Gender Differences in School Achievement: a Within-Class Perspective

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Introduction

The investigation of gender differences in mean achievement has extensively focused on possible variability in the direction and magnitude of the gender gap between populations and subpopulations of children.

The gender gap has been uniformly defined at the population or subpopulation level across schools and classes, ignoring the environment where the learning process takes place, that is, the classroom.

Introduction

Examples

"In the PISA 2009 reading assessment, girls outperform boys in every participating country by an average of 39 PISA score points"

"On average across OECD countries, boys outperform girls in mathematics by 12 score points"

OECD (2010), *PISA 2009 Results: Executive Summary*

Introduction

The Problem

Total, across-school and -class mean results may misrepresent the within–school and within-class reality and obscure its variability, and are likely to lead to mistaken conclusions, in particular the “ecological fallacy”.

Introduction

“The established methods [...] have generated false conclusions in many studies when used to investigate multilevel phenomena and the key sociological units namely, the classroom and the school, have been ignored”

(Raudenbuch, 1986)

Introduction

Asking the right question at the right level is [...] important for reaching the right conclusions about the educational reality.

(Cronbach, 1976)

Introduction

We suggest that, in co-educational systems, investigating the variability of within-class gender differences in achievement is important on both theoretical and statistical grounds.

Method

Database

The 5th grade students on the GEMS achievement tests, administered by the Ministry of Education in 2006.

The database includes 662 schools, 1430 classrooms and 37,861 students.

- 1/3 of the classrooms and 30% of the students studying in those classrooms are Arab-speaking
- All the classrooms included in the 2006 GEMS database are coeducational

Method

Statistical Analysis

We defined the standardized within-class mean gender difference in test score between boys and girls, d_j, as

$$d_j = \frac{M_j^b - M_j^g}{S_{wj}}$$

- M_j^b is the boys' mean raw test score in class j,
- M_j^g the girls' mean raw test score in class j,
- S_{wj} the pooled within-gender standard deviation of the raw test scores in class j.

Method

Statistical Analysis

$$d_j = \frac{M_j^b - M_j^g}{S_{wj}}$$

- A d_j was computed for each of the four achievement tests included in GEMS: Mathematics, Science, English and Native Language (NL)
- Positive d_j values indicate higher mean achievement for boys and negative d_j values indicate higher mean achievement for girls

Method

Statistical Analysis

$$d_j = \frac{M_j^b - M_j^g}{S_{wj}}$$

- d_j is independent of the metric of the particular test and fully comparable between tests
- A d_j value is defined as "noticeable" if it exceeds 0.5 in absolute value (Cohen, 1988)
- d_js were not weighted by n

