The Impact of Narrowing Secondary Curriculum in Scotland on Students Outcomes: Evidence from the 2018 PISA Study

Marina Shapira and Mark Priestley

University of Stirling

Background: Curriculum Reform in Scotland and its Unintended Consequences

CfE was implemented in 2011

Aimed to

- provide a more flexible, holistic, competence-based and student-centred approach to education in Scotland.
- to equip young people with the skills and knowledge needed to meet modern challenges.

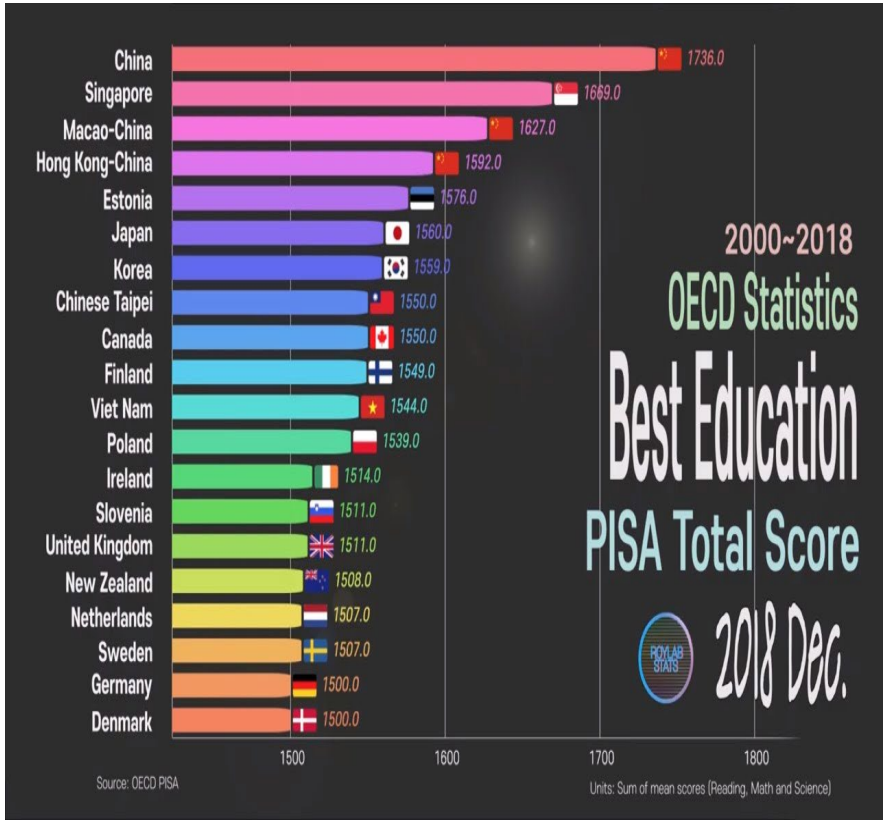
Key Findings from Our Nuffield-Funded Study (Shapira et al., 2023):

Reduction in Subject Choice:

- **Secondary Curriculum Narrowing:** CfE reforms led to a significant decrease in the number of subjects available during the senior phase of secondary education.
- **Relationship Between Subject Breadth and Attainment:** Students who study more subjects at the start of the senior phase achieve higher attainment levels across the Scottish Credit and Qualifications Framework (SCQF).and are more likely to move into a positive destination after school
- **Social and Economic Disparities:** Schools in socially and economically disadvantaged areas experienced greater reductions in subject choice.

Research Aims and Focus

- **Key Question for This Paper:**
  Can PISA data provide insights into school curriculum reform and its impact on young people's outcomes?
- **Focus:**
- The relationship between the **breadth of the secondary curriculum** under **Curriculum for Excellence (CfE)** and student outcomes, as measured by the **OECD's Programme for International Student Assessment (PISA)**.
- Specifically, the link between the **number of subjects** taken by 15-16-year-old students and their competencies in **mathematics**, **language**, **science**, and **global competencies from the 2018 PISA dataset.**



Why to combine national and international datasets?

Limitations of Using Only National Data for Curriculum Assessment

1.Restricted Scope of National Data:

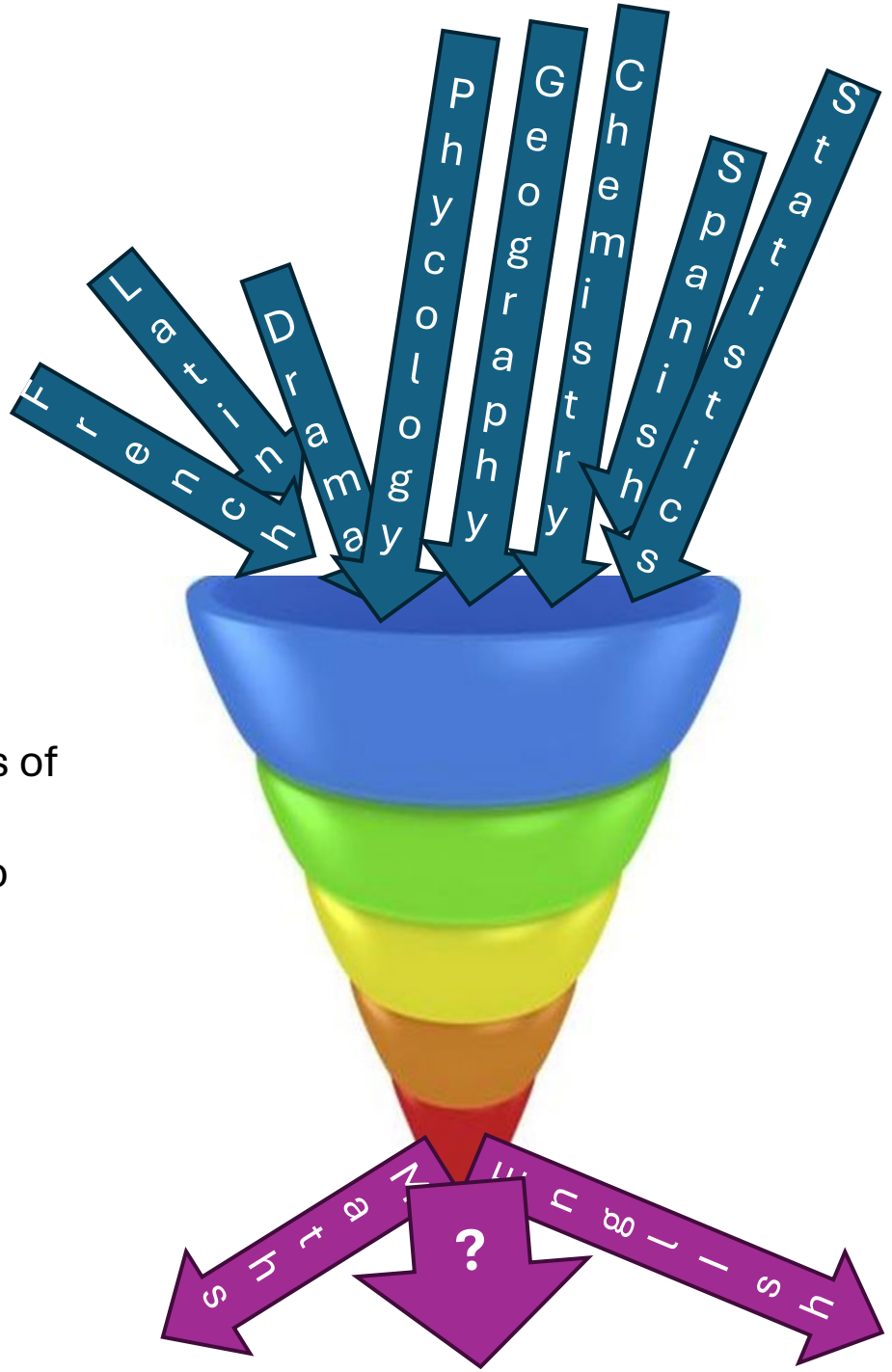
1. Primarily focuses on qualification attainment and student transitions.
2. Lacks comprehensive measures of broader student outcomes aligned with curriculum aims.

