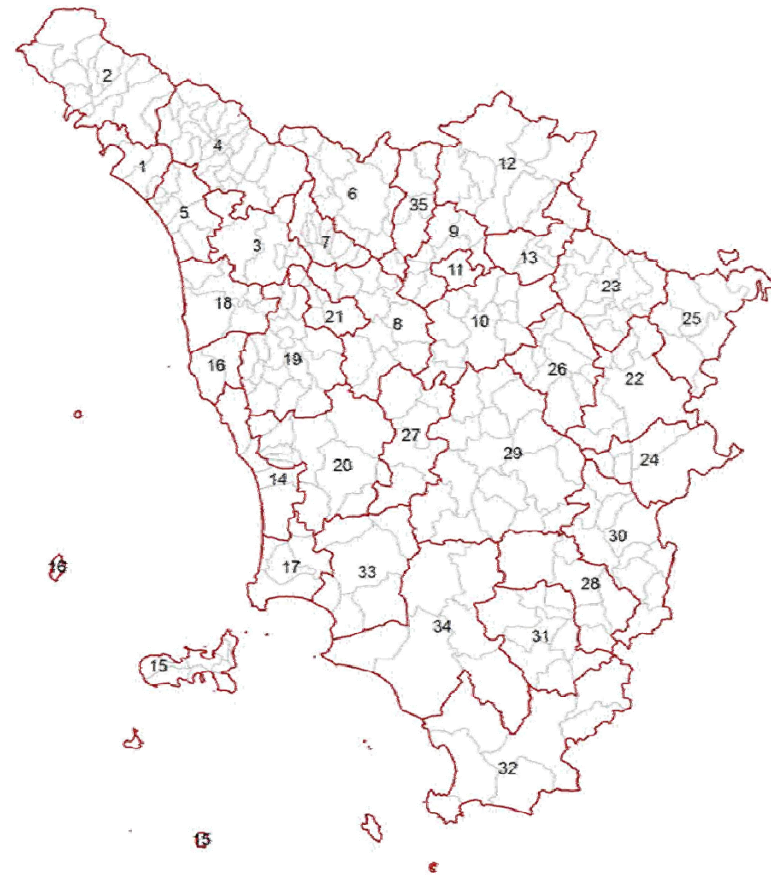
**After a cleaning process we have a database made up of  
24,200 pupils nested in 848 schools**

# Sub regional detail

**Location of primary schools**



**Zonal conferences**



# The model: covariates

| Individual-level | Class-level | School-level                         | Spatial-level             |
|------------------|-------------|--------------------------------------|---------------------------|
| Male             | Class size  | Average ESCS                         | Zonal Conferences dummies |
| Full time        |             | Incidence of late students           |                           |
| Foreign          |             | School building's status             |                           |
| Late             |             | Incidence of fixed-term teachers     |                           |
| Late x foreign   |             | Incidence of teachers over 55        |                           |
| ESCS             |             | Inverse of municipality's population |                           |

