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Covid-19, School Closures, and Student Learning Outcomes: New Global Evidence from PIS

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OVERVIEW

- ✓ **Key Issue:** Global school closures during the COVID-19 pandemic resulted in widespread disruptions to education.
- ✓ **Global Scope:** Schools were closed for many months globally, varying significantly across regions
- ✓ **Objective:**
  - ✓ Quantify the learning losses using internationally comparable PISA assessments in mathematics, reading, and science.
  - ✓ Model the impact of closures on learning outcomes globally.

OVERVIEW

- **Global Learning Loss:**
  - Average decline of 14% of a standard deviation (equivalent to around 7 months of learning).
- **Variation by Closure Duration**:
  - Countries with the shortest closures lost 5 months of learning.
  - Countries with the longest closures lost up to 12 months of learning.
- **Disadvantaged Groups:**
  - Losses were more pronounced among:
    - Immigrant students.
    - Boys in longer closures.
    - Students from lower socioeconomic backgrounds

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

Global learning loss in student achievement: First estimates using comparable reading scores

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COVID-19, School Closures, and Student Learning Outcomes

New Global Evidence from PISA

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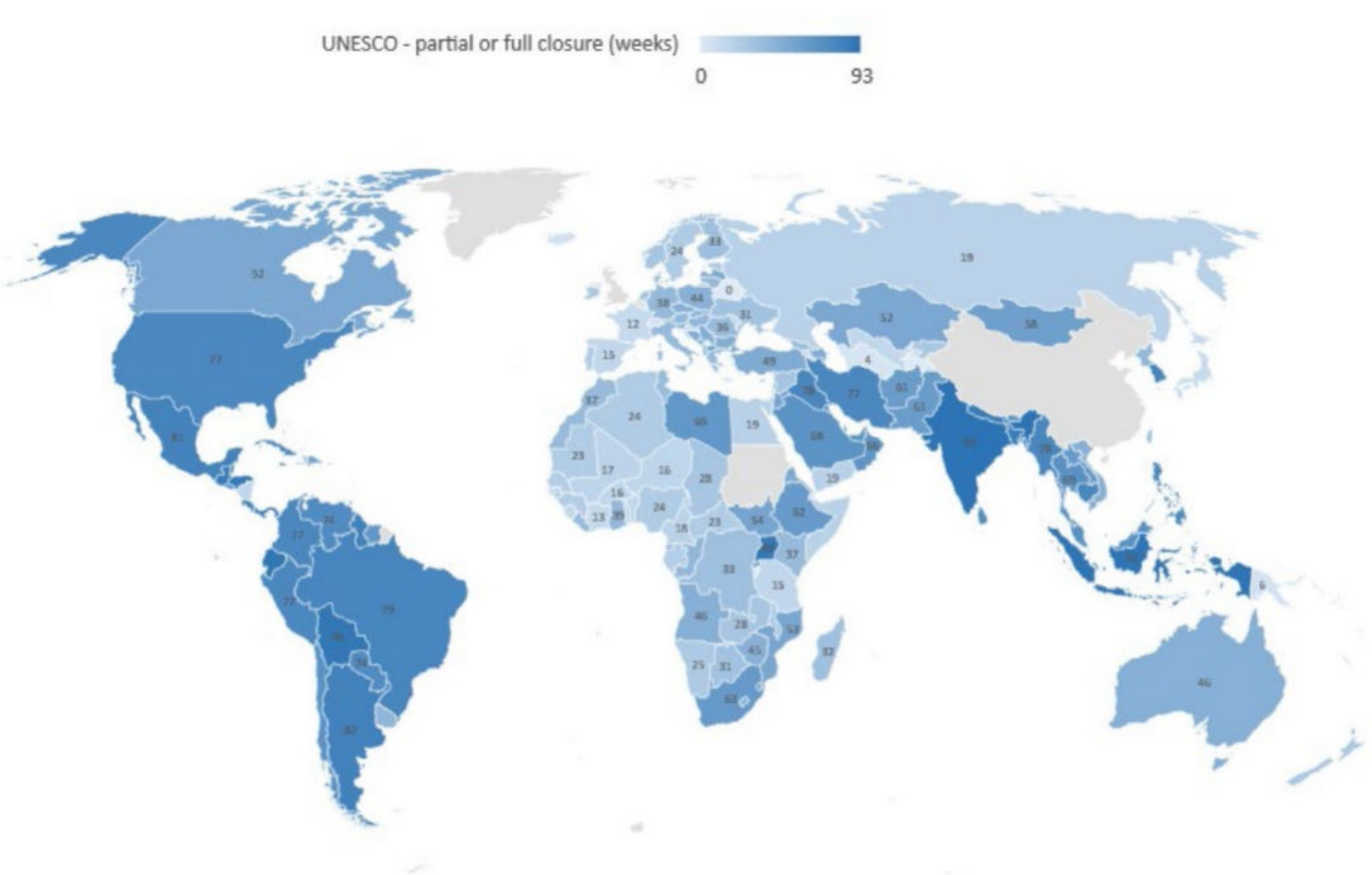


