



TRENDINOMICS

Página web: trendinomics.uanl.mx
TRENDINOMICS
 Revista Científica enfocada en Economías
 Latinoamericanas

□ UNIVERSIDAD AUTÓNOMA DE NUEVO LEÓN □ FACULTAD DE ECONOMÍA □ CENTRO DE INVESTIGACIONES ECONÓMICAS □

The role of attitudes on academic performance

La influencia de las actitudes sobre el desempeño académico

Cinthya Guadalupe Caamal Olvera*

Article information

 Received: 02/02/2026
 Accepted: 27/03/2026

 JEL Classification: D91, I21, I24, J16,
 O57

 Keywords: Education, Equity,
 Attitudes, Teaching, Learning

Abstract

This paper examines the factors behind the gender differences in academic performance across 77 countries. The study decomposes variation in the gender gap across observable and unobservable attributes. The paper found that enjoyment of reading and expectations about future careers are the main drivers of gender gaps in academic achievement. These factors are more relevant for explaining the reading gap, where girls outperformed boys; in the opposite case, where boys outperformed girls, these factors are also important but not sufficient to explain the endowments underlying the math and science gaps.

Información del artículo

 Recibido: 02/02/2026
 Aceptado: 27/03/2026

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 O57

 Palabras clave: Educación, Equidad,
 Actitudes, Enseñanza, Aprendizaje

Resumen

Este artículo examina los factores que explican las diferencias de género en el rendimiento académico en 77 países. El estudio descompone la variación de la brecha de género en atributos observables y no observables. El artículo identifica que el gusto por la lectura y las expectativas sobre las futuras carreras profesionales son los principales factores que impulsan las brechas de género en el rendimiento académico. Estos factores son más relevantes para explicar la brecha en lectura, en la que las niñas obtienen puntajes superiores a los de los niños. En el caso contrario, en el que los niños obtienen puntajes superiores a las niñas, estos factores también son importantes, pero no bastan para explicar las brechas en matemáticas y ciencias.

 *Universidad Autónoma de Nuevo León
cinthya.caamallv@uanl.edu.mx
<https://orcid.org/0000-0003-0249-4027>

1. Introduction

The objective of this study is to understand the reasons behind gender differences in academic performance across 77 countries, using Programme for International Student Assessment (PISA) scores administered by the Organization for Economic Co-operation and Development (OECD). Evidence on gender differences in academic performance suggests that girls outperform boys in reading across all ages (Johnson, 1996; Lietz, 2006; OECD, 2010, 2019), whereas boys outperform girls in mathematics and science (Lietz, 2006; Baye & Monseur, 2016; Reynolds et al., 2015).

The methodology to decompose the gender academic differences is based on Blinder-Oaxaca methods using microdata at the individual level to account for observable characteristics such as parents' education level, an index of socioeconomic conditions, if the student is immigrant, whether the student lives in an OECD country, as well as the available resources at home to study like computer, internet access and the number of books. The questionnaire from PISA allows us to understand the perceptions and the attitudes reported by the students, for example, if they like reading, if they think that studying hard will lead to a good job, if they like to compete, if they have felt fear of failure, if they have emotional support from their parents, measure of resilience attitude, among other factors that can affect academic performance.

The empirical strategy consists of estimating the effect of the same set of variables on each assessed topic: reading, math, and science. Because of differences across countries, the estimation is corrected for country-level clustering of standard errors. The results showed that including only socioeconomic characteristics explained less than 10% of the total variation in the reading gap. As more attitude-related variables were included, like enjoyment of reading and expectations for future careers, the estimates improved, accounting for 78% of the total variation in the reading gap. The largest difference was in reading, favoring girls; by contrast, the gaps in math and science were smaller and favored boys. The same observable factors cannot account for more than half of the total variation, leaving the unexplained factors as the main drivers behind the math and science gaps.

2. Literature review

The Expectancy-Value Theory (EVT) proposes that achievement-related choices are driven by individuals' expectations for success and the subjective value they assign to the task, and EVT can explain gender differences in academic performance (Eccles et al., 1983; Eccles & Wigfield, 2002). Accordingly, children are more likely to engage in and persist with an activity if they believe they can succeed and find it valuable. Stereotypes and cultural messages about gender capabilities influence boys' and girls' expectations for success and the value they assign to various subjects (Fan, 2011; Brown & Putwain, 2021). Personality might explain educational choices and outcomes (Furnham, 2025).

The reading gender performance gaps might be driven by girls' motivation or a higher sense of competition (OECD, 2009; Workman & Heyder, 2020). Differences in attitudes toward study, such as resistance to schooling, enjoyment of school, and the positive influence of peers, are more evident among boys (Geven et al., 2017). All these factors can shape students' expectations regarding their future careers and lives (Bian et al., 2017). Academic performance may also depend on students' motivation to learn and on the home environment regarding gender roles and stereotypes (Rodríguez-Planas & Nollenberger, 2018; Lundberg, 2020).

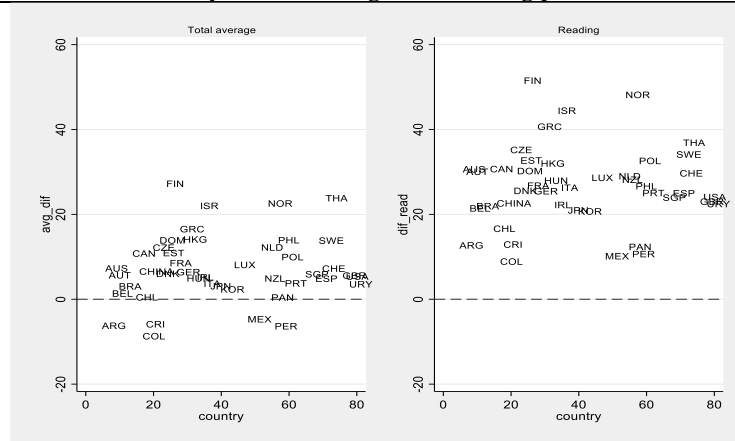
Gender roles and stereotypes at home can also impact academic performance (Rodríguez-Planas & Nollenberger, 2018; Lundberg, 2020). Girls' self-esteem declines during adolescence as they realize they are expected to demonstrate traditional behaviors, such as passivity, adjustment, and sensitivity to others' expectations, and to avoid competitiveness (Määttä & Uusiautti, 2020). Boys resist following the rules and defy teacher authority (Geven et al., 2017).