# Results: test scores' determinants (1)

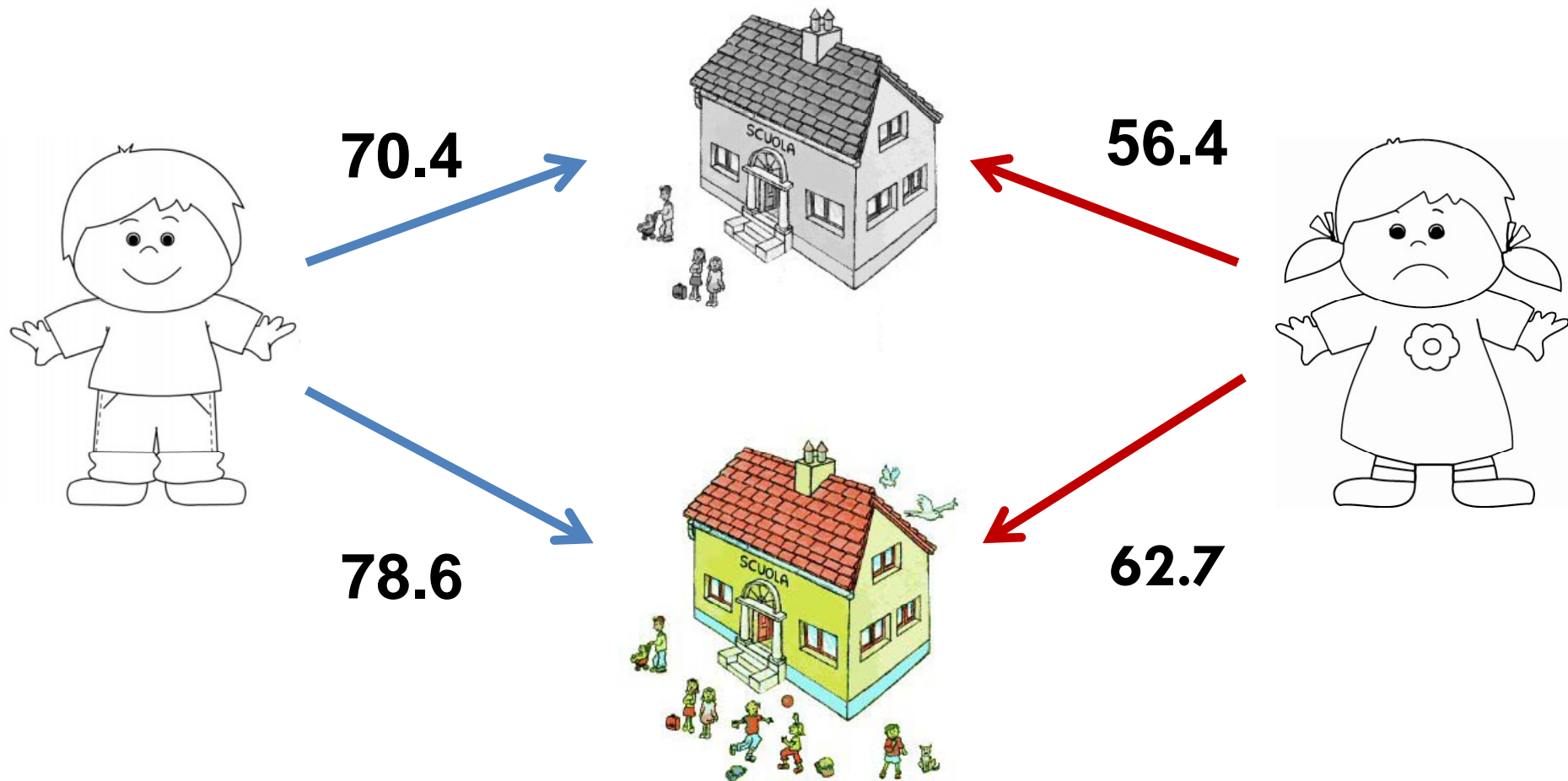
| <b>MATH</b>                                | A       | B                    | C                  | D                           |
|--|---------|----------------------|--------------------|-----------------------------|
|  | Empty   | Individual variables | + school variables | + Zonal Conferences dummies |
| Constant                                   | 69.3*** | 68.2***              | 66.7***            | 68***                       |
| Male                                       |         | 2.14***              | 2.14***            | 2.14***                     |
| Escs                                       |         | 3.95***              | 3.91***            | 3.91***                     |
| Foreign                                    |         | -3.62***             | -3.60***           | -3.60***                    |
| Late                                       |         | -8.01***             | -7.92***           | -7.87***                    |
| LateXforeign                               |         | 6.24***              | 6.20***            | 6.14***                     |
| Full time                                  |         | 0.40                 | 0.34               | 0.33                        |
| Class size: less than 10 pupils            |         |                      | -2.9**             | -1.61                       |
| Class size: more than 25 pupils            |         |                      | 1.47**             | 1.39**                      |
| Inverse of municipality's population       |         |                      | 3705**             | 3329*                       |
| % of late students in 5th grade classes    |         |                      | -0.09**            | -0.07                       |
| Average school escs                        |         |                      | 1.87**             | 1.56*                       |
| School building status                     |         |                      | 0.857*             | 0.61                        |
| % of fixed-term teachers: medium           |         |                      | -0.743             | -1.57*                      |
| % of fixed-term teachers: high             |         |                      | -2.60***           | -3.95***                    |
| % of teachers older than 55                |         |                      | -0.05              | -0.05                       |
| Territorial dummies                        | no      | no                   | no                 | yes                         |
| Between variance                           | 63.61   | 58.97                | 56.31              | 52.20                       |
| Within variance                            | 220.34  | 202.84               | 202.80             | 202.84                      |
| Total variance                             | 283.95  | 261.81               | 259.11             | 255.04                      |
| % between over total                       | 22.4%   | 22.5%                | 21.7%              | 20.5%                       |
| % change in between variance               | -       | -7.3%                | -4.5%              | -7.3%                       |
| % change in within variance                | -       | -7.9%                | 0.0%               | 0.0%                        |
| LR test vs. linear regression: chibar2(01) | 3545.94 | 3588.28              | 3368.97            | 3240.89                     |
| Prob >= chibar2                            | 0.00    | 0.00                 | 0.00               | 0.00                        |

