EUROPEAN UNION

# STEM orientation in European HEIs Analysis of institutional characteristics

## Policy conference *From data to direction: How can EHESO support the monitoring of the Union of Skills?*

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# Scope and methodological approach

- Identify and examine the **institutional characteristics** that could be potentially associated with varying levels of **STEM orientation** (defined as the share of students in science and technology).

$$STEM\ orientation\ (students) = \frac{\begin{array}{c} number\ of\ students\ ISCED\ 5-7\ in \\ fields\ 05\ (Natural\ sciences, mathematics\ and\ statistics), \\ 06\ (Information\ and\ communication\ technologies) \\ and\ 07\ (Engineering, manufacturing\ and\ construction) \end{array}}{Total\ number\ of\ students\ ISCED\ 5-7}$$

- The focus is on identifying **patterns that can inform policy discussion**s and highlight the **utility of EHESO data** for research purposes.

# Scope and methodological approach

The analysis establishes **three comparison groups of HEIs** (the indicated thresholds were calculated using a K-means clustering analysis):

- **HEIs with limited STEM orientation:** These will be the ones where students STEM orientation is within 0 - 16%
- **HEIs with moderate STEM orientation:** Students STEM orientation is within 16.1 - 56.9%
- **HEIs with high STEM orientation:** Students STEM orientation is within 57 - 100%

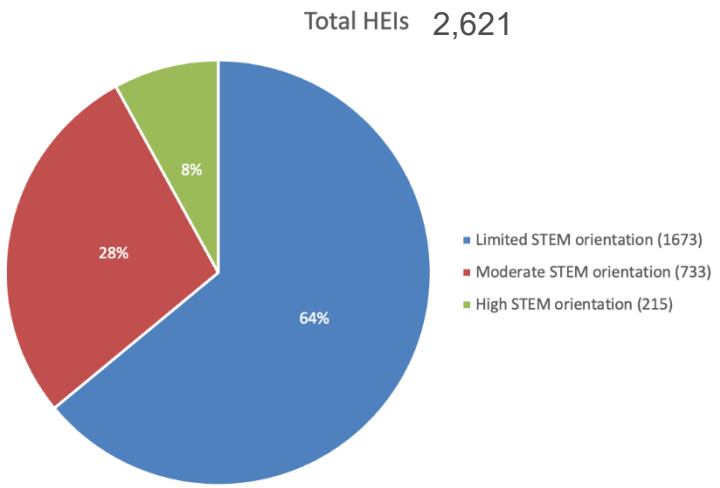
**Reference year:** The most recent available and complete wave of EHESO data (2022/2023).

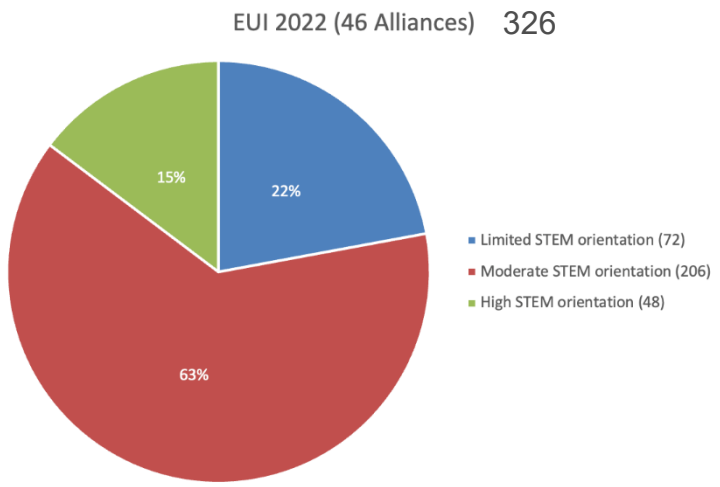
**Unit of analysis:** Individual HEIs included in the EHESO/ETER dataset for the selected reference year for which data on their STEM orientation is available.