2.Influence of Reform-Related Factors:

1. National attainment data may reflect unintended consequences of reforms (e.g., **performativity drive**).
2. In Scotland, curriculum narrowing emerged partly from efforts to improve attainment statistics by selectively limiting subject choices.

3.Value of International Data:

1. Free from reform-related biases influencing national data.
2. Offers broader measures of academic and non-academic outcomes, essential for evaluating holistic curriculum impacts.



Advantages of linking between Scotland's Administrative Data on Education and PISA 2018 Data

- Linking **national educational data** with **PISA data** provides a better understanding of curriculum processes and student outcomes, beyond just attainment on national qualifications .
- Reveals key insights into the impact of **curriculum narrowing** on student performance.
  - **Curriculum Variations:** Captures differences in curriculum breadth and subject choices for students aged 15–16.
  - **Beyond Attainment:** Shifts from focusing solely on attainment to **holistic measures of student outcomes**.

Curriculum Breadth & Global Competencies

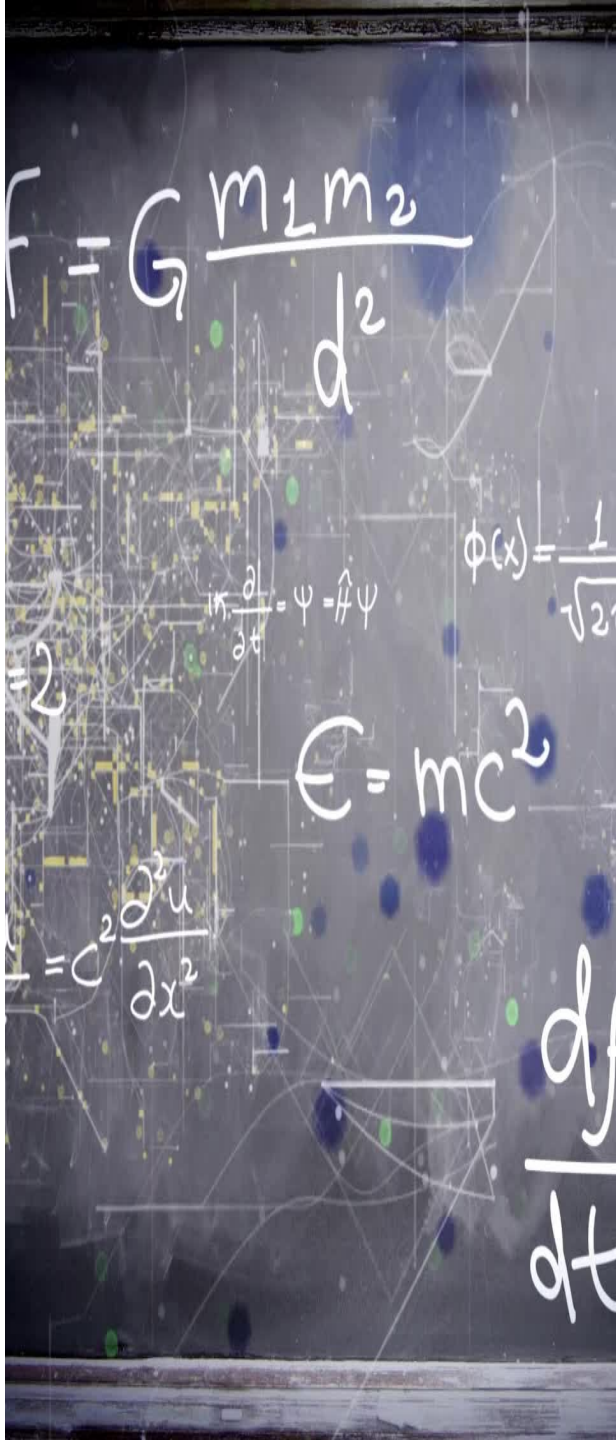
- **Curriculum Breadth:** Measured by the average number of subject entries in Year 4 (S4) of secondary education at the student's school.
- **Global Competencies (OECD):** Assesses cultural openness, sensitivity, self-awareness, resilience, and active citizenship, fostering critical thinking, adaptability, and communication in diverse contexts.
- **Relevance:** Similar to CfE's four capacities, which aim to develop successful learners, confident individuals, responsible citizens, and effective contributors.

Methodology

- **Data**: the 2018 Scotland PISA dataset, linked to the Scottish Government's administrative education data. **The data was linked using the school ID.**
  - **PISA Dataset**: This dataset includes information on student family characteristics, as well as test scores in maths, English, science and assessment on measures of global competences.
  - **Administrative Education Data**: This data provides details on enrolments and attainment in National Qualifications at different levels of the Scottish Credit and Qualifications Framework (SCQF) for state-funded secondary schools in Scotland.
- **Sample Distribution**: In Scotland's 2018 PISA study, the sample of students who took the PISA tests was equally distributed between S4 and S5 and included both 15 and 16 year-old students.

Method

- Multilevel regression modelling. **Mixed effect linear regression models with random intercepts**
  - Level 1 – Students
  - Level 2 – School
- **Dependent variables**
  1. PISA Maths Test score – an average of the plausible values 1-10 of the PISA test score in mathematics
  2. PISA Science Test score – an average of the plausible values 1-10 of the PISA test score in science
  3. PISA Language Test score – an average of the plausible values 1-10 of the PISA test score in language
  4. Various measures of global competences
- All metric variables were standardised (around the sample mean
- The data were weighed by the final trimmed nonresponse adjusted student weight (w_fstuwt)



Measures of global competences:

Measures (the values of the original variables have been combined Strongly disagree + disagree=0; Agree + Strongly agree=1)	Composite measure (number of competences)	PISA composite indexes of global competences
1. I feel like I belong at school. 2. I feel proud that I have accomplished things 3. I feel I can handle many things at a time 4. I analyse global issues with my friends 5. Are you informed about International conflicts 6. Are you informed about international migration 7. Are you informed about climate change and global warming. 8. I respect people from other cultures. 9. I learn at school about different cultures. 10. I can do something about the problems of the world	How many of these competences young people possess : counts how many statements in column 1 were answered positively (mean values)	1. Belong to School (belong) 2. Global issue awareness (gcaware) 3 .Fear of failure (gfofail) 4 .Global mindedness (globmind)

Level one (individual level) variables from the 2018 PISA dataset

- **Independent and Control Variables**
- Gender
- Age
- Immigration status
- Language students speak at home
- Highest parental level of educational qualifications index
- Highest level of parental occupation
- PISA index of family educational resources
- PISA index of family cultural resource
- Study time
- Work mastery
- Attitudes to school
- Resilience
- Completeness
- Perceived Teacher Interests
- Parents' emotional support perceived by student
- Hardworking
- Attitudes to reading
- Bullying experience

