MATH GENDER GAP ACCORDING TO SOCIO-ECONOMIC BACKGROUND IN ITALY:

THE BETTER THE CONDITIONS THE LARGER THE GAP?

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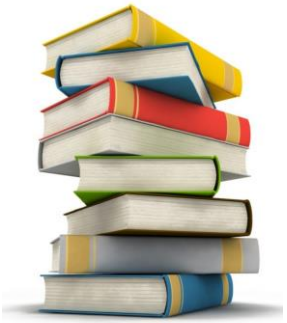
THE "INVALSI APPROACH"

STRONG FAMILIARITY
WITH DATA AND THEIR
POTENTIALITY

LIMITED IN DEPTH
KNOWLEDGE OF THE TOPIC



SIGNIFICANT (APPARENTLY INTERESTING)
RESULTS
IN NEED FOR MORE INTERPRETATION

THE IDEA BEHIND THE WORK

Agenda 2030 for sustainable development of United Nations:

GOAL 5 . Gender Equity

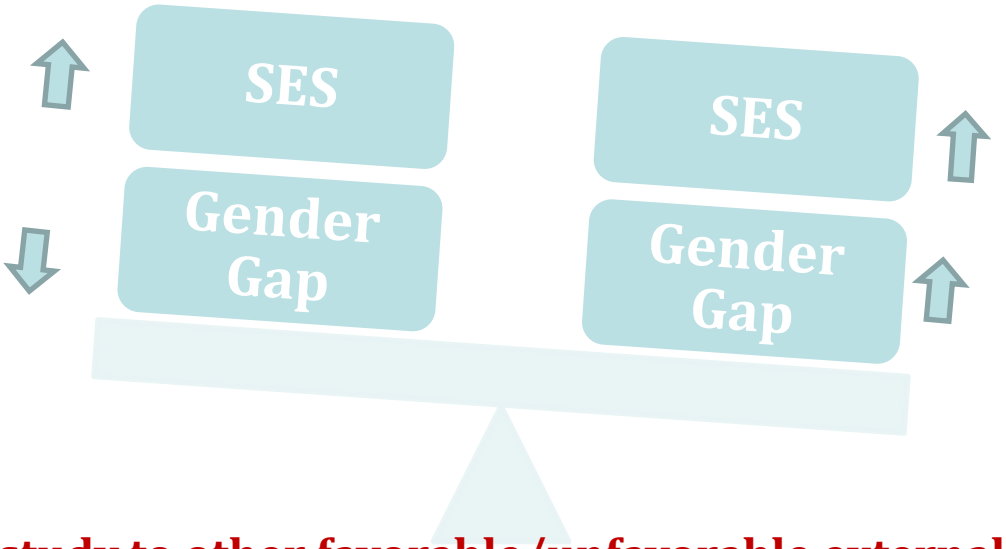
Interaction effects of gender gap with other sources of disadvantage

INITIAL RESEARCH QUESTIONS:

– does gender gap decrease when SES status is higher?
– is this effect constant over time?

ROLE OF SOCIO ECONOMIC BACKGROUND ON GENDER GAP

Expectations	Empirical Evidence



BROADEN this study to other favorable/unfavorable external conditions.

DATA and METHODOLOGICAL CHOICES

INVALSI Population Data for 5th grade Math → Cumulative advantage process

Decade 2009-2010 / 2018-2019 → Trend over time

Academic achievements measured by:

- Percentage scores
- WLE scores

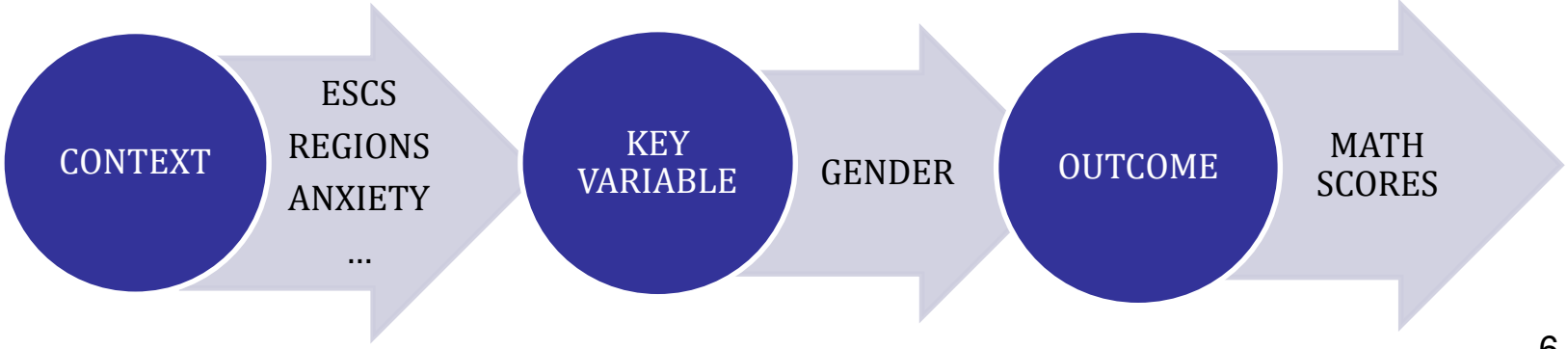
SES measured (alternatively) by:

- ESCS index
- Mother's educational attainment

2017-2018 maximum gender gap → focus

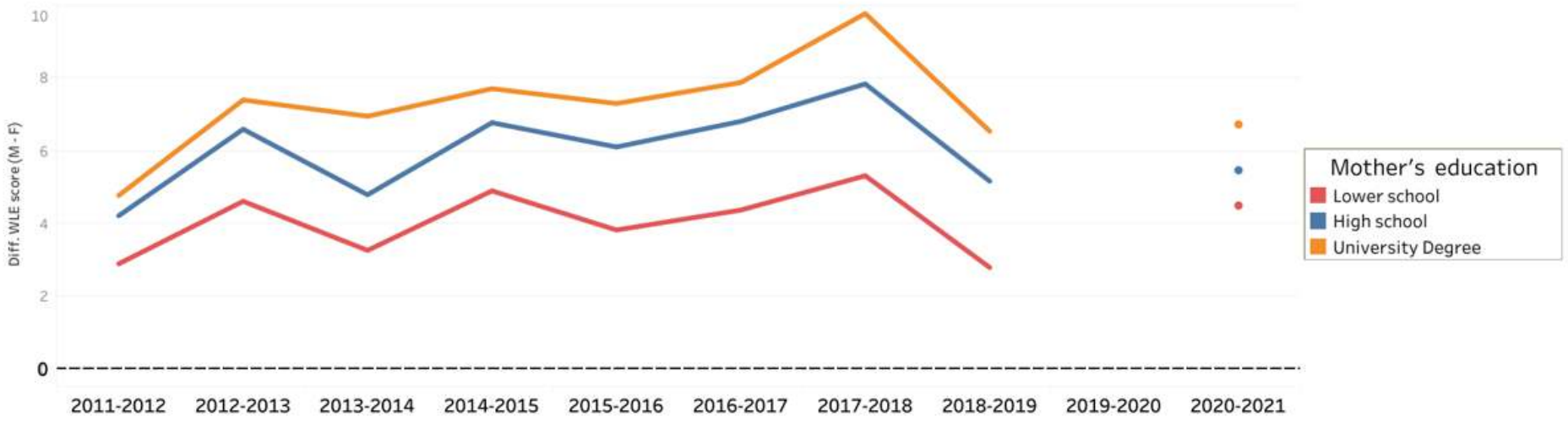
OUTLINE OF ANALYSIS

1. ***Trend of Gender Gap*** by SES over the decade 2009-2010 / 2018-2019
2. ***Geographical Map*** of Gender Gap over Italy (Regions /Provinces)
3. ***Nested Regression models*** for 2017-2018 with:



