The Digital Divide and Consequences of Computer-Based Testing

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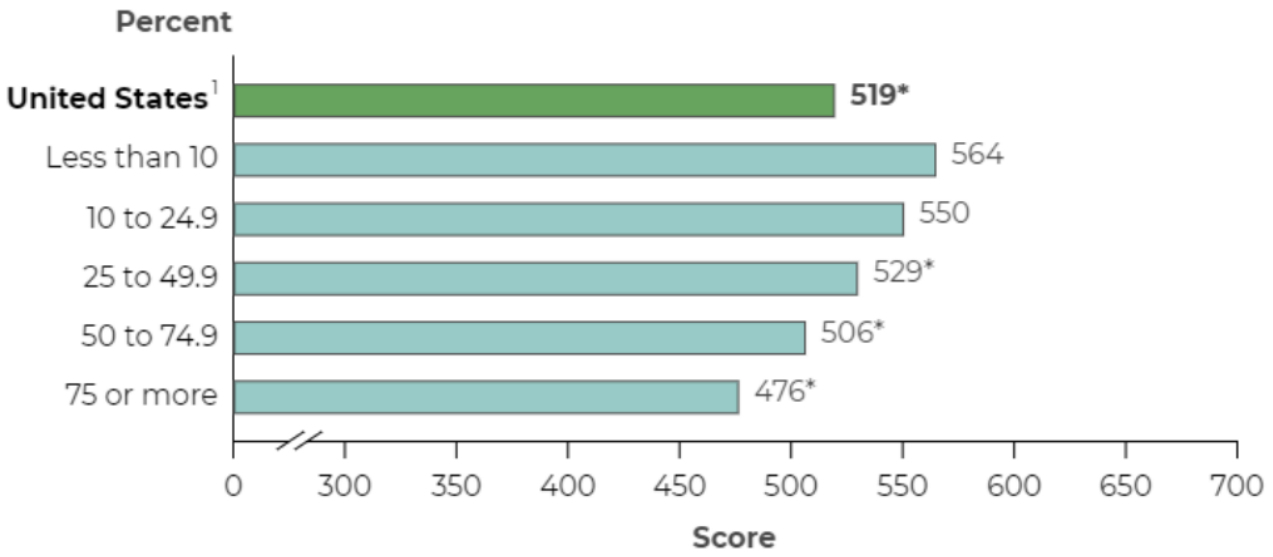
What is the Digital Divide?

- 64% of adults living in high-earning households have home broadband services, a smartphone, a desktop or laptop computer, and a tablet (Pew Research Center, 2019)
- 26% of adults living in low-earning households are "smartphone-dependent" internet users (Pew Research Center, 2019)

Digital Divide in Computer Literacy

Figure 11. Average CIL scores of U.S. 8th-grade students, by percentage of students in public school eligible for free or reduced-price lunch: 2018



* $p < .05$. Significantly different from the estimate for schools with less than 10% of students eligible for free or reduced-priced lunch at the .05 level of statistical significance.

[1] Did not meet the guidelines for a sample participation rate of 85 percent and not included in the international average.

NOTE: CIL = Computer and information literacy. The ICILS CIL scale ranges from 100 to 700. Data on free or reduced-price lunch are for public schools only.

SOURCE: International Association for the Evaluation of Educational Achievement (IEA), The International Computer and Information Literacy Study (ICILS), 2018.

What are Computer-based Tests?

- Standardized assessments of students have been transitioning or transitioned from paper-based to computer since 2010
- Between 2013-2016, 33 states report some technical issue (FairTest, 2016)
- 13 states outright cancelled tests or ignored results (FairTest, 2016)

Technical Issues (FairTest, 2016)

- Lack of sufficient, up-to-date, computers
- Inadequate bandwidth to support simultaneous connections
- Young, particularly low income students, do not have computer literacy skills
- Poor server-side capacity and security

