Gender biased grading and its effect on application behavior to selective schools

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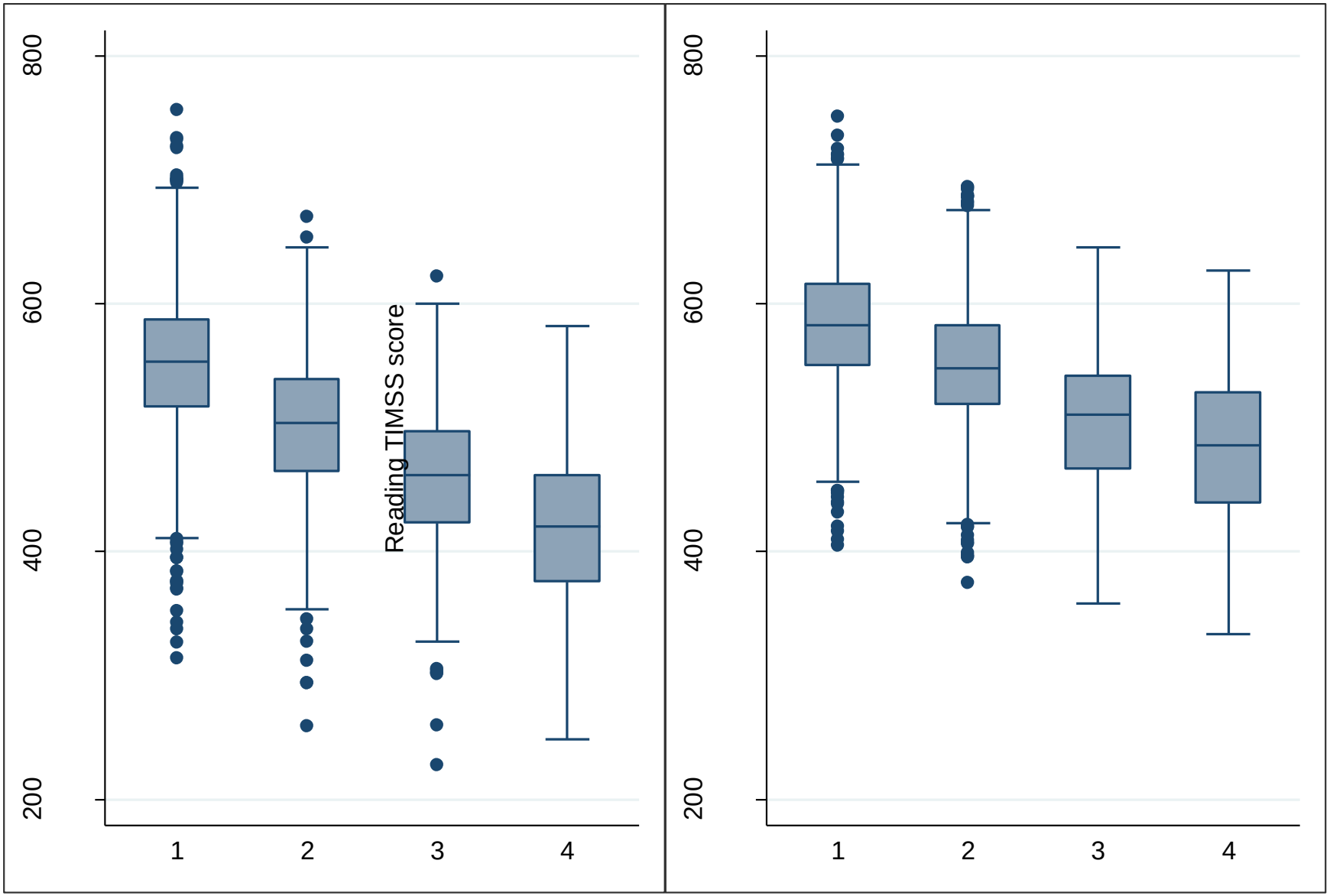
Motivation

- Pygmalion effect (or Rosenthal effect)
  - The greater the expectation placed upon people, the better they perform
- Rosenthal and Jacobson (1968)
  - Students perform better or worse simply because teachers expect them to do so
- Friedman and Manley (1992) – 72% of final grade reflect students' achievements