2.1. Data analysis

The PISA database provides information on students' scores in three different subjects: reading, mathematics, and science. The year 2018 is the latest wave available, before the COVID-19 pandemic. It is possible to determine school conditions, parents' level of education, and information on students' performance in real-life situations, thereby allowing the identification of cognitive abilities, aspirations, and interest in learning (Bian et al., 2017; Danovitch et al., 2021; Rivera-Garrido, 2022).

Figure 1 shows that most countries had a positive gender gap in the overall average of reading, math, and science, meaning that girls did better than boys, except in Latin American countries such as Argentina, Costa Rica, Colombia, Mexico, and Peru. This pattern is explained by the fact that girls perform better than boys, with the difference larger in Finland, Norway, Israel, and Greece, and still positive but lower in the same Latin American countries, including Panama and Chile.

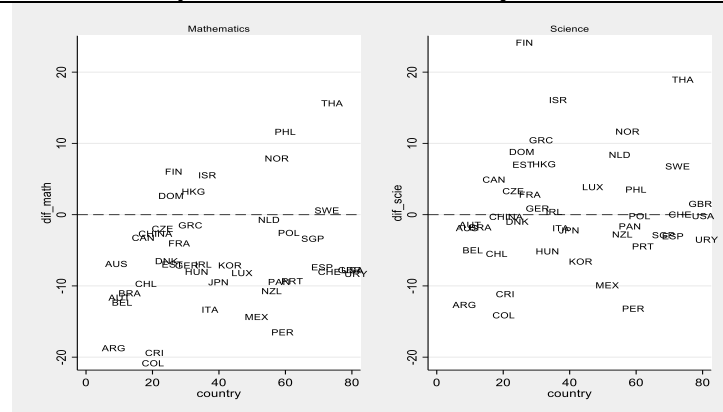
Figure 1: Girls' and boys' total average and reading performance PISA 2018



Source: Author's own calculations based on microdata from PISA 2018. <https://www.oecd.org/pisa/data/>

Figure 2 shows that gender gaps in mathematics and science scores do not follow a clear pattern. In math scores, eight countries have girls outperforming boys (positive difference), while most have boys outperforming girls (negative difference). The science scores showed a balance across the countries, so there is no clear indication of whether girls or boys perform better in science.

Figure 2: Girls and boys' mathematics and science performance PISA 2018



Source: Author's own calculations based on microdata from PISA 2018. <https://www.oecd.org/pisa/data/>

Table 1 presents the world average difference between girls and boys across the three assessed topics: reading, mathematics, and science. The most significant gender difference was in reading, with a 29.55-point gap favoring girls over boys.

In mathematics, boys outperformed girls; in science, the raw difference favored girls' scores over boys', with a slightly larger difference than in mathematics and statistical significance. The variables used as predictors are divided into two groups: socioeconomic conditions and attitudes toward studying, such as enjoyment and motivations, soft skills, and future career expectations. Most of the analyzed gender differences were statistically significant, except for the indicator of having internet at home.

Table 1: Gender girl-boy difference tests (countries average)

Average differences	Difference Girls-Boys	t-test
Reading scores PISA 2018	29.55869	110.57
Mathematics scores PISA 2018	-3.68801	-14.60
Science scores PISA 2018	4.01046	15.96
<i>Socioeconomic</i>		
No education for either parent	0.00097	3.53
Parents' highest level of education ISCED 1	0.00457	10.40
Parents' highest level of education ISCED 2	0.00382	5.37
Parents' highest level of education ISCED 3B, C	0.00392	6.54
Parents' highest level of education ISCED 3A, ISCED 4	0.01372	12.43
Parents' highest level of education ISCED 5B	0.00881	9.36
Parents' highest level of education ISCED 5A, 6	-0.03590	-27.93
Immigrants (native/first or second generation)	-0.00265	-3.06
Socioeconomic, social, and cultural status index	-0.01836	-6.36
Have computer at home (Yes/No)	0.00633	6.36
Have internet at home (Yes/No)	0.00101	1.40
Number of books at home	0.11151	29.87
Learning time (in minutes)	-8.67830	-22.08
<i>Attitudes</i>		
Enjoy reading index	0.52690	202.03
Think that "studying hard will get me a good job" (Yes/No)	0.04135	45.01
Competitiveness index	-0.16185	-60.19
General fear of failure index	0.27183	102.49
Students' perception of parents' emotional support index	0.16637	57.83
Resilience index	-0.01995	-7.17
Students' expected occupational status index	7.01665	156.52

Source: Author's own calculations based on microdata from PISA 2018. <https://www.oecd.org/pisa/data/>

For socioeconomic conditions, parents' education is coded into a binary variable indicating the highest level reported at home, either by the mother or the father. According to the OECD standard classification, in schooling years, ISCED 1 equals approximately six years of education; ISCED 2, approximately nine years; ISCED 3B or 3C, and ISCED 3A or 4, approximately twelve years; and ISCED 5B, approximately fifteen years. ISCED 5A or 6 is approximately sixteen years of education. The gender differences were marginal but statistically significant, indicating that differences in parents' education were not meaningful between girls and boys.

Boys had parents with the highest level of education. A larger proportion of boys had immigrant parents and more economic resources than girls; the difference was small in magnitude but statistically significant. On average, girls had more books at home, whereas boys spent more time studying; the magnitude of this effect was the largest, at -8.67. As shown in Table 1, girls appeared to have greater reading enjoyment and a higher ability to connect study effort with obtaining a good job. However, the difference was of smaller magnitude. Among the attitudes, girls reported greater fear of failure and greater awareness of the support they received from their parents than boys did. In contrast, boys showed higher competitiveness and resilience than girls.

