THE GENDER GAP IN MATHMATICS

PISA 2022 ITALIAN RESULTS

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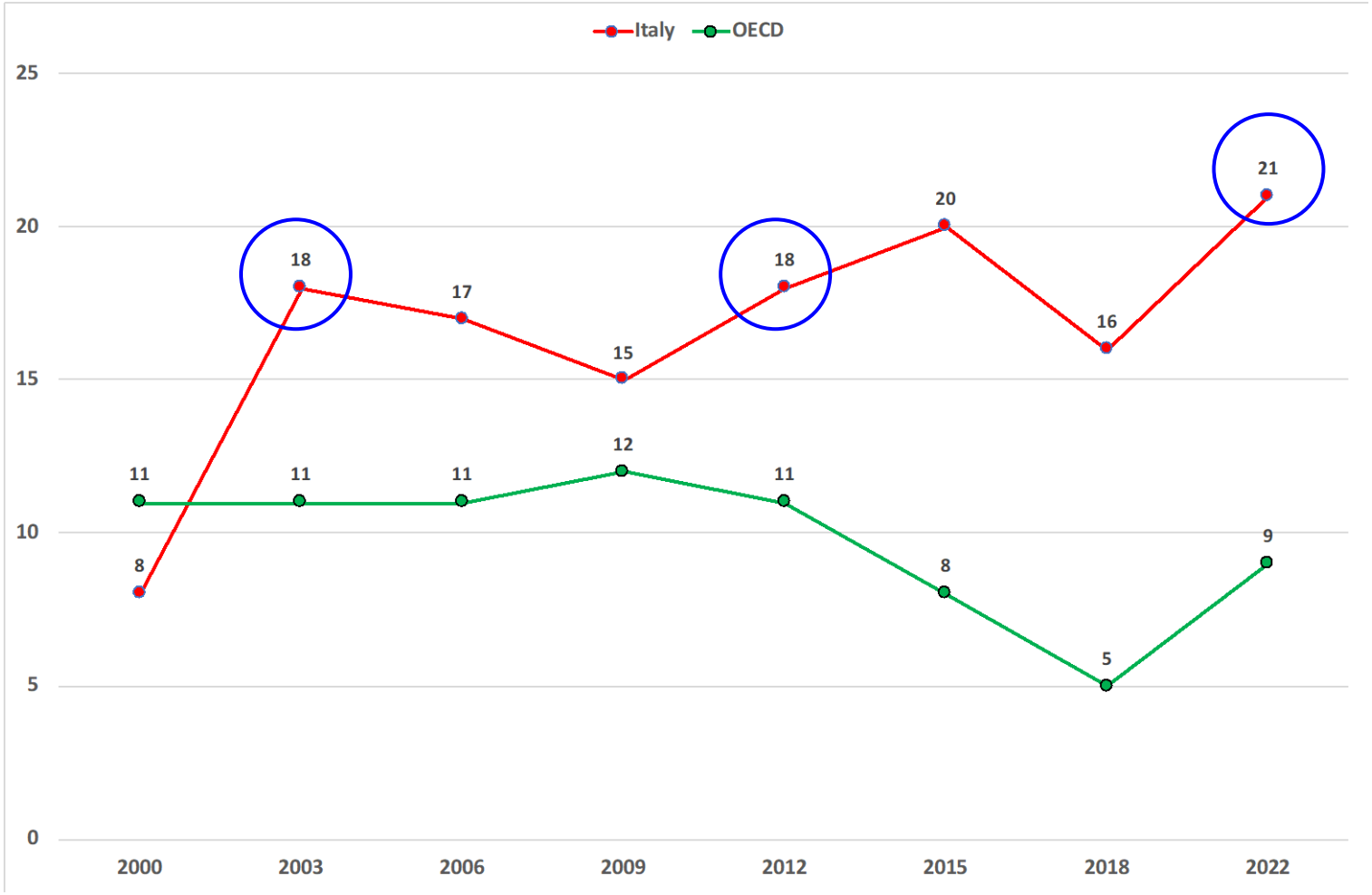
Gender gap in Mathematics performance (M - F) from PISA 2000 to PISA 2022, Italy and OECD average



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Research objectives

1. **To describe the gender gap in PISA 2022 Italian mathematics results**
   - on the overall scales and on the content and process subscales
   - at the national level and by macroarea and type of school

2. To examine **differences by gender in relation to set of social and psychological variables** related to the mathematics performance;

3. To investigate **whether and to what extent** - given the unequal distribution by gender in the different types of upper secondary education, characterised by a different mathematics curriculum - **the gender gap decreases when controlling**
   - for the type of school
   - for other variables affecting mathematics results

