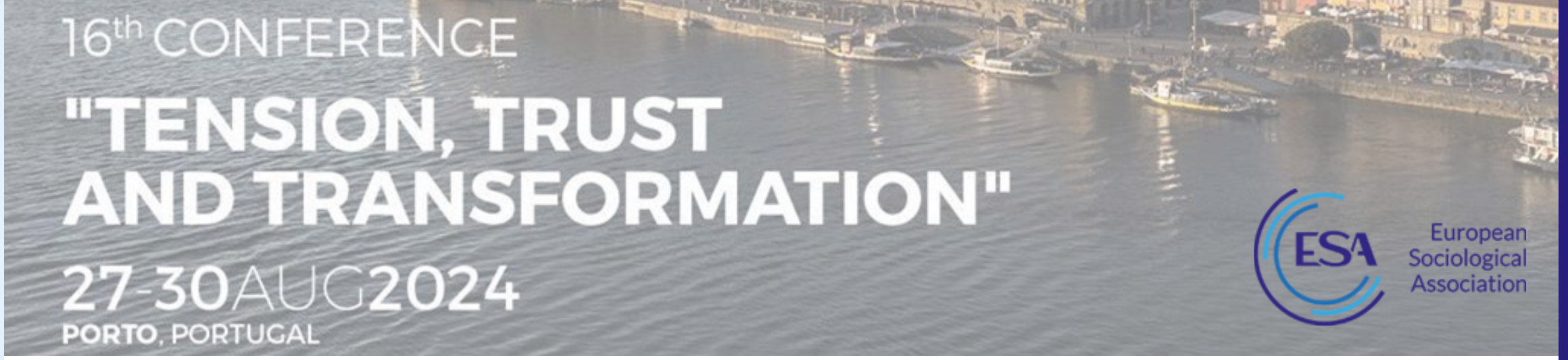

Gender Gaps in Mathematics and Reading

A Comparison Across Socio-Educational Contexts in Europe

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Introduction

Gender Gaps: A contextualisation

- Gender gaps in Maths and Reading performance emerge and widen throughout compulsory education (Fryer & Levitt, 2010; Lindberg et al., 2010).
- However, little attention has been paid to the drivers of gender gaps in primary school. Most international comparisons have focused on PISA data (15yo students).
- Large variation in educational gender gaps between countries, partially explained by societal gender equality (Nollenberger et al., 2016; Gevrek et al., 2020) and characteristics of education systems (standardisation, tracking…) (van Hek et al., 2019; Hermann & Kopasz, 2019; Bodovski et al., 2020; Scheeren & Bol, 2022).
- Still scarce evidence about the role of schools in moderating these gaps (Legewie & DiPrete, 2012).

How can we explain gender gaps in primary school and their variation in the European context?