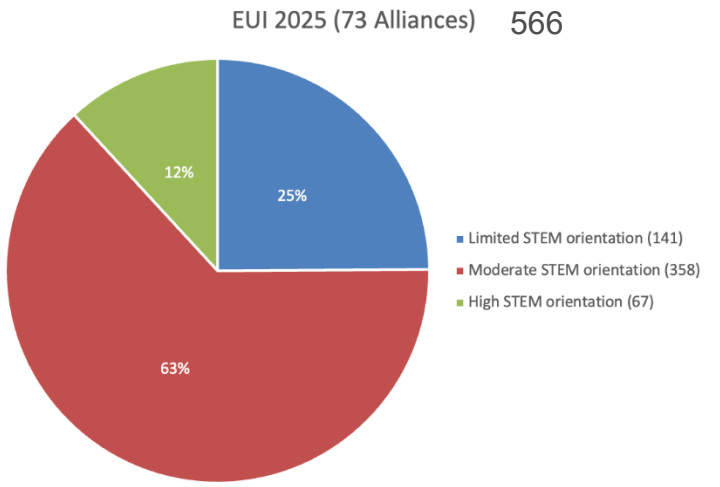
# Scope and methodological approach

- **Data treatment:** Winsorisation at the 5% level (both tails) to all continuous variables.
- **Measures of central tendency:** The analysis prioritises median values over means when comparing groups.
- **Statistical significance testing:** Kruskal-Wallis rank sum test evaluates whether at least one group differs significantly from the others.
- **Post-hoc pairwise comparisons:** Dunn's post-hoc test to identify which specific pairs of groups differ significantly.

