



The effect of social-media usage on students' academic performance: a
counterfactual-impact-evaluation analysis on ICISL 2023 data

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WHAT DID WE ASK?

- Does social media use impact students' academic performance? Test results have declined over the past decade, persisting post-pandemic. We examine social media as contributing factor.

WHAT DATA DID WE USE?

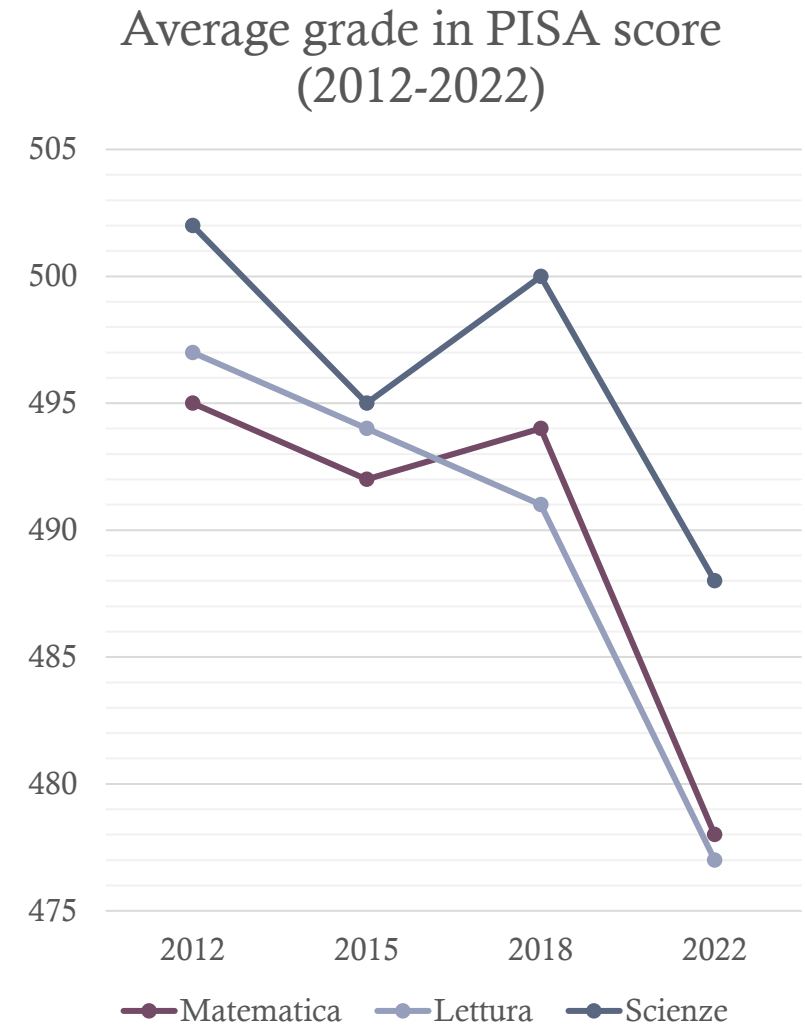
- ICILS 2023 (IEA), Analysis focuses on EU countries only. (22 Countries)

HOW DID WE MEASURE THAT?

- We apply counterfactual analysis using Propensity Score Matching to compare students with similar characteristics but different levels of social media use.
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CRISIS IN THE EDUCATION SYSTEM

- Student performance has declined over the last 10-15 years.
- Analysis of data collected by the PISA survey (OECD) shows a deterioration since 2012 in all core subjects (math, reading, science).



A PARALLEL DECLINE IN DIGITAL SKILLS

- The situation is similar with regard to digital literacy.
 - An analysis of the data collected by the ICILS (IEA) survey shows a decline in performance in both test domains measured (CIL and CT).
 - No country that participated in both 2013 and 2023 recorded an increase in CIL scores (IEA 2025).
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SOCIAL MEDIA USE AND NEGATIVE IMPACT

- Excessive use of social media constitutes a widespread potential risk factor (Salari et al., 2025).
 - Frequent use of social media during lessons or study is negatively associated with university results (Giunchiglia et al., 2020).
 - Cognitive fragmentation induced by social media compromises concentration and, consequently, academic performance (Sun & Chao, 2024).
 - Negative cognitive impact: EEG studies show that intensive use of short-form videos reduces executive control in the prefrontal cortex, decreasing attention and self-control (Yan et al., 2024).
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ICILS 2023 DATA

- Why ICILS 2023: International large-scale survey that allows country comparisons among EU member states and provides a large, representative student sample ($\approx 56,000$ students across 22 EU countries).
 - Relevance to our study: The student questionnaire includes a specific question on social media use, enabling us to investigate its relationship with cognitive performance.
 - **Outcome variable:** We use the Computational Thinking (CT) test score as our main outcome, as it captures key cognitive and problem-solving skills (e.g., decomposition, pattern recognition, abstraction, algorithmic thinking).
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PROPENSITY SCORE MATCHING ANALYSIS