The OECD developed an index to measure future career expectations, ranking the desired occupations reported by students. The results favored girls by 7.01 points, meaning girls reported higher career expectations than boys.

3. Data and methodology

The Blinder–Oaxaca methodology is suitable for identifying two primary sources to explain differences (Oaxaca, 1973; Blinder, 1973). The method first estimates an Ordinary Least Squares (OLS) regression from microdata obtained for every student who took part in PISA across countries. It accounts for the explained and unexplained factors behind the gender differences. The raw gender difference in PISA 2018 test scores, estimated for each country i , is denoted by RD_i . For example, the girls' scores are denoted by R_{ig} , and the boys' by R_{ib} . The gender differences in reading, mathematics, and science scores are as follows:

$$RD_i = E(R_{ig}) - E(R_{ib}) \quad (1)$$

The observable factors are X_{ig} for girls and X_{ib} for boys.

$$RD_i = E(R_{ig}) - E(R_{ib}) = E(X_{ig}\beta_{ig}) - E(X_{ib}\beta_{ib}) \quad (2)$$

After some simplification of the terms, it is possible to obtain an expression that represents a counterfactual combining the average characteristics of boys' and girls' academic performance; this term enables an analytical comparison of the gender difference. $\overline{X_{ib}\widehat{\beta}_{ig}}$. Therefore, the gender difference in reading scores is expressed as follows:

$$RD_i = (\overline{X_{ig}} - \overline{X_{ib}})\widehat{\beta}_{ig} + (\widehat{\beta}_{ig} - \widehat{\beta}_{ib})\overline{X_{ib}} \quad (3)$$

Equation (3) denotes the Blinder–Oaxaca decomposition for gender difference. The first term represents the portion of the gender difference score explained by observable variables such as parents' education, socioeconomic characteristics, and other academic performance-related factors. The explained portions of the gender gaps are known as endowments because they represent group differences in the predictors (Jann, 2008). The second term is the unexplained part of the score difference; some factors are omitted from the models, and others are unobserved in the data. PISA results allow the identification of some of these variables, thereby reducing omitted-variable bias and leaving only minor variations unexplained. Some unobservable variables in the datasets account for qualitative indicators of taste, well-being, life satisfaction, and gender roles. Other unobservable variables affect academic performance among boys and girls.

4. Results and discussion

The microdata includes a set of student-level variables covering the educational systems of 77 countries, drawn from the OECD PISA database; the total sample size is 437,992. There are four model specifications,¹ each including the same variables across the assessed topics. The empirical strategy will quantify the effect of closing the gender academic gap, controlling only for socioeconomic factors, using Models (1), (5), and (9) for reading, math, and science, respectively. The second model (2, 6, and 10) includes the enjoyment of reading index and the perception that studying hard will lead to a good job. The third model (3, 7, and 11) for each topic includes students' perceptions of competitiveness at school and fear of failure, whether students report that their

¹ The complete list of variables is shown in Table A6.

parents show emotional support, and a resilience index. The last column shows the fourth model (4), (8), and (12), which include expectations for future careers.

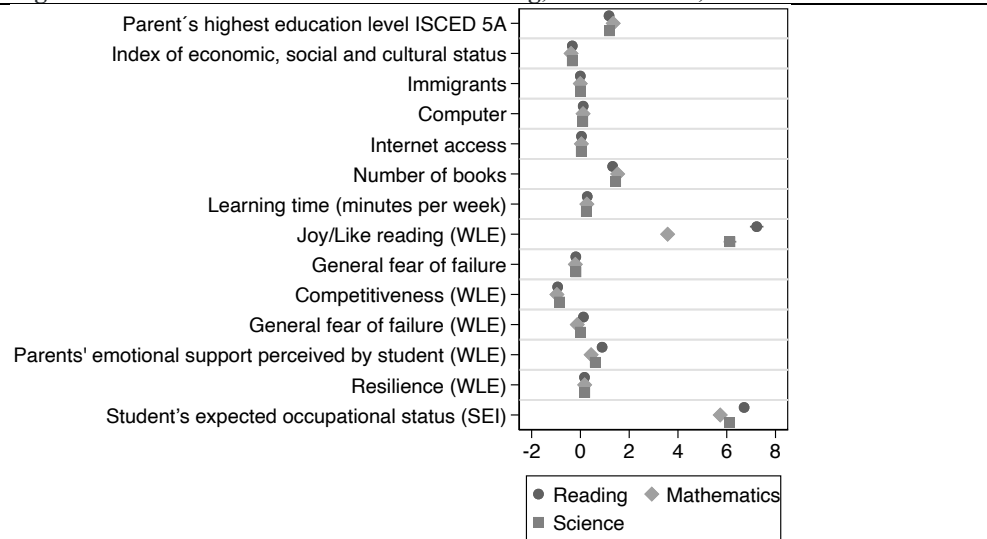
Results show that including socioeconomic characteristics accounts for the smallest portion of the gender difference. In the reading gap, these characteristics account for 9.49% of it. The math gap was -8.71, the endowment estimate was 2.50, and the unobservable coefficient was -11.21; this means that the unobservable factors explained a magnitude four times that of the endowment effect, favoring boys. Finally, the science gap is not statistically significant in the first three models. From the last column of each Table A2-A4, it is evident that when more variables are included in the students' attitude, the goodness of fit increases, and the Variance Inflation Factor (VIF) and Root Mean Squared Error (RMSE) decrease.

When expectations of future careers were included in the last models, they seemed to be a better fit for understanding the gender academic gap, because the endowments explained the largest share of the reading gap, 76%. This set of factors also explains the largest share of the variation gap in math and science; however, a larger share of the gap remained unexplained. The science gap, for Model 12, is the only statistically significant gender difference. The detailed estimations can be seen in the appendix from Tables A2-A4.