# Key findings: Composition

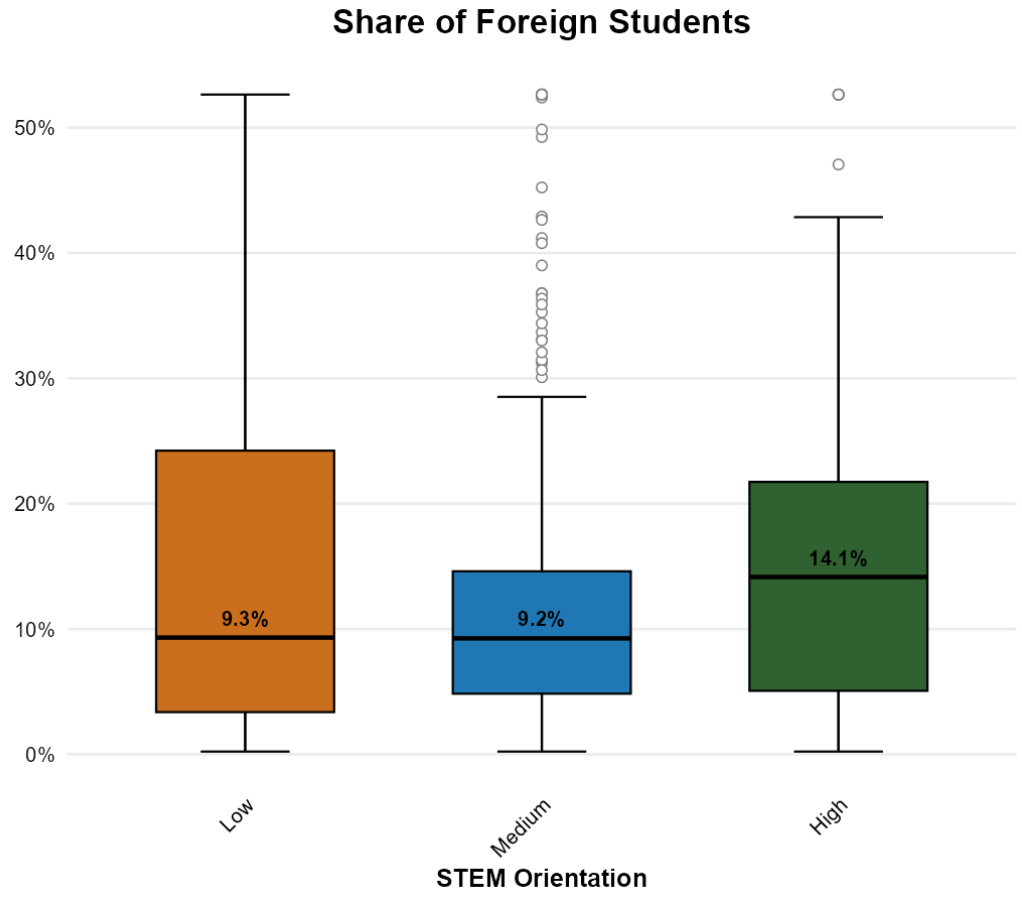


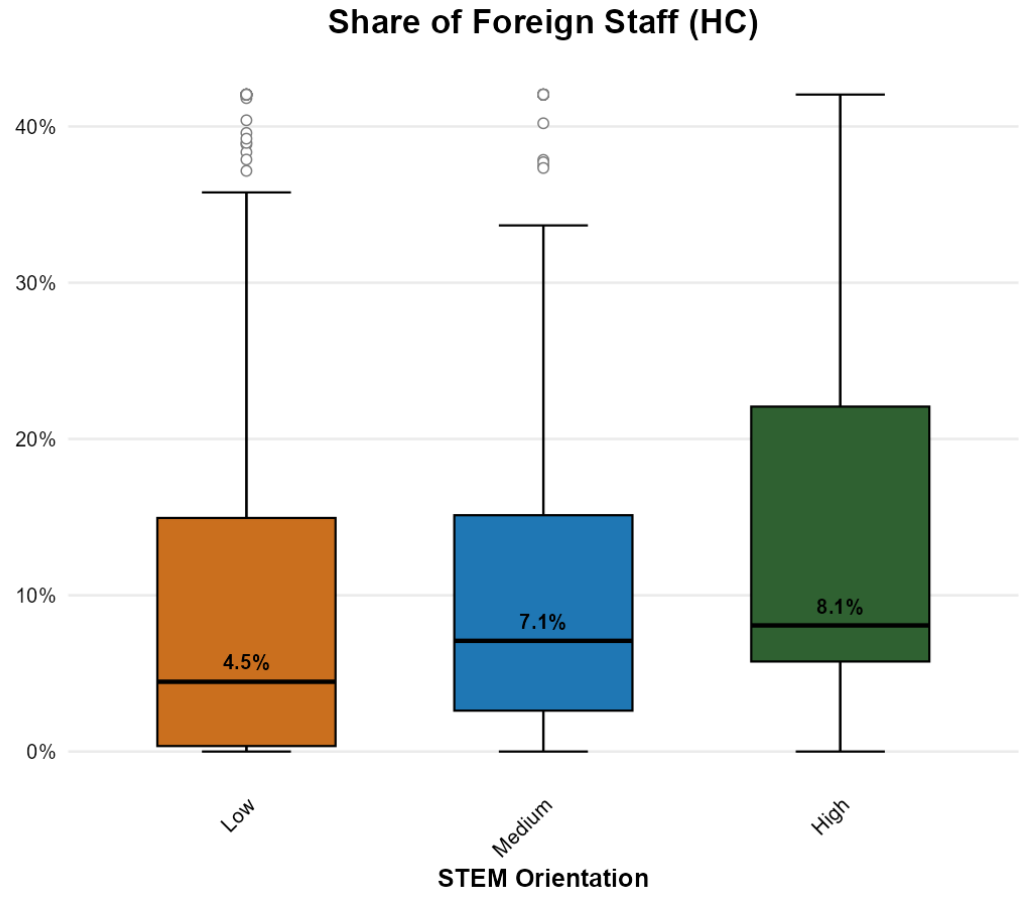




- General HEI population exhibits **concentration at the limited STEM** end of the spectrum.
- **The EUI,** whether by design or emergent effect, systematically favour **HEIs with more balanced disciplinary portfolios** (potentially larger universities; consistent with the analysis of EUI institutional characteristics).
- Questions on **access of limited STEM HEIs to the EUI** and the **resource advantages and international networks** characteristic of more STEM-focused HEIs.