Grading vs. TIMSS scores

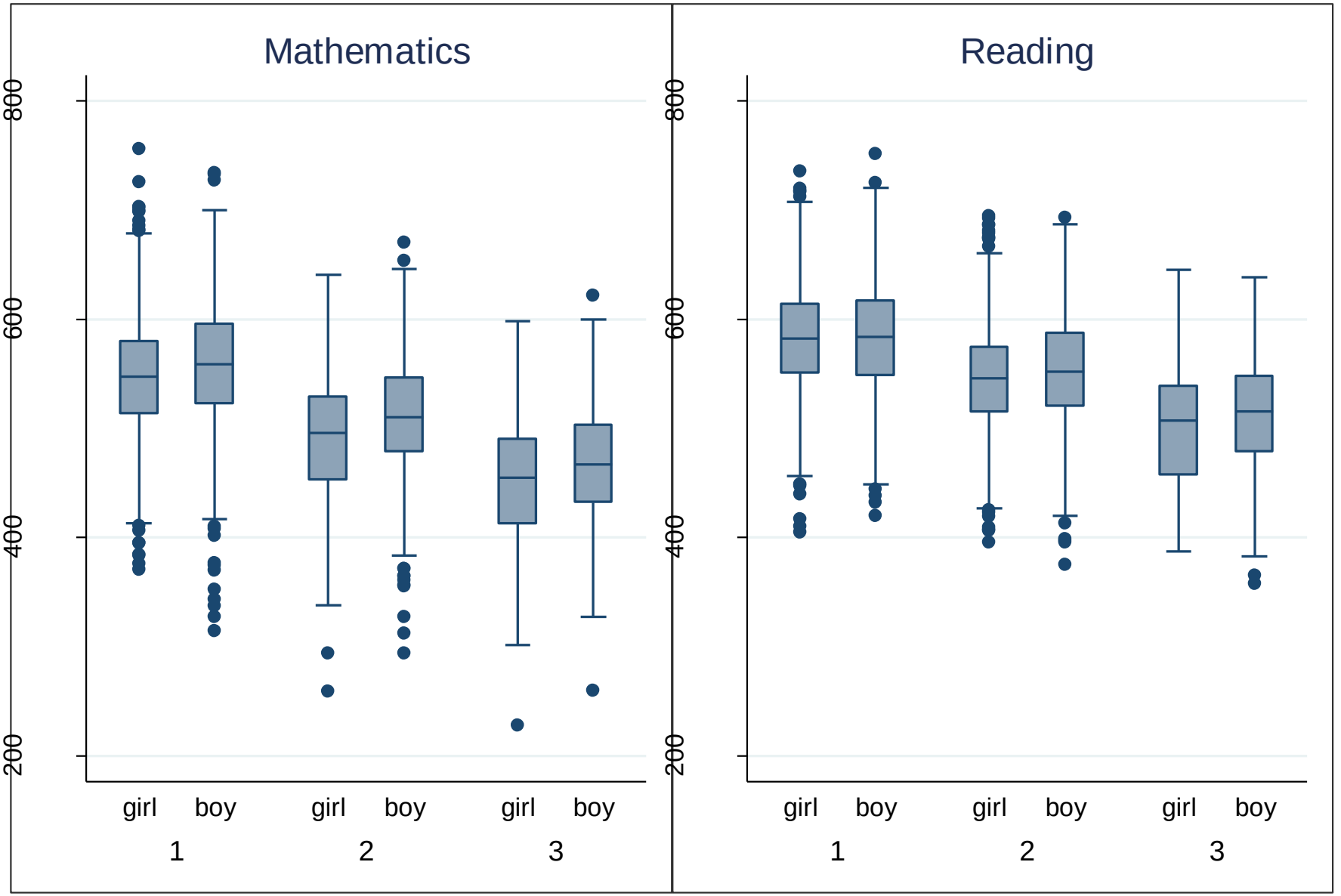


Source: Own calculations, CLoSE.

Motivation

- Gender differences in literacy and its effect on
  - Gender inequalities in educational opportunities (differences in attainment rates in higher education)
  - The occupational choices (women represented more in social sciences and men in the fields of science, technology) and as a consequence on wages
- Gender differences in grading

Gender and Grading



Source: Own calculations, CLoSE.

Research question

- Consequences of gender bias in grading?
  - Probability to apply for selective schools and to be successful on admission exams
  - Teachers attitudes toward pupils and its effect on their future career (Pygmalion effect)

Can teacher grading deter or encourage students to apply for academic schools and to be successful on admissions?