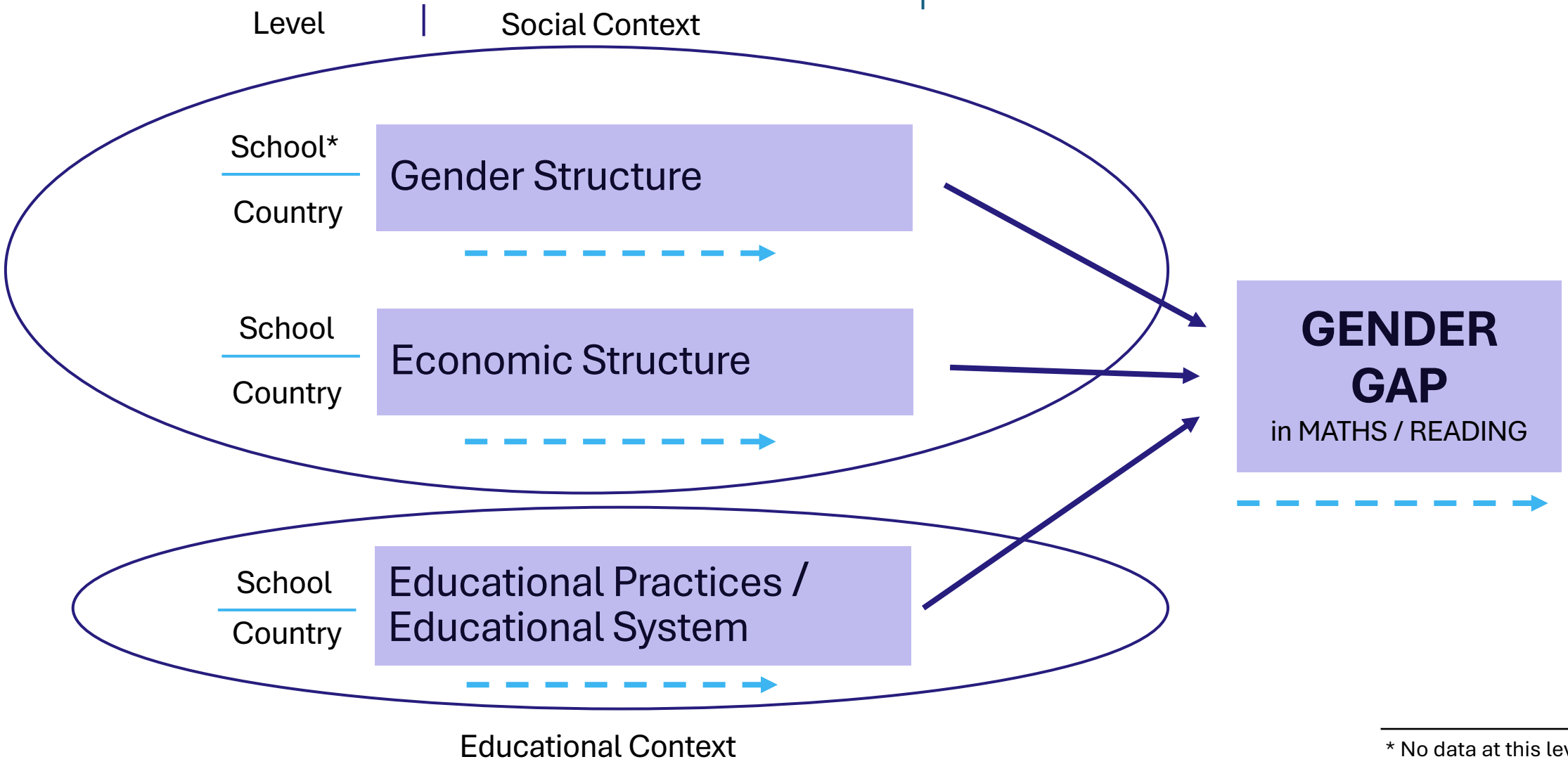
Data & Methods

- Multilevel Linear Models (**MLMs**) with Gender Random Slopes at School and Country Level
  - Cross-level interactions to identify moderators of the gender slopes in Maths and Reading (gender gaps).
- Data from TIMSS & PIRLS assessments (IEA, 2020, 2023).
  - N = 95,000 - 105,000 4th Grade students in 27 European countries