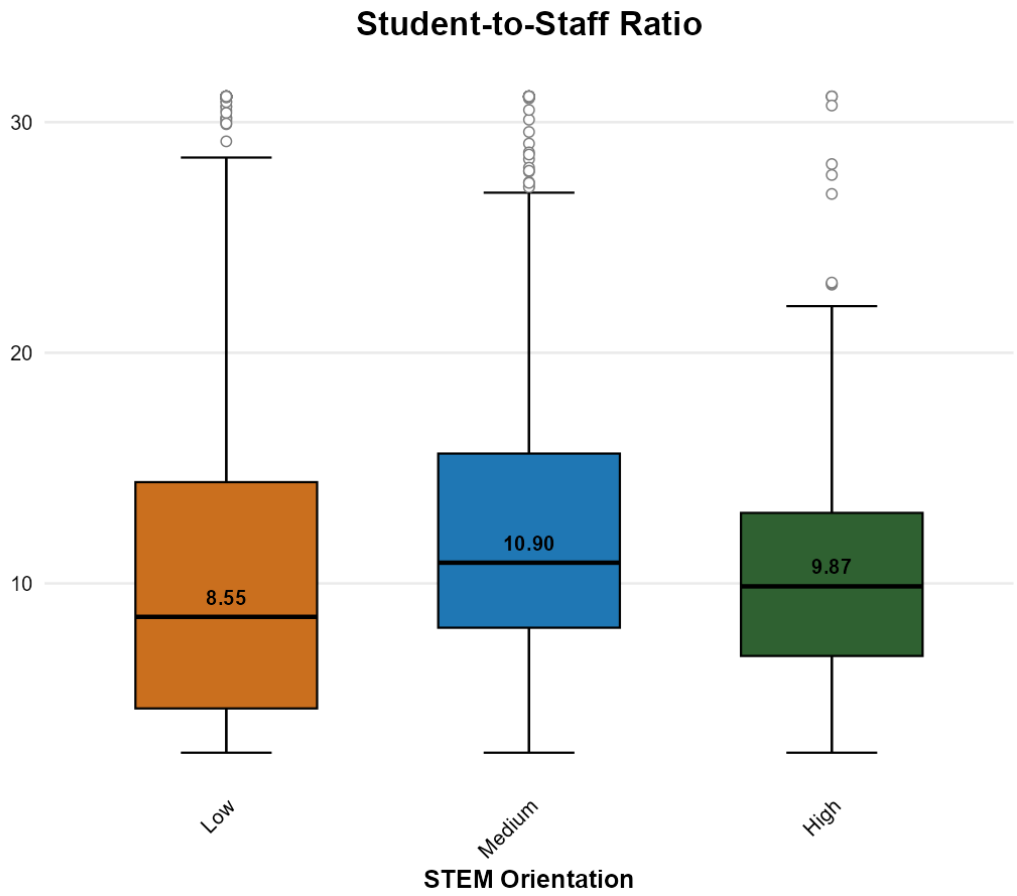
# Key findings: Internationalisation



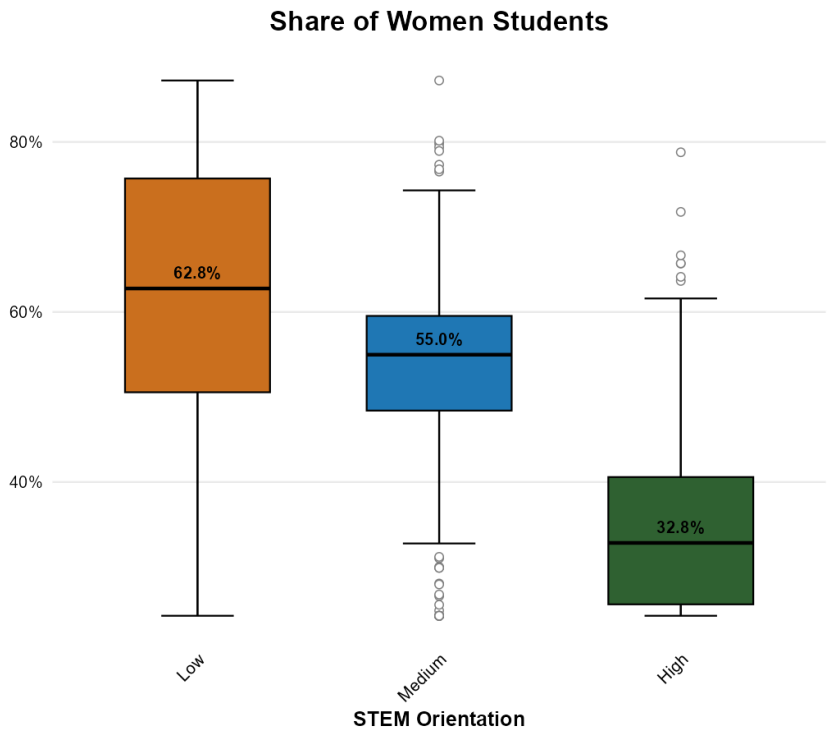

- A **high degree of internationalisation** is a key characteristic of STEM-focused HEIs.
- The data also raise questions about whether