# Results: test scores' determinants (2)

| <b>READING</b>                             | A       | B                    | C                  | D                           |
|--|---------|----------------------|--------------------|-----------------------------|
|  | Empty   | Individual variables | + school variables | + Zonal Conferences dummies |
| Constant                                   | 74***   | 75.2***              | 77.7***            | 77.8***                     |
| Male                                       |         | -0.37**              | -0.36**            | -0.37**                     |
| Escs                                       |         | 3.36***              | 3.34***            | 3.34***                     |
| Foreign                                    |         | -5.58***             | -5.57***           | -5.56***                    |
| Late                                       |         | -7.66***             | -7.55***           | -7.55***                    |
| LateXforeign                               |         | 3.19***              | 3.15***            | 3.14***                     |
| Full time                                  |         | -0.90***             | -0.87***           | -0.78***                    |
| Class size: less than 10 pupils            |         |                      | -1.22              | -0.91                       |
| Class size: more than 25 pupils            |         |                      | -0.02              | -0.07                       |
| % of late students in 5th grade classes    |         |                      | -0.11***           | -0.090**                    |
| Average school escs                        |         |                      | 0.49               | 0.45                        |
| School building status                     |         |                      | -0.16              | -0.37                       |
| % of fixed-term teachers: medium           |         |                      | -0.948*            | -1.25*                      |
| % of fixed-term teachers: high             |         |                      | -2.88***           | -3.34***                    |
| % of teachers older than 55                |         |                      | 0.00               | -0.00                       |
| Inverse of municipality's population       |         |                      | 854                | 1574                        |
| Territorial dummies                        | no      | no                   | no                 | yes                         |
| Between variance                           | 38.68   | 34.43                | 32.47              | 30.31                       |
| Within variance                            | 164.79  | 147.19               | 147.22             | 147.18                      |
| Total variance                             | 203.48  | 181.62               | 179.69             | 177.49                      |
| % between over total                       | 19.0%   | 19.0%                | 18.1%              | 17.1%                       |
| % change in between variance               | -       | -11.0%               | -5.7%              | -6.6%                       |
| % change in within variance                | -       | -10.7%               | 0.0%               | 0.0%                        |
| LR test vs. linear regression: chibar2(01) | 2876.81 | 2860.5               | 2648.94            | 2477.78                     |
| Prob >= chibar2                            | 0.00    | 0.00                 | 0.00               | 0.00                        |