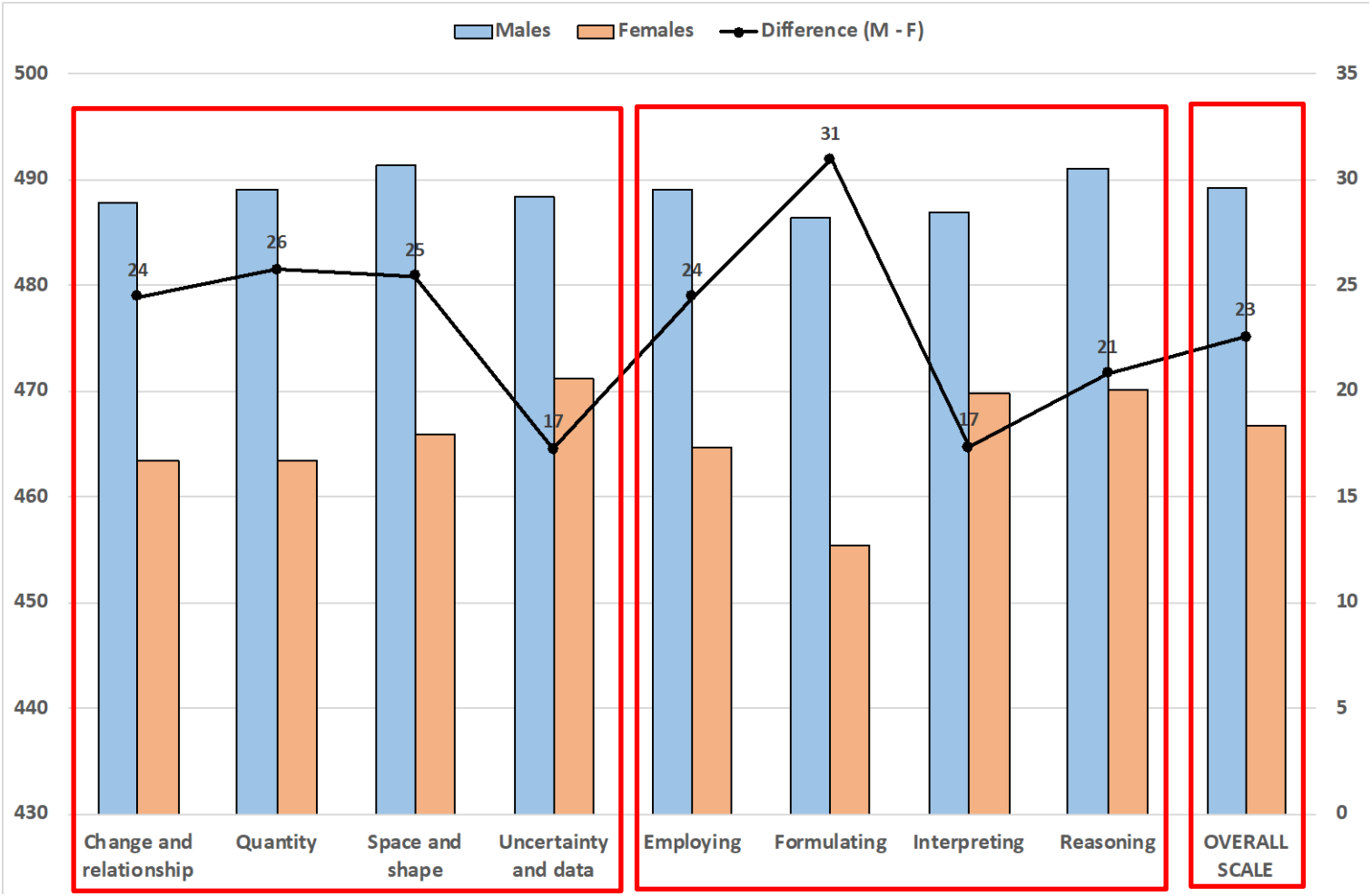
4. To **compare grades and PISA scores** and in particular
   - the school grades obtained in mathematics by boys and girls at the same level on the proficiency scale
   - the average grade and PISA score of boys and girls in each type of school.

Data and Method

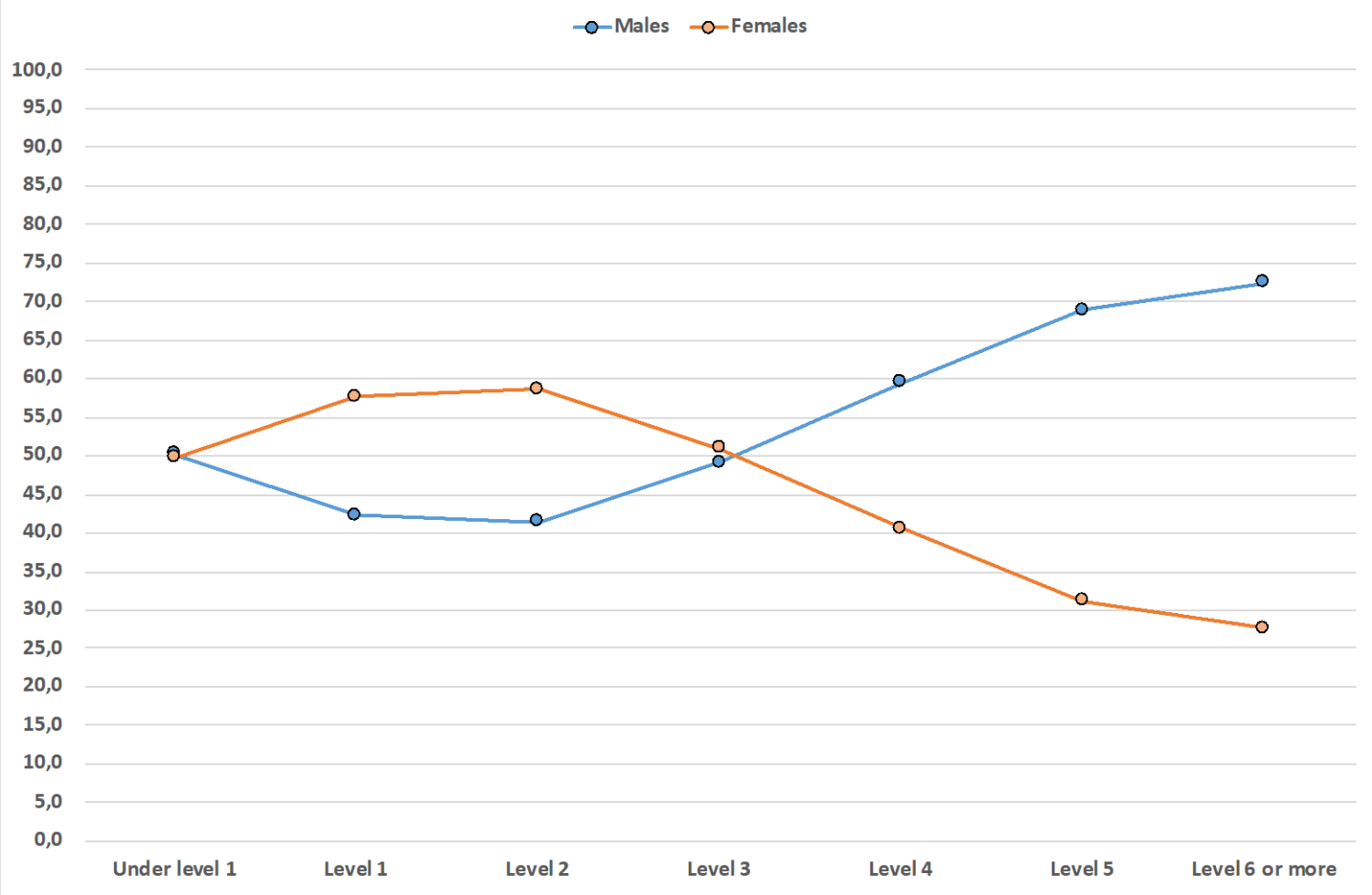
DATA:
PISA scores in mathematics of the students in the PISA Italian sample attending the second grade of secondary school (modal class in Italy) who took both the PISA test and the INVALSI mathematics test in 2022, corresponding to 72% of the unweighted and to 82% of the weighted data of the total sample.
The data were **DISAGGREGATED according to the objectives of the study** and the scores of males and females (in the PISA test and in a set of variables) compared.