Gender Gaps

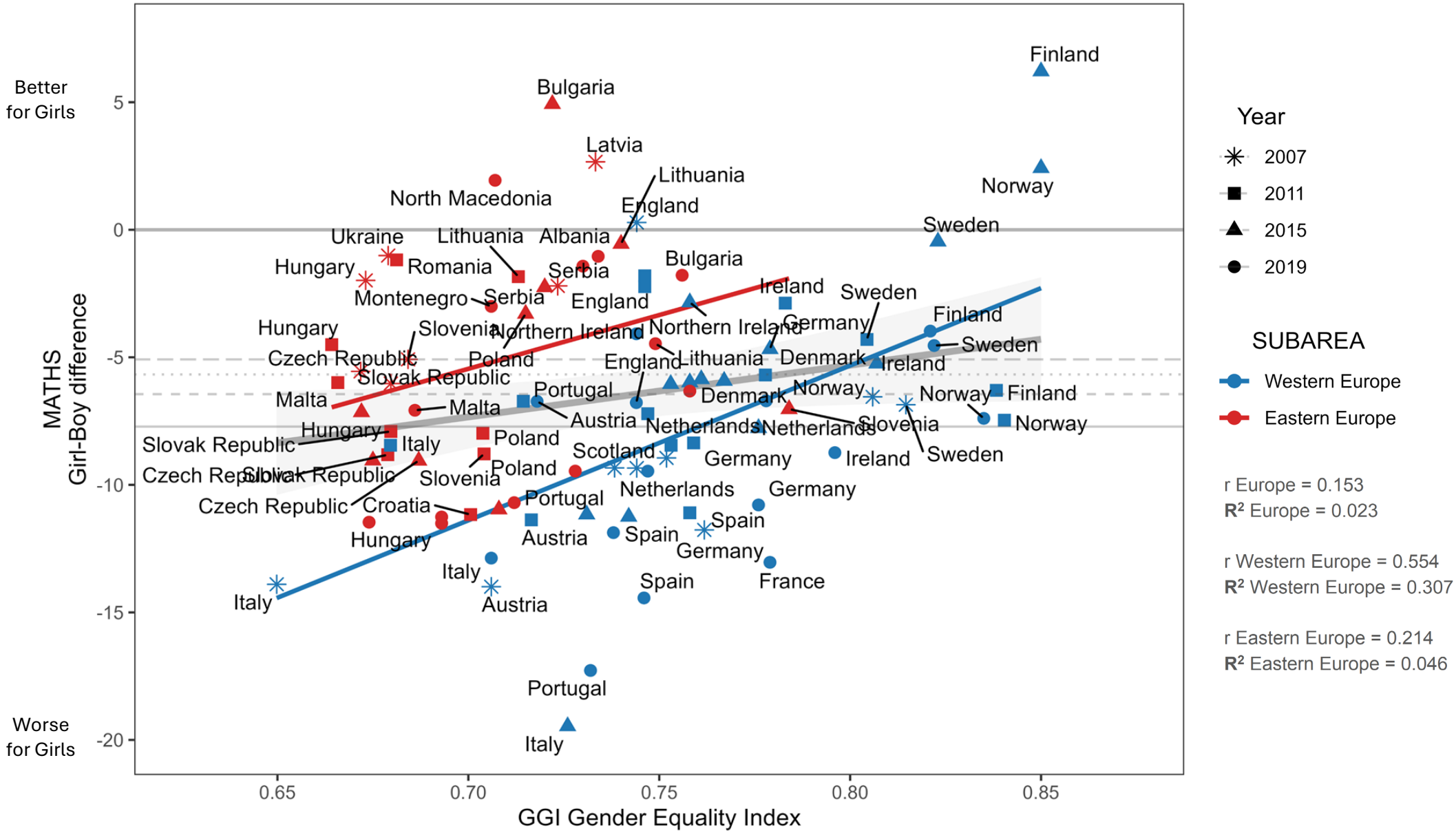
Hypothesis

Gender Gaps being moderated by social and educational context at different levels