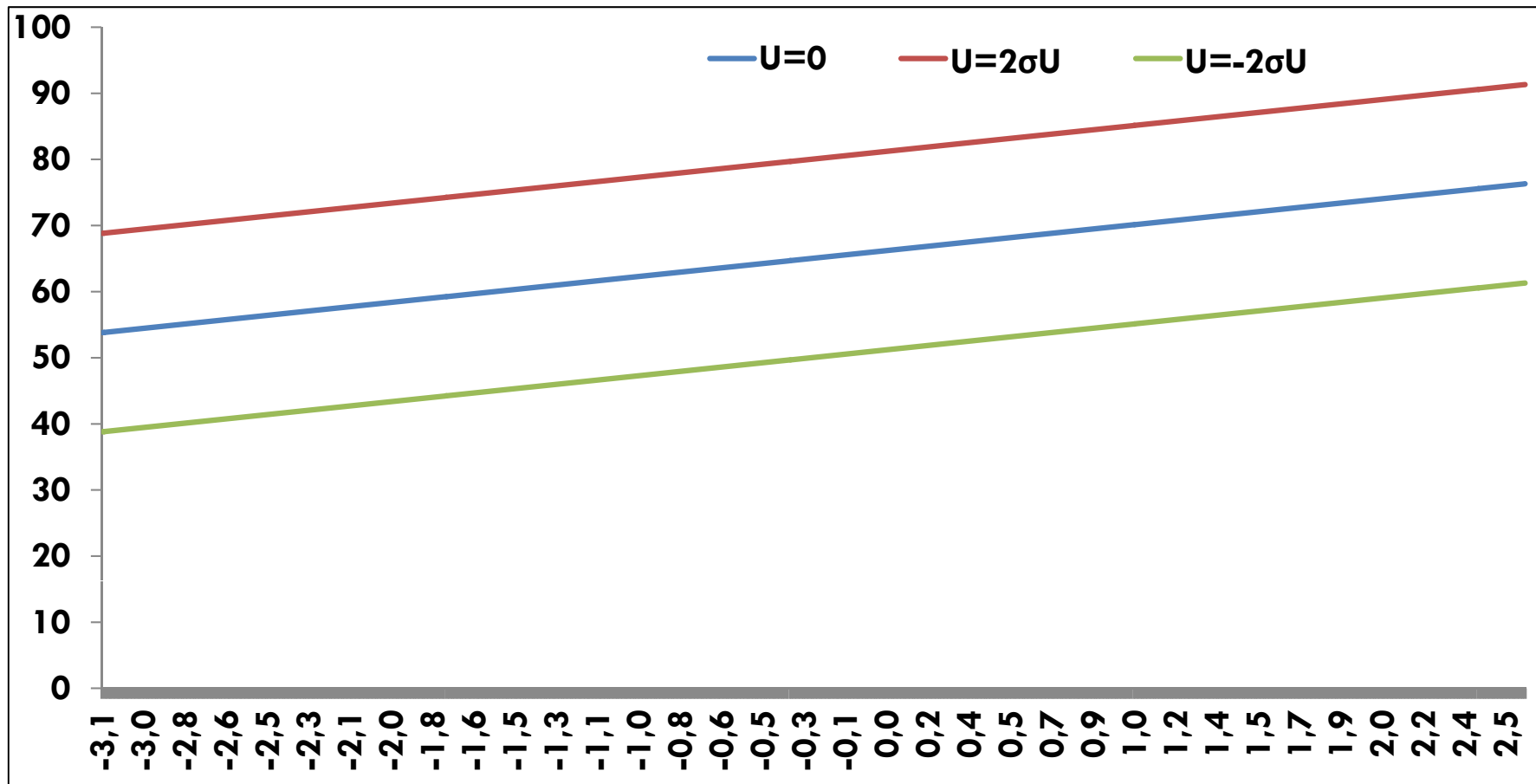


# Results: expected test scores for different profiles (1)