The coefficients of these models for each topic are shown in Figure 3. It is evident that most variables have similar effects across the three topics analyzed; however, some variables do not statistically explain the academic gap, such as lower levels of education, being an immigrant, having a computer at home, and having internet access. Other variables have a statistically significant negative effect on the gender gap, including the socioeconomic index, OECD country status, belief that studying hard will lead to a good job, and the perception of competitiveness at school. On the contrary, factors that positively explain the gender gap are the highest level of education, the number of books, enjoyment of reading, fear of failure, and, above all, expectations for a future career, which explain most of the gap across the three topics.

The enjoyment of reading is a factor that helps explain the reading gap (9.16); that is, girls perform better than boys in reading because they enjoy reading. Nevertheless, the estimated coefficient for reading enjoyment is also high for the math gap (4.95) and the science gap (7.82). Therefore, this is a factor that can push the scores in the three assessed topics, in a larger magnitude in reading and a lesser one in math gaps, though. The students' expectations of future careers are the second-highest coefficients that explain the academic gap in reading (5.23), math (4.41), and science (4.76).

Figure 3: Estimated coefficients for the reading, mathematics, and science test scores



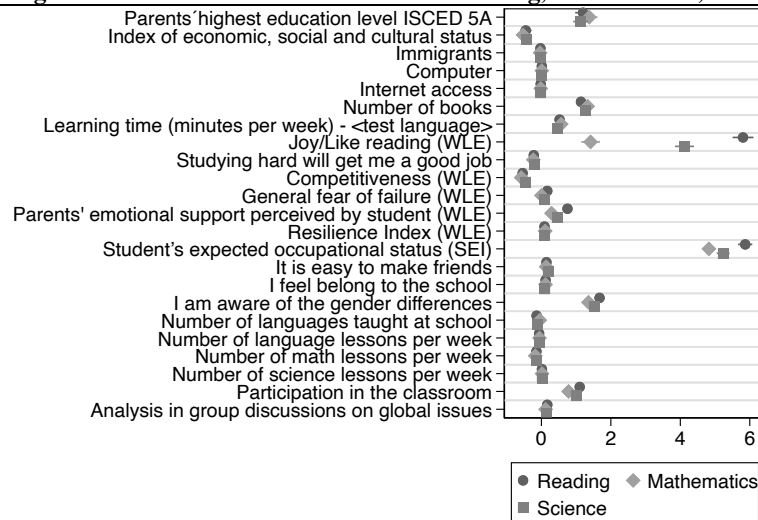
Notes: Standard robust errors in parentheses. Significance level * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Heteroscedasticity correction using country-level clustered standard errors.

Source: Author's own calculations based on microdata from PISA 2018. On the graphs are Models 4, 8, and 12.

To test the robustness of the coefficients, Table A5 showed the extended models (4), (8), and (12), including more variables related to school practices or how school environment might change their attitudes, for example, how easy is to make friends, feel belonging to school, students aware of gender differences, variables related to the number of classes they were taught, and whether they participation and discussion in class. The estimated coefficients are shown in Figure 4.

The endowment coefficients are similar in direction and magnitude; the variables that still explain academic gaps positively are the number of books, the belief that studying hard will lead to a good job, a high sense of competition, and the resilience index.

Figure 4: Estimated coefficients for the reading, mathematics, and science test scores: school effects



Notes: Standard robust errors in parentheses. Significance level * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Heteroscedasticity correction using country-level clustered standard errors.

Source: Author's own calculations based on microdata from PISA 2018. The graphs show extended Models 4, 8, and 12.

It is interesting how the factors relate in the same direction to the gender gap, but the magnitude can be higher for one topic than for another. In the reading gap, the endowment factors are of greater magnitude than in math and science, including enjoyment of reading, parents' emotional support, expectations for future careers, a sense of belonging at school, awareness of gender differences, participation in class, and discussions about global issues. For the case of the math gender gap, the more relevant endowment factors are the socioeconomic conditions, the highest education level of their parents, the number of books, learning time, the belief that studying hard will lead to a good job, the sense of competitiveness, and the resiliency index. Finally, in the science gap, the more relevant endowment, relative to the reading and math gaps, is the ease of making friends.

In general, the estimated differences were reduced for the reading academic gap (20.57), and the variation explained increased to 78%. However, the opposite occurred for the academic gaps in math (-11.89) and science (-4.38): even though their absolute values increased, unexplained factors remain more important than endowments. The enjoyment of reading explains more of the reading gap (5.81), the science gap (4.12), and the smallest math gap (1.42). The expectations of future careers are similar in magnitude across the three assessed topics (5.80, 5.23, and 4.82). The math gender gap is mainly driven by factors other than the endowments, relative to the science academic gap.

5. Conclusions and recommendations

This study analyzed the factors explaining gender differences in academic performance, using data from the PISA database across 77 countries. The empirical strategy of estimating the Blinder-Oaxaca decomposition

uses microdata at the individual level to account for observable characteristics such as education, socioeconomic conditions, resources and materials available for study, time dedicated to study, as well as perceptions and attitudes that students report across several topics that can impact academic performance.

The results showed that the largest gender differences exist in reading, with girls outperforming boys. The factors that explain this gap are girls' enjoyment of reading and their higher motivation, driven by expectations for future careers. Other endowments seem to have a greater impact on reading than on gaps in math and science, such as parents' emotional support, a stronger sense of belonging at school, awareness of gender differences, and active class participation.

The enjoyment of reading was also a relevant factor in explaining the academic gaps in math and science; however, when additional factors related to school practices and social attitudes, such as making friends, belonging to the school, and class participation, were considered, its importance decreased drastically, especially for the math gap. The variable that remained robust and important in explaining academic gaps was expectations for future careers. The largest share of the explained difference was in reading, with 78% attributable to the observed variables. However, for math and science, the largest part of the difference remained unexplained. Therefore, the contribution of this paper is the finding that variables related to motivation and encouragement were more relevant to explaining why girls outperformed boys in reading; however, these factors cannot explain why boys outperformed girls in math or science.