TEMPORAL TREND OF GENDER GAP ACCORDING TO SES

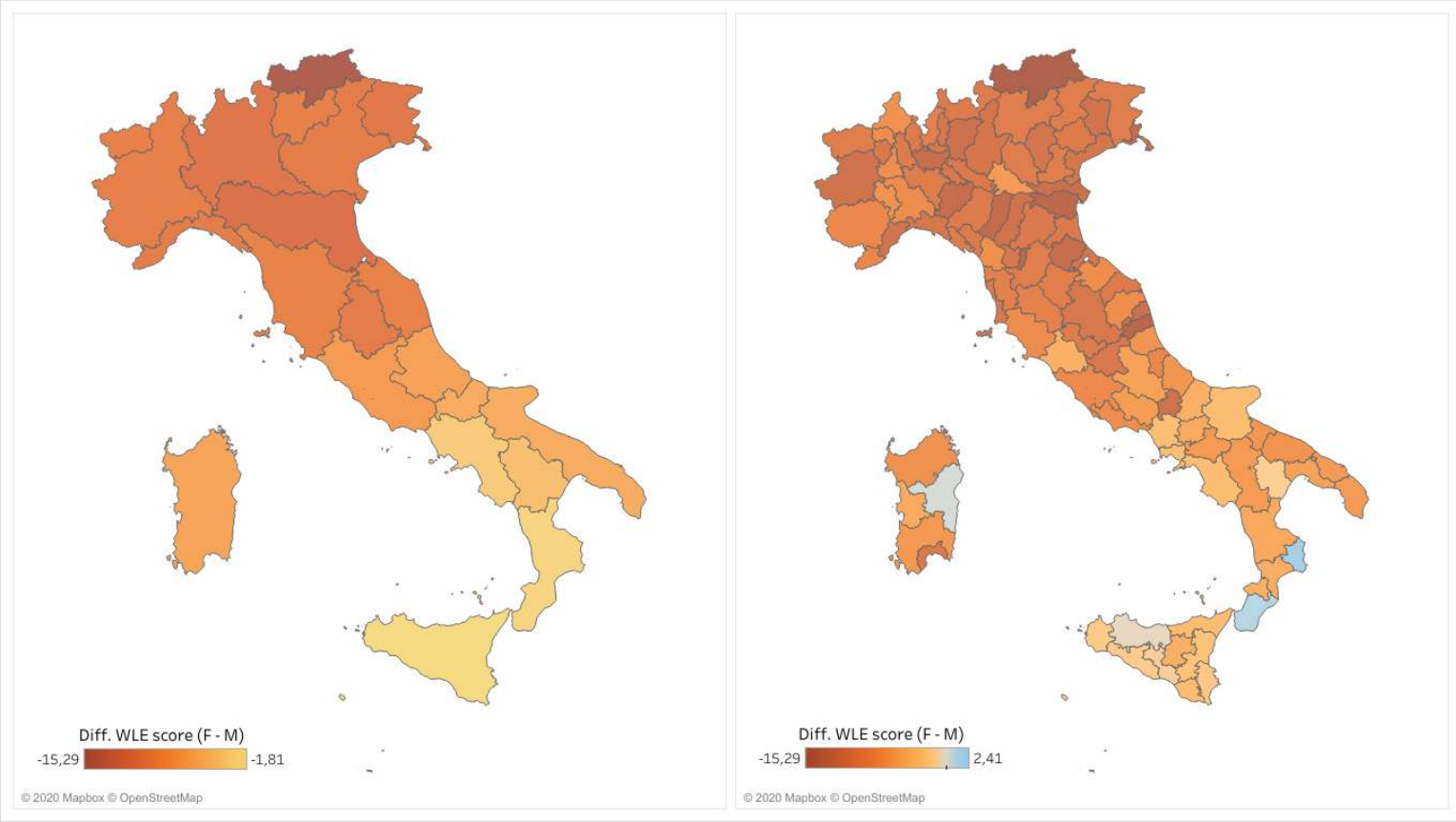
Gender gap by Mother's education from 2011-2012 to 2018-2019 (WLE score)



PERFORMANCE OF STUDENTS WITH TOP ESCS :

BOYS AND GIRLS COMPARED

GEOGRAPHICAL TREND OF GENDER GAP – REGIONS AND PROVINCES



The better the conditions the larger the gender gap in Math.

THE BETTER THE CONDITIONS THE LARGER THE GAP?

Is this true for other beneficial conditions?

Nested Regression models:

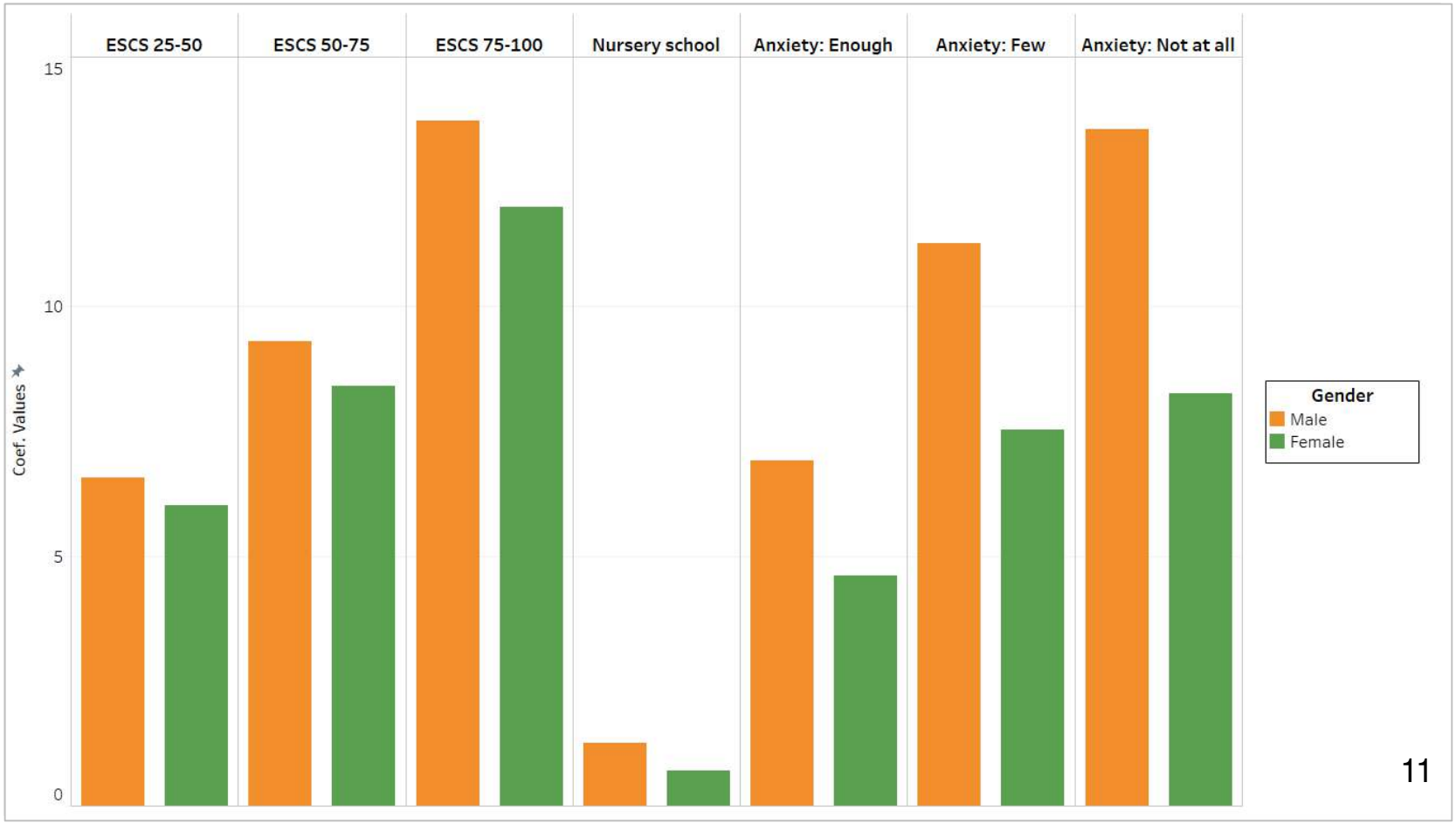
- WLE Math scores *(quantitative) - OUTCOME*
- Gender – KEY VARIABLE
- ESCS quartiles -
- Geographical Area *(North-East; North_West; Centre; South)*
- Attending nursery school *(yes/no)*
- Anxiety before the test *(Not at all; Few; Enough; A lot)*
- WLE scores in G2 *(quantitative)*

Interactions:

Primary effects: beneficial effect for boys

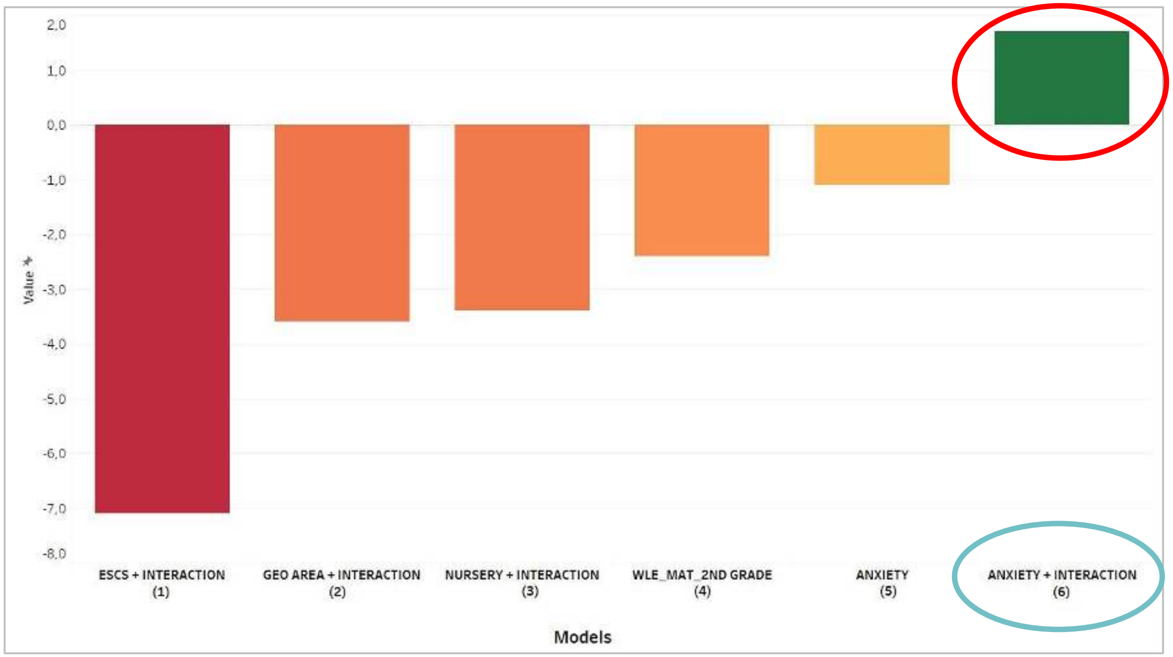
Interaction effects: beneficial effect for girls

NESTED REGRESSIONS: THE REDUCTION OF BENEFITS FOR GIRLS



THE EFFECT OF BEING A GIRL

The coefficient of «girl» is the effect of female gender, controlled for other variables



In Model 6 the coefficient for girls becomes positive (+1.78), reversing the gender gap (girls doing better than boys in math).

In Model 6 the reference category includes all the disadvantages: lowest ESCS, school in the South, no nursery school attendance, high anxiety levels.

TO SUM UP: MAIN RESULTS

- In difficult conditions girls of 5th grade perform better than boys in Math
- As conditions improve boys increase their performances more than girls
- Among TOP PERFORMERS (10% of students with the best results) 62% are males
- The girls advantage osberved in the worst conditions reverse and become disadvantage in more favorable situations

THE BETTER THE CONDITIONS THE LARGER THE GAP:

POSSIBLE EXPLANATIONS

Socio-cultural interpretation:

the influence of the **cultural stereotype** that sees girls "not suited" for Mathematics, is **greater at high levels of performance** (which require more motivation and self-efficacy)

Biological/cognitive interpretation:

Girls overperform boys in difficult conditions: **precision, perseverance, concentration** count the most.

Boys overperform in most favorable conditions: **intuition, propensity to new methods,** alternative approaches count the most

COGNITIVE INTERPRETATION: EMPIRICAL EVIDENCE

Neuroscience:

Brain functioning different, already in 1 year of life (Goldman, 2017)

Gender Gap has specificity:

- Specific items (Cascella *et al.,* 2020)
- Specific Domains: Relation and Functions higher than Statistics

Gender Gap is sensitive to Teaching Methods:

Case – Control studies with classes exposed to new methods

(Di Tommaso *et al.*, 2020)

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THEACHING STRATEGIES AND GENDER GAP

TEACHING MATH:

- Collaborative work
- Proactivity
- Investigative approach
- Treating mistakes as an opportunity
- Peer interactions
- Sharing of ideas
- Problem posing

(Boaler, 2013; Di Tommaso et al., 2020)

GENDER GAP

CONCLUSIONS AND FUTURE PERSPECTIVES

- ✓ Part of Gender Gap can be reinforced or weakened based on the educational methods adopted
- ✓ Changing teaching strategy in a more proactive and cooperative way opens the field to potential significant reductions of gender gap

FURTHER LINES OF RESEARCH:

- ➢ Looking at gender gap in different disciplines
- ➢ Investigating the gender gap at the lowest level of performances (higher impact of disadvantageous conditions on boys?)

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THANK YOU FOR YOUR ATTENTION

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