Fig. 1. Weeks of partial/full school closure.
Source: UNESCO, 2023.

Pros and cons of using international assessments to estimate learning loss

PROS

- ✓ Nearly 100 countries with comparable achievement data
- ✓ Cross-sectional surveys, panels possible with country averages only

CONS

- ? School closure definition varies across countries
- ? Low quality information of what countries/schools did during the pandemic

Table 1. UNESCO and PISA measures of school closures (in weeks)

	UNESCO		PISA country average	
	Full closures	Full and partial closures	Student-provided length of closures	Principal-provided length of closures
Shortest (p10)	5	15	10.6	8.0
Very short (p25)	9	29	16.1	13.7
Average (p50)	14	38	21.5	17.9
Long (p75)	20	54	29.5	29.0
Longest (p90)	33	77	38.8	40.4

Methodology

- **Data Source**: OECD's PISA assessments (2000–2022).
  - Sample: **175 million students aged 15 from 72 countries**.
- **Model**:
  - Measured deviations from long-term learning trends.
  - Used four independent measures of school closure durations from PISA and UNESCO.
- **Robustness Checks**:
  - Analyzed trends across time, gender, socioeconomic status, and immigrant background.

Data and methods (PISA)

- ✓ All countries participating in PISA since 2000
- ✓ Assuming country-specific linear trends in learning outcomes (but testing non-linearities)
- ✓ Controlling for country fixed effects and student characteristics
- ✓ Departure from the trends in 2022 = learning loss
- ✓ Length of closurees in weeks = learning loss caused by school closures

$$Y_{ijk} = \sum_{k=1}^{n} \alpha_k + \sum_{k=1}^{n} \beta_k * time + \tau D_{2022} + \gamma X_{ijk} + \varepsilon_{ijk} \qquad (1)$$

$$Y_{ijk} = \sum_{k=1}^{n} \alpha_k + \sum_{k=1}^{n} \beta_k * time + \tau D_{2022} + \pi D_{2022} * weeks_k + \gamma X_{ijk} + \varepsilon_{ijk} \qquad (2)$$

Differences between PIRLS and PISA

PIRLS

- Around 50 countries
- 4th grade (10 to 11-years-old)
- Reading
- 2001 to 2021
- Some countries postponed the assessment to autumn 2021 or 2022
- Controlling for age, grade, gender

PISA

- Around 80 countries
- 15-years-old
- Math, reading, science
- 2000 to 2022
- All countries did it at the same time
- Controlling for gender and SES