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Appendix

Table A1: List of countries

No.	ID	Country	Number of students
1	ALB	Albania	6,044
2	ARE	United Arab	17,748
3	ARG	Argentina	10,879
4	AUS	Australia	12,306
5	AUT	Austria	6,498
6	BEL	Belgium	7,822
7	BGR	Bulgaria	4,543
8	BIH	Bosnia and H	5,912
9	BLR	Belarus	5,640
10	BRA	Brazil	9,219

No.	ID	Country	Number of students
11	BRN	Brunei Darus	6,645
12	CAN	Canada	20,270
13	CHE	Switzerland	5,490
14	CHL	Chile	7,063
15	COL	Colombia	6,849
16	CRI	Costa Rica	6,334
17	CZE	Czech Repub	6,675
18	DEU	Germany	4,481
19	DNK	Denmark	6,798
20	DOM	Dominican R	4,195

No.	ID	Country	Number of students
21	ESP	Spain	34,320
22	EST	Estonia	5,146
23	FIN	Finland	5,387
24	FRA	France	5,908
25	GBR	United Kingd	12,934
26	GEO	Georgia	4,828
27	GRC	Greece	6,132
28	HKG	Hong Kong	5,785
29	HRV	Croatia	6,383
30	HUN	Hungary	4,993

No.	ID	Country	Number of students
31	IDN	Indonesia	11,708
32	IRL	Ireland	5,482
33	ISL	Iceland	3,071
34	ISR	Israel	6,033
35	ITA	Italy	11,073
36	JOR	Jordan	8,443
37	JPN	Japan	6,033
38	KAZ	Kazakhstan	18,791
39	KOR	Korea	6,599
40	KSV	Kosovo	4,658

Table A1: List of countries (continued)

No.	ID	Country	Number of students
41	LTU	Lithuania	6,581
42	LUX	Luxembourg	5,012
43	LVA	Latvia	5,087
44	MAC	Macao	3,763
45	MDA	Moldova	5,174
46	MEX	Mexico	6,140
47	MLT	Malta	3,152
48	MNE	Montenegro	6,107
49	MYS	Malaysia	6,004
50	NLD	Netherlands	3,817

No.	ID	Country	Number of students
51	NOR	Norway	5,431
52	NZL	New Zealand	5,962
53	PAN	Panama	4,827
54	PER	Peru	5,410
55	PHL	Philippines	7,002
56	POL	Poland	5,498
57	PRT	Portugal	5,552
58	QAT	Qatar	12,272
59	QAZ	Baku (Azerbaijan)	5,527
60	QCI	B-S-J-Z (China)	11,951

No.	ID	Country	Number of students
61	QMR	Moscow Region (R)	1,908
62	QRT	Tatarstan (RUS)	5,497
63	ROU	Romania	4,911
64	RUS	Russian Federation	7,127
65	SAU	Saudi Arabia	5,811
66	SGP	Singapore	6,611
67	SRB	Serbia	5,887
68	SVK	Slovak Republic	5,536
69	SVN	Slovenia	6,074
70	SWE	Sweden	5,217

No.	ID	Country	Number of students
71	TAP	Chinese Taipei	7,132
72	THA	Thailand	8,472
73	TUR	Turkey	6,740
74	UKR	Ukraine	5,789
75	URY	Uruguay	4,458
76	USA	United States	4,651
77	VNM	Vietnam	5,336

Source: PISA 2018. <https://www.oecd.org/pisa/data/>

Table A2: Reading difference scores for girls and boys

	Model (1)	Model (2)	Model (3)	Model (4)
Overall				
Girls	486.4*** (5.782)	487.0*** (5.791)	485.8*** (5.780)	483.4*** (5.916)
Boys	461.4*** (6.282)	462.7*** (6.139)	462.4*** (6.232)	461.1*** (6.318)
Difference	24.95*** (1.233)	24.32*** (1.239)	23.39*** (1.296)	22.28*** (1.327)
Endowments	2.377*** (0.417)	12.36*** (1.218)	13.33*** (1.265)	16.92*** (1.371)
Coefficients	22.57*** (1.283)	11.97*** (1.900)	10.06*** (2.024)	5.366*** (2.025)
Endowments				
ISCED 1	-0.00222 (0.0108)	-0.00553 (0.0102)	-0.00805 (0.0113)	-0.00591 (0.0101)
ISCED 2	-0.0164 (0.0199)	-0.0179 (0.0220)	-0.0178 (0.0235)	-0.0270 (0.0206)
ISCED 3B, C	-0.105** (0.0520)	-0.102** (0.0508)	-0.111* (0.0569)	-0.0606 (0.0396)
ISCED 3A, ISCED 4	-0.325*** (0.121)	-0.324*** (0.118)	-0.357*** (0.129)	-0.319** (0.127)
ISCED 5B	-0.280** (0.114)	-0.270** (0.110)	-0.223** (0.102)	-0.167* (0.0939)
ISCED 5A, 6	1.231*** (0.318)	1.230*** (0.307)	1.255*** (0.320)	1.172*** (0.319)
Socioeconomic, social and cultural	-0.166 (0.241)	-0.190 (0.247)	-0.220 (0.254)	-0.372* (0.218)
Immigrants	-0.00744 (0.0151)	-0.00650 (0.0134)	-0.00311 (0.0118)	-0.00523 (0.0113)
Computer	0.130** (0.0634)	0.139** (0.0661)	0.136* (0.0707)	0.103 (0.0721)
Internet acces	0.0562 (0.0523)	0.0597 (0.0594)	0.0615 (0.0621)	0.0427 (0.0610)
Number of books	1.853*** (0.242)	1.409*** (0.191)	1.325*** (0.195)	1.225*** (0.194)
Learning Time (mins)	0.179 (0.124)	0.191 (0.120)	0.220* (0.126)	0.208* (0.120)
OECD	-0.170 (0.147)	-0.245 (0.189)	-0.366* (0.198)	-0.543** (0.216)
Enjoy reading index		10.52*** (1.072)	10.18*** (1.169)	9.164*** (1.207)
Studying hard- Good job		-0.0362 (0.0771)	-0.136* (0.0772)	-0.165** (0.0763)