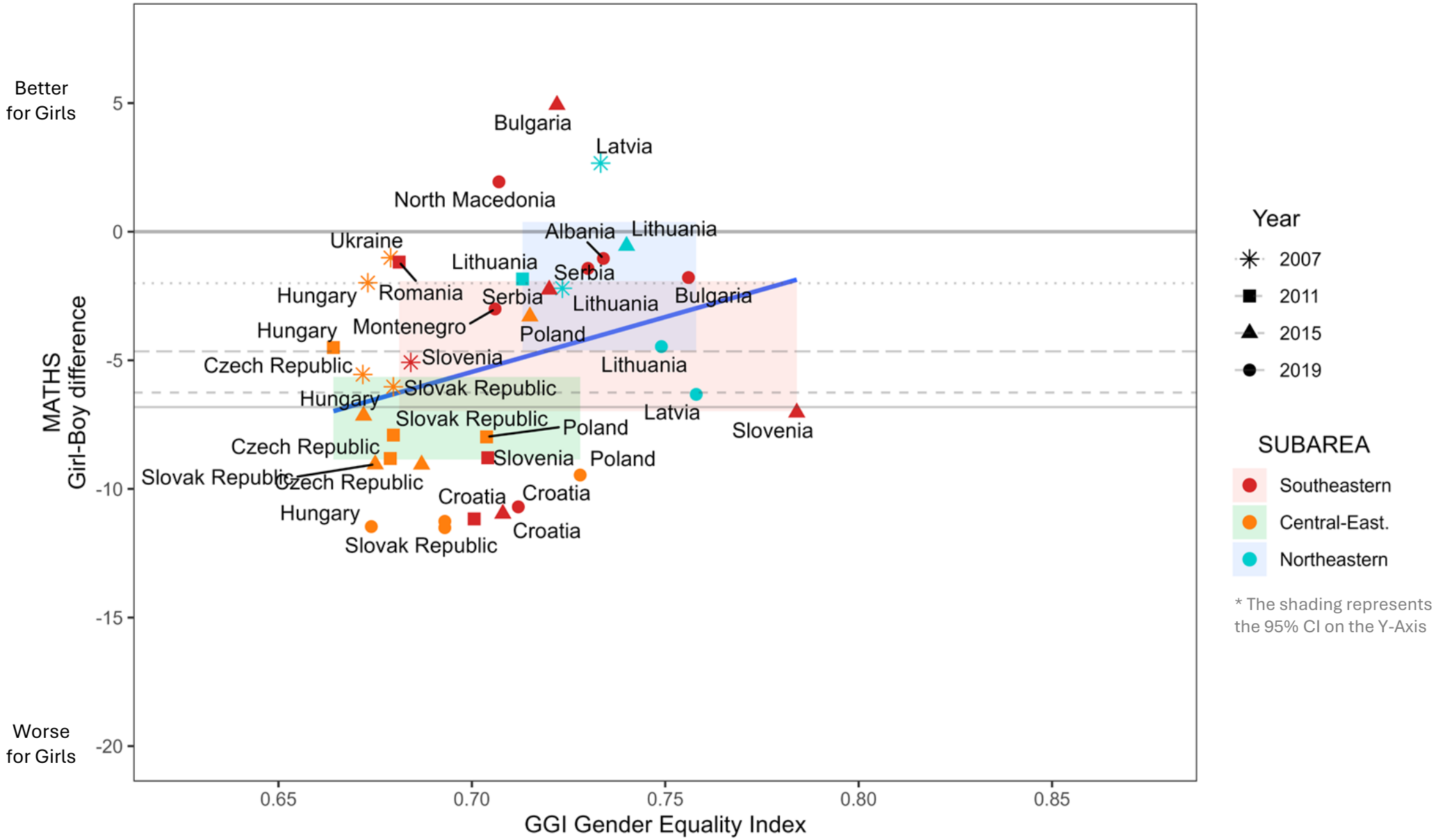
* No data at this level

Fig. **Gender Gaps (MATHS 4th Grade): Europe**



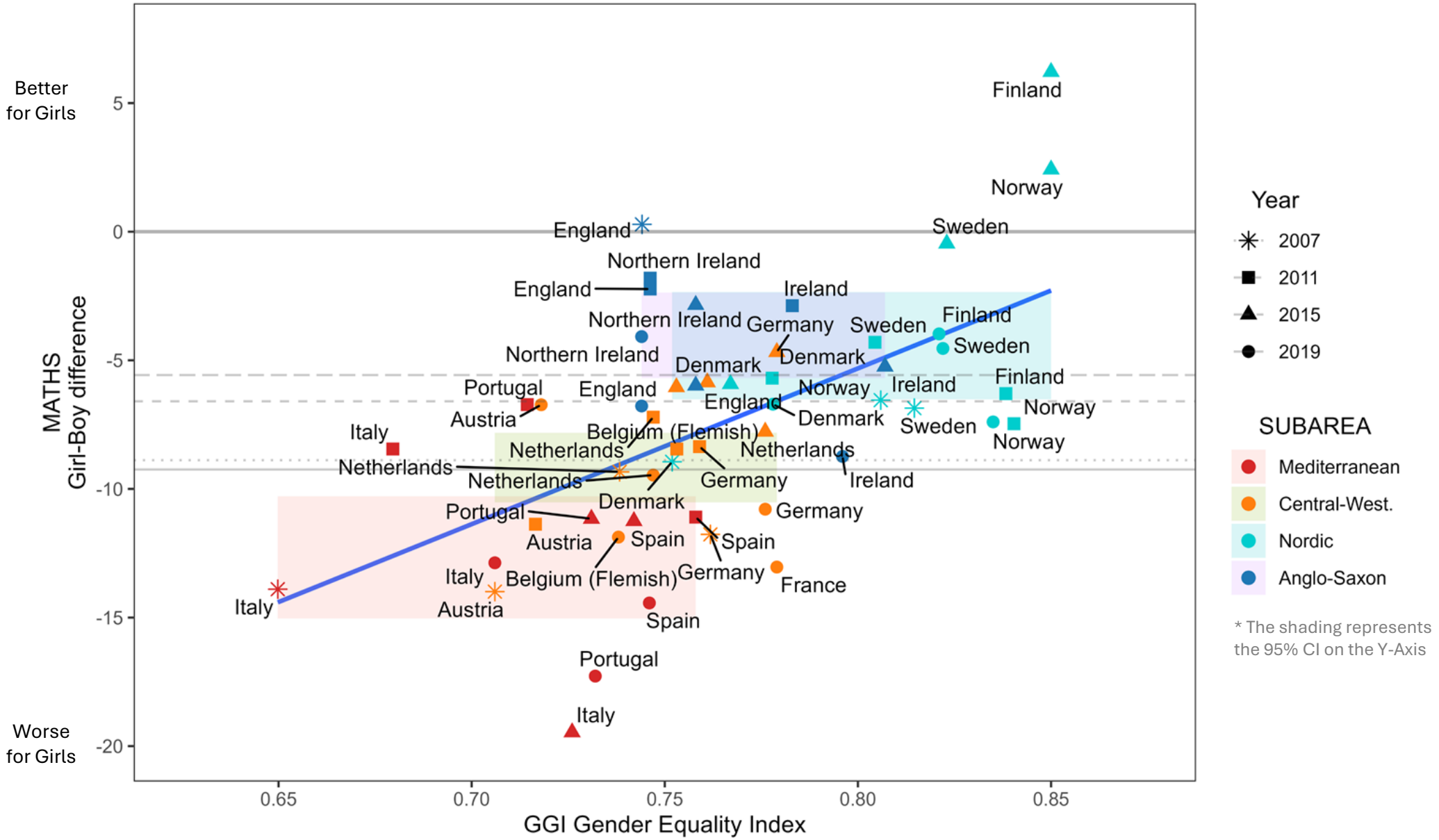
Own elaboration from TIMSS microdata (IEA, 2008, 2012, 2016, 2020)