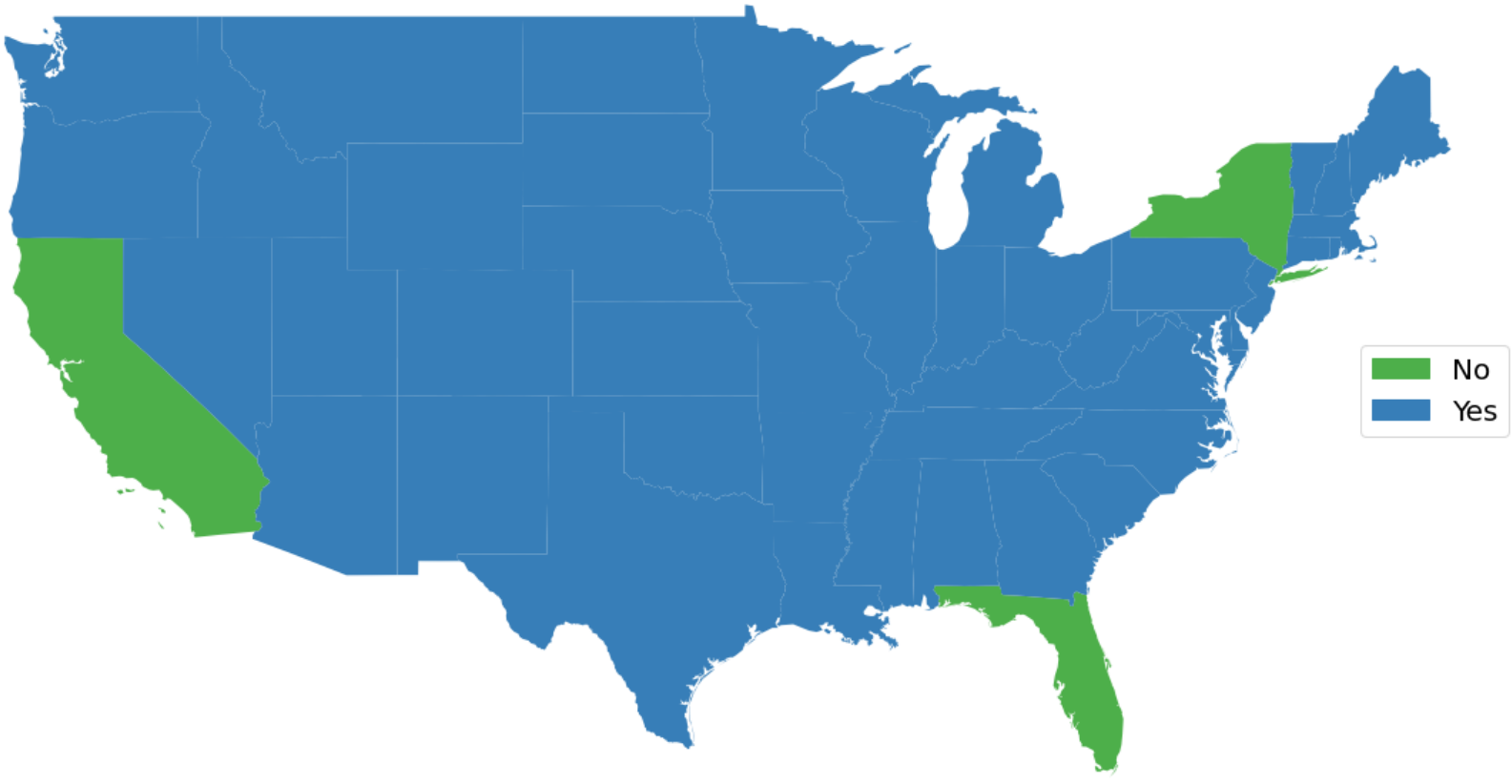
Research Question

- Does computer-based testing contribute to the digital divide?
- Is the transition to computer-based testing creating an additional barrier for English Learners (ELs)?
  - Are there heterogeneous effects depending on the subject?