Table A2: Reading difference scores for girls and boys (continued)

	Model (1)	Model (2)	Model (3)	Model (4)
Competition competitiveness			-0.734*** (0.198)	-0.635*** (0.194)
Fear of failure			1.287*** (0.369)	1.180*** (0.366)
Parents' emotional support			0.870*** (0.111)	0.685*** (0.101)
Resilience index			0.165* (0.0878)	0.205** (0.100)
Expectations Future career				5.229*** (0.436)
Unexplained				
ISCED 1	-0.0663 (0.0984)	-0.0777 (0.0940)	-0.0342 (0.0994)	-0.0117 (0.0997)
ISCED 2	0.00122 (0.272)	-0.0754 (0.278)	-0.0436 (0.294)	-0.106 (0.275)
ISCED 3B, C	0.177 (0.263)	0.101 (0.261)	0.156 (0.274)	-0.0968 (0.237)
ISCED 3A, ISCED 4	0.180 (0.993)	-0.217 (0.984)	-0.145 (1.012)	-0.885 (0.898)
ISCED 5B	0.339 (0.747)	0.0674 (0.732)	0.0446 (0.727)	-0.628 (0.646)
ISCED 5A, 6	2.479 (2.233)	1.732 (2.230)	1.918 (2.181)	0.254 (1.900)
Socioeconomic, social and cultural	-0.196 (0.187)	-0.269 (0.200)	-0.376 (0.233)	-0.958*** (0.367)
Immigrants	-0.0875 (0.214)	-0.213 (0.205)	-0.0944 (0.207)	0.256 (0.228)
Computer	-2.850** (1.413)	-3.758*** (1.317)	-3.216** (1.393)	-3.297** (1.390)
Internet acces	-0.332 (1.159)	-0.387 (1.279)	-0.748 (1.462)	-1.320 (1.416)
Number of books	-0.503 (1.345)	-7.347*** (1.111)	-7.446*** (1.211)	-6.028*** (1.179)
Learning Time (mins)	5.757*** (1.077)	5.669*** (1.125)	4.758*** (1.129)	4.757*** (1.177)
OECD	-1.024 (1.198)	-0.755 (1.005)	-0.861 (0.961)	-0.901 (0.887)
Enjoy reading index		0.754** (0.303)	1.018*** (0.359)	1.353*** (0.412)
Studying hard- Good job		0.342 (0.864)	1.426 (0.893)	1.692* (0.869)
Competition competitiveness			-0.486** (0.191)	-0.539*** (0.192)
Fear of failure			-0.162 (0.201)	-0.160 (0.216)
Parents' emotional support			-0.0164 (0.0647)	-0.0742 (0.0559)
Resilience index			-0.120* (0.0614)	-0.167** (0.0829)
Expectations				-31.29***
Future career				(2.485)
Constant	18.70*** (6.608)	16.40** (6.551)	14.49** (6.764)	43.51*** (6.503)
N	437,992	433,942	391,599	331,792

Table A2: Reading difference scores for girls and boys (continued)

Test				
Adjusted R2	0.2575	0.2906	0.2948	0.3124
Root MSE	86.106	83.836	82.798	80.943
Multicollinearity+	9.21	8.25	6.75	6.45
Heteroscedasticity				
Breusch-Pagan+	954.01	254.56	224.22	373.44
Prob >Chi2	0.000	0.000	0.000	0.000
White test+	15119.41	14766.60	17139.94	14659.15
Prob >Chi2	0.000	0.000	0.000	0.000

Notes: Standard robust errors in parentheses. Significance levels * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. + Tests results are calculated from the Ordinary Least Squares Model. Coefficients shown are corrected for heteroscedasticity using country-level cluster robust standard errors

Source: Author's own calculations based on microdata from PISA 2018. <https://www.oecd.org/pisa/data/>

Table A3: Gender differences in girls' and boys' mathematics

	Model (5)	Model (6)	Model (7)	Model (8)
Overall				
Girls	473.5*** (5.831)	474.1*** (5.793)	473.3*** (5.927)	470.7*** (6.060)
Boys	482.2*** (6.278)	483.4*** (6.156)	483.5*** (6.388)	481.6*** (6.479)
Difference	-8.711*** (1.036)	-9.312*** (1.076)	-10.13*** (1.132)	-10.97*** (1.132)
Endowments	2.496*** (0.412)	7.927*** (1.313)	8.174*** (1.367)	11.39*** (1.431)
Coefficients	-11.21*** (1.134)	-17.24*** (1.955)	-18.30*** (2.042)	-22.36*** (1.964)
Endowments				
ISCED 1	-0.00151 (0.00934)	-0.00314 (0.00905)	-0.00748 (0.0102)	-0.00311 (0.00950)
ISCED 2	-0.0119 (0.0161)	-0.0124 (0.0168)	-0.0139 (0.0194)	-0.0179 (0.0201)
ISCED 3B, C	-0.0973* (0.0529)	-0.0969* (0.0528)	-0.112* (0.0619)	-0.0625 (0.0447)
ISCED 3A, ISCED 4	-0.301** (0.128)	-0.300** (0.126)	-0.347** (0.142)	-0.308** (0.146)
ISCED 5B	-0.298** (0.127)	-0.289** (0.124)	-0.250** (0.118)	-0.193* (0.112)
ISCED 5A, 6	1.268*** (0.365)	1.263*** (0.358)	1.344*** (0.381)	1.273*** (0.389)
Socioeconomic, social and cultural	-0.177 (0.256)	-0.200 (0.260)	-0.237 (0.274)	-0.410* (0.241)
Immigrants	-0.00678 (0.0142)	-0.00624 (0.0133)	-0.00290 (0.0112)	-0.00480 (0.0113)
Computer	0.125** (0.0611)	0.130** (0.0624)	0.125* (0.0658)	0.0952 (0.0669)
Internet acces	0.0479 (0.0453)	0.0487 (0.0491)	0.0504 (0.0515)	0.0352 (0.0506)
Number of books	1.887*** (0.256)	1.629*** (0.216)	1.557*** (0.223)	1.464*** (0.226)
Learning Time (mins)	0.180 (0.131)	0.185 (0.127)	0.211 (0.135)	0.203 (0.129)
OECD	-0.118 (0.112)	-0.161 (0.134)	-0.241 (0.153)	-0.351* (0.184)
Enjoy reading index		5.824*** (1.119)	5.713*** (1.244)	4.949*** (1.308)