- Methodology: Application of Propensity Score Matching (PSM) to estimate the causal effect of a treatment using observational data.
 - Application in the study: The method **compares students with similar profiles but different levels of social media use**, allowing us to isolate the effect of heavy social media use on academic performance. In practice, **it estimates the average difference in test scores between treated students (heavy users) and their matched controls (non-heavy users)**.
 - Specification: A radius (caliper) matching was applied, with a radius of 0.01.
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CONTROL VARIABLES

The control variables used in estimating the propensity score include:

- **Age**
 - **Gender**
 - **Motivation**
 - **Migration Background**
 - **Language spoken at home**
 - **IISB (**Socioeconomic status index**, constructed based on the number of books at home, parents' education level, and parents' occupation)**
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- **Treatment variable** derived from the student questionnaire, based on the question: “Outside of school, how often do you use social media (e.g., Instagram, TikTok, Snapchat) to post or view content while doing your schoolwork?”
 - **Response scale:** Categorical variable with 5 levels of intensity of use:



- Although it does not directly measure the total time spent on social media, the frequency of multitasking with studying is a plausible indicator of overall intensive use of social media.
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THREE ANALYTICAL APPROACHES BASED ON DIFFERENT DICHOTOMIZATIONS OF THE TREATMENT VARIABLE

1

Heavy use of social media

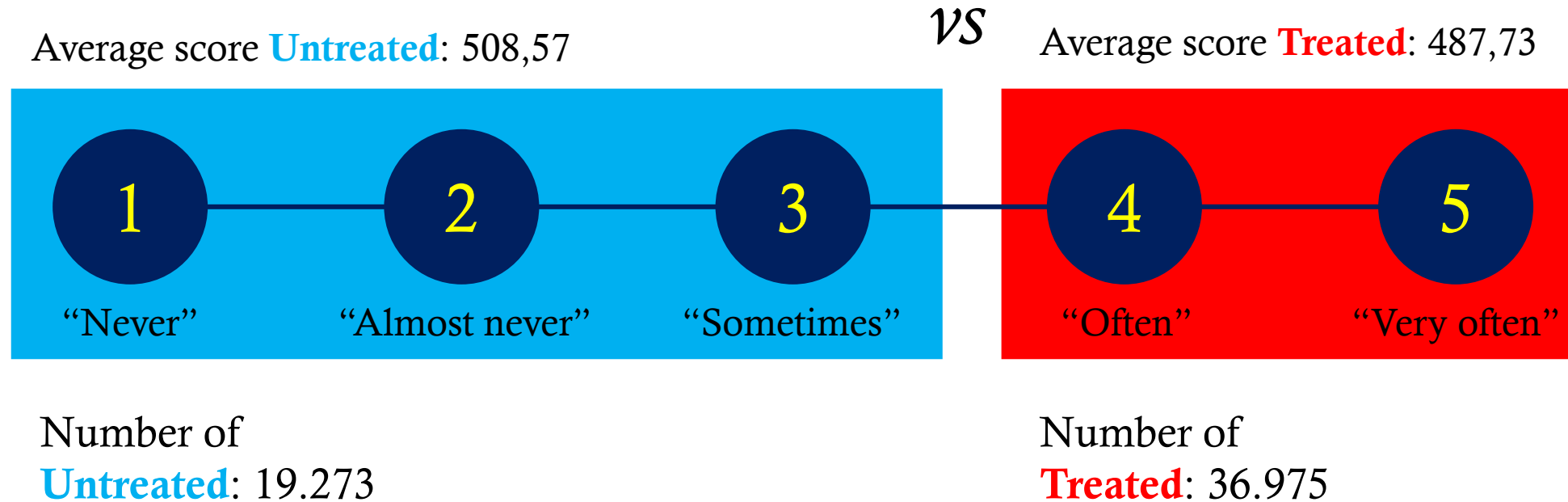
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Heavy use vs Light use