English Learners and Testing

- For every student entering the public school system for the first time, parents fill out a Home Language Survey
- If identified as EL an exam is administered and the exam score determines classification as EL, those not reclassified are tested the following year
- Tests, proficiency level cut-offs, and additional criteria vary by state

Computer-Based English Proficiency Exam (2018)



Consequences for EL Students

- ELs are often younger, low-income students that lack computer literacy skills
- Title VI of the Civil Rights Act of 1964 entitles EL students to testing accommodations
- Evidence that not reclassifying can be beneficial (Figlio and Özek 2019, Pope 2016)

"A lot of keyboard writing in kindergarten and first grade is looking for individual letters, and I wonder how many of their errors are just mistypes."

– Bilingual Teacher, Park Avenue Elementary School

Literature Review

- Digital Divide
  - Dettling, Goodman, and Smith (2018), Dettling (2017), Akerman, Gaarder, and Mogstad (2015), Araque et al. (2013), Huang and Russell (2006), Prieger (2003)
- EL Students and Reclassification
  - Onda and Seyler (2020), Figilio and Özek (2019), Cimpian, Thompson, Makowski (2017), Thompson (2017), Pope (2016), Carlson and Knowles (2016), Umansky (2016), Guo and Kortez (2013),
- Testing Medium
  - Backes and Cowan (2019), Roohr and Sireci (2016), Bennett et al. (2008)

Contributions

1. Provide causal evidence of the digital divide with respect to the test medium
2. Provide causal evidence of a potential barrier to reclassification

Data

- School- and grade- level average test scores for the Connecticut's Language Proficiency Exam (LAS Links) from 2015-2020
  - Includes the average score and the number of students that scored above proficient on each tested category: listening, speaking, reading, and writing
- School-level data on the academic year in which schools moved to online testing
- ACS 2017 5-year estimates on computer availability and internet access

CT Schools and English Learners (CSDE)

- CT is comprised of 205 school districts, containing 1,511 schools
- There were 34,833 EL students enrolled in 2015 and 43,568 in 2019
- Spanish speakers account for more than 70% percent of EL students
- 76% percent of ELs were eligible for either free or reduced-price meals

LAS Links

- CT has used LAS Links since the 90s
- Schools began to opt into computer-based testing as early as 2005
- All remaining schools went computer-based for the 2017-2018 academic year

- Exploit variation in the timing of the implementation of LAS Links Online within school districts