Objectives

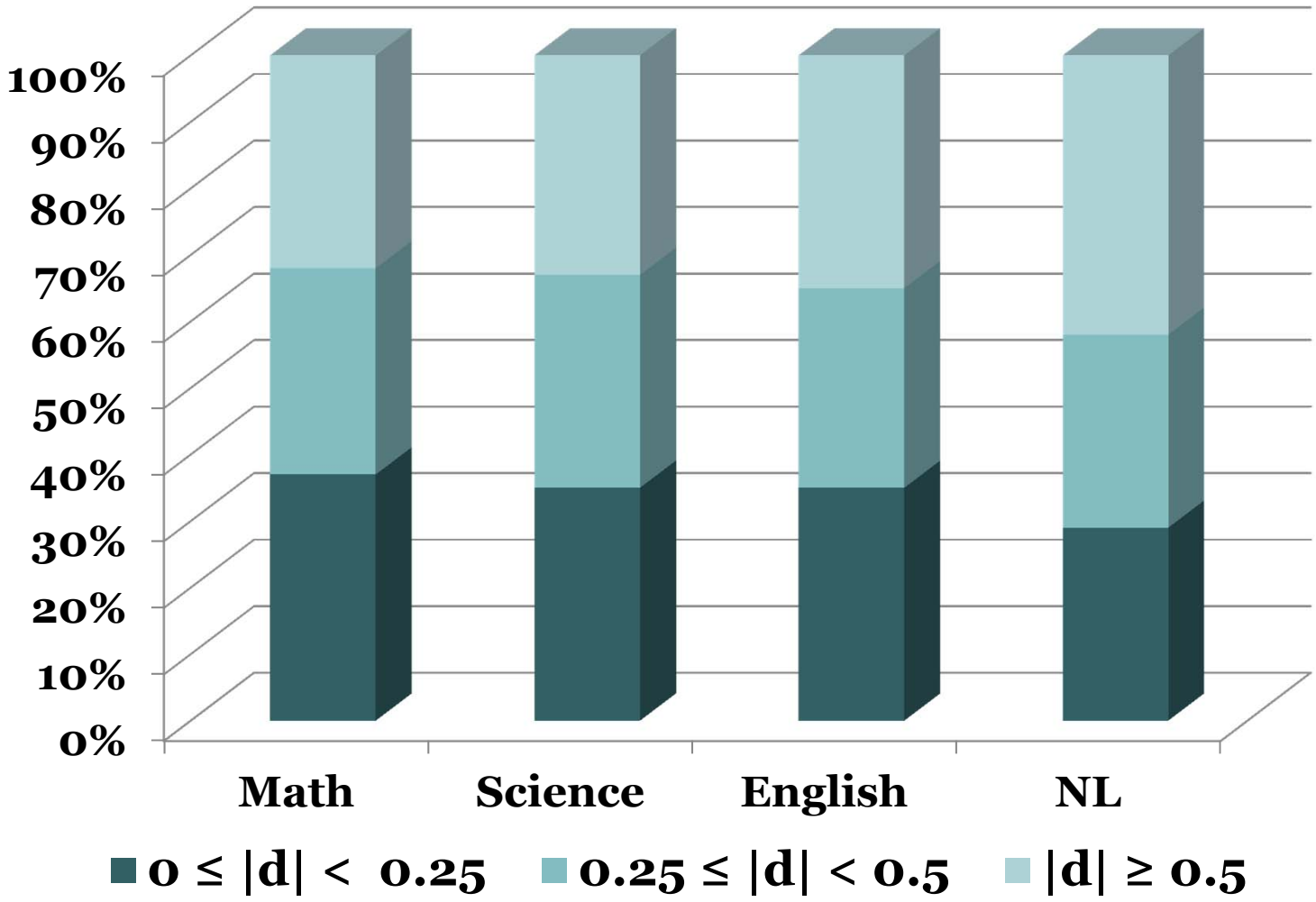
I. Estimation of the variability of d_j

II. Estimation of the stability of the within-class gender gap in achievement

III. Estimation of the within-school and between-school components of the d_j variability