European STEM education relies on **imported talent** rather than developing domestic capacity (**Future**: looking into share of third-country students and academics).

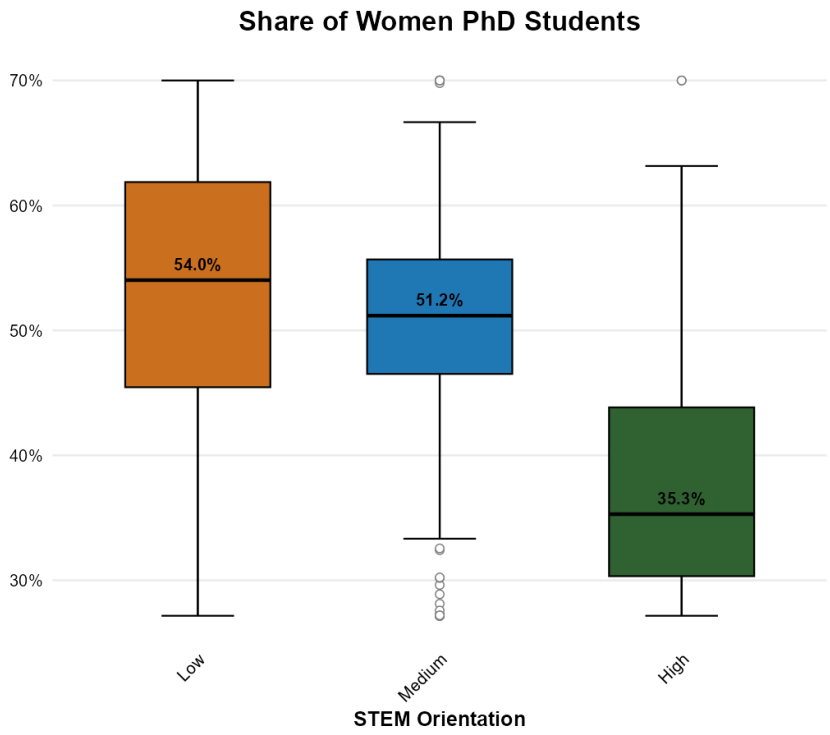
# Key findings: Student to academic staff (HC) ratio