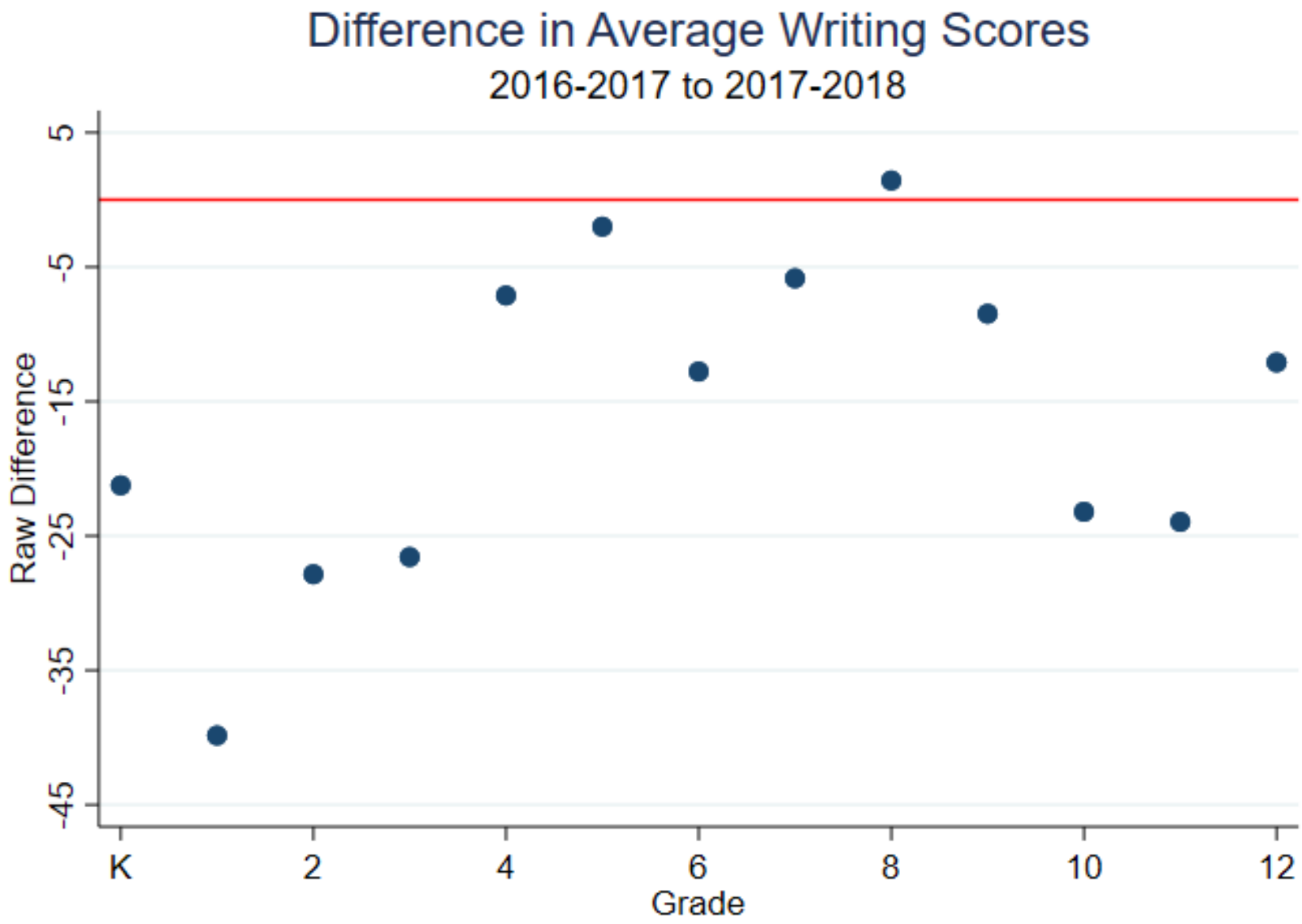
- Assumptions in Staggered DiD (Rambachan and Roth, 2020; Callaway and Sant'anna, 2020; Goodman-Bacon, 2019; Adabie, 2005)
  1. Sampling of the data is either panel or a repeated cross-sections
  2. Parallel trends holds conditional on school-level characteristics
  3. Transitioning to computer-based is irreversible
  4. Schools that transition and those that do not must share a common support

