



# Learning Losses during Pandemic Times: What Role for School Closures Choices?

Silvia Duranti <sup>a</sup>, Giada Garbini <sup>b</sup>, Leonardo Grilli <sup>c</sup>, Patrizia Lattarulo <sup>a</sup>, Annalisa Luporini <sup>c</sup>

<sup>a</sup> IRPET, <sup>b</sup> University of Turin & Collegio Carlo Alberto, <sup>c</sup> University of Florence

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# Outline

- 1. Introduction and Problem Statement**
- 2. Literature Review**
- 3. Research Question**
- 4. Governance of School Closures in Italy**
- 5. Some Adjustments to the INVALSI Dataset**
- 6. Empirical Strategy**
- 7. Results**
- 8. Discussion and Open Questions**

# 1. Introduction and Problem Statement

- In March 2020, Covid-19 triggered both an economic and **education crisis** (school closures and distance learning – “*DAD*”\*)
- Research topic: **response of school-age children** in terms of **performance to Covid-19** pandemic in **Italy**
- Use of **INVALSI data**

- Covid-19's detrimental effects:
  1. short-run: **learning losses**
  2. long-run: potential **adjustment** to **individual human capital investments** (high-school and college choice), **labor market earnings, welfare**
  
- Italy is an interesting case study:
  1. among the countries with the longest school closures in Europe (UNESCO data)
  2. largely unprepared for “*DAD*” because of its technological backwardness (DESI 2020, ISTAT data)
  3. wide heterogeneity in students' performance across the country (North vs. South)
  4. alarming PISA data wrt OECD average

## 2. Literature Review

- Before Covid-19, only studies on the effect of school non-attendance on learning due to summer vacation, teacher strikes, inclement weather and natural disasters, wars, absenteeism

### International Literature

- Emphasis on elementary and middle schools in high-income countries (not on high schools)
- Systematic review of existing empirical papers (Donnelly and Patrinos, 2021; Hammerstein et al., 2021; Thorn and Vincent-Lancrin, 2021; Zierer, 2021; Moscoviz and Evans, 2022; Patrinos et al., 2022)
- Meta-analysis: greater learning loss in countries with longer school closures and ill-equipped for distance learning (Storey and Zhang, 2021; Konig and Frey, 2022; Betthausen et al., 2023; Di Pietro, 2023)

## The Case of Italy

- Consensus:
  1. the older the students, the greater the learning loss
  2. learning loss in both reading and math skills (see below)
- No consensus: negative, null, or positive effect on Italian for elementary schools?
- Emphasis on **results** at **national level**, not regional level



except for *Battisti and Maggio (2023)*:

school closure days at municipal level +  
estimate of the effect of a school closure day

**BUT FOR SICILY ONLY**  
(elementary, middle, high schools)

- Heterogeneity analysis:

1. ***Contini et al. (2022)***: greater loss for girls and high-achieving students of low educated parents (elementary schools)
2. ***Contini et al. (2023)***: greater loss for low-achieving students, improvement in relative position of girls wrt boys, no differences across parents' education levels (high schools)
3. ***Bazoli et al. (2022)***: no differences across socioeconomic and migrant statuses, geographical areas of residence (North and Centre VS. South and Islands), high school tracks (elementary, middle, high schools)
4. ***Borgonovi and Ferrara (2023)***: greater loss for middle-achieving students and gains for high-achieving students, reduction in gender disparities (except for math in elementary schools), no differences across socioeconomic statuses (elementary, middle schools)

**5. *Carlana et al. (2023)***: greater loss for immigrant students and students in the bottom SES quantile, no differences across gender (middle schools)

**6. *Aparicio Fenoll (2022)***: parents in teleworkable occupations as a mitigation mechanism (elementary schools)

**7. *Bertoletti et al. (2023)***: teachers' skills in using digital tools and assessing students, and school principals' leadership as a mitigation mechanism (elementary, middle schools)



# 3. Research Question

1. What was the overall effect of Covid-19 on reading and math skills of school-age students in Italy at national level? And at regional level?
2. What was the effect of an additional Covid-19 school closure day at national level? And at regional level?
3. Did the regions with the longest school closures suffer the greatest learning losses?

