

# Exacerbated Inequalities: the Learning Loss from COVID-19 in Italy

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The COVID-19 pandemic has forced schools to close globally, affecting approximately 94% of the world’s student population (UNESCO, 2020). According to The World Bank et al. (2021), the generation impacted by school closures expects losses amounting to \$17 trillion in lifetime earnings. Furthermore, school closures risk exacerbating existing inequalities, as children from more disadvantaged backgrounds may be less likely to receive homework help or home instruction from parents, and may also lack the infrastructure required to benefit from remote instruction.

This paper focuses on learning losses experienced by middle schoolers in Italy, analyzing differential impacts by students’ socioeconomic status (SES), gender, and immigration status. Italy was one of the first countries to close schools in March 2020 and students were offered exclusively remote instruction until the end of the school year (around 14 weeks) (Carlana and La Ferrara, 2021). The Italian case is thus informative, as one of the countries in Europe that had the most prolonged school closures. Using administrative data on the universe of 8th-graders, we compare achievement for two cohorts: one that graduated middle school in 2019 and one in 2021. First, we find an average learning loss of 0.14 SD in math and 0.05 SD in reading for 8th grade students in 2021 compared to 8th grade students in 2019. Second, inequalities in learn-

ing appear to be exacerbated after the pandemic: learning losses are 0.21 SD in math and 0.10 SD in reading for students in the bottom quintile of SES, while students in the top quintile had a much smaller learning loss (0.05 SD) in math and actually improved their scores in reading by 0.04 SD. Third, learning gaps do not vary systematically by gender, at least not in a quantitatively meaningful way. Finally, we find that for immigrant students the learning loss in math is substantially larger than for native students.

The average size of the learning loss that we estimate is comparable to the average reported by Patrinos et al. (2022) in a recent review of the literature (0.17 SD, equivalent to approximately one-half year’s worth of learning). Our findings of widening gaps by SES and immigration status are also consistent with the literature showing that the disruption in the educational systems exacerbated inequalities for students from disadvantaged backgrounds and underrepresented groups (Engzell et al., 2021; Agostinelli et al., 2022; Kuhfeld et al., 2022; Lichand et al., 2022).

Most of the early studies relied on simulations (Azevedo et al., 2020) or evidence from non-representative samples, due to the limits to in-person testing due to the pandemic. This paper contributes to the growing debate of learning losses after COVID-19 by using the *universe* of students in grade 8 attending the educational system and showing how baseline disparities in learning have been affected. We share the interest in quantifying learning losses with recent work by Singh et al. (2022) and Boronovi and Ferrara (2022). In particular, we differ from the latter study - which is also on Italy - because we adopt a different specification to make our results comparable with international estimates (Patrinos

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et al., 2022) and we also analyze learning losses by immigration status.

### I. Data

To measure the learning loss in math and reading, we use administrative data collected by the National Institute for the Evaluation of Educational Instruction and Training (INVALSI) in Italy. We have access to INVALSI tests scores in math and reading for all students attending grade 8 during school years 2018/2019 and 2020/2021.<sup>1</sup> To compute the learning loss, we standardize the math and reading test scores for the entire dataset using the 2019 results as a benchmark, with a mean of 0 and a standard deviation of 1.

In addition to the test scores, our dataset contains students’ and parents’ demographic information, notably gender, immigration status, and “Economic, Social and Cultural Status” (denoted SES from now on, for simplicity). The SES variable is a standardized index computed by INVALSI using three sets of variables collected in grade 8: (a) parents’ occupation; (b) parents’ years of education; and (c) the availability of material goods such as a computer, study desk, books, internet, and own bedroom (as a proxy of the economic and cultural support for learning available in the family). For each cohort, we calculate the quintiles of the SES variable, to compare learning losses across groups.

### II. Results

Table 1 shows the average learning loss, calculated by regressing the standardized test scores of students attending grade 8 on a dummy variable that indicates the 2021 cohort (post-lockdown). Overall, students in 2021 have a 0.143 SD lower test score in math (Panel A, col. 1) and 0.054 SD lower performance in reading (Panel B, col. 1), relative to students that took the test in

2019. The larger negative impact in math compared to reading is consistent with evidence from other countries (Singh et al., 2022).

However, these average results hide important heterogeneity by socio-economic background, reported in Figure 1. Each graph displays in the top part (left vertical axis) the test scores for each cohort (by SES quintile), and in the bottom part (right vertical axis) the regression coefficients corresponding to the standardized learning differences for the 2021 cohort versus the 2019 cohort. Appendix Table A.I quantifies the effects shown in Figure 1, providing the precise point estimate of the learning loss.