Table A3: Gender differences in girls' and boys' mathematics (continued)

	Model (5)	Model (6)	Model (7)	Model (8)
Studying hard- Good job		-0.0839	-0.138	-0.153*
		(0.0820)	(0.0848)	(0.0840)
Competition competitiveness			-0.917***	-0.832***
			(0.250)	(0.244)
Fear of failure			0.794**	0.738*
			(0.390)	(0.387)
Parents' emotional support			0.465***	0.339***
			(0.103)	(0.0970)
Resilience index			0.182*	0.223**
			(0.1000)	(0.113)
Expectations Future career				4.405***
				(0.465)
Unexplained				
ISCED 1	0.0833	0.0733	0.103	0.106
	(0.0891)	(0.0858)	(0.0917)	(0.102)
ISCED 2	0.329	0.273	0.292	0.201
	(0.231)	(0.237)	(0.248)	(0.232)
ISCED 3B, C	0.337	0.288	0.326	0.0677
	(0.228)	(0.222)	(0.231)	(0.199)
ISCED 3A, ISCED 4	1.195	0.968	0.981	0.187
	(0.879)	(0.869)	(0.882)	(0.782)
ISCED 5B	0.864	0.711	0.671	-0.0156
	(0.671)	(0.652)	(0.632)	(0.548)
ISCED 5A, 6	4.333**	3.877*	3.844*	2.202
	(2.069)	(2.080)	(2.022)	(1.731)
Socioeconomic, social and cultural	-0.0885	-0.139	-0.199	-0.650**
	(0.197)	(0.204)	(0.237)	(0.322)
Immigrants	-0.507**	-0.573**	-0.522**	-0.275
	(0.222)	(0.237)	(0.237)	(0.198)
Computer	-3.896**	-4.485***	-4.095***	-3.978***
	(1.542)	(1.434)	(1.494)	(1.466)
Internet acces	-4.053**	-3.800**	-4.438**	-5.258***
	(1.880)	(1.924)	(2.048)	(1.840)
Number of books	-0.874	-5.142***	-5.245***	-4.107***
	(1.164)	(1.192)	(1.202)	(1.113)
Learning Time (mins)	4.975***	4.911***	3.978***	4.087***
	(1.161)	(1.187)	(1.194)	(1.199)
OECD	-2.026**	-1.593**	-1.363*	-1.615**
	(0.933)	(0.788)	(0.743)	(0.730)
Enjoy reading index		0.569**	0.743**	1.024***
		(0.274)	(0.318)	(0.369)
Studying hard- Good job		1.781**	2.525***	3.173***
		(0.902)	(0.884)	(0.933)
Competition competitiveness			-0.249*	-0.252
			(0.145)	(0.172)
Fear of failure			-0.122	-0.121
			(0.162)	(0.181)
Parents' emotional support			-0.00921	-0.0363
			(0.0395)	(0.0285)
Resilience index			-0.157*	-0.218*
			(0.0831)	(0.114)
Expectations Future career				-28.20***
				(2.920)
Constant	-11.88*	-14.96**	-15.37**	11.32*
	(6.784)	(6.737)	(6.898)	(6.259)
N	437992	433942	391599	331792

Table A3: Gender differences in girls' and boys' mathematics (continued)

Tests				
Adjusted R2	0.2599	0.2714	0.2759	0.2899
Root MSE	80.518	79.583	79.308	78.008
Multicollinearity+	9.21	8.25	6.75	6.45
Heteroscedasticity				
Breusch-Pagan+	375.05	244.76	420.91	565.88
Prob >Chi2	0.000	0.000	0.000	0.000
White test+	19162.68	18590.32	19477.58	17387.91
Prob >Chi2	0.000	0.000	0.000	0.000

Notes: Standard robust errors in parentheses. Significance levels * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Tests results are calculated from the Ordinary Least Squares. Coefficients shown are corrected for heteroscedasticity using country-level cluster robust standard errors.

Source: Author's own calculations based on microdata from PISA 2018. <https://www.oecd.org/pisa/data/>