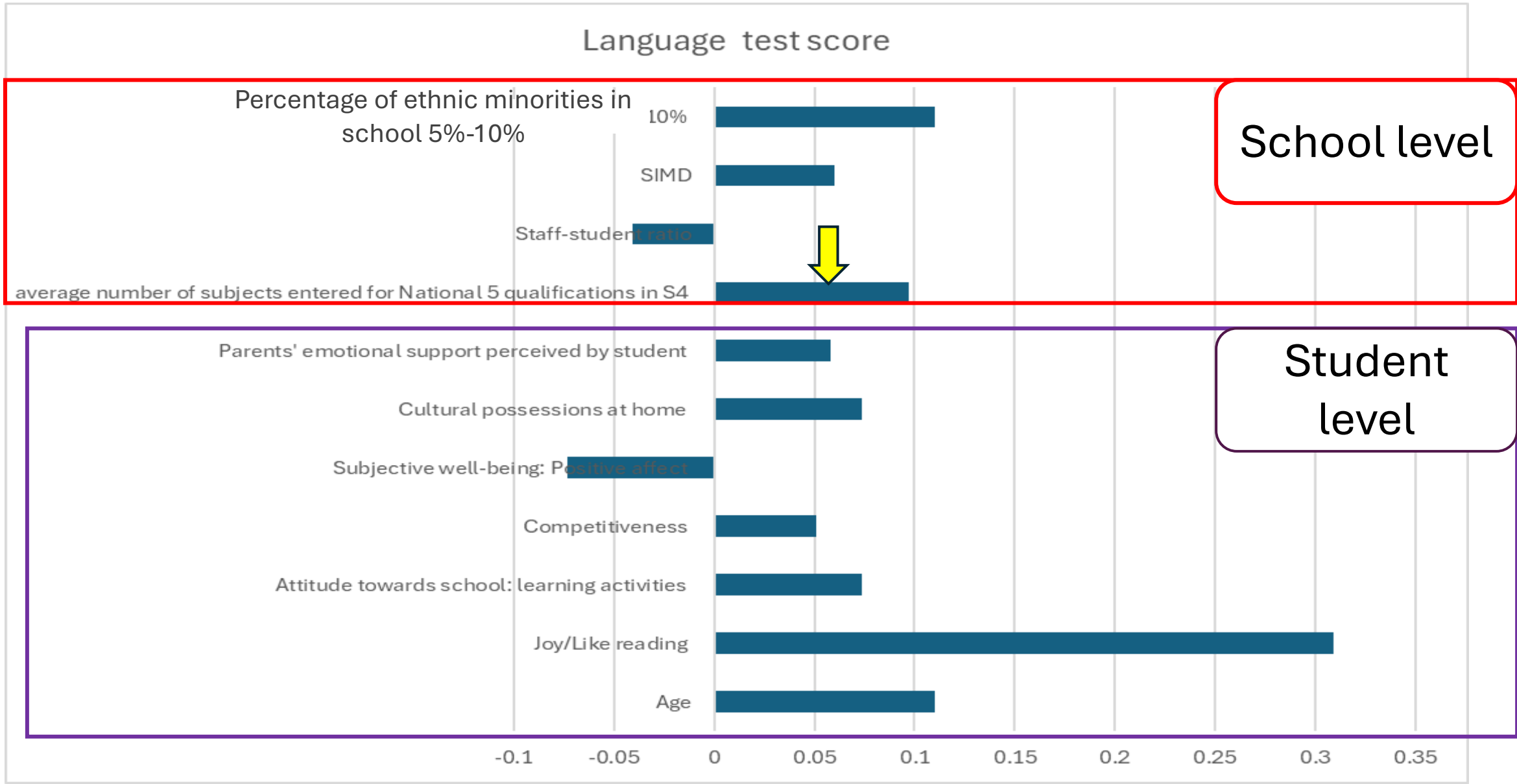
Level two (school level) Variables from the 2018 Scotland's administrative education data

- **Percentage of students in receipt of free school meals**
- Percentage of students with additional support needs
- Proportion of students from ethnic minority background
- **Characteristics of school area (SIMD, the urban/rural indicator)**
- Staff/Student ratio
- The number of entries of students to SCQF levels 5 (National 5) qualifications in Secondary 4
- Size of year/stage roll
- **Derived variable: Average number of subjects entered in S4 for National 5 level qualifications (obtained by dividing the total number of subject entries to National 5 qualifications in S4 by the number of students in S4).**

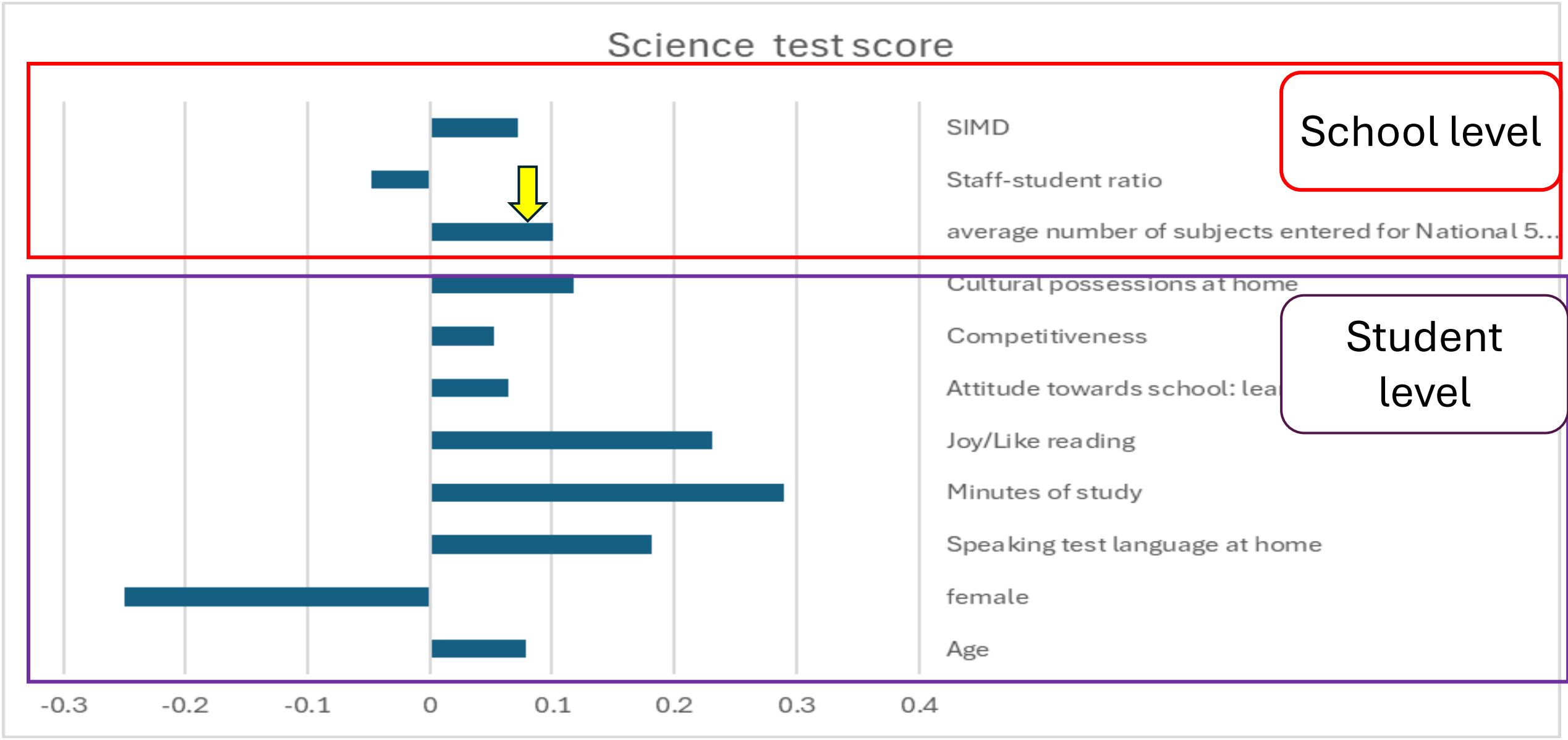
Findings

Part 1: Breadth of secondary curriculum and PISA mathematics, science and reading test scores: multilevel regression modelling