Fig. **Gender Gaps (MATHS 4th Grade): Eastern Europe**



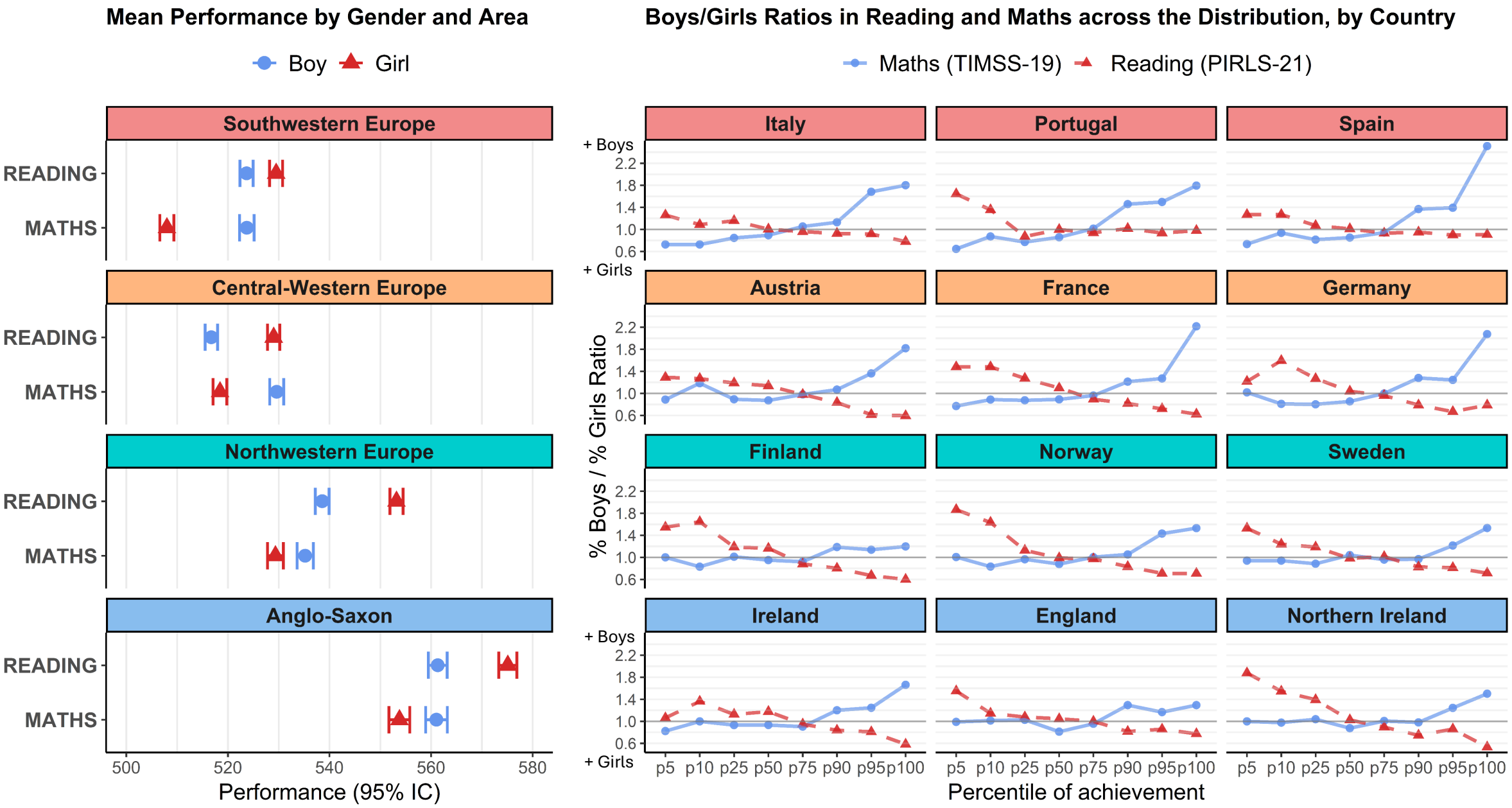
Own elaboration from TIMSS microdata (IEA, 2008, 2012, 2016, 2020)