ANALYSES:
Regression analyses were conducted to test the weight of a number of selected variables (starting with school type) on the PISA mathematics score and to estimate how the gender gap varies all other conditions being equal.
A comparison was made between **mathematics grades and PISA scores** and between the socio-economic status of boys and gurls by type of school

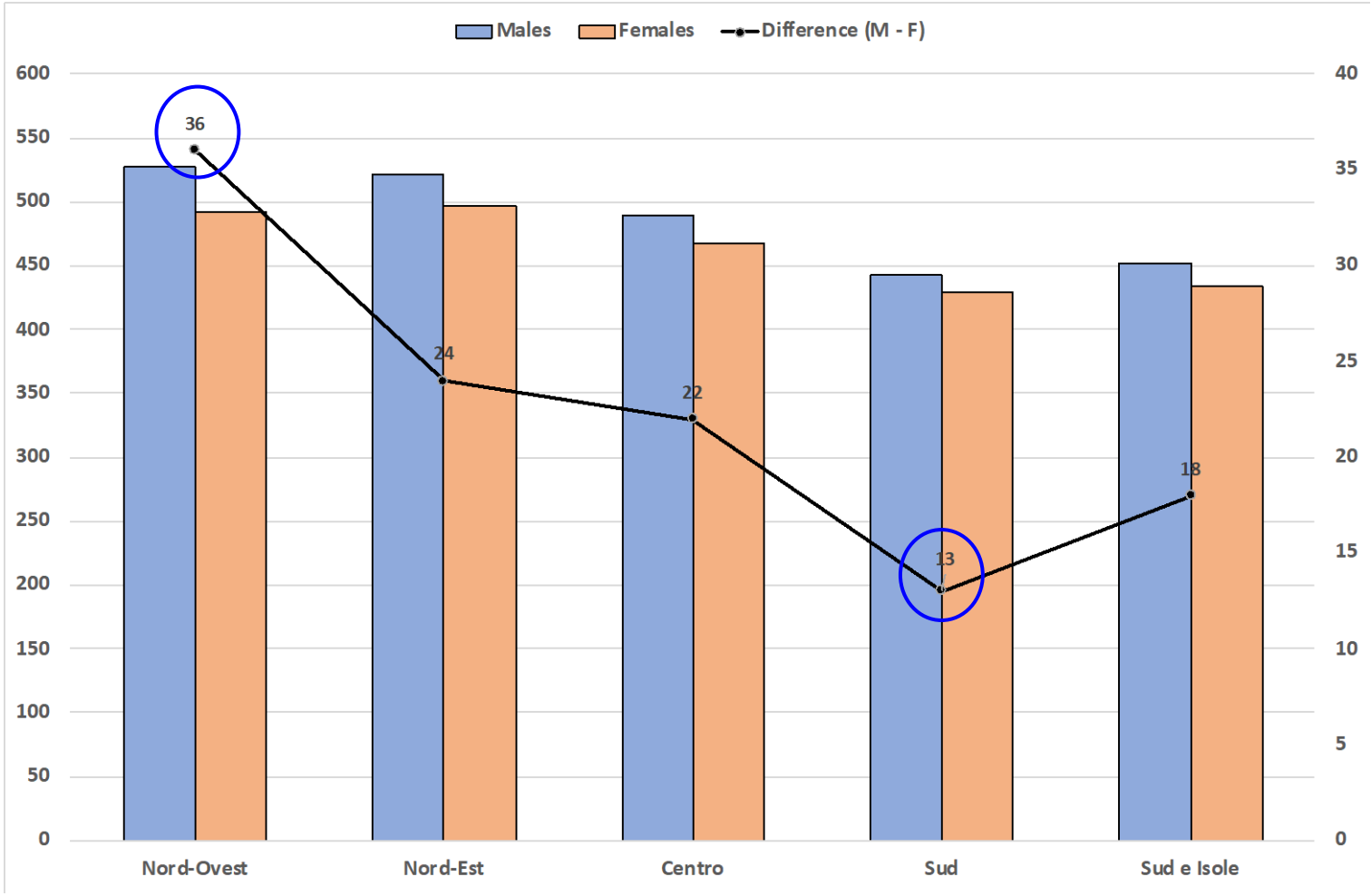
Mathematics score and gender difference (M-F) PISA 2022 Subscales and Overall Scale