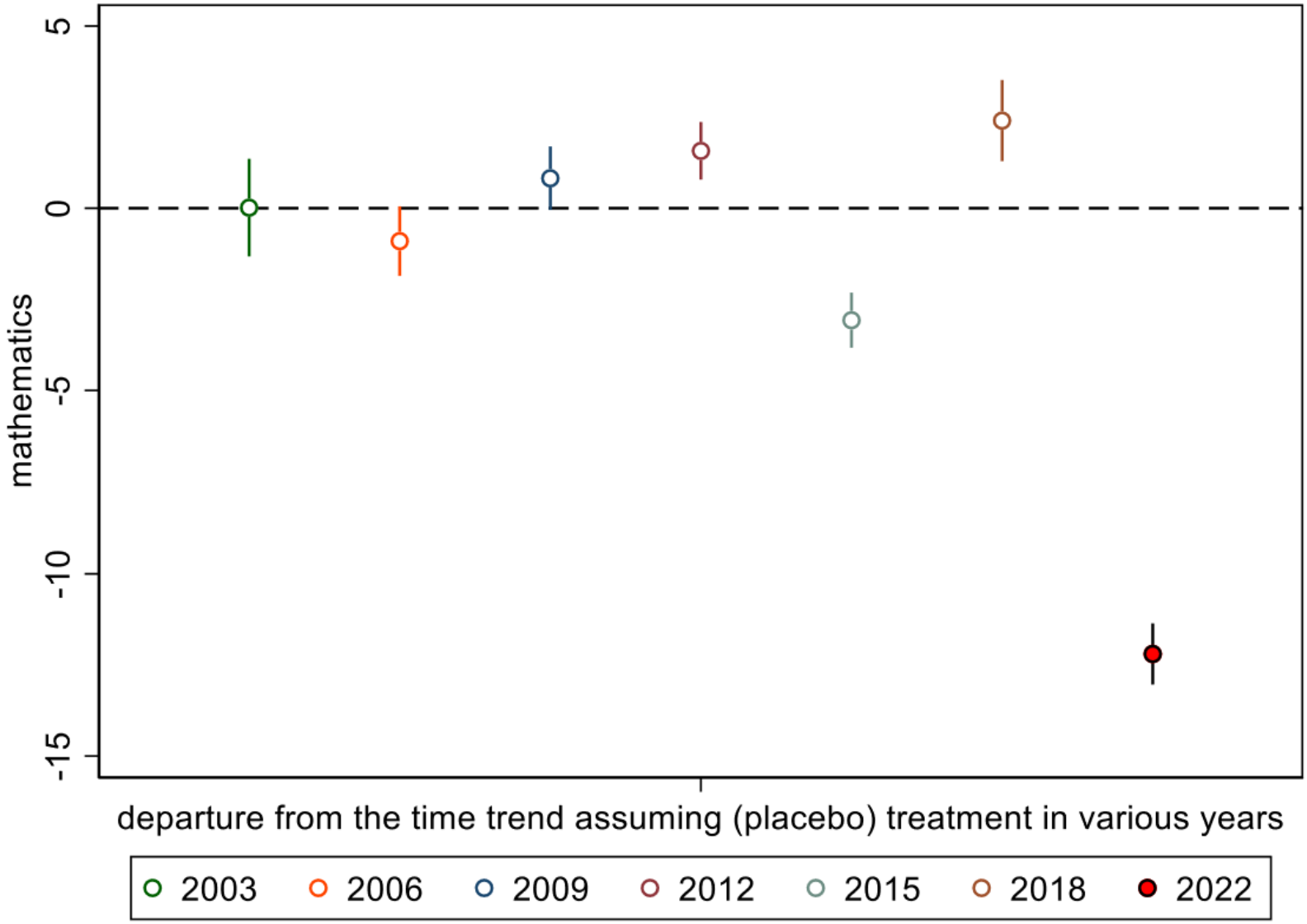
Table 1
Impact of pandemic on student reading.

	(1)	(2)	(3)
Departure from linear trend in 2021	**−14.64*****	**−27.27*****	2.46
	(2.55)	(2.00)	(3.07)
UNESCO data on the number of weeks with full or partial school closures			**−0.78*****
			(0.09)
Additional controls			
• country fixed effects	Yes	Yes	Yes
• country*year	Yes	Yes	Yes
• student grade	No	Yes	Yes
• student age	No	Yes	Yes
• country average student age	No	Yes	Yes
N	1,086,625	1,085,335	996,220

Standard errors in parentheses. *p < 0.05; **p < 0.01; ***p < 0.001.

Figure 3. Departures from the time trend separately for each year of PISA assessment

(95% confidence intervals)