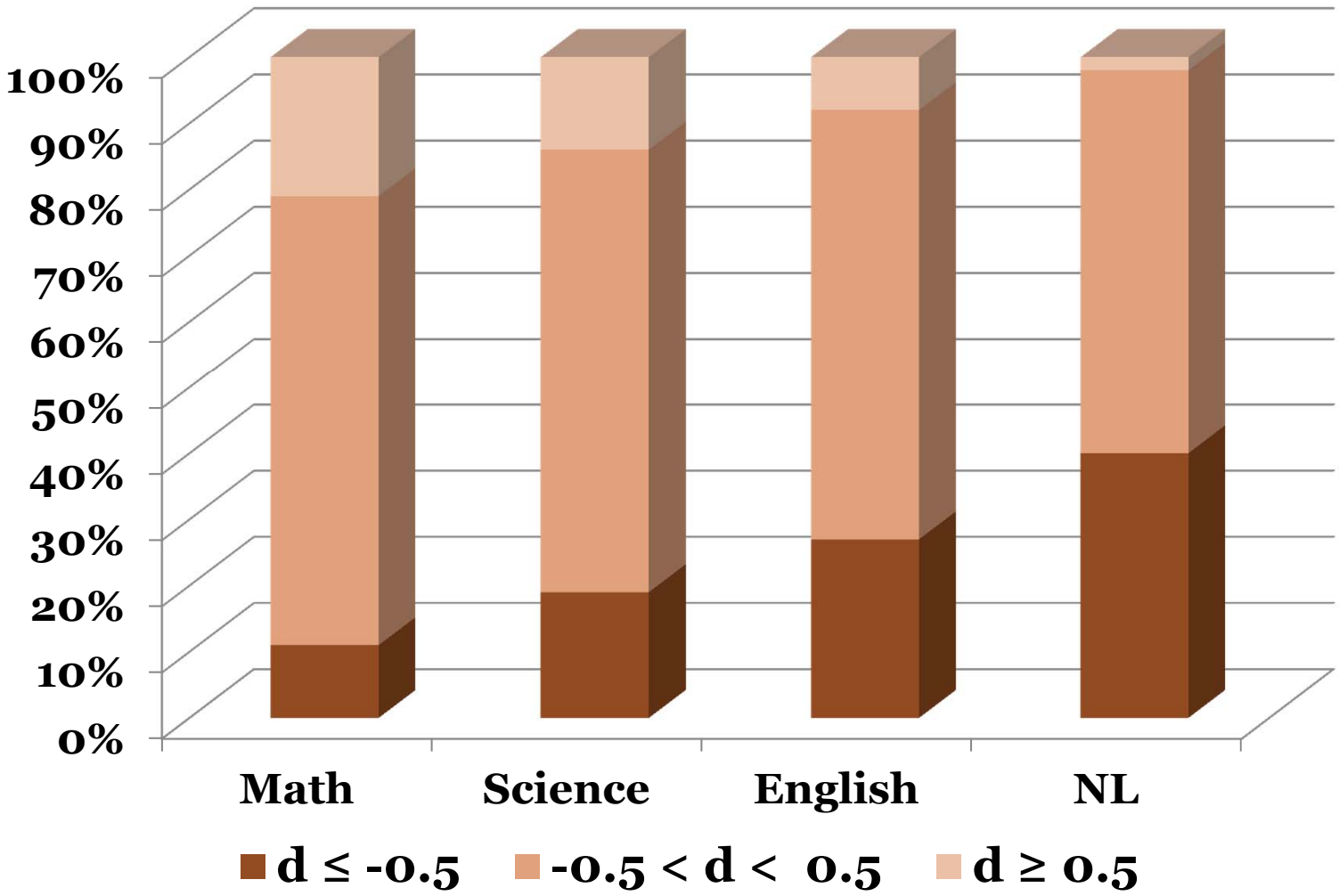
Results

The variability of d_j



Results

The variability of d_j



Results

The variability of d_j: conclusion

Considerable between-class variability of d_j in terms of both sign and magnitude found for each of the four tests.