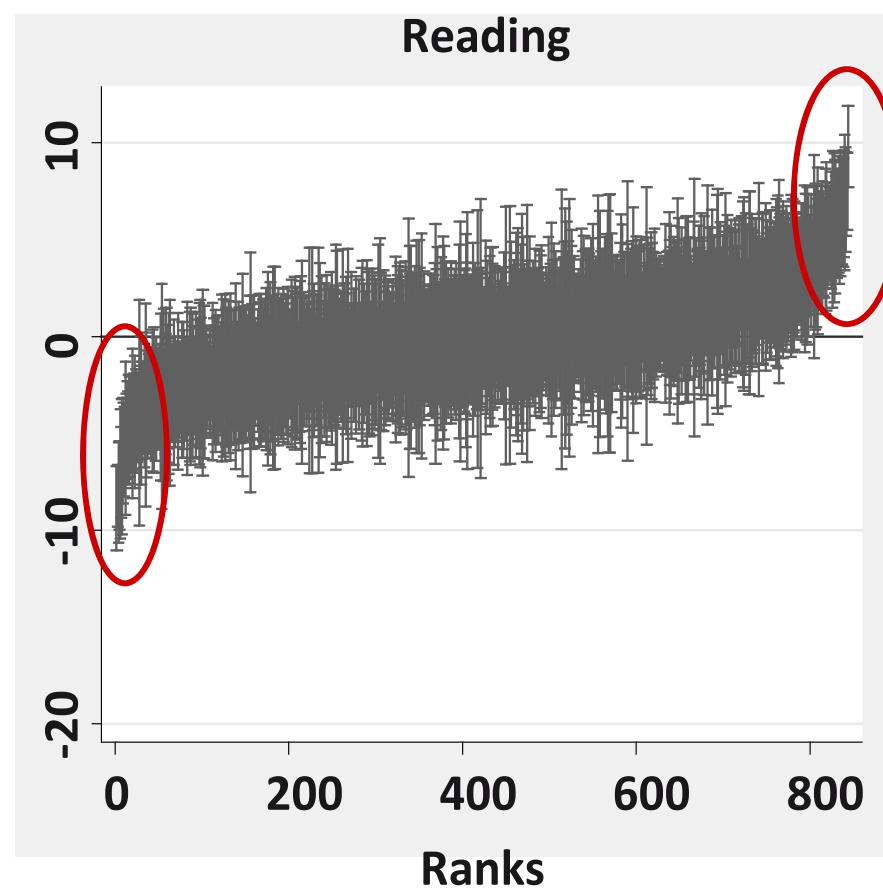
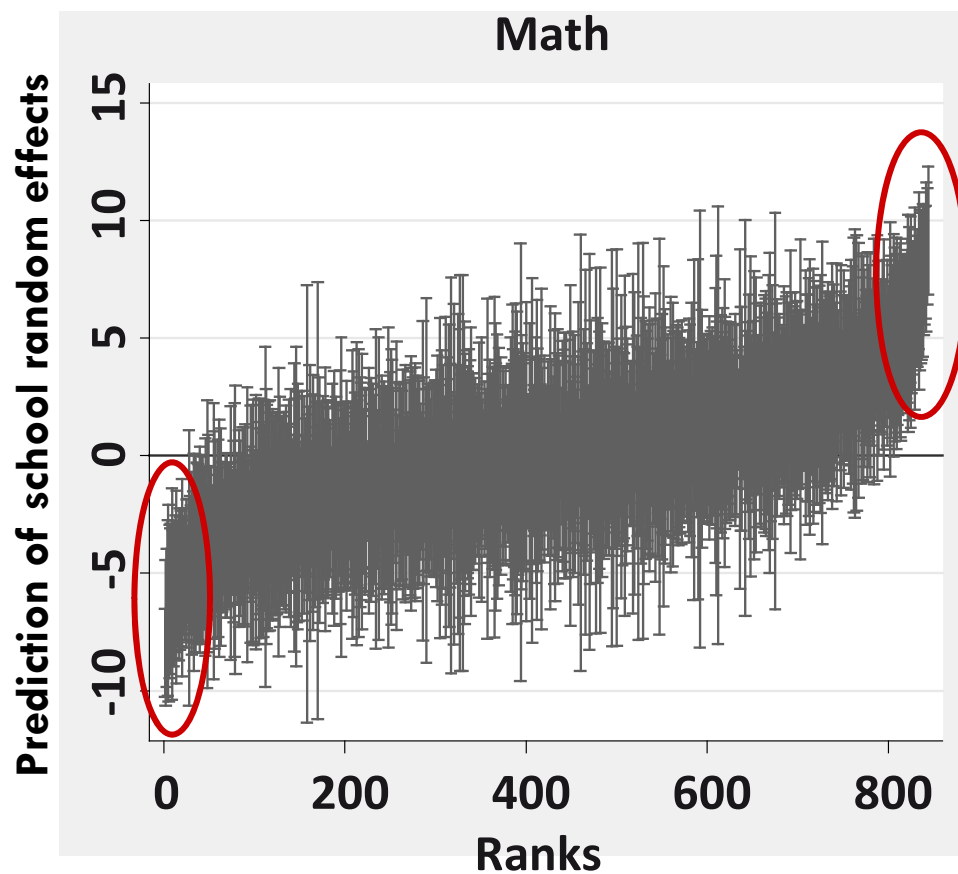
# Results: expected test scores for different profiles (2)