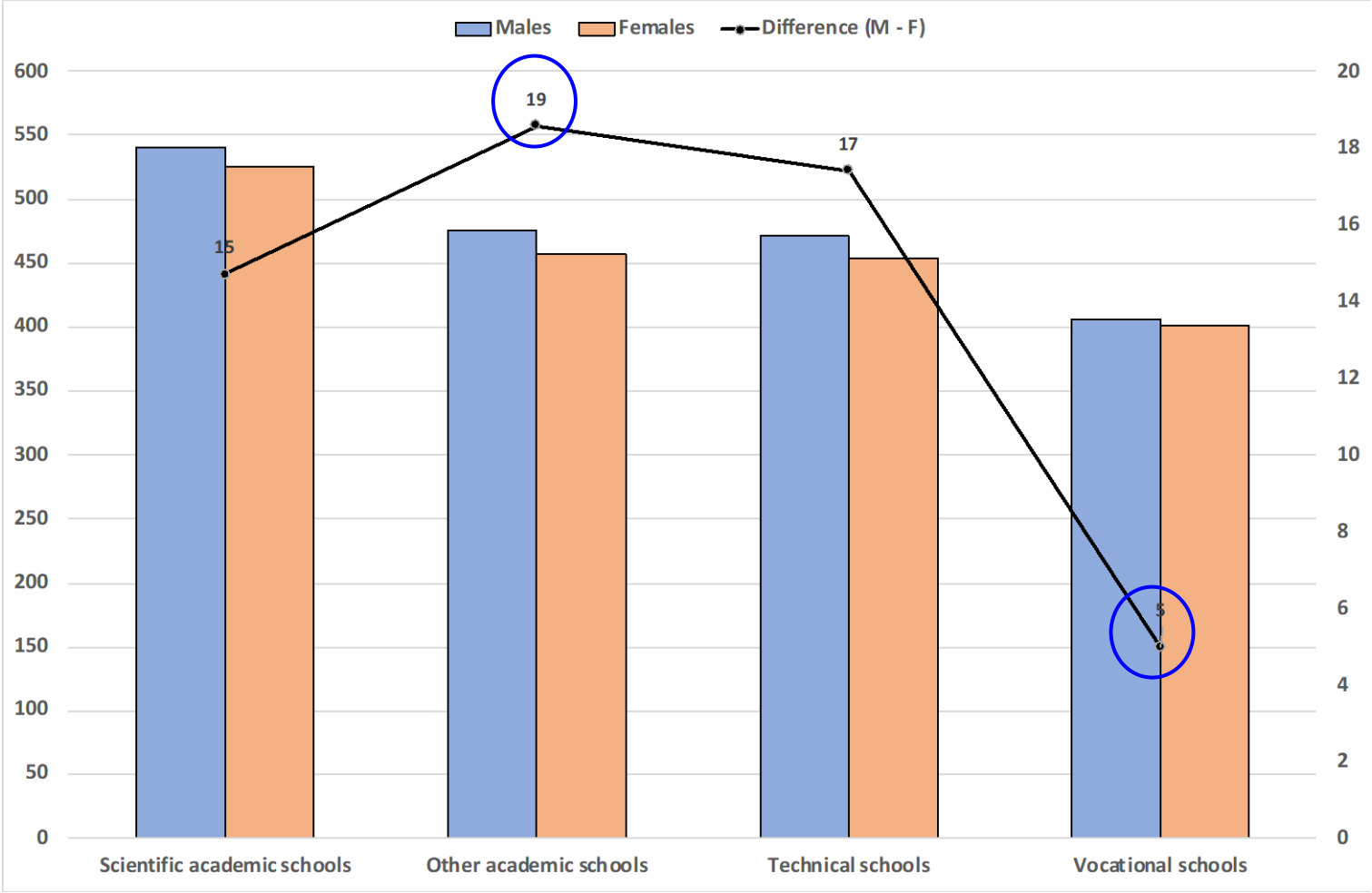
Percentage distribution on the PISA 2022 Matematics scale by gender



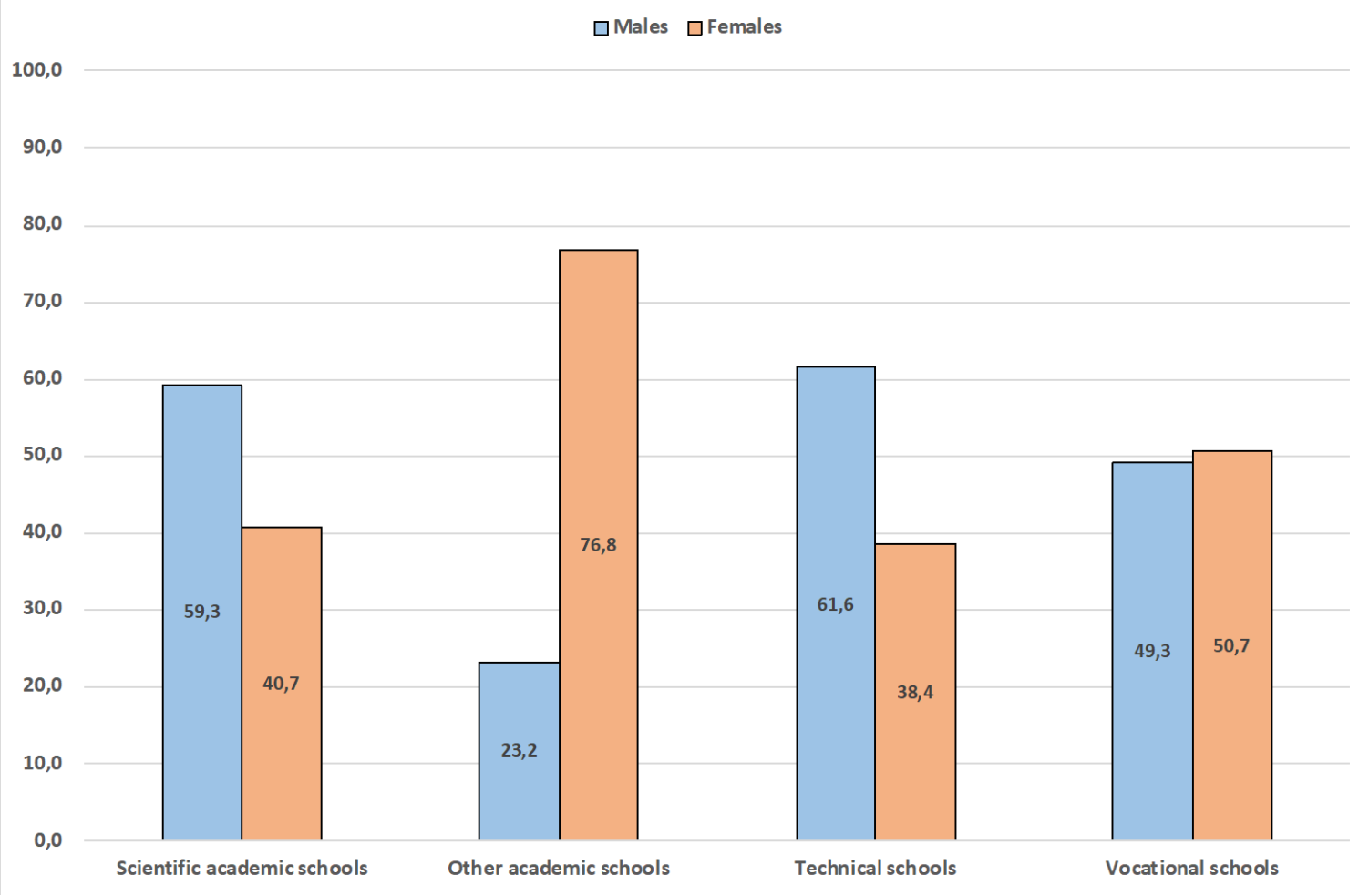
Mathematics score and gender difference (M-F) in PISA 2022 by macro-area