Panel A of Figure 1 shows that the decrease in learning levels is observed throughout the distribution, except for the top quintile in learning. The contrast between the bottom and top 20% of the distribution is quite striking: while the effect on math and reading is, respectively, -0.21 SD and -0.10 SD for students in the bottom SES quintile, the corresponding changes in scores for students in the top quintile were -0.05 SD and +0.04 SD. It is interesting that performance in reading actually *improved* for this group, possibly due to higher investment in terms of parents’ time and resources available for remote learning. The two snapshots from 2019 and 2021 show a worsening in existing inequalities in educational outcomes in the Italian context, similarly to the US (Kuhfeld et al., 2022).<sup>2</sup>

To gauge the magnitude of these differences, in Appendix Table A.II we show some correlates of test scores in 2019. The reduction in math performance for the 20% most disadvantaged students (-0.21 SD) is only slightly smaller compared to the difference in test scores of students whose mother had at most a high school diploma instead of a mother with a college degree in 2019 (0.24 SD). The result is equivalent to approximately 0.6 school years of learning (Hanushek and Woessmann, 2020).

<sup>1</sup>The test is administered at the end of the school year. There are no test scores for 2019/20 because INVALSI did not administer any tests due to the lockdown. We restrict the sample to students who took the test in grade 8 and for whom we have data on citizenship and gender from the Ministry of Education.

<sup>2</sup>Borgonovi and Ferrara (2022) do not find differences in learning loss across SES quartile, possibly due to the different sample and different specification used (in particular, they use the SES variable collected in grade 5 and they condition on earlier test scores).

### A. Gender Gaps

Before the pandemic, girls had 0.04 SD lower performance in math and 0.13 SD higher performance in reading. Panel B of Figure 1 shows that there are no substantial gender differences in the learning losses due to the pandemic. Solid lines indicate the average performance of students by quintile in 2019, and the dashed lines show performance in 2021, with red color indicating girls and blue color boys. The gender gaps are similar throughout the distribution of family background. Based on col. 2-3 in Panel A and B of Table 1, there are slightly more pronounced learning losses for girls in math and boys in reading, but very small in magnitude (0.01 SD).

### B. Gaps by Immigration Status

In 2019, native Italian students outperformed immigrant students across all SES quintiles in both subjects, potentially due to difficulties with the language and limited school integration. The learning loss in math is 0.19 SD for immigrants and 0.14 SD for natives, while in reading, it is 0.06 SD for both groups (col. 4-5 in Panel A and B of Table 1).

Panel C of Figure 1 shows the results by family background, following the same structure as previous panels (in this case, brown color refers to natives and green to immigrants). For both math and reading, there is a widening of the gaps between native and immigrant students, with the only exception of the bottom SES quintile. Surprisingly, for this quintile there are practically no differences for immigrants in reading in 2021 with respect to 2019. This could be explained by a floor effect, given that immigrant students already had very low reading performance in 2019. On the other hand, we observe a widening of the gaps in performance between immigrant and native students in math, especially among those in the middle and higher portion of the SES distribution. These detrimental results could translate into higher disparities in the medium run, affecting high-school track choice and overall achievements (Carlana et al., 2022).