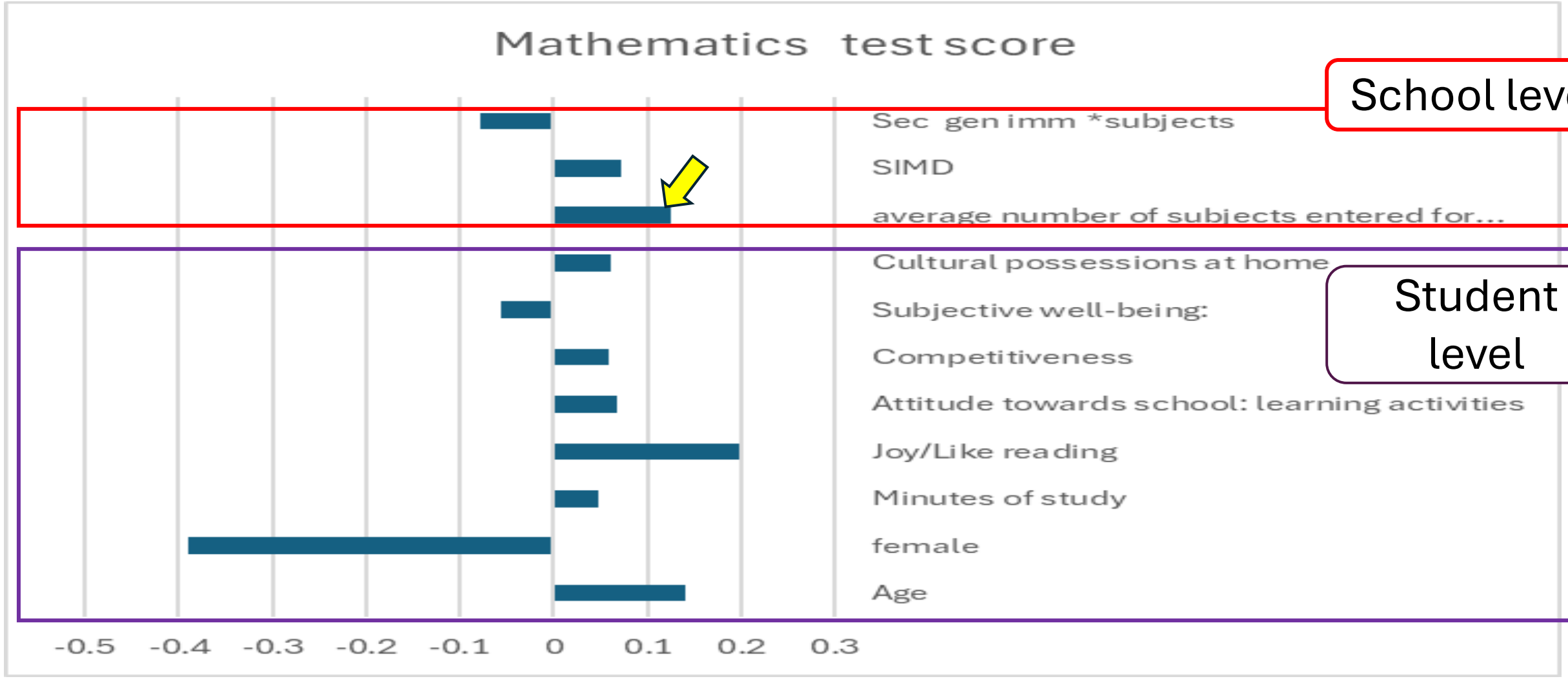
Breadth of the curriculum and the PISA language test score (statistically significant coefficients)



Breadth of the curriculum and the PISA science test score (statistically significant coefficients



Breadth of the curriculum and the PISA mathematics test score (statistically significant coefficients)



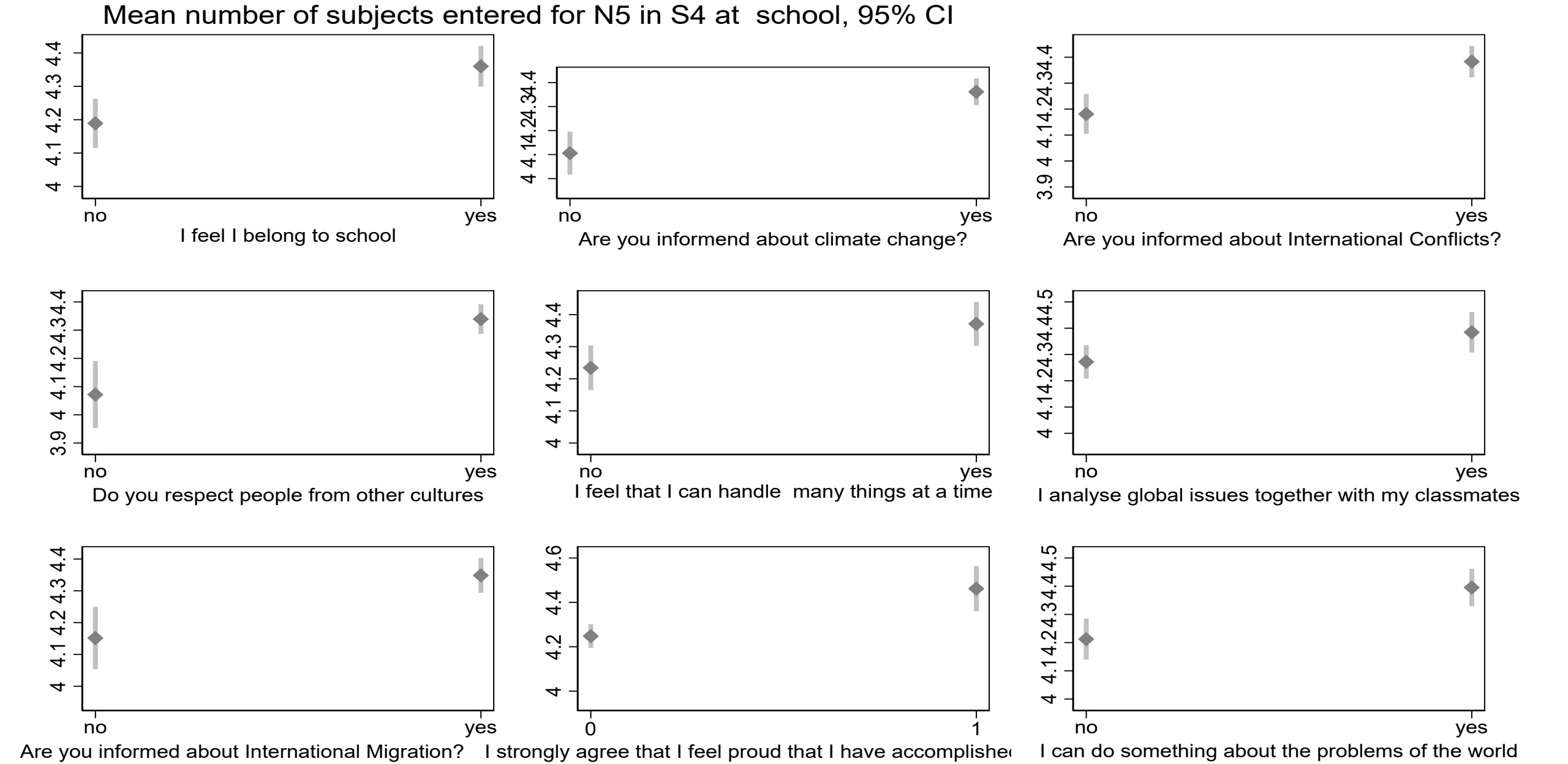
Summary of findings 1

- **What is the relationship between the breadth of the curriculum and the outcome measures offered by the PISA test?**
  - Students who attended schools with a broader S4 curriculum scored better on the PISA language, science, and mathematics tests.
  - Positive relationship between the breadth of S4 curriculum and individual PISA test scores remained statistically significant for mathematics, science, and language when examined using a multivariate multilevel regression modelling, while controlling for individual, family, and school characteristics.
  - Studying in schools with 5-10% ethnic minorities is positively associated with individual PISA language test scores.
  - Staff-student ratio at school is negatively associated with individual language and science test scores.
  - Attending schools in areas with high levels of multiple deprivation is negatively associated with attainment on all three tests.