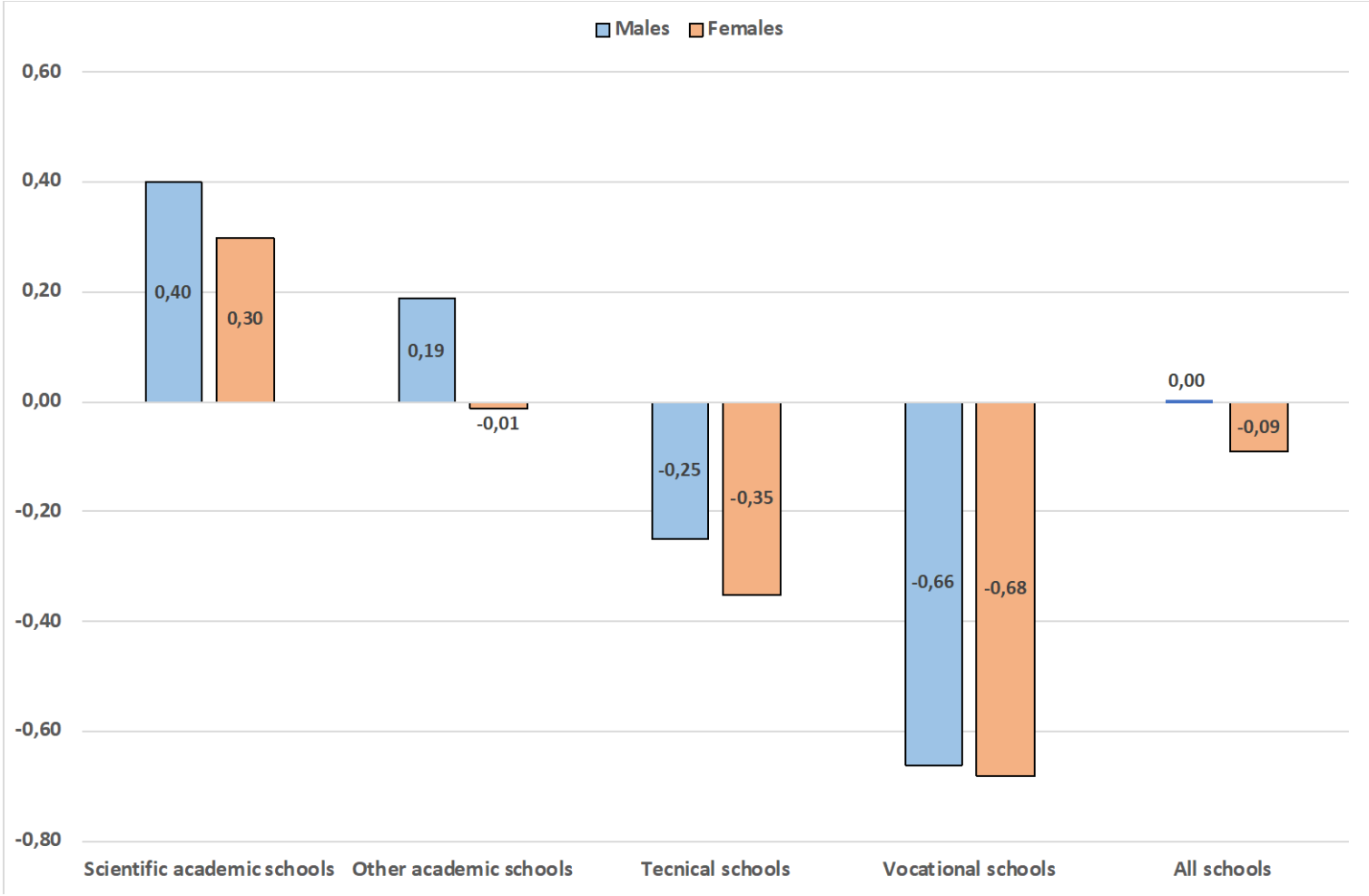
Mathematics score and gender difference (M-F) PISA 2022 by type of school