Expected math score for different individual ESCS and school effectiveness



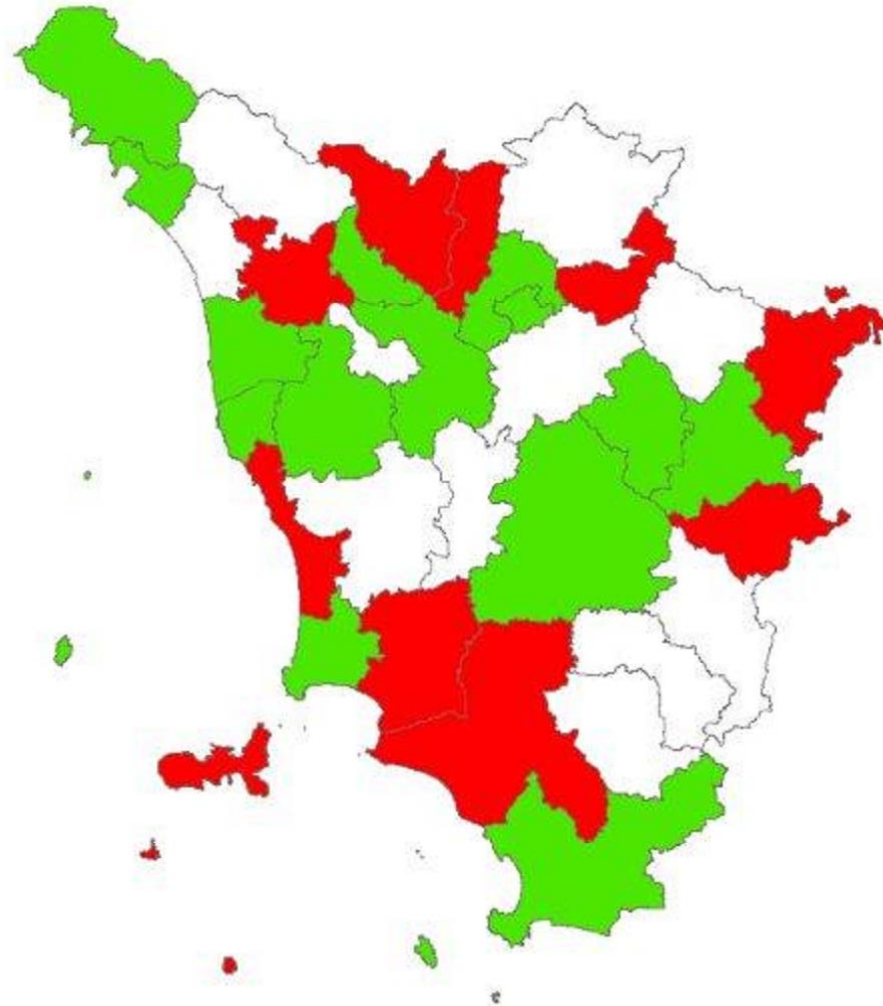
# Results: schools' rankings

## Ranking of Tuscan primary schools by level 2 residuals of the math and reading model



# Results: the best and worst schools

Zonal conferences by homogeneity degree of schools' effectiveness



# Conclusions

- Individual characteristics are the main determinants of pupils' achievements
- Since the first years of schooling, schools can make the difference (around 20% of total variance)
- 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

# The future has early roots. Learning outcomes and school's effectiveness in Tuscany's primary education system

*E. CONTI (\*), S. DURANTI (\*), M. L. MAITINO (\*),  
C. RAMPICHINI (\*\*), N. SCICLONE (\*)*

(\*)



**IRPET**

Istituto Regionale  
Programmazione  
Economica della  
Toscana

(\*\*)



UNIVERSITÀ  
DEGLI STUDI  
FIRENZE

Workshop "Youth and their future: Work, Education and Health"

Salerno, October 17th-18th, 2013 - University of Salerno