Literature

Gender differences in grading

- Jussim (1989) – teachers perhaps intentionally use grades to reward hard-working students and punish lazy students (usually boys)

- Mechtenberg (2009) – game theoretical model in which different kinds of gender gaps are a result of teacher and student behavior in school
  - teacher biases the grades (they grade also student attitudes and motivation)
  - girls and boys internalize the same kind of feedback (grades) differently (because they have different beliefs about how honestly the teacher behaves to them)

- Falch and Naper (2013) - girls get better grades than boys when assessed by their teacher compared to results at anonymously evaluated central exit exams

Data

- CLoSE (*Czech Longitudinal Study in Education*)
  - follows the cohort of students in the Czech Republic that were tested in the 4th grade by TIMSS and PIRLS 2011
  - Data include detailed questionnaire about the intention to apply for selective school, the preparation for admission exams and their results in 2012

- Achievements:
  - Scores in mathematics and reading skills – pupils tested at the end of the 4^{th} grade (scores on scale 0-800)
  - Grades from Mathematics and Czech language after the first semester of the 5^{th} grade (on scale 1-5) – assessed by teachers

- Possible problem – students already start with the preparation for admission exams during the first semester of 5^{th} grade
  - It can affect the grade in the 5^{th} grade – exclude pupils that applied for selective schools (no change)

Data

- Transformation of math and reading scores on scale 1-5
  - Within each class, rank pupils according to scores from the best to the worst
  - For each class, compute the number of pupils with grade 1, 2, 3, 4 and 5 (separately for math and czech)
  - Assign to each pupil a new grade according to pupil rank of scores