Percentages of boys and girls by type of school



Socio-economic status by gender and type of school



Variables related to Mathematics performance by gender

Anxiety vs math

Familiar conc math

Percep math easy

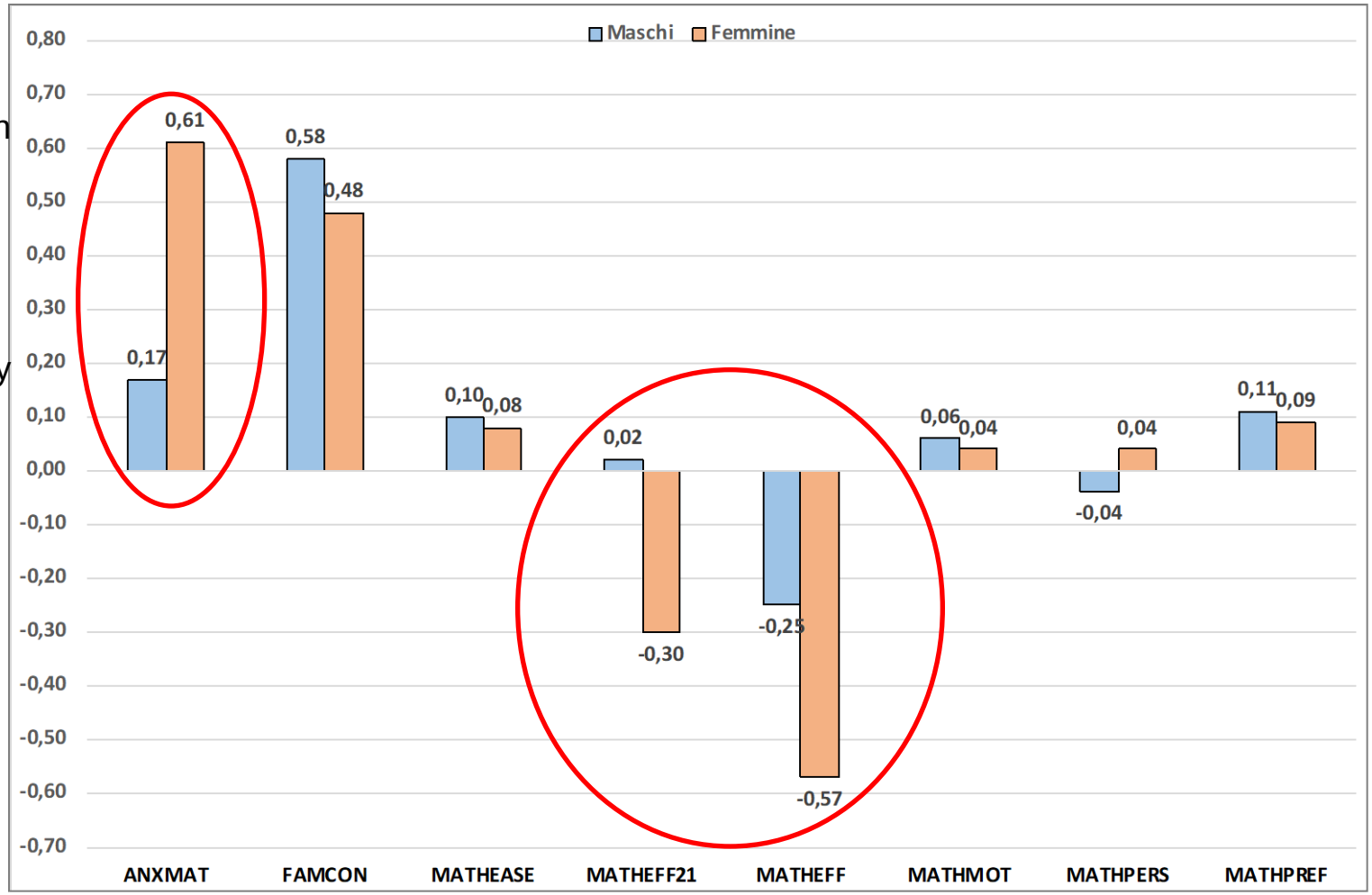
Autoeff math