Assumption 2: Parallel Trends

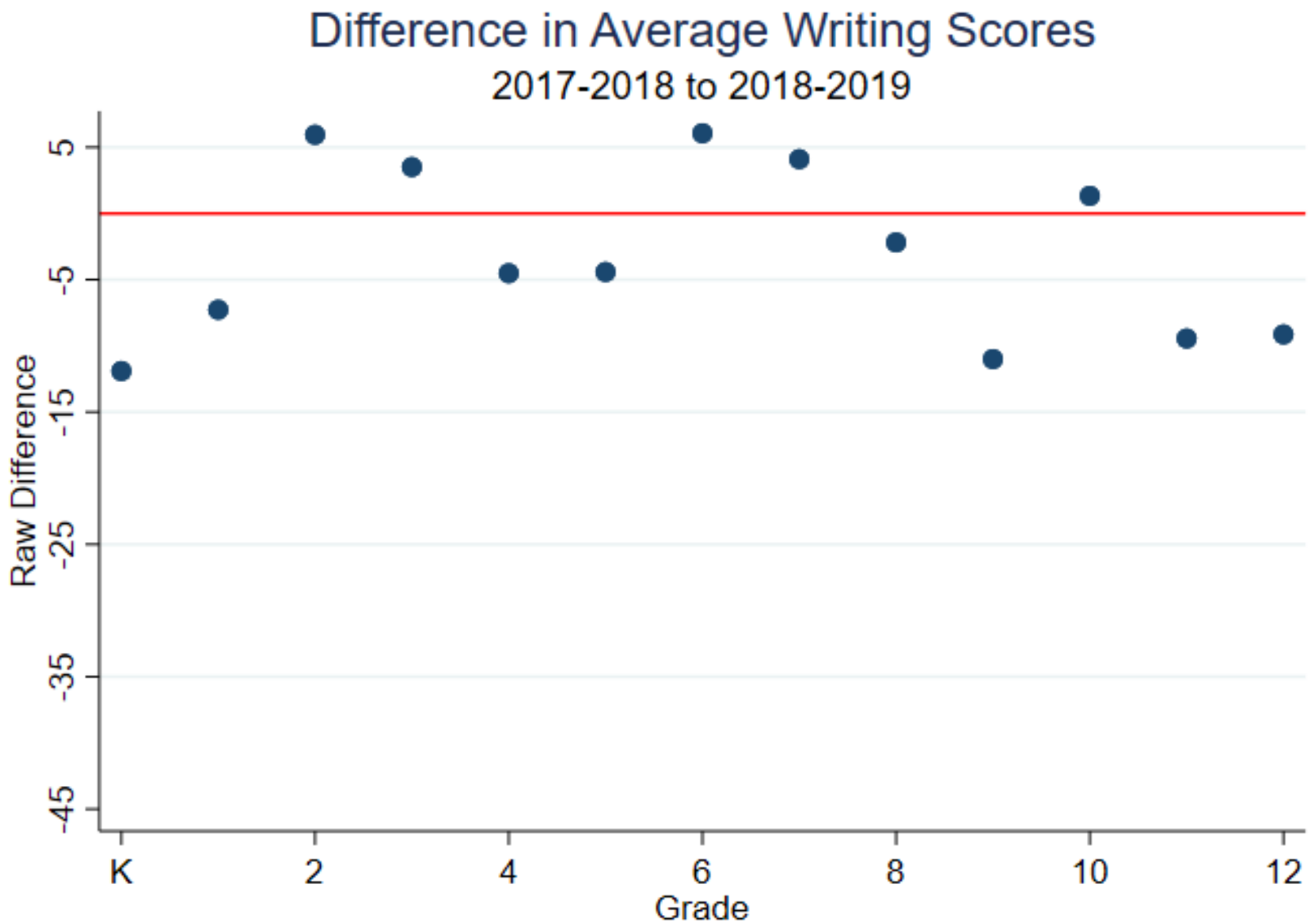
1. Wealthier schools within a district could transition earlier and have better teachers or resources available for EL students $\Longrightarrow$ positive selection

2. Schools with fewer EL students that lack EL-specific resources transition earlier $\Longrightarrow$ negative selection