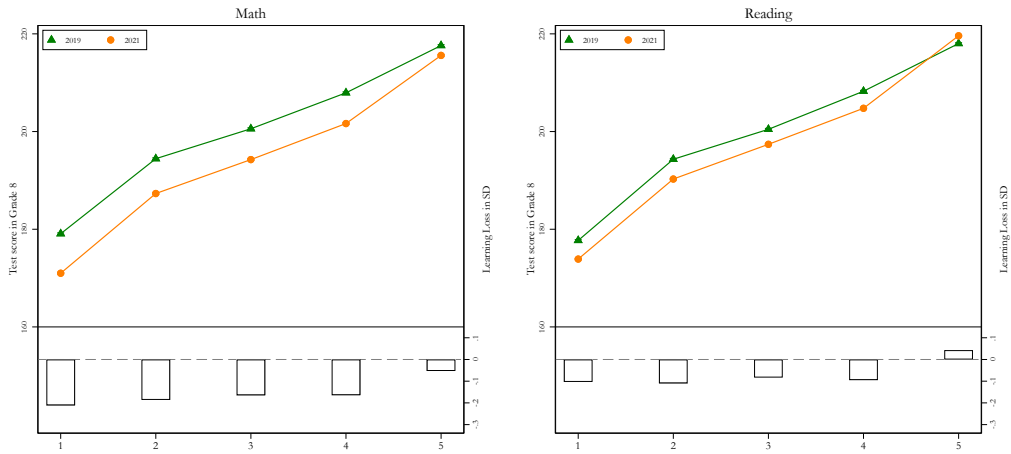
### III. Conclusions

Inequalities have been exacerbated by the COVID-19 pandemic in most countries (Stantcheva, 2022). The loss of in-person education due to school closures is likely to have long-term consequences for students. In this paper, we quantify the magnitude of the impact one year after the schools reopened after the lockdown in Italy. We find evidence of large negative impacts for students in math and smaller negative impacts in reading. Furthermore, the learning loss seems to have exacerbated existing inequalities, with stronger negative impacts for disadvantaged students in both subjects and some learning gains in reading for students in the top SES quintile. Interventions must be implemented to help the most affected groups recover from such learning loss and mitigate the negative long-term impacts. One avenue that has been explored with promising results is in-person and online tutoring targeted to disadvantaged and underrepresented groups (Nickow et al., 2020; Carlana and La Ferrara, 2021; Hardt et al., 2023; Robinson and Loeb, 2021).

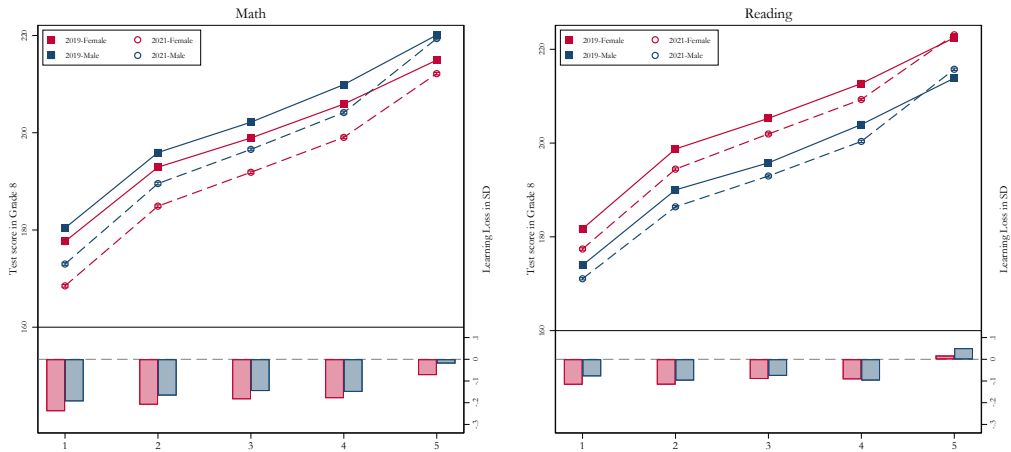
### REFERENCES

- Agostinelli, F., Doepke, M., Sorrenti, G., and Zilibotti, F. (2022). When the great equalizer shuts down: Schools, peers, and parents in pandemic times. *Journal of Public Economics*, 206:104574.
- Azevedo, J. P., Hasan, A., Goldemberg, D., Iqbal, S. A., and Geven, K. (2020). Simulating the potential impacts of COVID-19 school closures on schooling and learning outcomes: A set of global estimates. *Policy Research Working Paper Series 9284*, The World Bank.
- Borgonovi, F. and Ferrara, A. (2022). The effects of COVID-19 on inequalities in educational achievement in Italy. *SSRN Electronic Journal*.
- Carlana, M. and La Ferrara, E. (2021). Apart but connected: Online tutoring and student outcomes during the COVID-19 pandemic. *CEPR Discussion Paper No. DP15761*.