Fig. **Gender Gaps (MATHS 4th Grade): Western Europe**



Own elaboration from TIMSS microdata (IEA, 2008, 2012, 2016, 2020)

Figs. **Gender Gaps by Subareas in Western Europe**



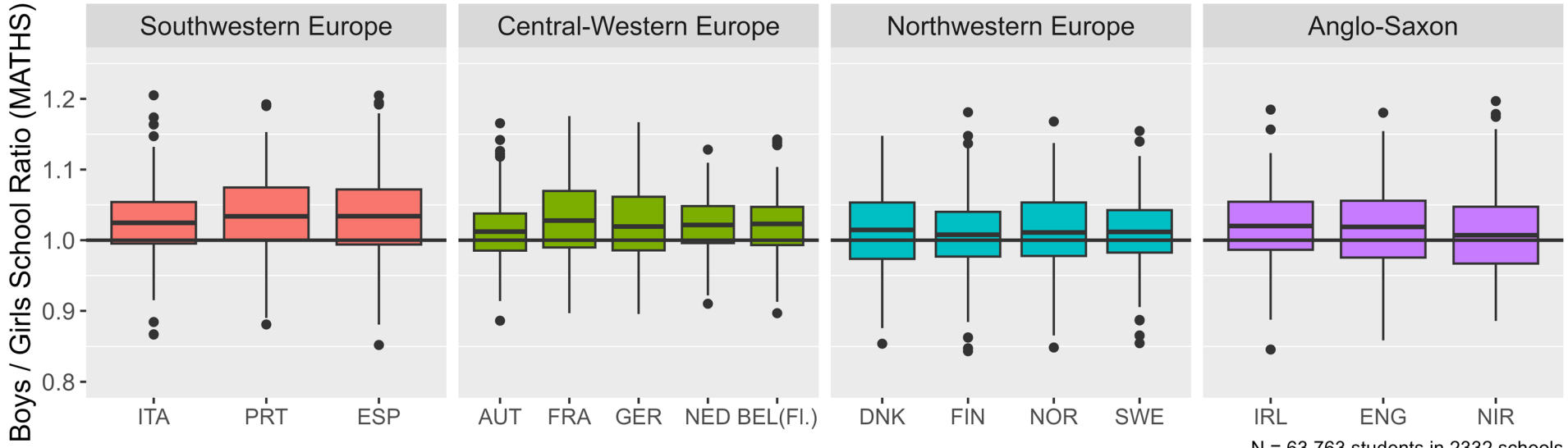
Own elaboration from **TIMSS-2019** and **PIRLS-2021** microdata (IEA, 2020, 2023)

Within-School Gender Ratios of Performance

MATHS

How many schools where girls perform better than boys in MATHS?