Results

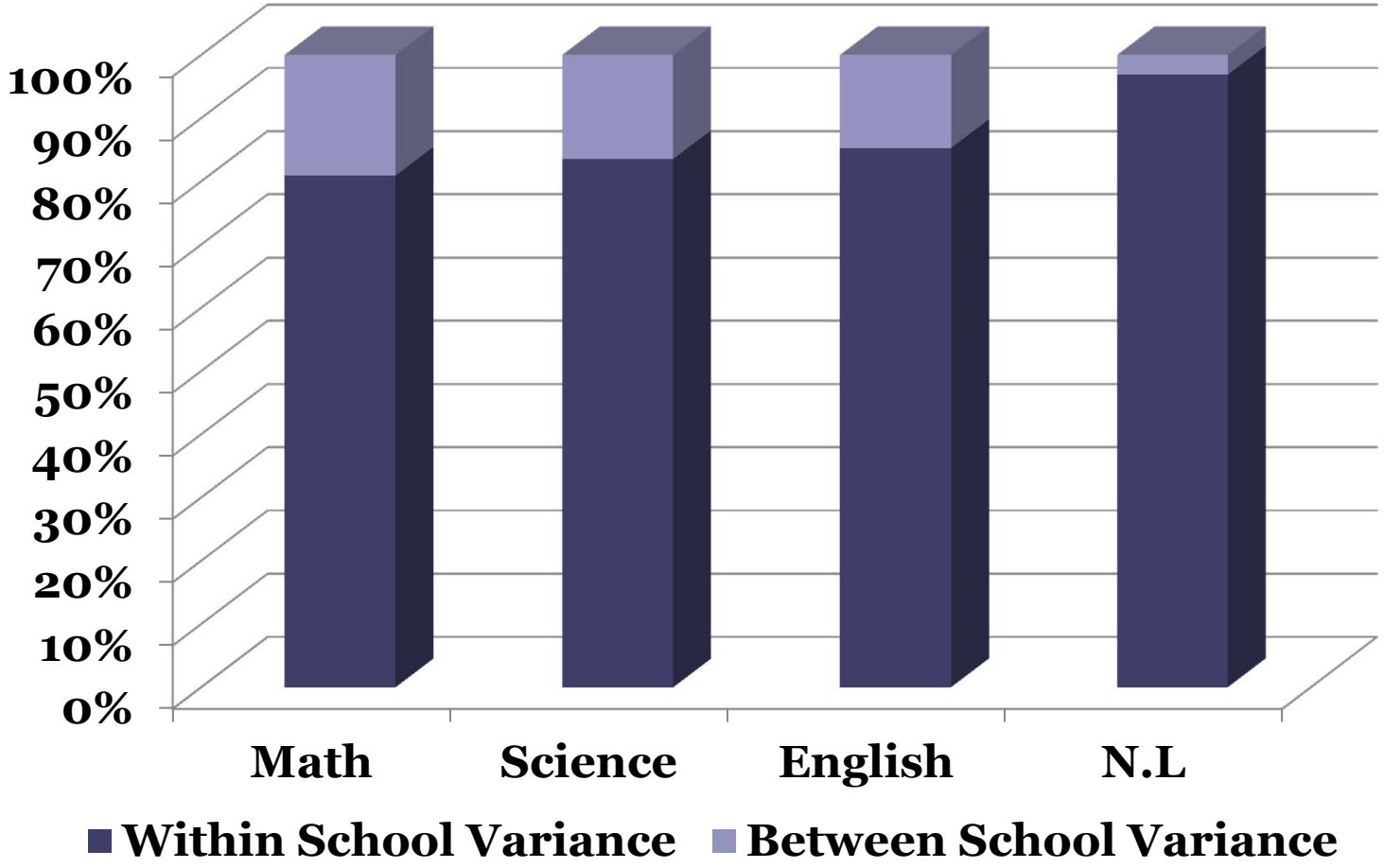
The across-subject stability of d_js

	Math	Science	English
Science	.58		
English	.51	.47	
NL	.52	.50	.46

Substantial across-subject consistency of the within-class mean gender differences

Results

Percentages of total d_j variance lying within and between schools by test (ICC, estimated by HLM)



Conclusion

I. High variability of the d_j: children studying in different classes are exposed to different, sometimes quite opposite, gender differences. This variability would have been masked by the aggregate-level analyses.

Conclusion

II. The within-class mean gender differences are relatively stable across subject-matters (sizeable correlations between d_j for various subject-matters) suggesting that the within-class gender difference in achievement is a general characteristic of the classroom.

Conclusion

III. The lion's share of the d_j variability lies within - rather than between - schools, suggesting that accounting for this variability should focus more on class, rather than school, characteristics.

Future Directions

- Looking for correlates which could account for the d_j variability

- Examination of the d_j variability between subsystems (e.g. Jewish/Arabs)

Thank You!