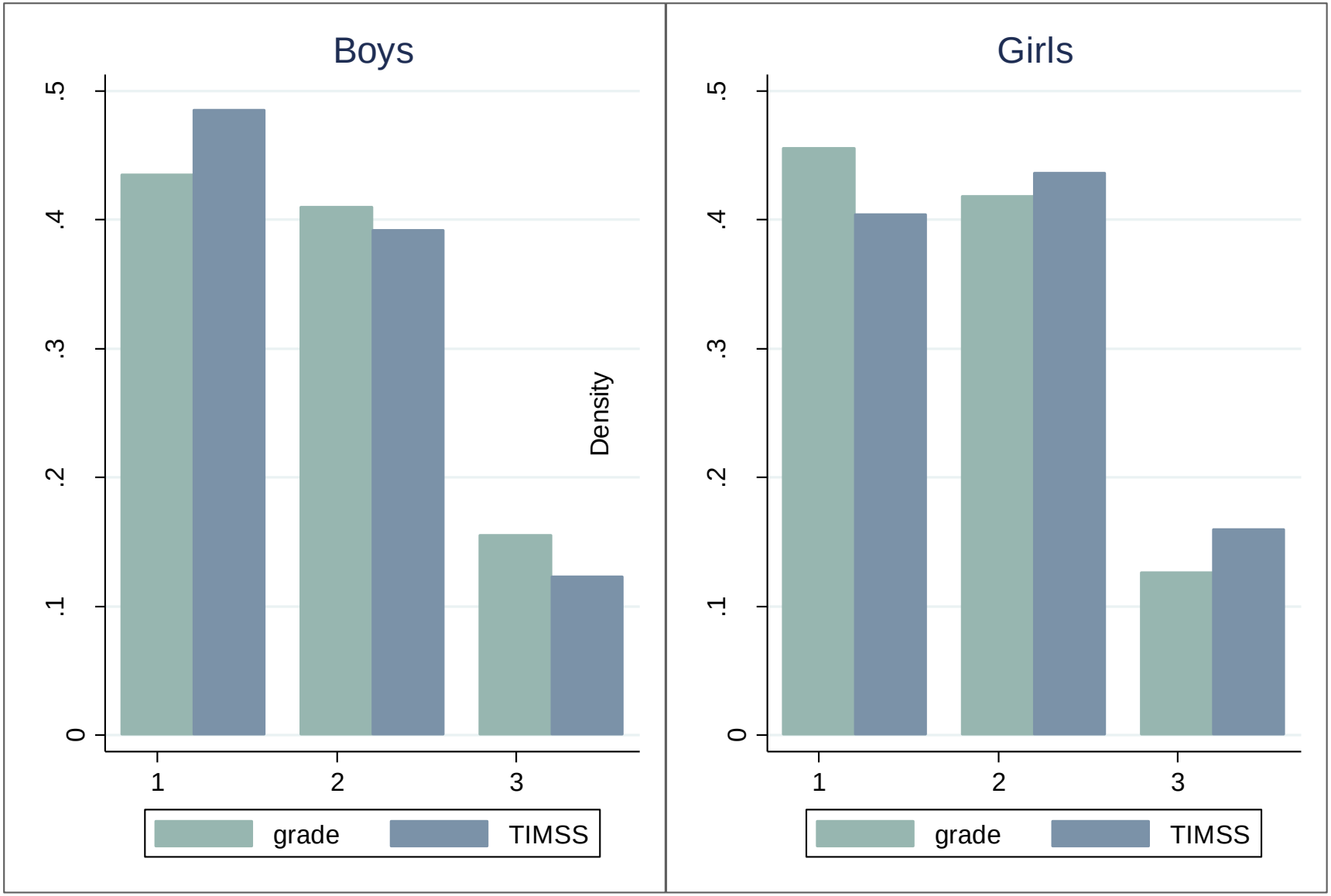
1
2
3 **1**
4

5
6 **2**
7

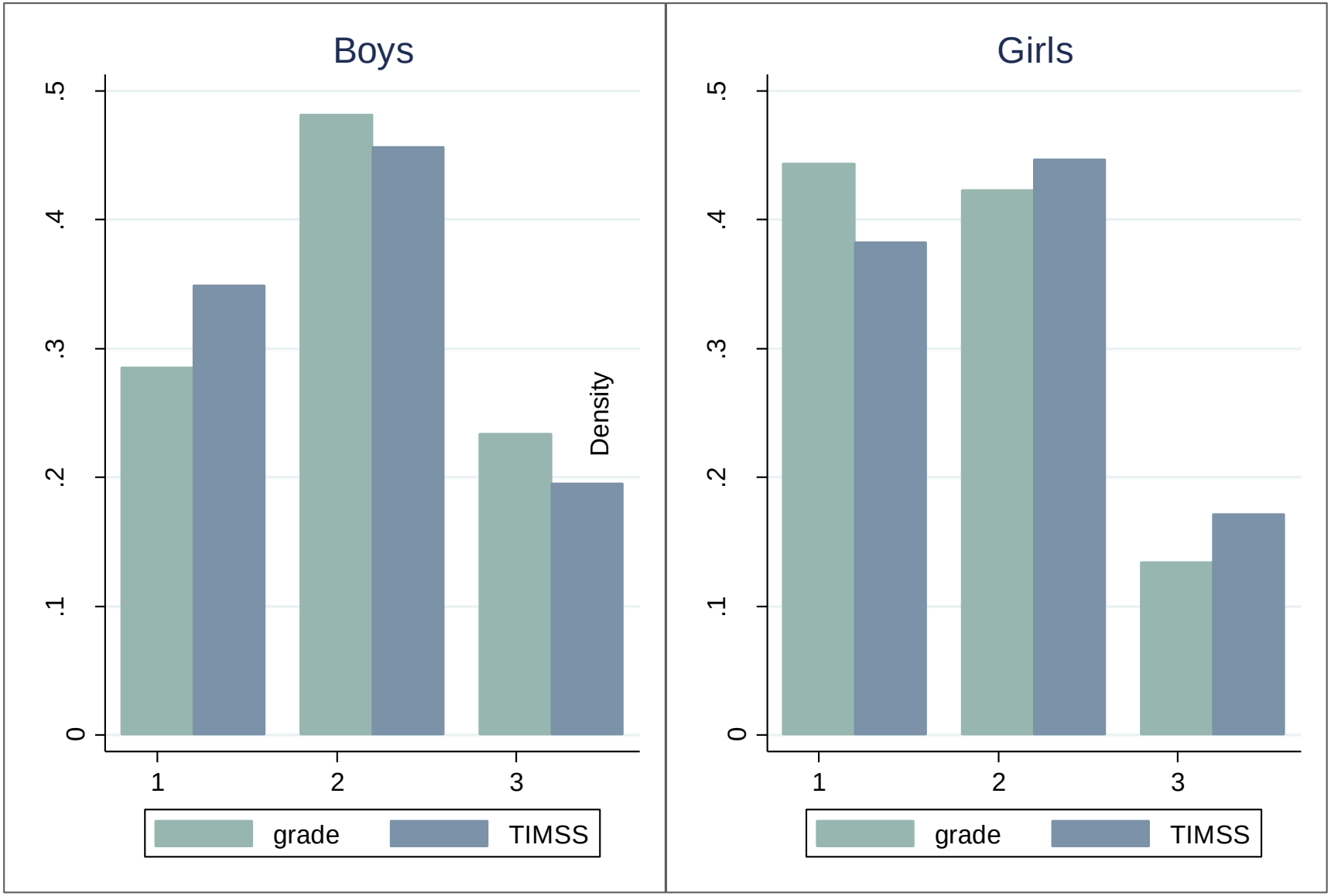
8
9 **3**
10

11
12 **4**

TIMSS scores vs. grades in Math



TIMSS scores vs. grades in Czech



TIMSS scores vs. grades

	MATH			CZECH		
	TIMSS	Grade	Diff	TIMSS	Grade	Diff
Total	1.79	1.79	-0.000	1.93	1.93	-0.000
	[0.82]	[0.82]	(0.019)	[0.85]	[0.85]	(0.020)
Girls	1.84	1.75	**0.095**	1.90	1.76	**0.136**
	[0.82]	[0.80]	**(0.027)**	[0.84]	[0.79]	**(0.027)**
Boys	1.73	1.82	**-0.093**	1.97	2.10	**-0.134**
	[0.82]	[0.84]	**(0.027)**	[0.86]	[0.88]	**(0.029)**
Difference	**-0.116**	**0.073**	**-0.189**	**0.073**	**0.342**	**-0.271**
	(0.027)	**(0.027)**	**(0.038)**	**(0.028)**	**(0.028)**	**(0.040)**