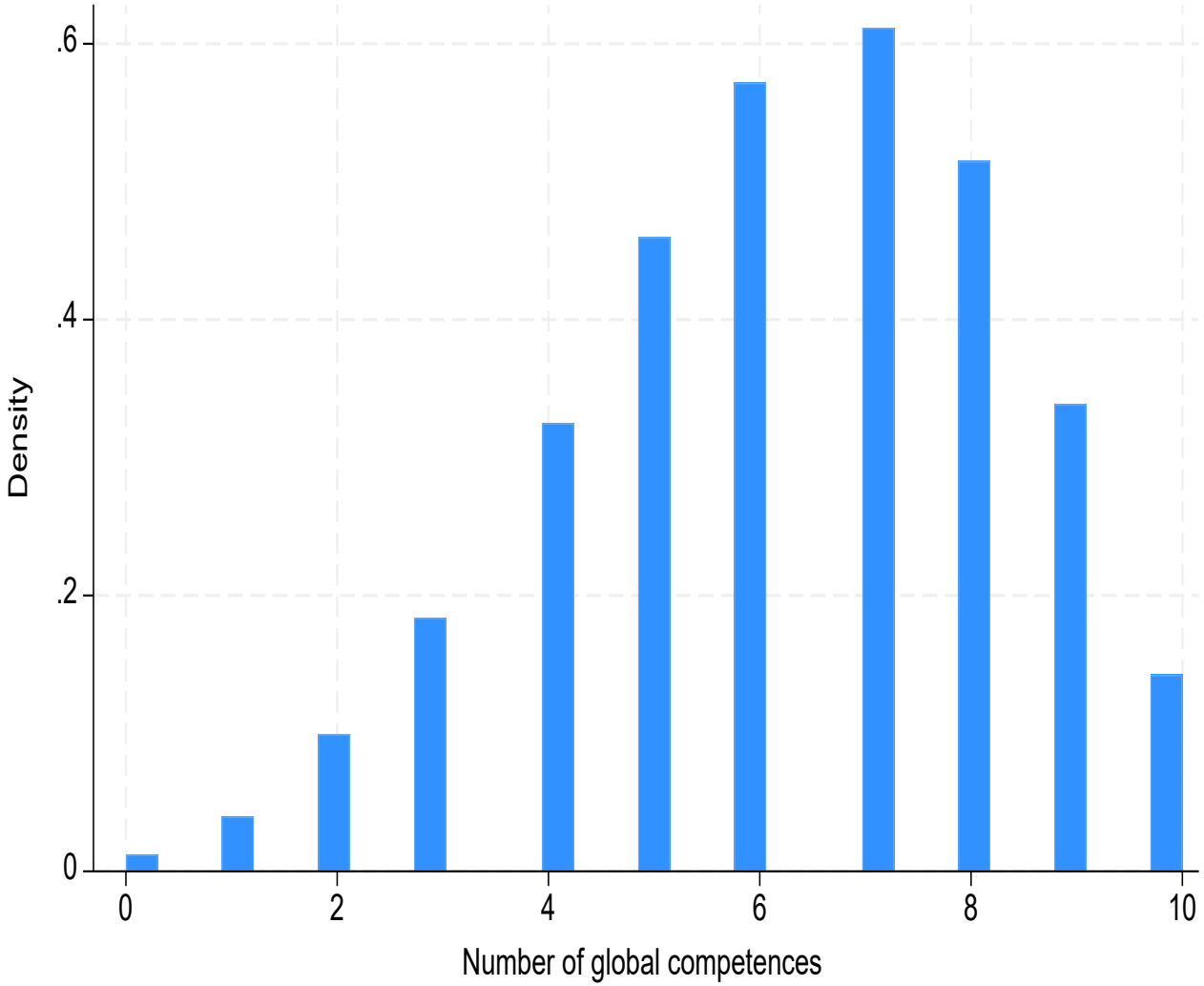
Findings.

Part 2: Secondary Curriculum Breadth and its Impact on Global Competencies

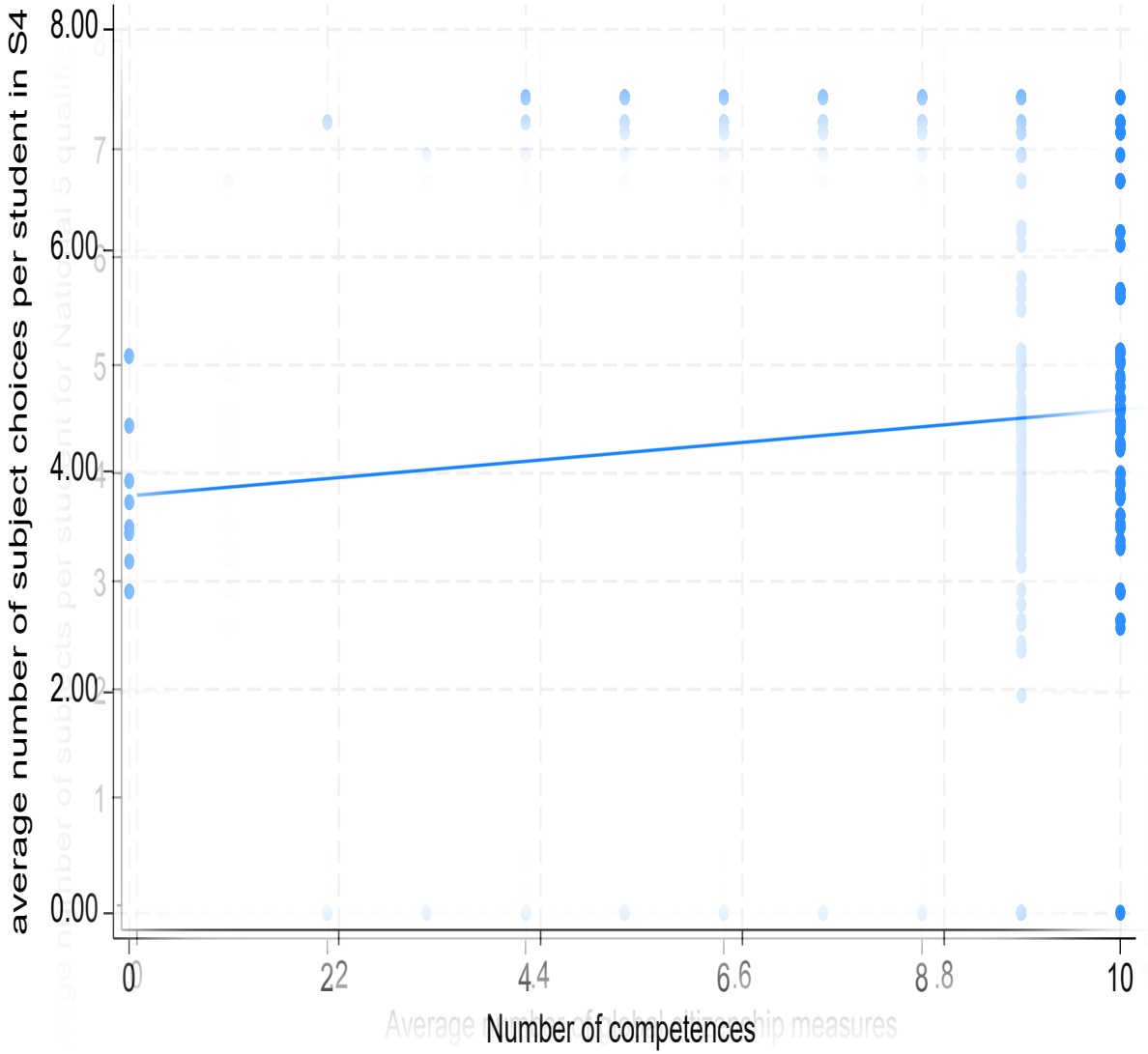
Measures of global competences and the secondary curriculum breadth