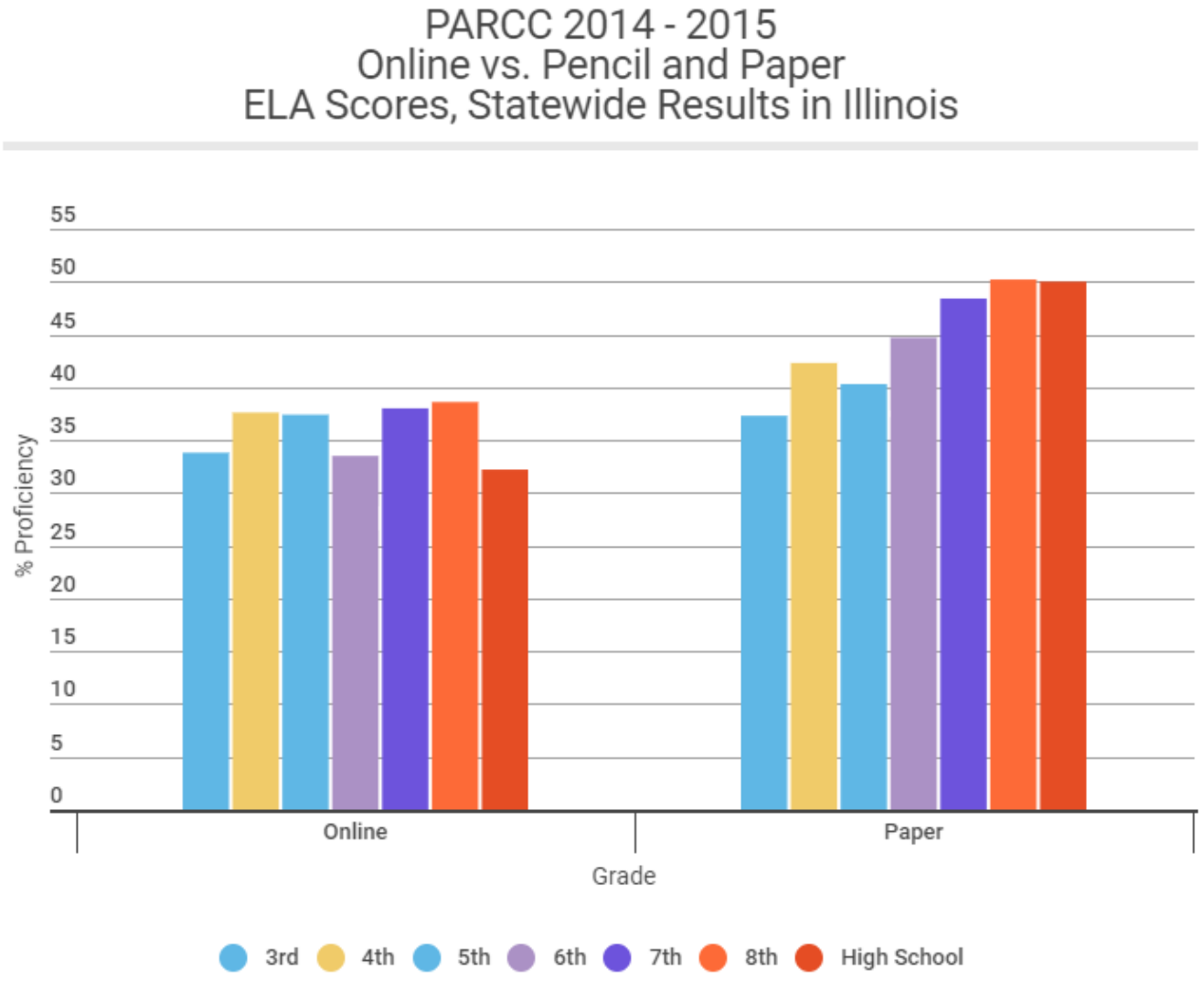
3. Schools with many EL students transition earlier to alleviate administrative burden of testing, if these are underfunded schools $\Longrightarrow$ negative selection


Difference in Average Writing Scores
2016-2017 to 2017-2018
Raw Difference
5
-5
-15
-25
-35
-45
K
2
4
6
8
10
12
Grade

Suggestive Evidence (Cont.)