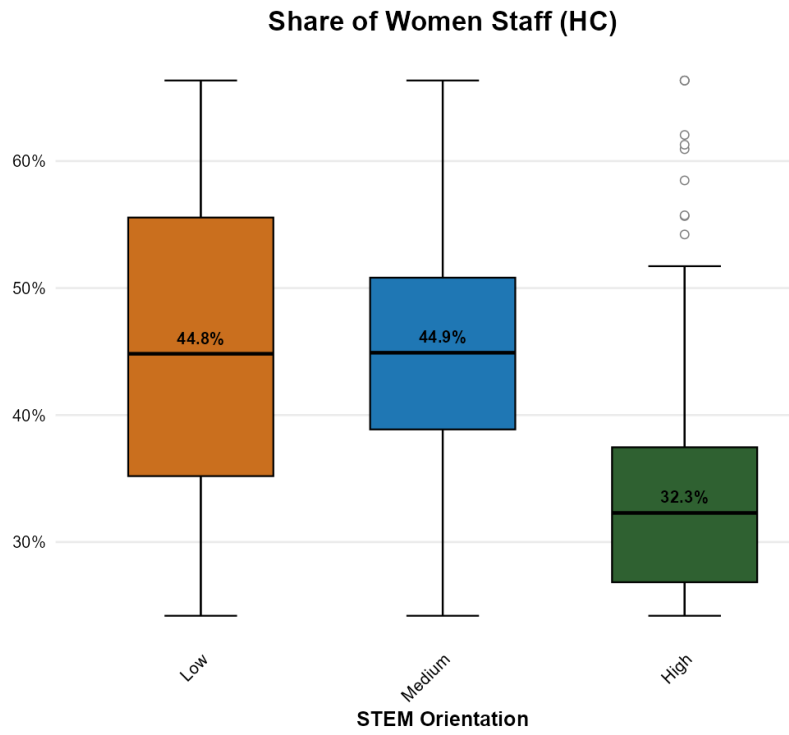



- **Moderate STEM institutions** have a higher student-to-staff ratio than both high STEM and limited STEM groups.
- **Further investigation/research** is required to better understand the underlying causes.