Autoef today ability

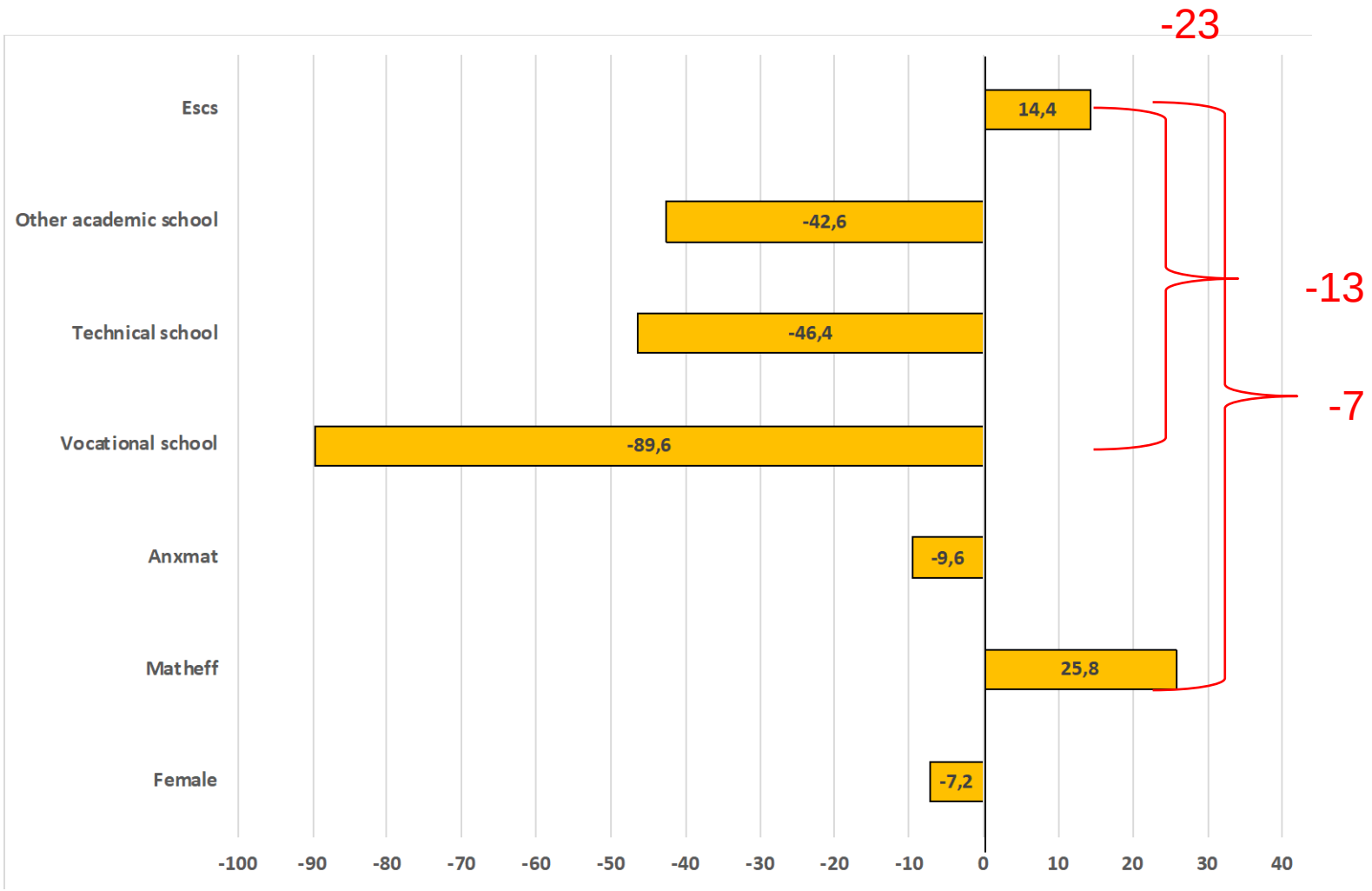
Motivat to suceed

Persistence math

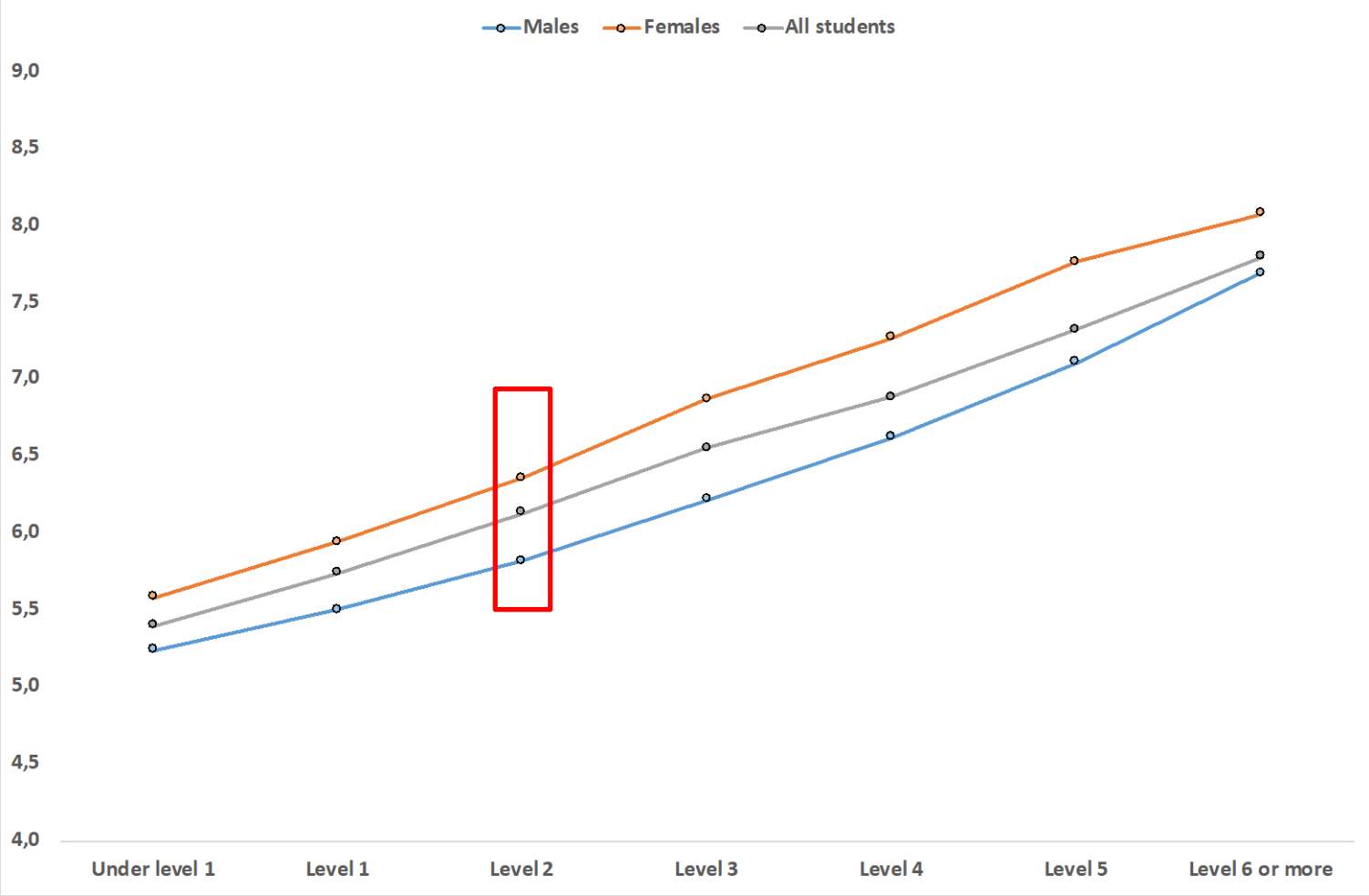
Preference math



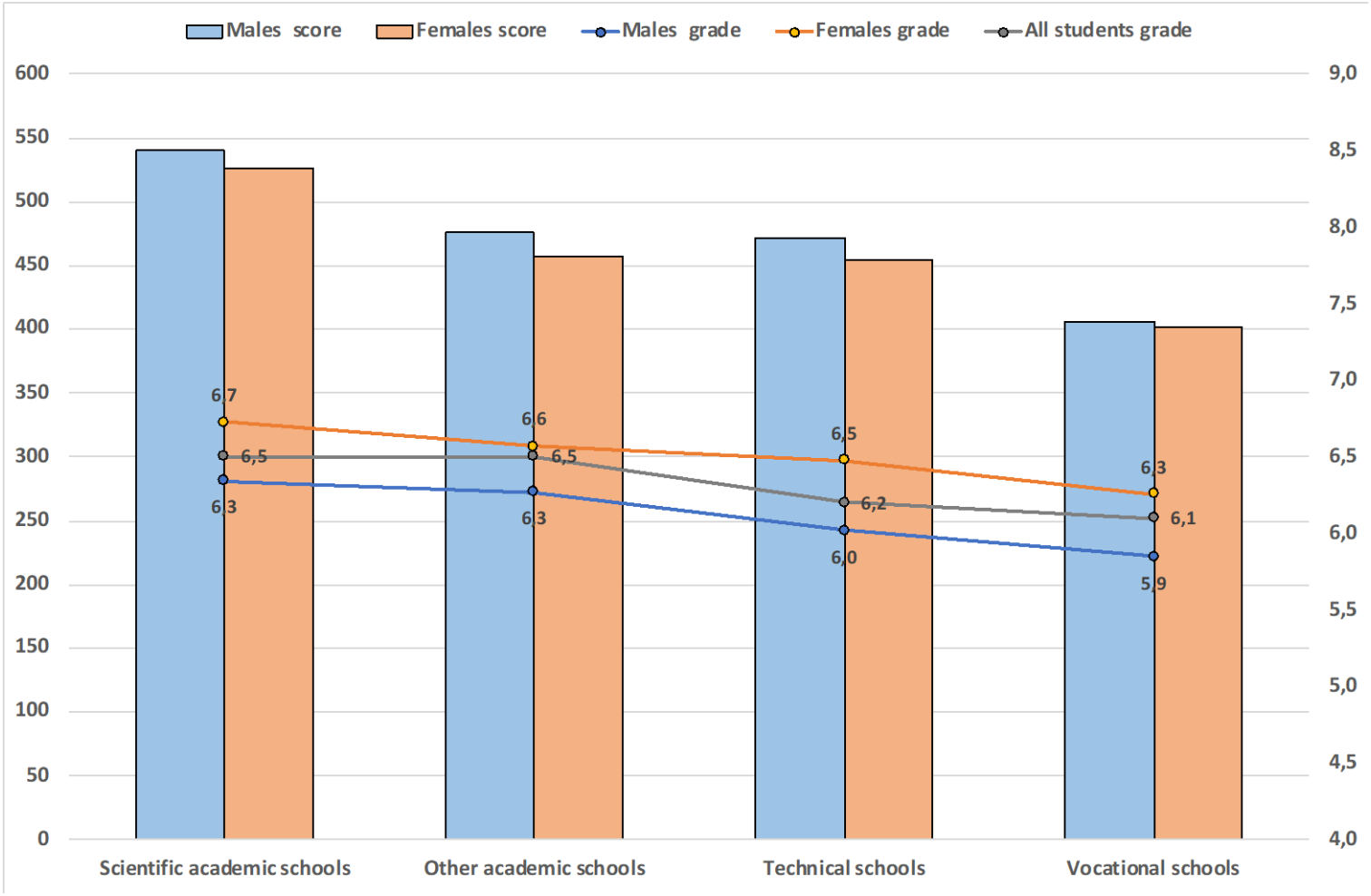
Regression coefficients on PISA 2022 Mathematics score