-teachers, using grades, favor girls more than boys – in both, math and czech

-according to test scores, girls should have worse grades that they actually have; on the contrary, boys should have better grades

-according to test scores, girls are better in czech than boys and boys are better in math

Methods

- What is the effect of gender bias in grading on decision to apply for selective school?
  - Grades vs. real knowledge measured by test scores in TIMSS and PIRLS and its effect on gender gap in application
  - Classes with different gender biased grading and application behavior

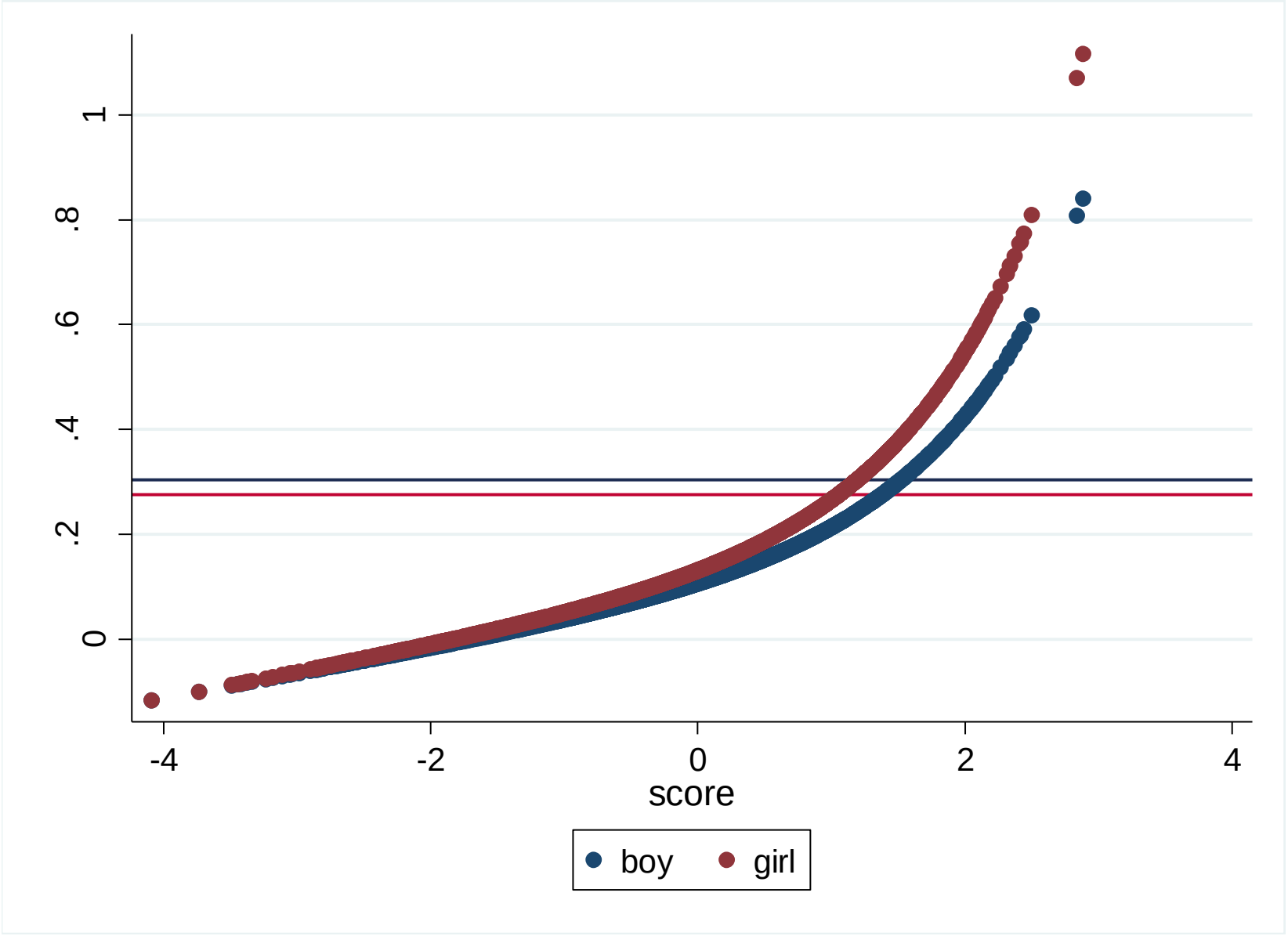
- Linear probability model

$$\text{Application} = \alpha + \beta * x + \gamma * z + \varepsilon$$

x … grades / test scores / bias in grading

z … vector of control variables (parents education, motivation)