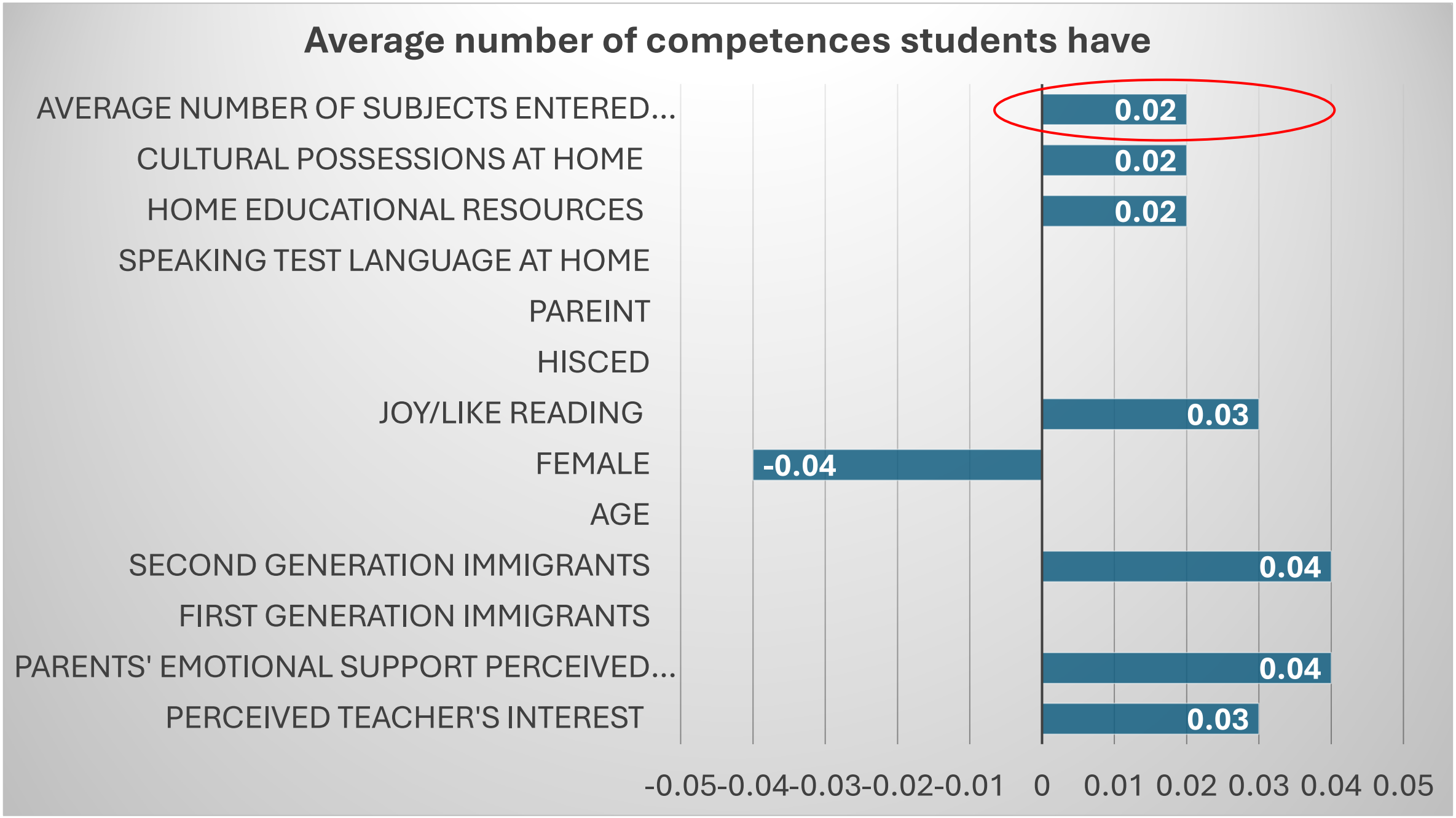


Composite measure – number of global competences

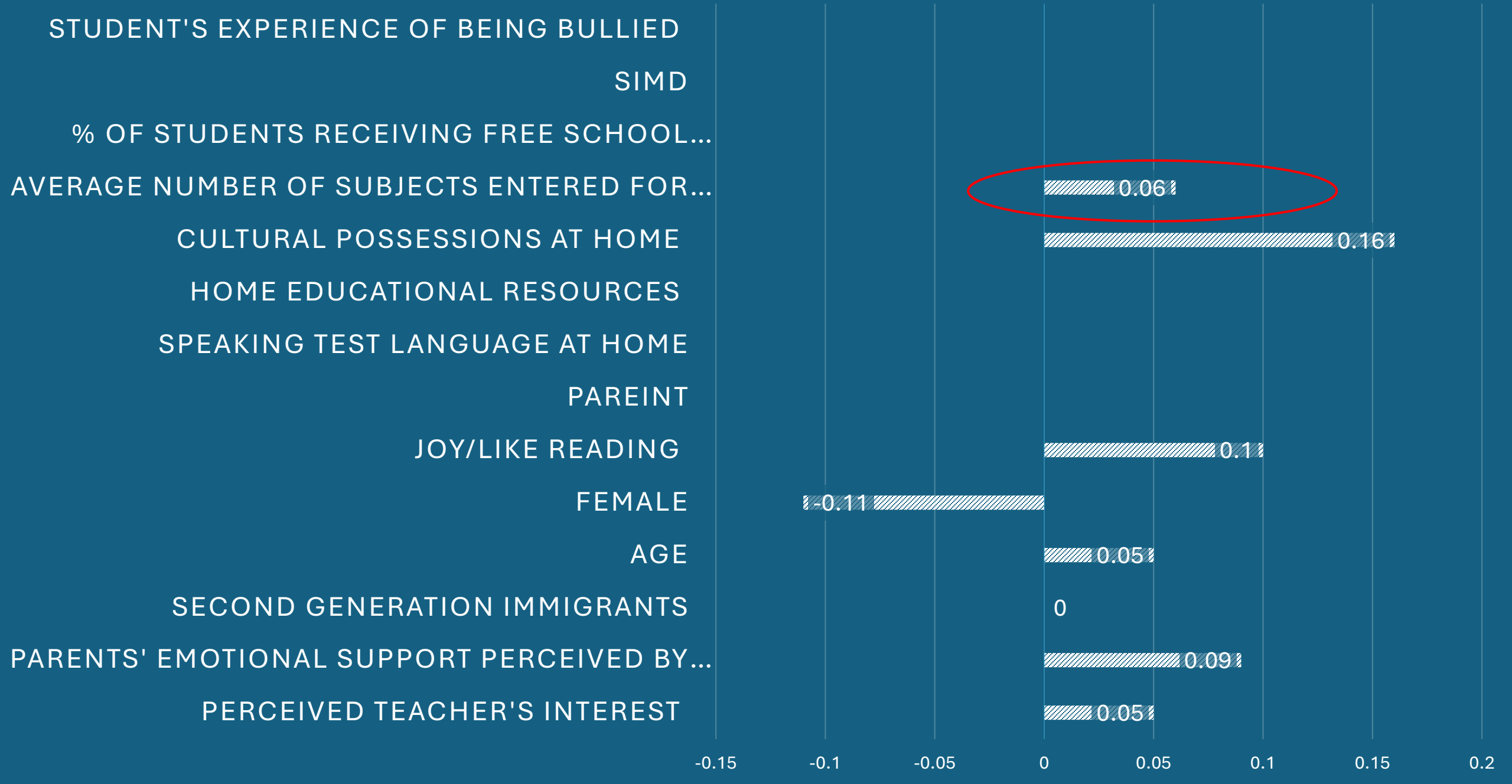


Number of global competences and the curriculum breadth number of global competences