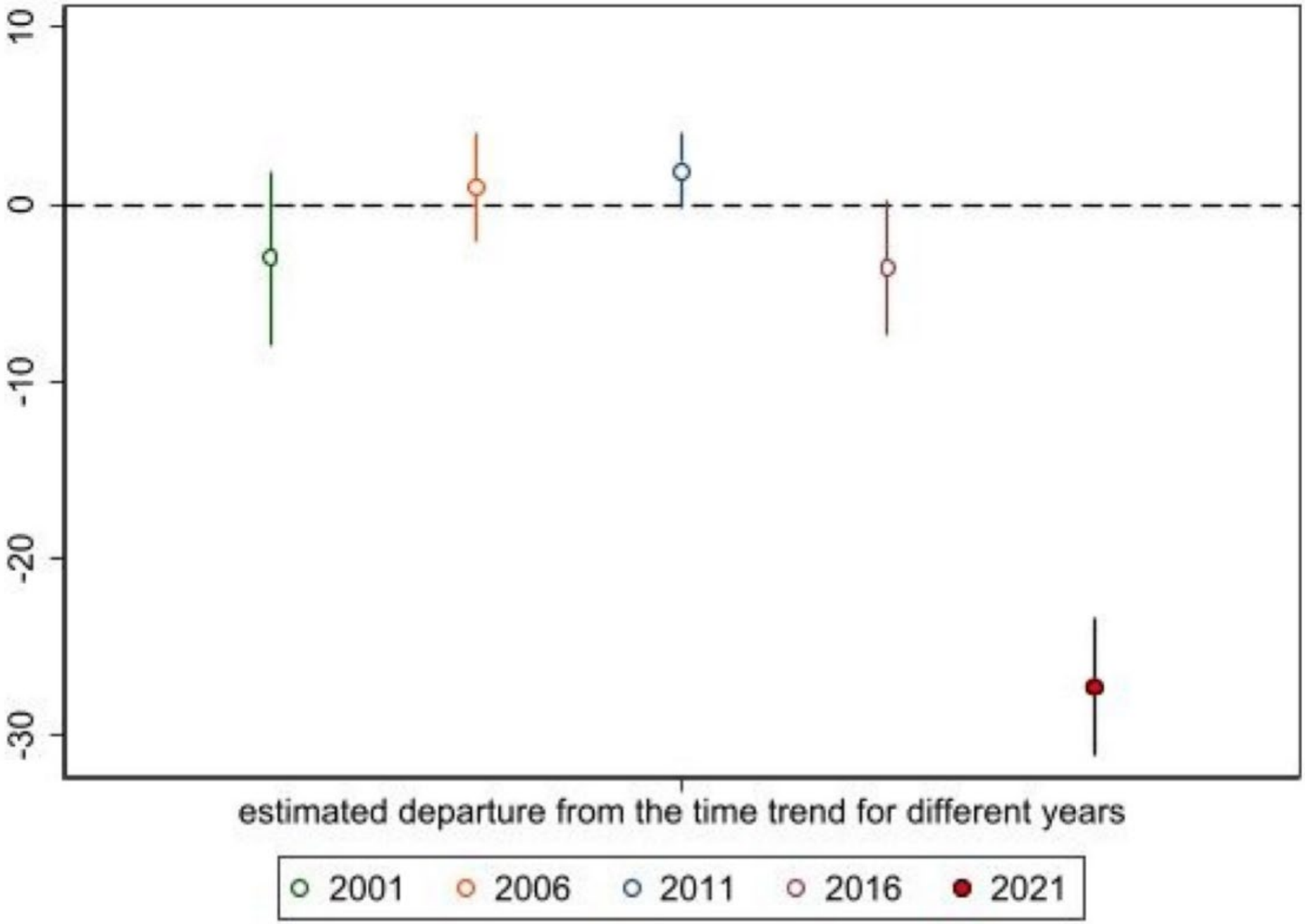
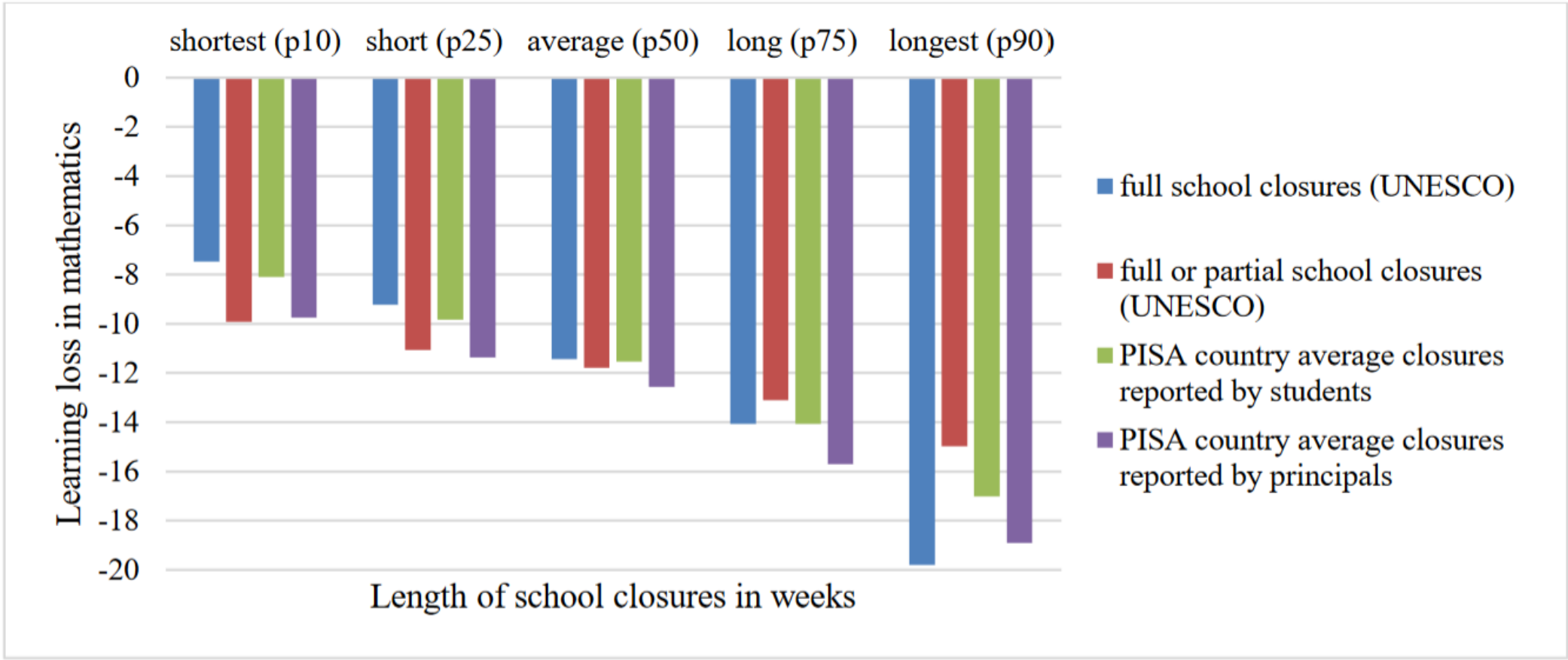