Southern Europe =~ 25% Northern Europe =~ 50%

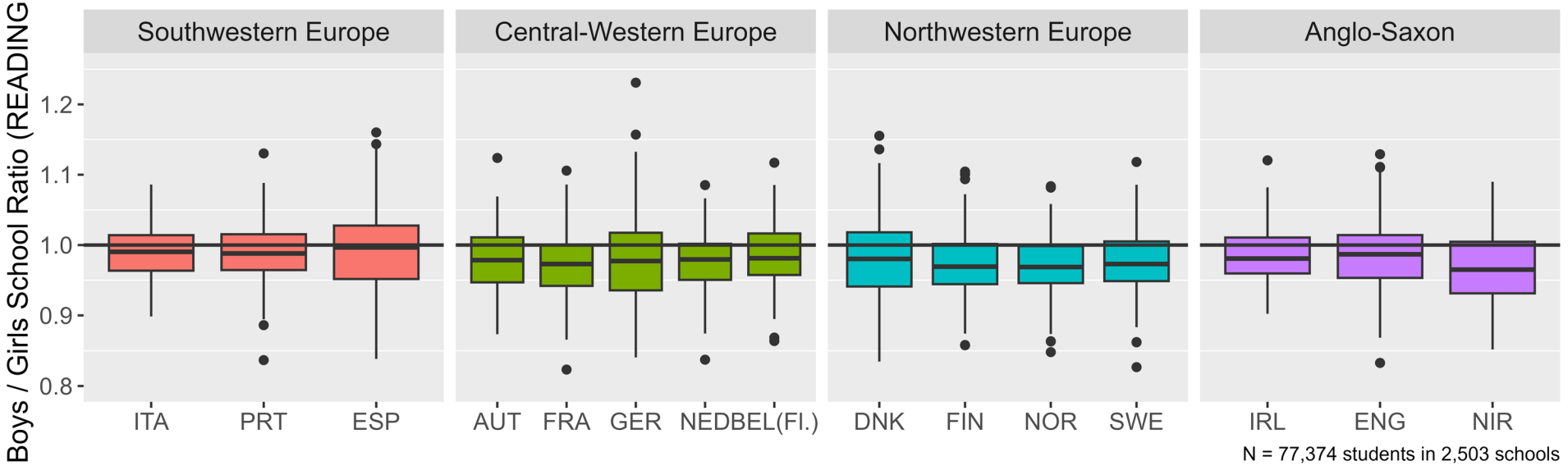


N = 63,763 students in 2332 schools

READING

How many schools where girls perform better than boys in READING?

Southern Europe =~ 50% Northern Europe =~ 75%



N = 77,374 students in 2,503 schools

Own elaboration from **TIMSS-2019** and **PIRLS-2021** microdata (IEA, 2020, 2023)

Multilevel Linear Models

MLM. Western & Eastern Europe

FIXED EFFECTS	MATHS	READING
(Intercept)	507.15***	487.18***
Gender: Girl	-17.27***	11.38***
Interactions		
Girl × Student SES	-2.07**	-0.20
Girl × School SES	-5.21***	0.53
Girl × Country SES	-7.72*	-2.52
Girl × Gender Equality Index (GGI)	4.95***	4.81***
Girl × Eastern Europe	6.05*	9.37**

Controlling by: SES, Immigrant Status, School SES, % Girls in School, % Immigrant Students, Country SES, GGI, Area (Western vs Eastern Europe)

RANDOM EFFECTS		
Random Intercept - Gender Random Slope Correlation		
At School Level	-0.33	-0.47
At Country Level	-0.23	-0.34
% Gender Random Slope Explained		
At School Level	39.8%	4.5%
At Country Level	87.9%	91.7%