# Key findings: Women in STEM

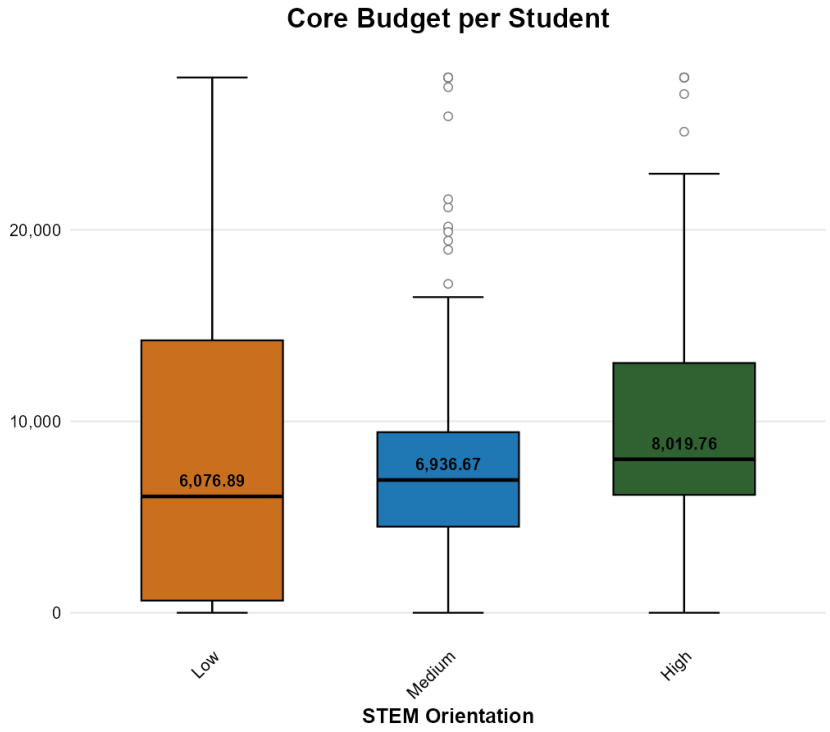


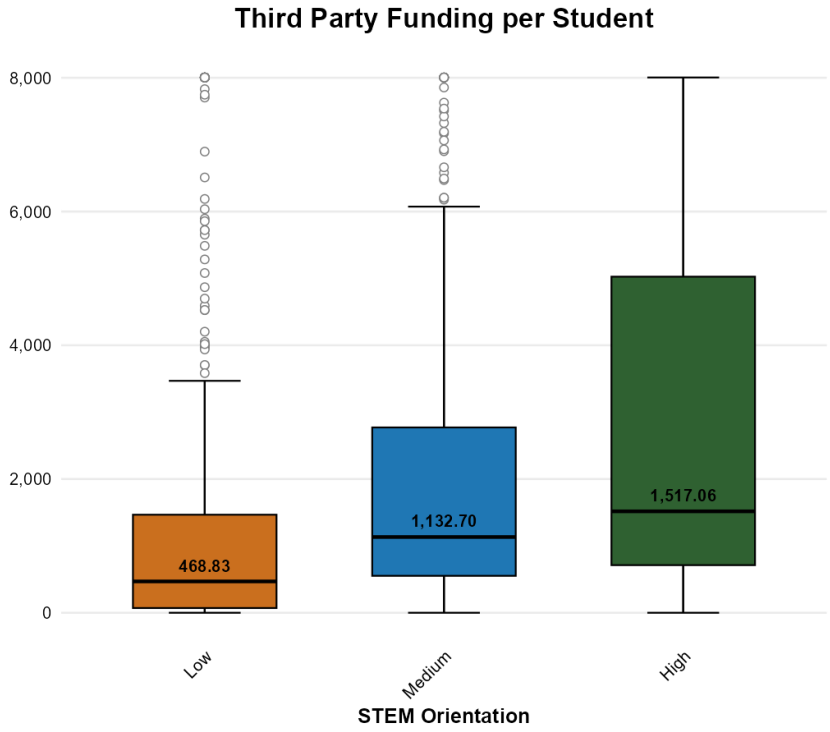



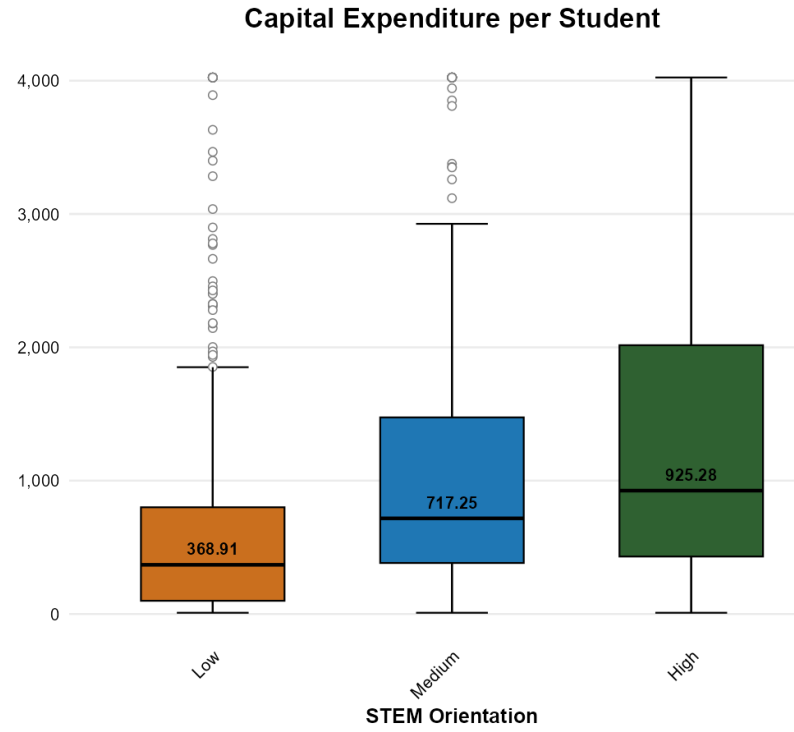




- **Inverse relationship** between STEM orientation and women participation aligning with extensive research documenting barriers to women's participation in STEM fields
- A **bidirectional pattern** suggests that gender segregation in higher education could be reflecting broader societal patterns in educational and professional choices.
- **Concurrent underrepresentation of women** among both students and academic staff in high STEM institutions suggests mutually reinforcing dynamics.

# Key findings: Financial profile




- High STEM institutions demonstrate substantially **greater resource intensity** across all measured financial dimensions
- The identified patterns reflects the **inherent need for significant and continuous investmen**t in STEM education and research.
- **For policymakers:** The findings provide a crucial evidence base for policy discussions on investment strategies to support STEM education in Europe.

# Thank you!

PPMi
Part of the Verian Group

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