Application behavior – scores vs. grades



Application behavior – scores vs. grades

- Scores transformed to grades on scale 1-5

Dependent variable: *Probability to apply*	Boys		Girls	
	Scores	Grades	Scores	Grades
Math	-0.074***	-0.088***	-0.059***	-0.030*
	(0.014)	(0.019)	(0.014)	(0.016)
Czech	-0.021	-0.044**	-0.031**	-0.097***
	(0.014)	(0.019)	(0.012)	(0.015)
Controls	Yes	Yes	Yes	Yes
N	1,667	1,673	1,696	1,700
R^2	0.208	0.221	0.204	0.230

- For girls, scores in math are more important than grades for application decision, whereas in czech skills grades are more important (in line with Mechtenberg)

Bias in grading within class

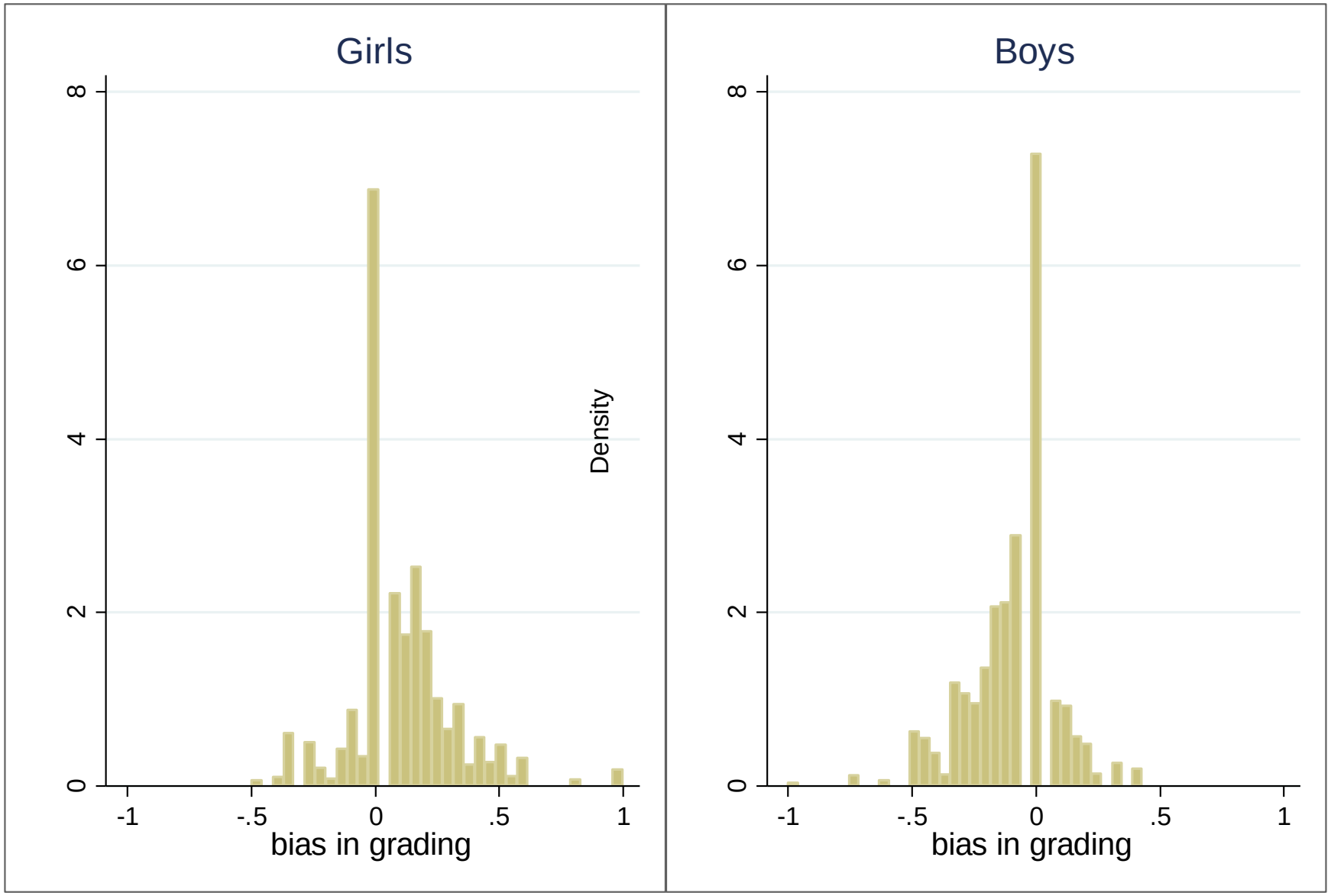
- Within class – potential presence of gender biased grading