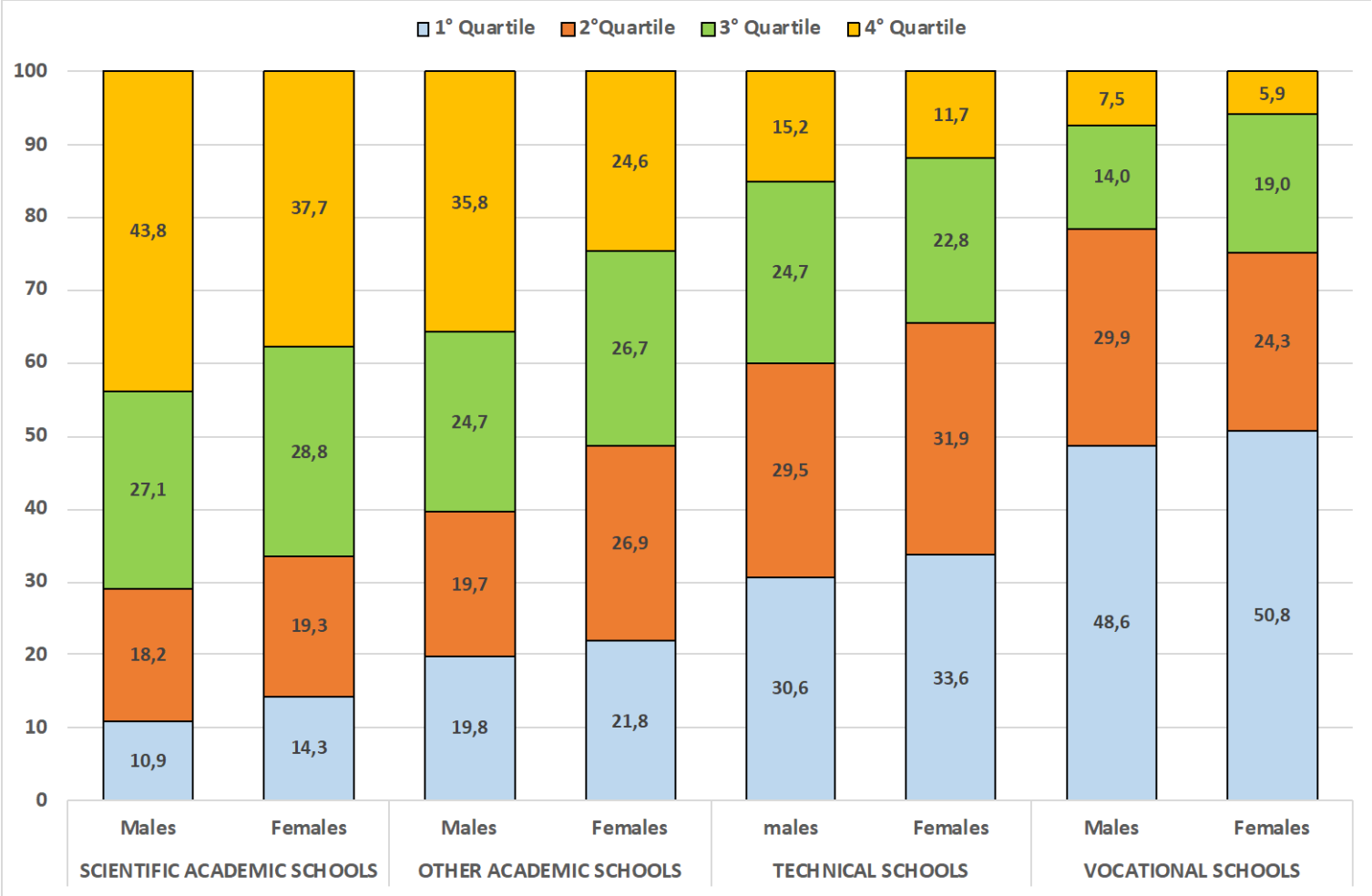
Mathematics grades at each level of the PISA 2022 math scale, by gender



PISA 2022 Math score and mean Mathematics grade by gender and type of school



Percentages of boys and girls in the quartile of ESCS index by type of school



Conclusions

- **Boys outperform girls** on the overall mathematics scales and on all the content and process subscales.
- **The gap is not the same along the scale**: it widens at the highest levels and narrows at the lowest ones
- **The gender gap is larger in geographical areas and school types with higher results and smaller in those where they are lower.**

Conclusions

- **There are differences between girls and boys, both in the distribution by type of schools and in the socio-economic and psychological profile**
  - **The socio-economic status of girls is lower than that of boys**, especially in academic oriented and technical schools,…
  - while, at the same time, the **effect of the socio-economic** on mathematics achievement **is stronger for boys** than for girls (35 points vs 29).
  - **Girls show higher levels of anxiety** about mathematics and **lower self-confidence** in their ability to succeed in math than boys.
- **When controlling for socio-economic status and school type** (to take into account differences in the math curriculum)**, the gender gap diminishes considerably, from 23 to 13 score point, and it diminishes further to 7 points when also anxiety and sense of self-efficacy are controlled.**

The gender gap and the education system

- Comparing PISA math scores with school grades shows that, **at the same level on the proficiency scale, girls receive higher grades than boys**, and the same holds within each type of school.

- **This, combined with the different proportions of males and females in the Escs quartiles in each type of school, seems to indicate that the school system operates a more marked selection towards boys,** (more frequently expelling pupils of lower status or directing them towards paths of lesser prestige and thus indirectly favouring the retention and upward mobility of females)**.**

- **However, girls' choices of high school and university pathways,** despite the better school grades,
  - **still appear tied to traditional models,** with the risk of reproducing the historical division between the "two cultures" according to a gender divide
  - This also seems to be linked to the fact that **girls' instrumental motivation for studying mathematics is lower** than that of boys**.**

Grazie