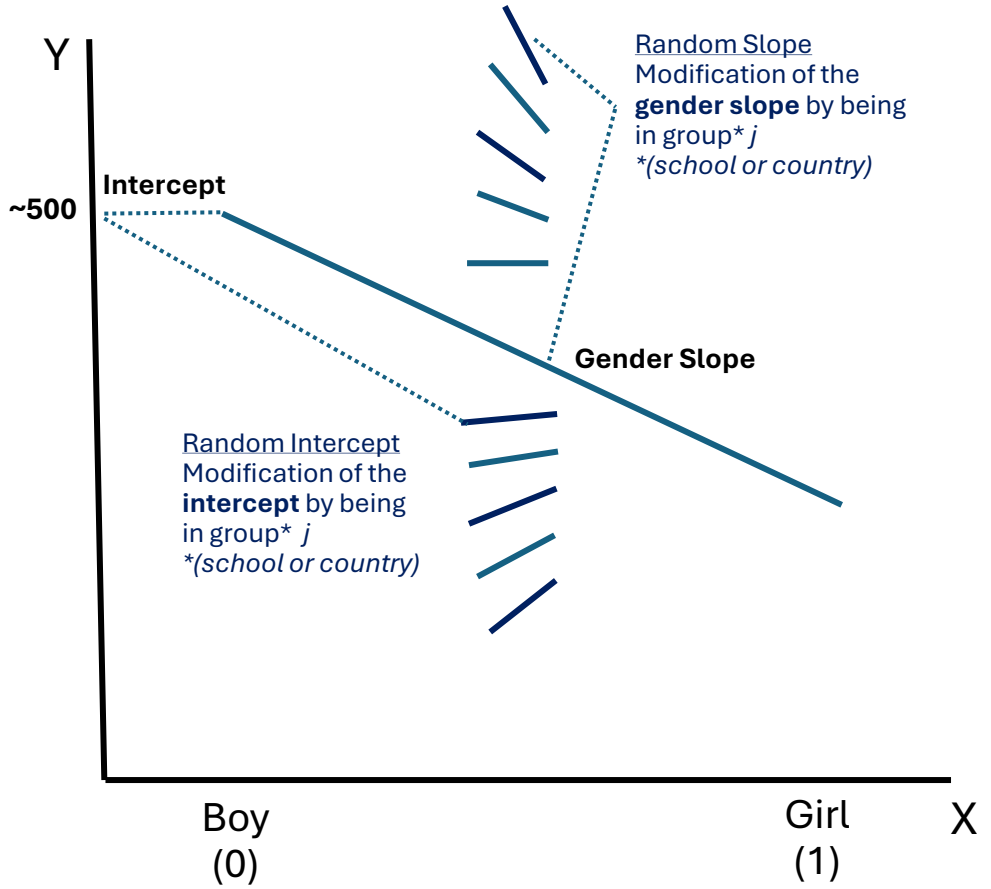
STAGE-2 MODEL

LM on ***Country-Level Gender Random Slope (DV)*** *by Country SES, GGI and Area (IVs at Country-Level)*

R2	0.385	0.330

Fictional Example of a MLM with Random Slope (RS) and Random Intercept (RI)

-With negative slope for girls (case of MATHS)
-And negative correlation between RS and RI



Summary

Main Findings

- Larger Gender Gaps to the detriment of girls in **Southwestern European Countries**, smaller in the **North-West**.
  - only **25%** of **schools with girls performing better than boys in mathematics** in **Mediterranean** countries, compared to almost **50%** in **Northwestern** Europe).

- In Europe, **greater societal gender equality** is associated with better girls' overall outcomes.
  - This pattern is not found in other settings, where the effects of SES or average performance seem to predominate.

- Conversely, **higher country- and school-socioeconomic status** are associated with lower mathematics achievement for girls relative to boys.
- Boys' overall performance increases more than girls' in schools and **countries with higher average performance**.
  - In **Western Europe**, and only at the country level, these patterns are reversed or mitigated, possibly because of the contrast between Mediterranean and Nordic countries.

Summary

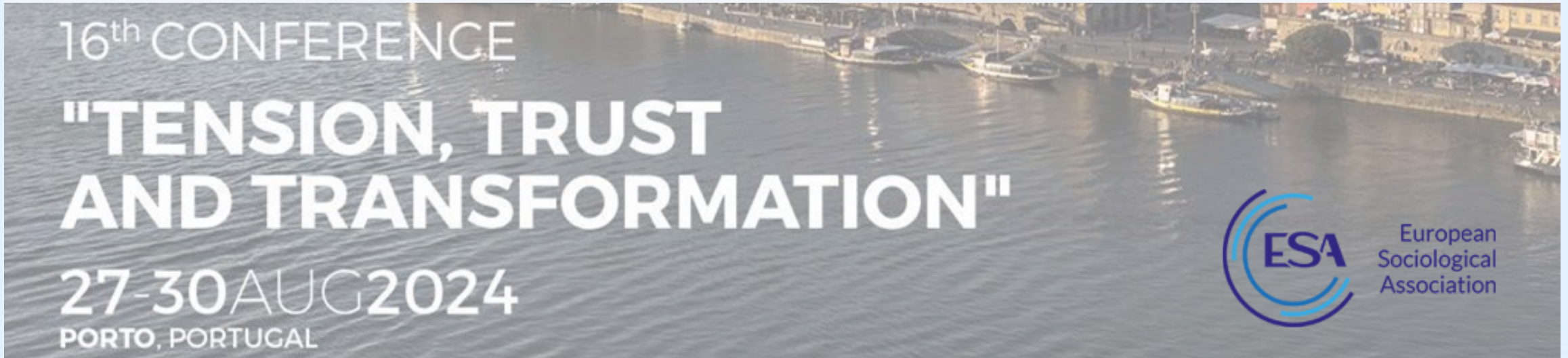
Implications and Future Considerations

- The *Gender Stratification Hypothesis* (Baker & Jones, 1992) becomes more robust in countries that are more developed in terms of gender equality. But alternative explanations are needed outside these contexts.

- **Gender gaps are dependent on the socio-educational, but also socioeconomic context**. This suggests a greater sensitivity of boys to the school social context, but it can also be understood as a greater resilience of working-class girls.
  - What are the dispositions, motivations and expectations of working-class girls and their families that promote their school engagement ?

- **What specific education policies or school practices contribute to reducing gender gaps**? How to generate favourable socio-educational contexts to reduce the achievement gaps between boys and girls?
  - What happens with boys and reading? Can specific policies aimed at encouraging their interest in reading reduce gender gaps in this area?

Thanks for your attention



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