Bias in grading = grades derived from scores – real grades from teachers

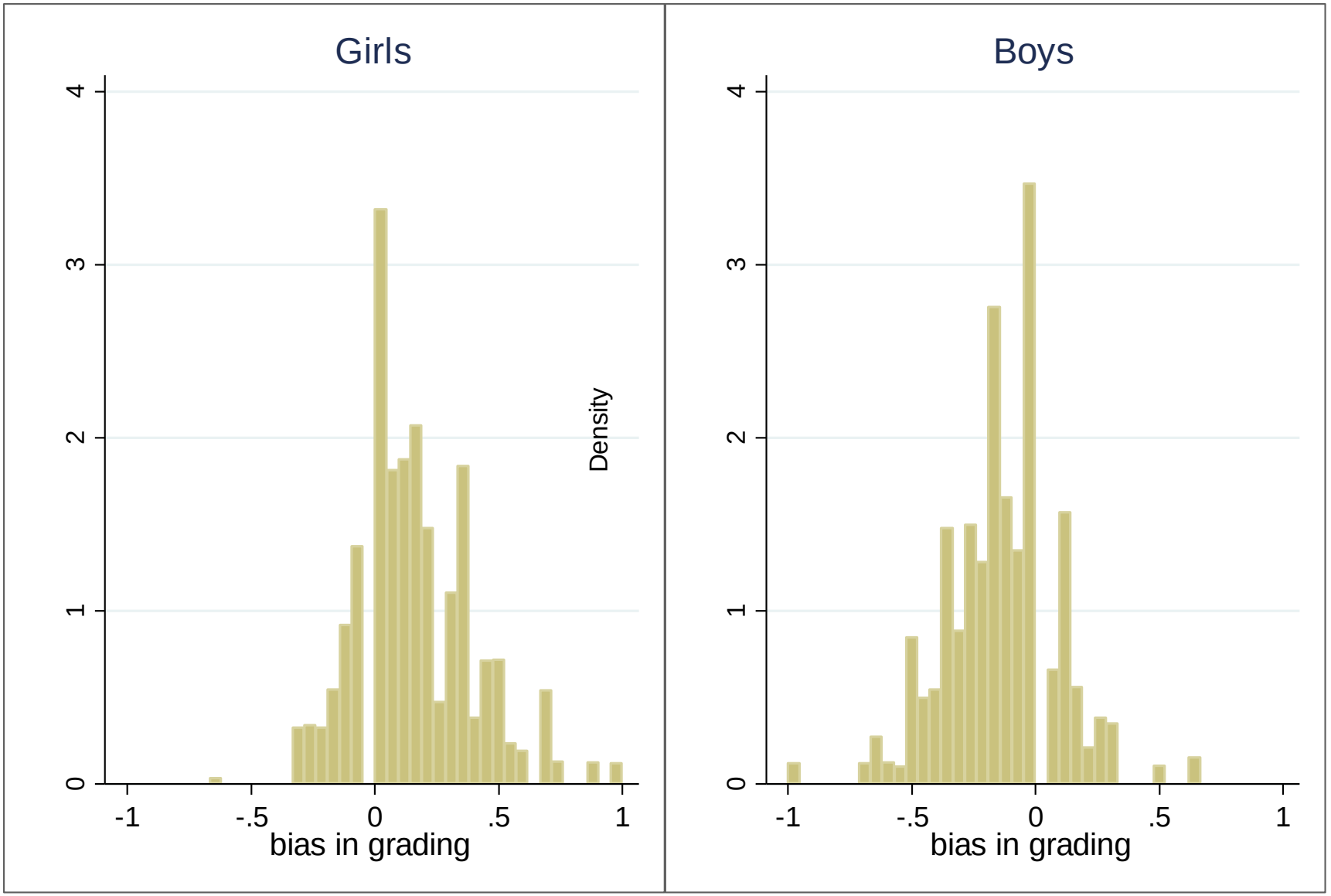
-for each class, average bias in grading on gender and subject level (math and czech)

-i.e. positive bias indicate teachers assess pupils with better grades compared to test scores