Fig. 2. Departures from the time trend separately for each year of PIRLS assessment (95% confidence intervals).

Table 2. Impact of Pandemic on Student Mathematics Achievement

	(1)	(2)	(3)	(4)	(5)
Departure from linear trend	-12.20***	-5.27***	-8.70***	-4.74***	-7.50***
in 2022	(0.43)	(0.79)	(1.03)	(1.14)	(0.88)
UNESCO: number of weeks with full closures		-0.44***			
		(0.04)			
UNESCO: number of weeks with full or partial closures			-0.08***		
			(0.02)		
PISA: country average student-provided number of weeks of closures				-0.32***	
				(0.04)	
PISA: country average principal-provided number of weeks of closures					-0.21***
					(0.03)
Additional controls					
Individual level: gender, immigrant background, SES	Yes	Yes	Yes	Yes	Yes
Country average: gender, immigrant background, SES	Yes	Yes	Yes	Yes	Yes
• country fixed effects	Yes	Yes	Yes	Yes	Yes
• country*time	Yes	Yes	Yes	Yes	Yes
N	2,896,916	2,896,916	2,896,916	2,791,234	2,791,234

Figure 1. Learning loss depending on the length of school closures



Learning loss is larger for younger students and in countries with longer closures

- ✓ PIRLS: scores declined by 18%-33% SD
- ✓ PISA: scores declined by 14% SD = 7 months of learning

PIRLS and PISA show similar effects of weeks of closures:

- ✓ The shortest closures → 9%-12% of a SD or 4-6 months of learning
- ✓ Average closures → 13%-14% SD or 7 months of learning
- ✓ The longest closures 17%-23% SD, or 9-12 months of learning.