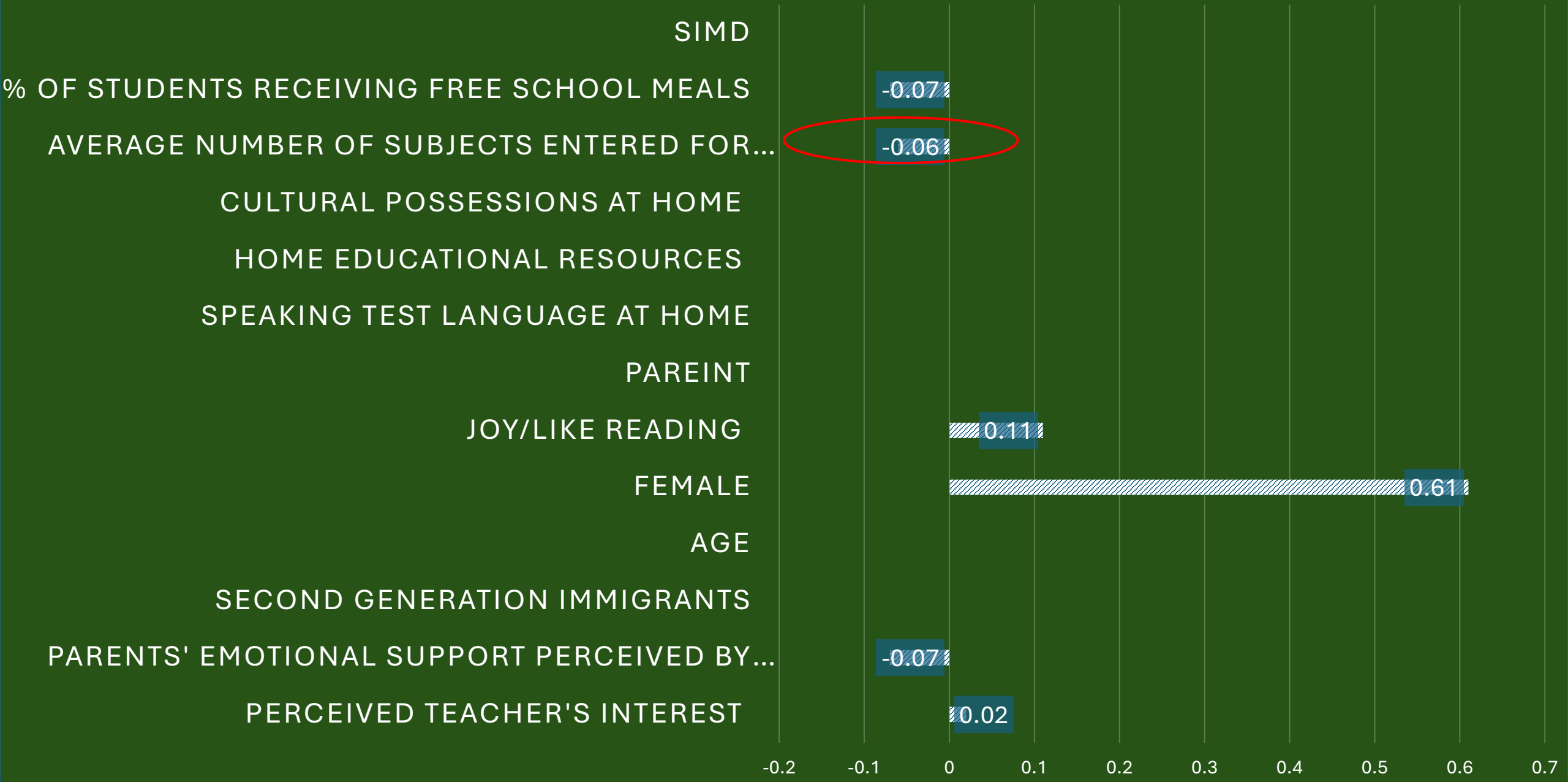


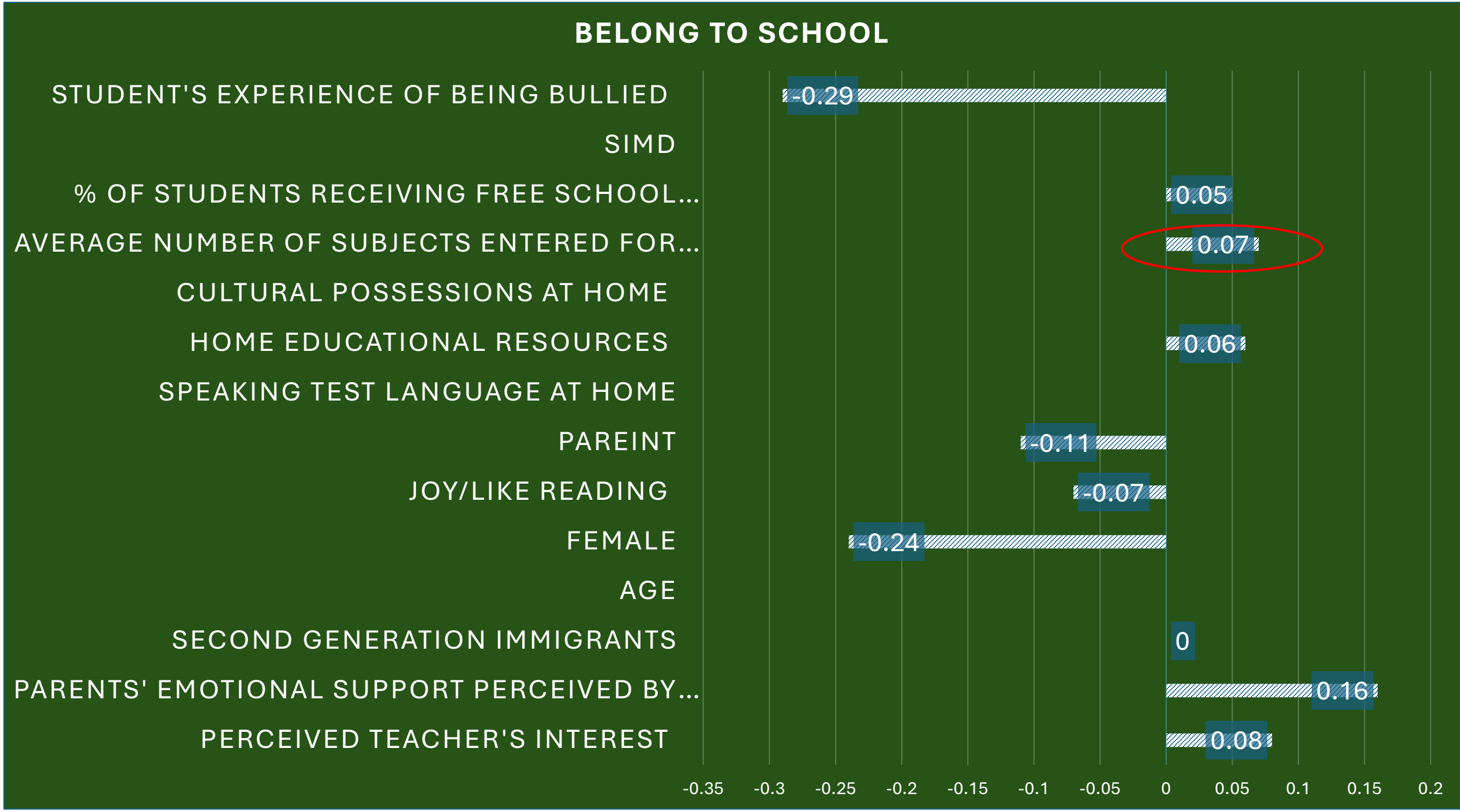

Average number of competences students have
AVERAGE NUMBER OF SUBJECTS ENTERED...
CULTURAL POSSESSIONS AT HOME
HOME EDUCATIONAL RESOURCES
SPEAKING TEST LANGUAGE AT HOME
PAREINT
HISCED
JOY/LIKE READING
FEMALE
AGE
SECOND GENERATION IMMIGRANTS
FIRST GENERATION IMMIGRANTS
PARENTS' EMOTIONAL SUPPORT PERCEIVED...
PERCEIVED TEACHER'S INTEREST
0.02
0.02
0.02
0.03
-0.04
0.04
0.04
0.03
-0.05 -0.04 -0.03 -0.02 -0.01 0 0.01 0.02 0.03 0.04 0.05