**NOVEL CONTRIBUTION:**

**DATASET ON COVID-19 SCHOOL CLOSURE DAYS AT REGIONAL LEVEL**

**+**

**FOCUS ON IMPACT AT REGIONAL LEVEL**

# 4. Governance of School Closures in Italy

## **FIRST WAVE** (Feb 2020 – Jun 2020):

- No differences in school closures by region (except for the North) and grade
- No exercise of regional autonomy

## **NEXT WAVES** (Sept 2020 – Apr 2021):

- Differences in school closures by:
  1. region: yellow, orange or red area (Minister of Health)
  2. grade: always in-person learning for elementary schools (except if red area in March 2021), “*DAD*” for middle schools if red area
- Exercise of regional autonomy to increase school closures, especially middle schools

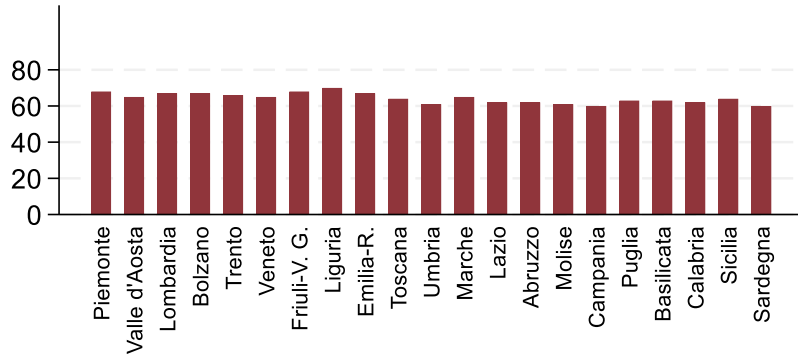
# How to count regional-level school closure days?

1. Collection of deliberations of regional councils approving school calendar for S.Y. 2019-20 and 2020-21
2. Collection of **government measures, ordinances of Minister of Health, ordinances of regional governors** (only those for whole regional territory) on Covid-19 school closures for period Feb 2020-Apr 2021
3. Joint reading of measures approved at national and regional level