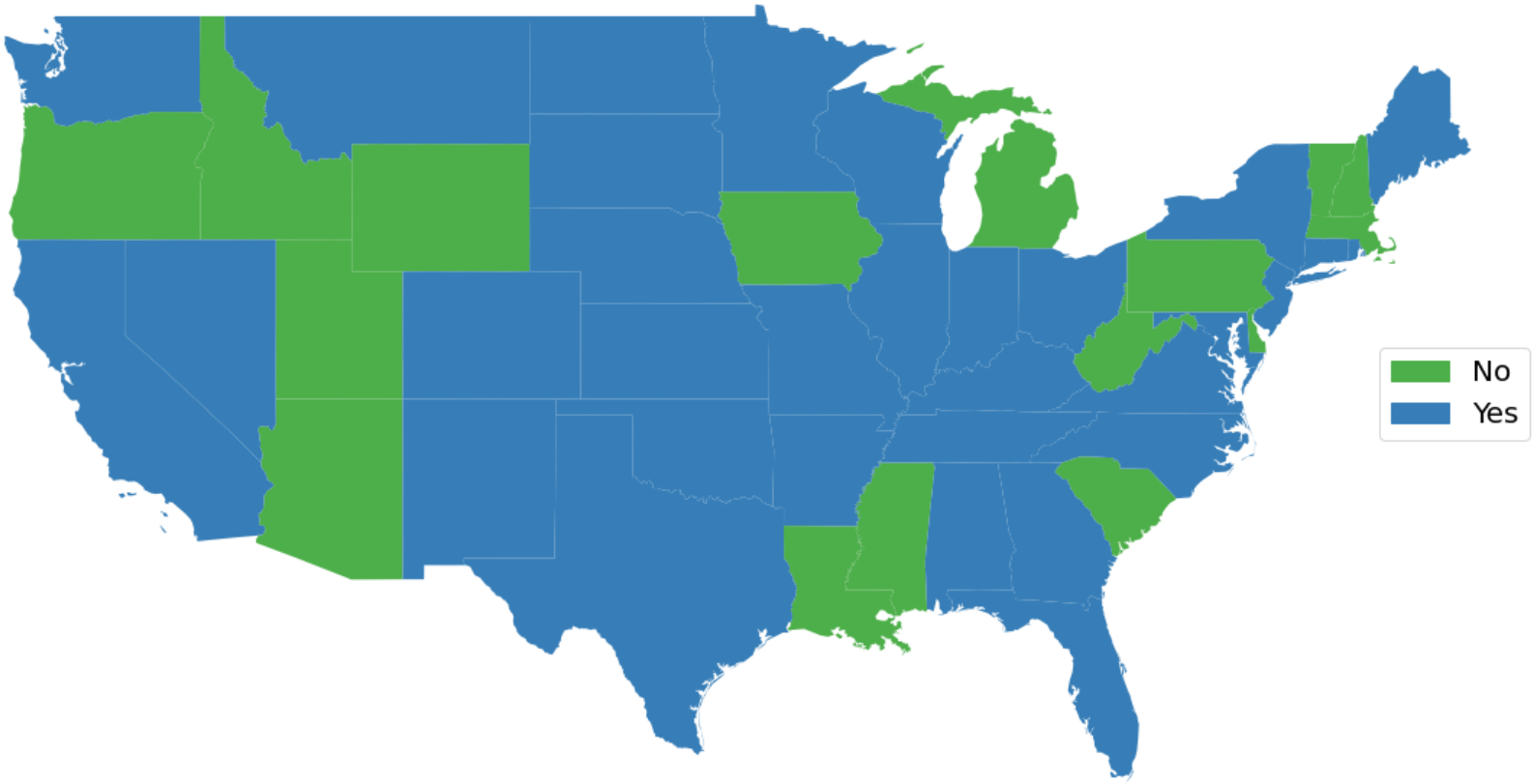


College Readiness Exam (ISBE, 2015)



Back

Computer-based Testing Issue (2013-2016)



California Home Language Survey

1. Which language did your child learn when they first began to talk?

2. Which language does your child most frequently speak at home?

3. Which language do you (the parents and guardians most frequently use when speaking with your child?

4. Which language is most often spoken by adults in the home? (parents, guardians, grandparents, or any other adults)

Please sign and date this form in the spaces provided below, then return this form to your child's teacher. Thank you for your cooperation.

Signature of Parent or Guardian

Date

California 1st Grade Scoring Cut-offs

	Level 1 Beginning	Level 2 Early Intermediate	Level 3 Intermediate	Level 4 Proficient	Level 5 Above Proficient
Speaking	300-431	432-461	462-495	496-550	551-580
Listening	300-431	432-449	450-475	476-520	521-530
Reading	240-359	360-384	385-422	423-478	479-550
Writing	200-354	355-434	435-488	489-534	535-630
Overall	260-393	394-432	433-470	471-520	521-572
Oral	300-431	432-462	463-489	490-529	530-555
Comprehension	270-389	390-415	416-451	452-485	486-540
Literacy	220-356	357-409	410-455	456-506	507-590
Productive	250-392	393-447	448-491	492-542	543-605
CA ELD PL	**Emerging**		**Expanding**	**Bridging**	

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English Proficiency Exam (2018)