- ✓ In countries with the longest closures, boys and immigrant students lost more

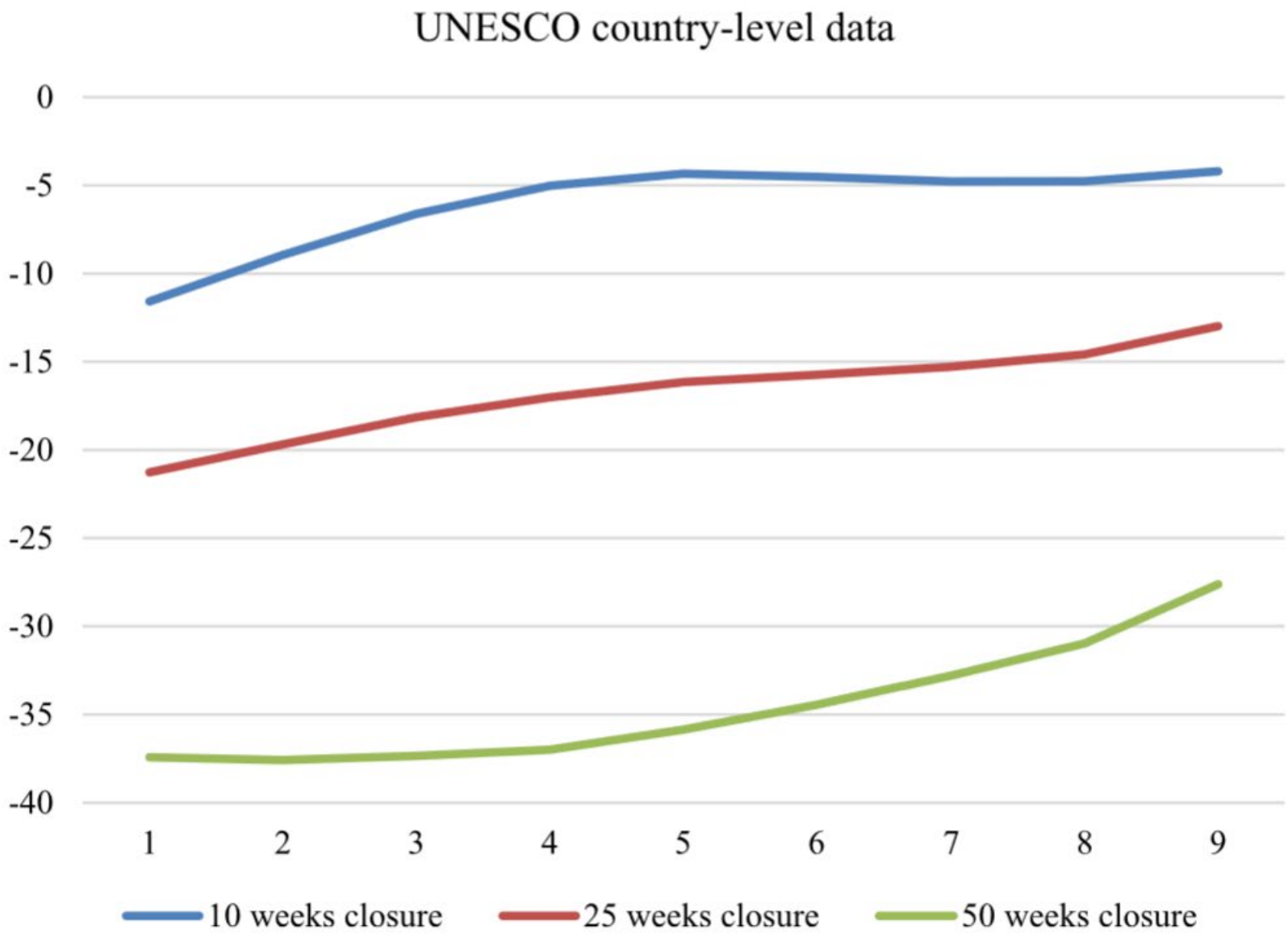
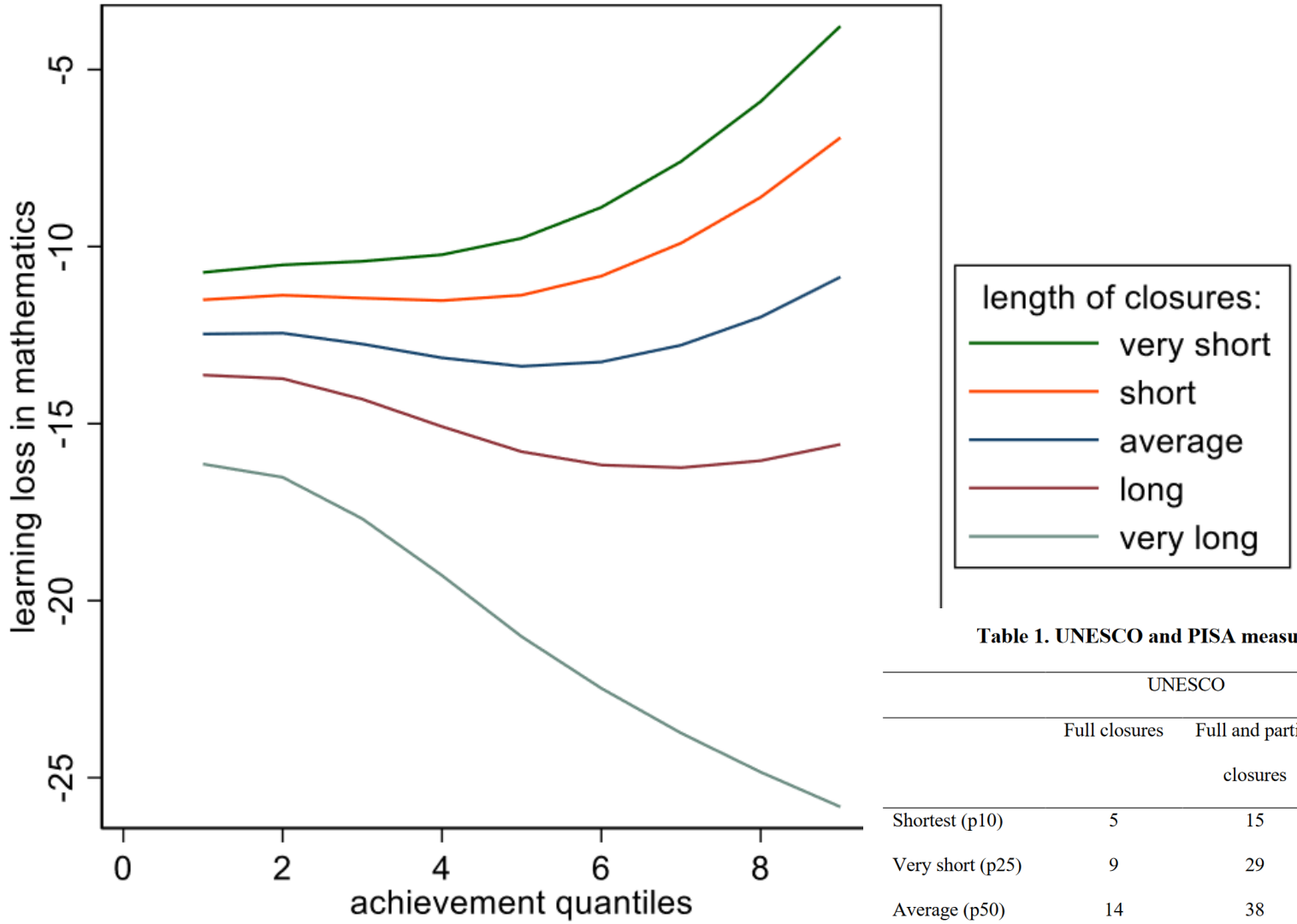


Fig. 3. The impact of COVID19-related school closure on students at different achievement levels by duration of closures.

Figure 2. Learning loss estimates depending on student achievement quantiles and the length of closures



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Impact by Group

- **Achievement Distribution**:
  - Low-achieving students were disproportionately affected in countries with shorter closures.
  - High-achieving students saw greater losses in countries with longer closures.
- **Socioeconomic Inequalities**:
  - Socioeconomic status became a stronger predictor of achievement post-pandemic.
  - Inequality widened, with a **7% increase in the socioeconomic achievement gap**.

Economic Implications

- **GDP Loss**:
  - Learning losses could reduce global GDP growth by **0.15 percentage points annually**, amounting to **$17 trillion in economic losses**.
- **Labor Market Impact**:
  - Educational losses translate into lower productivity and earnings for the current generation of students.

Summary

- ✓ Significant learning losses → still fundamental for societies!!!
- ✓ Larger for younger students
- ✓ Larger for countries with longer closures
- ✓ Larger for low-achieving students in countries with short/average closures
- ✓ Results robust to regression specifications, data selection, weighting, placebo tests (for reading in PIRLS and mathematics in PISA)
- ✓ Significant trends before 2022 in PISA reading and science

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