Grading bias in math



Grading bias in czech



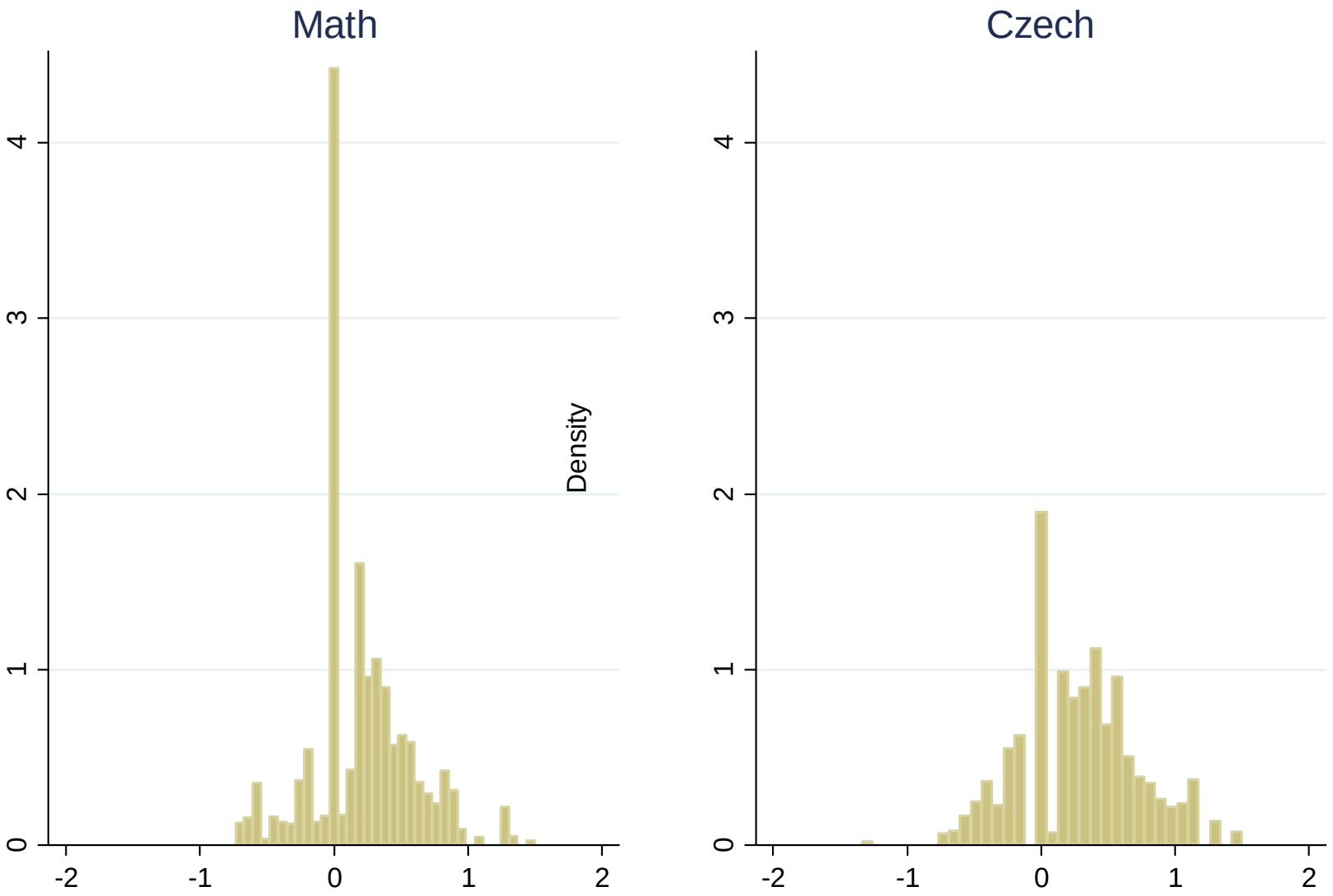
Gender biased grading (GBG)

- Different grading in comparison with real knowledge from test scores between girls and boys within class

$$GBG = (\text{bias in grading})^{Girls} - (\text{bias in grading})^{Boys}$$

  - on class and subject level
  - i.e. positive GBG indicate girls are more in favor of teachers (in comparison with test scores) than boys

Gender bias grading



Gender bias grading

Dependent variable: *Probability to apply*	Gender bias in grading	
	Math	Czech
Girls	-0.051**	-0.044**
	(0.025)	(0.021)
Boys	-0.013	-0.028
	(0.022)	(0.020)

- The higher gender differences in grading the lower the probability to apply – significant effect only for girls

Discussion

- Teachers biases the grades – girls get usually better grades than boys in both, math and Czech
- For application behavior, grades are more important than test scores (except grades in Czech for girls)
- Higher gender biased grading within class significantly decrease the probability of application to selective schools for girls
- Extension: effect on admission rate