A. All



B. By Gender



C. By Immigration Status

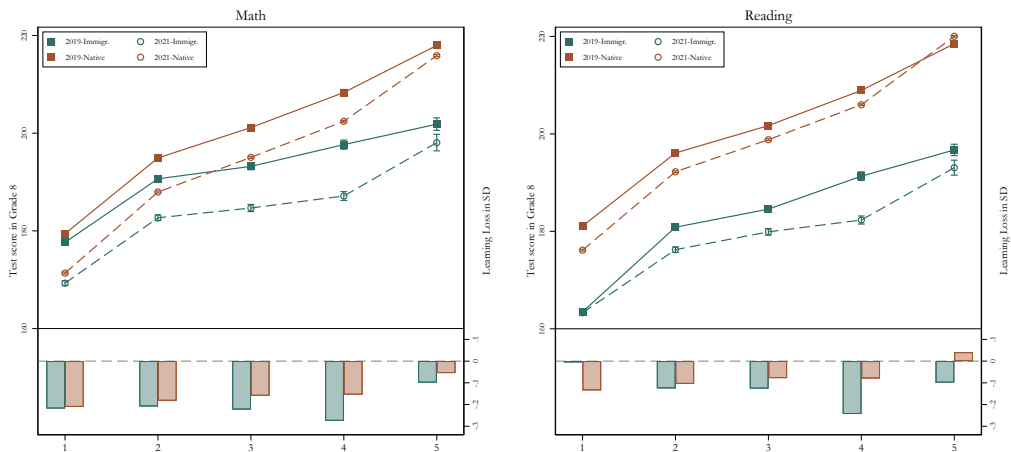


Figure (1) Learning Losses by Quintile of SES

Note: In each graph, lines connect the average test scores in grade 8th by quintile of SES in 2019 and 2021. At the bottom of each graph, the bars indicate the learning losses which are computed using the regression described in Section II.

Table (1) Average Learning Losses

	(1) All	(2) Female	(3) Male	(4) Immigrant	(5) Native
<b>Panel A. Standardized Test Scores in Grade 8: Math</b>					
2021	-0.143*** (0.002)	-0.148*** (0.003)	-0.137*** (0.003)	-0.194*** (0.007)	-0.138*** (0.002)
Mean 2019	0.000	-0.042	0.040	-0.348	0.034
N	1053954	511930	542024	93742	960212
<b>Panel B. Standardized Test Scores in Grade 8: Reading</b>					
2021	-0.054*** (0.002)	-0.047*** (0.003)	-0.062*** (0.003)	-0.057*** (0.007)	-0.055*** (0.002)
Mean 2019	0.000	0.125	-0.118	-0.652	0.064
N	1054894	512486	542408	93775	961119

Notes: Robust standard errors. Dependent variable is the standardized test score at the individual level. \*, \*\*, and \*\*\* denote statistical significance at the 10, 5, and 1 percent levels respectively.

- Carlana, M., La Ferrara, E., and Pinotti, P. (2022). Goals and gaps: Educational careers of immigrant children. *Econometrica*, 90(1):1–29.
- Engzell, P., Frey, A., and Verhagen, M. D. (2021). Learning loss due to school closures during the COVID-19 pandemic. *Proceedings of the National Academy of Sciences*, 118(17).
- Hanushek, E. A. and Woessmann, L. (2020). The economic impacts of learning losses. *Education Working Papers, No. 225, OECD Publishing, Paris*.
- Hardt, D., Nagler, M., and Rincke, J. (2023). Tutoring in (online) higher education: Experimental evidence. *Economics of Education Review*, 92:102350.
- Kuhfeld, M., Soland, J., Lewis, K., Ruzek, E., and Johnson, A. (2022). The COVID-19 school year: Learning and recovery across 2020–2021. *AERA Open*, 8:233285842210993.
- Lichand, G., Doria, C. A., Leal-Neto, O., and Fernandes, J. P. C. (2022). The impacts of remote learning in secondary education during the pandemic in Brazil. *Nature Human Behaviour*, 6(8):1079–1086.
- Nickow, A., Oreopoulos, P., and Quan, V. (2020). The impressive effects of tutoring on PreK–12 learning: A systematic review and meta-analysis of the experimental evidence.
- Patrinos, H. A., Vegas, E., and Carter-Rau, R. (2022). *An Analysis of COVID-19 Student Learning Loss*. The World Bank.
- Robinson, C. D. and Loeb, S. (2021). High-impact tutoring: State of the research and priorities for future learning.
- Singh, A., Romero, M., and Muralidharan, K. (2022). Covid-19 Learning Loss and Recovery: Panel Data Evidence from India. *NBER Working Paper*.
- Stantcheva, S. (2022). Inequalities in the times of a pandemic. *Economic Policy*, 37(109):5–41.
- The World Bank, UNESCO, and UNICEF (2021). *The State of the Global Education Crisis: A Path to Recovery*. Washington D.C., Paris, New York: The World Bank, UNESCO, and UNICEF.
- UNESCO (2020). Education: From disruption to recovery. Technical report, UNESCO Building peace in the minds of men and women.