3

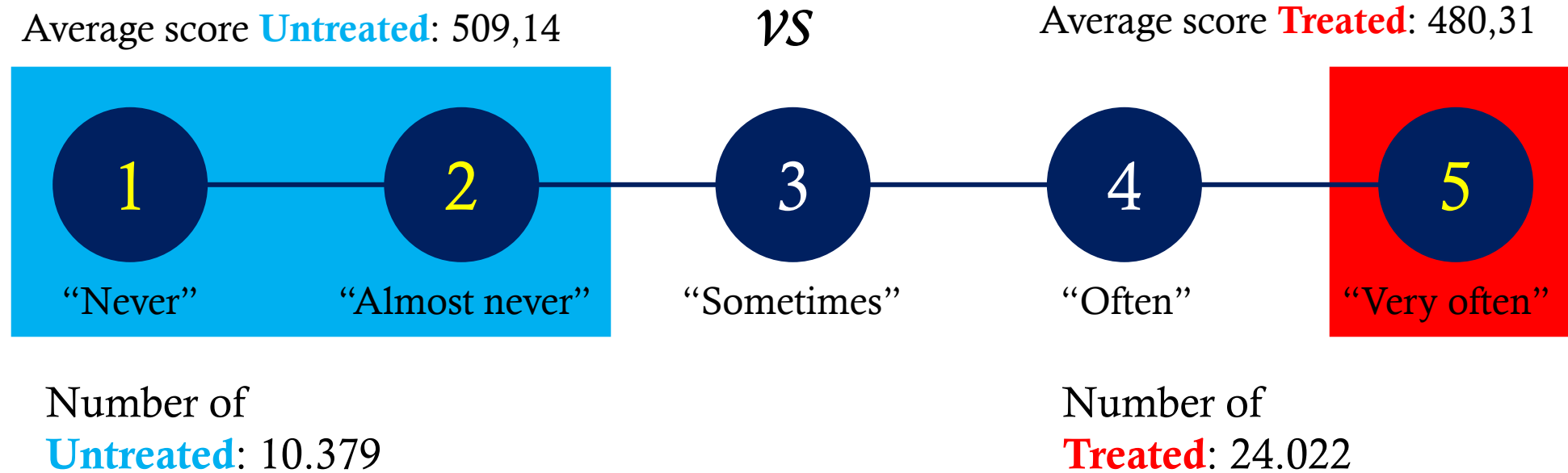
Heavy use vs No use

Heavy use of social media: To estimate the effect of intensive social media use compared to low or moderate use.



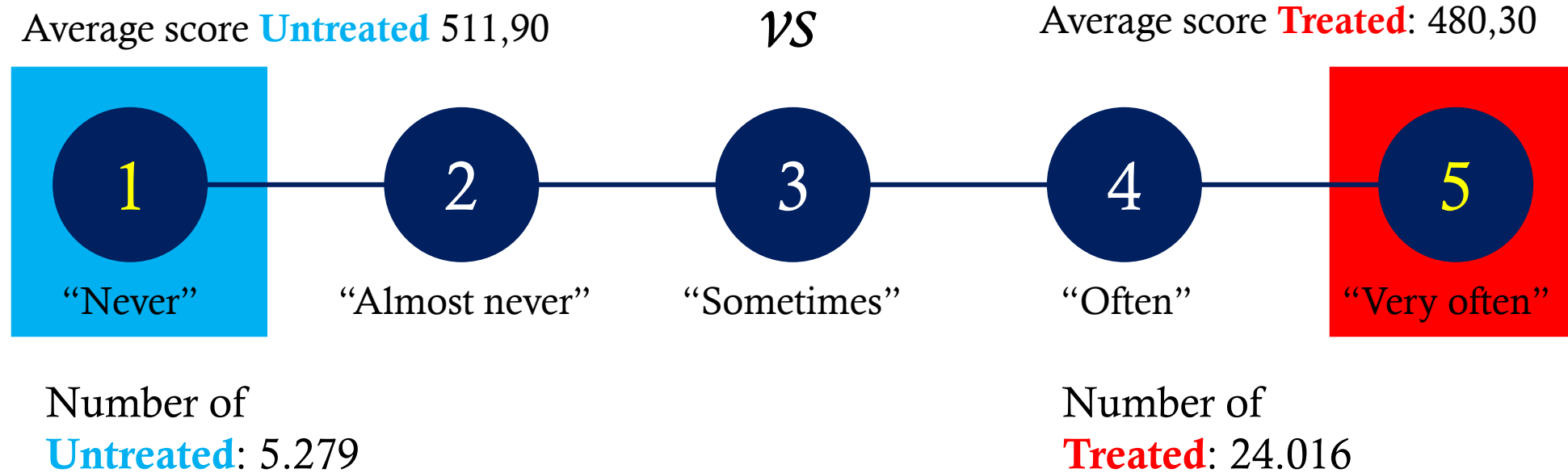
Result of the analysis: $ATT = -20.85$

Heavy use vs Light use: Compare very frequent users with occasional or minimal users.



Result of the analysis: **ATT = -28.83**

Heavy use vs No use: Evaluate the extreme effect of intensive use compared to total absence of use.



Result of the analysis: **ATT = -31.59**

COMMENT ON RESULTS

- The Average Treatment Effect on the Treated (ATT) ranges from approximately -20 to -30 points across the three analyses.
 - As the comparison between groups becomes more extreme (from general heavy use to heavy vs no use), the negative effect on performance increases, indicating a progressive decline in academic outcomes associated with more intensive social media use.
 - To contextualize these results, according to IEA descriptive data from ICILS, the performance gap between students with and without tertiary-educated parents is 38.5 points, and between students with and without an immigration background is 39.2 points (without controlling for other variables).
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If you would like to know more about this work or discuss it further,
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Thank you for your attention!