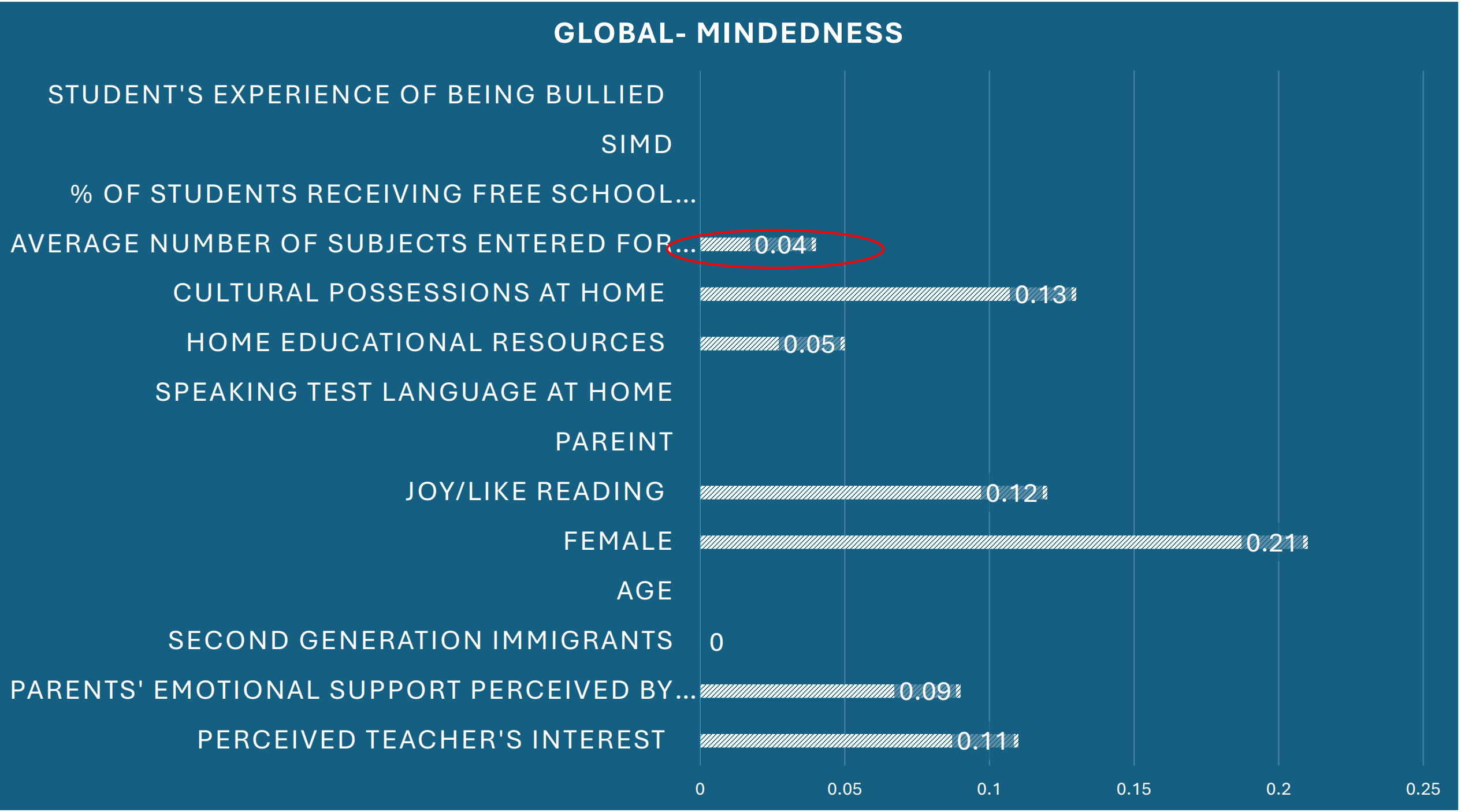
GLOBAL ISSUE AWARENESS



FEAR OF FAILURE




BELONG TO SCHOOL
STUDENT'S EXPERIENCE OF BEING BULLIED
SIMD
% OF STUDENTS RECEIVING FREE SCHOOL...
AVERAGE NUMBER OF SUBJECTS ENTERED FOR...
CULTURAL POSSESSIONS AT HOME
HOME EDUCATIONAL RESOURCES
SPEAKING TEST LANGUAGE AT HOME
PAREINT
JOY/LIKE READING
FEMALE
AGE
SECOND GENERATION IMMIGRANTS
PARENTS' EMOTIONAL SUPPORT PERCEIVED BY...
PERCEIVED TEACHER'S INTEREST
-0.29
0.05
0.07
0.06
-0.11
-0.07
-0.24
0
0.16
0.08
-0.35
-0.3
-0.25
-0.2
-0.15
-0.1
-0.05
0
0.05
0.1
0.15
0.2


GLOBAL- MINDEDNESS
STUDENT'S EXPERIENCE OF BEING BULLIED
SIMD
% OF STUDENTS RECEIVING FREE SCHOOL...
AVERAGE NUMBER OF SUBJECTS ENTERED FOR...
0.04
CULTURAL POSSESSIONS AT HOME
0.13
HOME EDUCATIONAL RESOURCES
0.05
SPEAKING TEST LANGUAGE AT HOME
PAREINT
JOY/LIKE READING
0.12
FEMALE
0.21
AGE
SECOND GENERATION IMMIGRANTS
0
PARENTS' EMOTIONAL SUPPORT PERCEIVED BY...
0.09
PERCEIVED TEACHER'S INTEREST
0.11
0
0.05
0.1
0.15
0.2
0.25

Summary of findings 2

- **Curriculum Breadth and Global Competencies**
  - Global competencies were positively linked to the number of subjects entered in S4 for National 5 qualifications.
  - Multilevel and multivariate analyses confirmed these associations, even after controlling for students' age, gender, family education, economic resources, and school characteristics.
- **Specific Competencies Associated with Curriculum Breadth:**
  - PISA measures of global issue awareness, global-mindedness, and sense of belonging to school.
  - Broader curriculum was negatively associated with fear of failure.
- **Other Key Relationships:**
  - **Student Characteristics:**
  - Joy of reading was positively associated with all global competencies.
  - Bullying experiences negatively impacted sense of belonging to school.
  - **Teacher Influence:**
  - Perceived teacher interest was positively linked to most competencies but also to fear of failure.
  - **Family Support:**
  - Perceived parental emotional support and access to educational and cultural resources were positively associated with global competencies.
- **Comparison with PISA Academic Tests:**
- Unlike math, science, and reading scores, school characteristics did not significantly impact global competencies after accounting for individual characteristics and curriculum breadth.

Conclusions

Broader Curriculum Benefits Competencies Development:

- A broader range of subject entries for National 5 qualifications in S4 at school is positively associated with higher competencies in language, mathematics, and science.
- This positive relationship remains statistically significant after accounting for family background and school characteristics.

Global Competencies Enhanced by Curriculum Breadth:

- Students in schools with broader S4 curriculum scored higher on OECD measures of global competencies, including self-awareness, resilience, and active citizenship.
- These students demonstrated a better understanding of modern world complexities and were more likely to feel empowered to address global challenges.

Impact on Well-being and Social Outcomes:

- Broader curriculum develops a stronger sense of belonging, pride in accomplishments, and openness to learning about diverse cultures, while it also reduces of fear of failure.

Role of Family and School Characteristics:

- While school and family characteristics influence outcomes, the breadth of the S4 curriculum plays a critical role in shaping both academic and global competencies .

Conclusions

- This paper explores how combining national attainment data with PISA data insights into how educational policies impact student outcomes.
- These findings challenge the Scottish Curriculum for Excellence (CfE) policies, which unintentionally reduced subject choices for students aged 15-16, driven by an emphasis on attainment data over a more holistic educational approach.
- The study's findings align with our previous findings from the analysis of national educational data showing that a broader secondary curriculum is positively linked to better outcomes, while a narrower curriculum correlates with poorer results in national qualifications.
- These results highlight the importance of offering a broad secondary curriculum to develop a wide range of competencies, equipping students for academic success and active participation in a complex and interconnected world.
- The findings also highlight the need for policies that better support diverse educational experiences and outcomes, particularly for students in disadvantaged schools or from socio-economically disadvantaged background

Thank you!

marina.shapira@stir.ac.uk