# Covid-19 school closure days at a glance

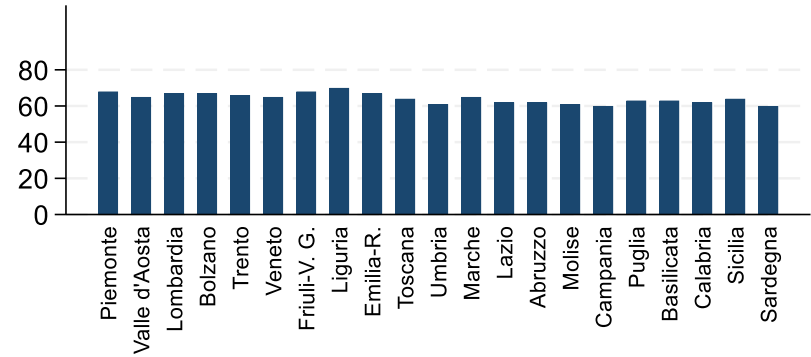
## ELEMENTARY SCHOOLS

Feb 2020 - Jun 2020

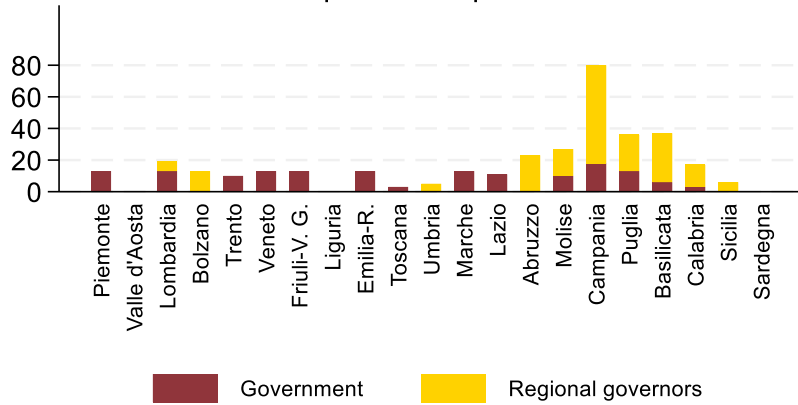


## MIDDLE SCHOOLS

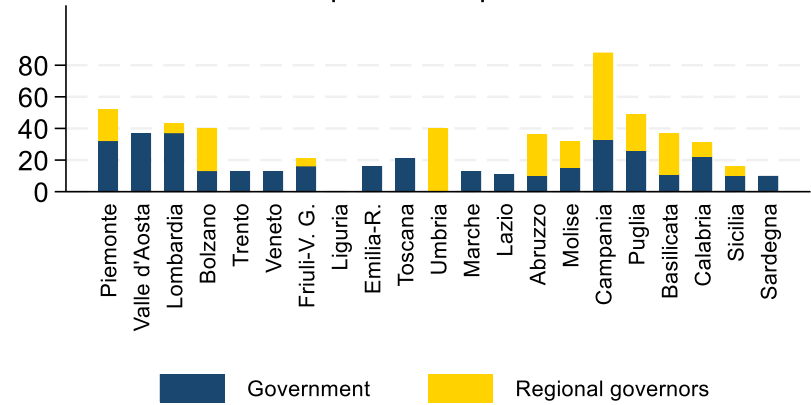
Feb 2020 - Jun 2020



Sept 2020 - Apr 2021



Sept 2020 - Apr 2021



# MIDDLE SCHOOLS WERE CLOSED LONGER THAN ELEMENTARY SCHOOLS

**S.Y. 2019/20:**

**S.Y. 2020/21:**

HOMOGENEITY ACROSS  
REGIONS & SCHOOL  
GRADES

*V.S.*

HETEROGENEITY ACROSS  
REGIONS & SCHOOL  
GRADES



No. school closure days at regional level (Feb 2020-Apr 2021):

1. elementary schools: **65** (Valle d'Aosta) – **140** (Campania)
2. middle schools: **70** (Liguria, Sardegna) – **148** (Campania)

# 5. Some Adjustments to the INVALSI Dataset

- Use of **municipal-level INVALSI data** (open data):
  1. elementary schools: 2<sup>nd</sup> and 5<sup>th</sup> grade (second and final year)
  2. middle schools: 8<sup>th</sup> grade (final year)
- Each municipality with Covid-19 school closure days in their region (minimal potential underestimation)
- Dataset problems:
  1. mergers among small neighbouring municipalities over time
  2. not all Italian municipalities, but only those with at least 3 schools b/c of confidentiality reasons (except for S.Y. 2018/19)



No. of municipalities changing over time

+

no complete national coverage

- Adjustments to the dataset:
  1. merge municipalities involved in mergers since the beginning of our observation period
  2. remove merged municipalities whose individual parts are not in the dataset
  3. keep only municipalities with obs in all s.y. of interest to us



**SUBSAMPLE OF MUNICIPALITIES** (Math subsample in fig.):

good coverage in terms of students for elementary schools  
but not for middle schools

+

**imbalance towards large municipalities**

	Municipalities		Students	
	Subsample	Coverage (%)*	Subsample	Coverage (%)
<b>ELEMENTARY SCHOOLS</b>	1 927	31	391 149	<b>78</b>
<b>MIDDLE SCHOOLS</b>	722	14	304 268	<b>57</b>

\* Coverage wrt total No. of municipalities with at least 1 school

- No. of municipalities in the subsample: differences in coverage across regions (Math subsample in fig.)

	Coverage (%)*	
	Elementary schools	Middle schools
Piemonte	15	11
Lombardia	23	14
Veneto	44	11
Friuli-V.G.	26	8
Liguria	23	10
Emilia-R.	49	14
Toscana	56	24
Umbria	39	11
Marche	29	15
Lazio	33	20
Abruzzo	22	11
Molise	9	6
Campania	40	17
Puglia	44	23
Basilicata	19	9
Calabria	33	11
Sicilia	41	20
Sardegna	11	7
<b>Italy</b>	<b>31</b>	<b>14</b>

- All regions but Trento, Bolzano, Valle d'Aosta in the analysis b/c of data scarcity
- **No. of students as a weight** for each municipality (Ministry of Education data)





Estimation by school level (elementary, middle) and subject (Italian, Math), at national and regional level:

1. effect of Covid-19 school closures on INVALSI scores:

$$Y_{ict} = \alpha_{ic} + \beta t + \delta ct + e_{ict}$$

2. effect of an additional Covid-19 school closure day on INVALSI scores:

$$Y_{ict} = \alpha_{ic} + \beta t + \rho Day_{ict} + e_{ict}$$

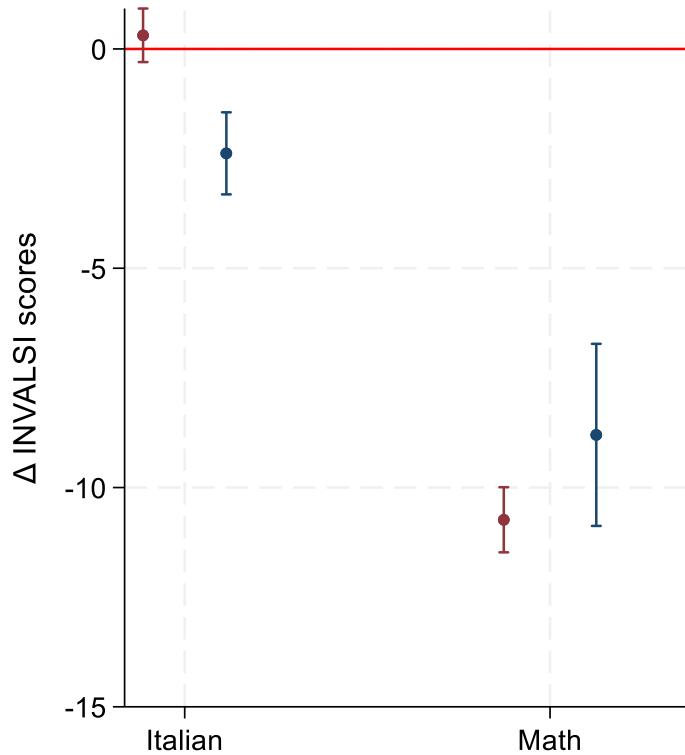
where

- $i$  = municipality,  $c$  = cohort,  $t$  = time,  $Day$  = Covid – 19 school closure days
- $Y$ : municipal-level INVALSI scores
- $\alpha$ : cohort-specific municipal fixed effects
- $\beta$ : time effect
- $\delta, \rho$ : **causal effect of interest**
- $e$ : zero-mean homoscedastic normal residuals

# 7. Results

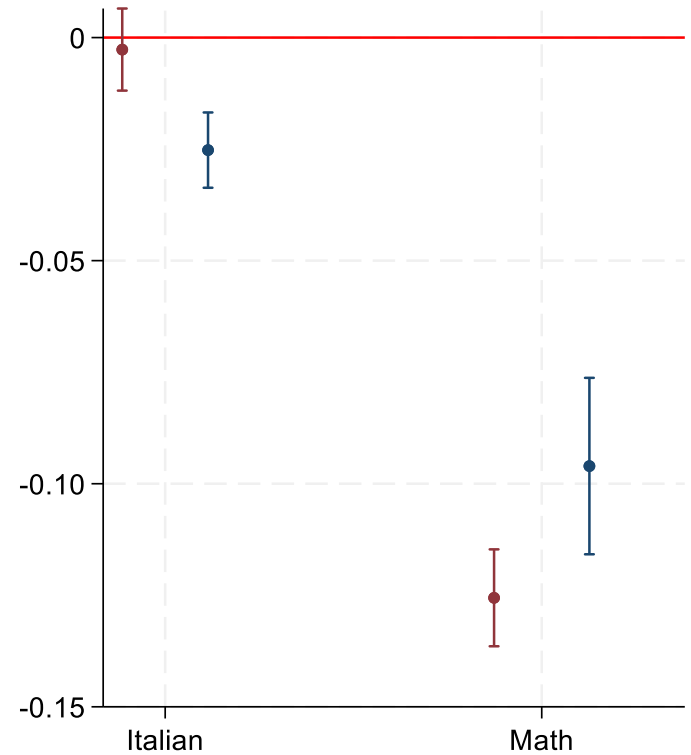
## National level

Effect of Covid-19 school closures



- Elementary schools
- Middle schools

Effect of a Covid-19 school closure day



- Elementary schools
- Middle schools

## Elementary schools

1. *Ita*:

**no effect**

(positive estimate, but not stat. sign.)

1. *Math*:

**learning loss of 10.3 pts**

(effect of each day=-0.13 pts)

V.S.

## Middle schools

1. *Ita*:

**learning loss of 2.4 pts**

(effect of each day=-0.030 pts)

2. *Math*:

**learning loss of 8.8 pts**

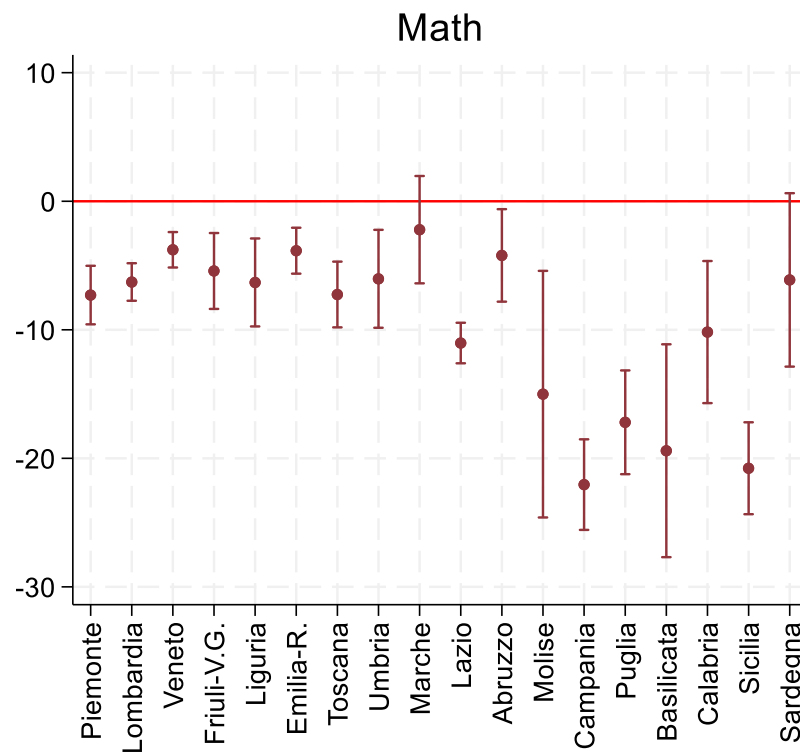
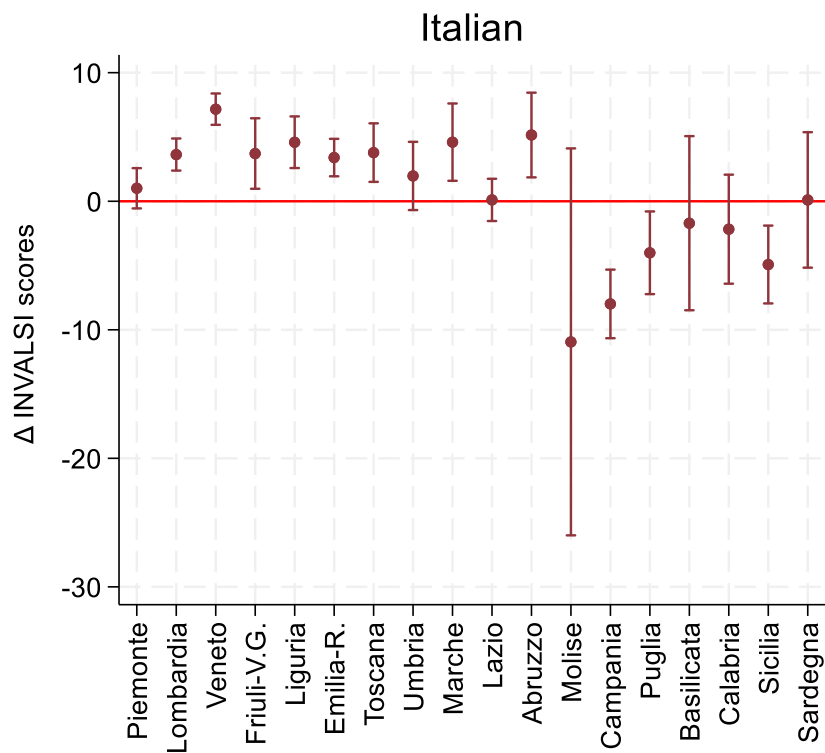
(effect of each day=-0.10 pts)

# Regional level

(estimates not for middle schools due to data scarcity)

## ELEMENTARY SCHOOLS

### Effect of Covid-19 school closures



## Italian:

- no effect:

Piemonte, Umbria, Lazio, Molise,  
Basilicata, Calabria, Sardegna

- positive effect:

Lombardia, Veneto, Friuli-V.G.,  
Emilia-R., Toscana, Marche,  
Abruzzo

- negative effect:

Campania, Puglia, Sicilia

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## Math:

negative effect across all  
regions (except for Marche,  
Sardegna), but with different  
intensity



**largest learning losses:**

**PUGLIA, SICILIA, CAMPANIA**

# 8. Discussion and Open Questions

- **Unequal effect** of Covid-19 school closures across **school level, subject, region**
- Unexpectedly, **greatest learning losses not in regions with longest school closures** (except for Campania)
- **Widening disparities** in educational outcomes btw **North and South** due to Covid-19



WHAT ADDITIONAL FACTORS CONTRIBUTED TO THE DIFFERENCES IN LEARNING LOSSES ACROSS REGIONS, OTHER THAN THE LENGTH OF SCHOOL CLOSURES?

Family background (ESCS, no. of pc)? Teachers (age, type of contract – fixed-term vs. temporary)? Something else?



**Thank you for your attention!**

[giada.garbini@carloalberto.org](mailto:giada.garbini@carloalberto.org)