Table A4: Gender differences between girls' and boys' science scores

	Model (9)	Model (10)	Model (11)	Model (12)
Overall				
Girls	476.8*** (5.632)	477.4*** (5.600)	476.6*** (5.654)	474.3*** (5.787)
Boys	477.6*** (6.373)	478.8*** (6.214)	478.8*** (6.384)	477.3*** (6.459)
Difference	-0.862 (1.297)	-1.471 (1.316)	-2.244 (1.397)	-3.052** (1.403)
Endowments	2.374*** (0.411)	10.83*** (1.360)	11.32*** (1.374)	14.69*** (1.451)
Coefficients	-3.236** (1.420)	-12.30*** (2.248)	-13.56*** (2.343)	-17.74*** (2.315)
Endowments				
ISCED 1	0.00629 (0.00912)	0.00381 (0.00815)	0.000744 (0.00836)	0.00478 (0.00878)
ISCED 2	-0.0121 (0.0160)	-0.0132 (0.0173)	-0.0143 (0.0196)	-0.0195 (0.0191)
ISCED 3B, C	-0.103* (0.0533)	-0.101* (0.0521)	-0.116* (0.0604)	-0.0647 (0.0429)
ISCED 3A, ISCED 4	-0.308** (0.125)	-0.306** (0.122)	-0.352*** (0.136)	-0.310** (0.137)
ISCED 5B	-0.278** (0.119)	-0.268** (0.114)	-0.229** (0.108)	-0.173* (0.101)
ISCED 5A, 6	1.173*** (0.348)	1.169*** (0.335)	1.241*** (0.354)	1.157*** (0.360)
Socioeconomic, social and cultural	-0.160 (0.231)	-0.182 (0.237)	-0.215 (0.248)	-0.365* (0.215)
Immigrants	-0.00558 (0.0120)	-0.00475 (0.0106)	-0.00222 (0.00872)	-0.00351 (0.00916)
Computer	0.105** (0.0518)	0.112** (0.0540)	0.110* (0.0575)	0.0831 (0.0585)
Internet acces	0.0411 (0.0390)	0.0446 (0.0449)	0.0457 (0.0467)	0.0317 (0.0457)
Number of books	1.914*** (0.259)	1.533*** (0.207)	1.457*** (0.213)	1.361*** (0.214)
Learning Time (mins)	0.142 (0.128)	0.152 (0.123)	0.180 (0.129)	0.173 (0.124)
OECD	-0.141 (0.128)	-0.204 (0.162)	-0.305* (0.175)	-0.449** (0.199)
Enjoy reading index		8.953*** (1.172)	8.718*** (1.304)	7.819*** (1.358)

Table A4: Gender differences between girls' and boys' science scores (continued)

Studying hard- Good job		-0.0559	-0.122	-0.148**
		(0.0742)	(0.0757)	(0.0752)
Competition competitiveness			-0.818***	-0.733***
			(0.240)	(0.237)
Fear of failure			0.980***	0.905**
			(0.367)	(0.362)
Parents' emotional support			0.575***	0.433***
			(0.102)	(0.0948)
Resilience index			0.183*	0.222**
			(0.0994)	(0.112)
Expectations Future career				4.762***
				(0.433)
Unexplained				
ISCED 1	0.00708	-0.00884	0.0337	0.0430
	(0.0959)	(0.0910)	(0.0978)	(0.107)
ISCED 2	0.154	0.0674	0.123	0.0543
	(0.230)	(0.241)	(0.258)	(0.246)
ISCED 3B, C	0.274	0.209	0.284	0.0239
	(0.240)	(0.235)	(0.247)	(0.212)
ISCED 3A, ISCED 4	0.642	0.277	0.462	-0.390
	(0.953)	(0.946)	(0.977)	(0.860)
ISCED 5B	0.584	0.345	0.415	-0.316
	(0.720)	(0.693)	(0.691)	(0.595)
ISCED 5A, 6	3.348	2.682	3.016	1.238
	(2.230)	(2.217)	(2.196)	(1.879)
Socioeconomic, social and cultural	-0.101	-0.165	-0.232	-0.731**
	(0.190)	(0.196)	(0.230)	(0.330)
Immigrants	-0.0774	-0.184	-0.123	0.170
	(0.225)	(0.222)	(0.235)	(0.247)
Computer	-3.927***	-4.749***	-4.249***	-4.069***
	(1.499)	(1.372)	(1.468)	(1.466)
Internet acces	-1.462	-1.399	-1.757	-2.417
	(1.342)	(1.487)	(1.648)	(1.546)
Number of books	-0.361	-6.380***	-6.582***	-5.411***
	(1.270)	(1.147)	(1.220)	(1.174)
Learning Time (mins)	5.406***	5.334***	4.298***	4.472***
	(1.096)	(1.128)	(1.109)	(1.150)
OECD	-2.571**	-2.237**	-2.048**	-2.235**
	(1.284)	(1.033)	(1.009)	(0.970)
Enjoy reading index		0.722**	0.939**	1.227***
		(0.318)	(0.373)	(0.423)
Studying hard- Good job		0.911	1.884**	2.065**
		(0.862)	(0.881)	(0.879)
Competition competitiveness			-0.251*	-0.241*
			(0.131)	(0.146)
Fear of failure			-0.125	-0.121
			(0.177)	(0.190)
Parents' emotional support			-0.0113	-0.0596
			(0.0572)	(0.0472)
Resilience index			-0.132*	-0.189*
			(0.0734)	(0.102)
Expectations Future career				-28.45***
				(2.583)
Constant	-5.152	-7.727	-9.507	17.60***
	(7.087)	(7.047)	(7.207)	(6.362)
N	437992	433942	391599	331792

Table A4: Gender differences between girls' and boys' science scores (continued)

Tests				
Adjusted R2	0.2427	0.2703	0.2745	0.2915
Root MSE	81.488	79.698	79.029	77.409
Multicollinearity+	9.21	8.25	6.75	6.45
Heteroscedasticity				
Breusch-Pagan+	1765.29	1029.02	1132.43	1253.37
Prob >Chi2	0.000	0.000	0.000	0.000
White test+	17323.77	16668.84	17992.66	15896.09
Prob >Chi2	0.000	0.000	0.000	0.000

Notes: Standard robust errors in parentheses. Significance levels * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Tests results calculated from the Ordinary Least Squares Models. Coefficients shown are corrected for heteroscedasticity using country-level cluster robust standard errors.

Source: Author's own calculations based on microdata from PISA 2018. <https://www.oecd.org/pisa/data/>

Table A5: Extended models of gender differences in reading, math, and science

	Reading Extended Model (4)	Mathematics Extended Model (8)	Science Extended Model (12)
Overall			
Girls	482.1*** (6.046)	469.4*** (5.708)	472.4*** (5.438)
Boys	461.5*** (6.003)	481.2*** (5.982)	476.8*** (5.762)
Difference	20.57*** (1.092)	-11.88*** (1.150)	-4.375*** (1.189)
Endowments	16.00*** (1.394)	9.683*** (1.245)	13.32*** (1.227)
Coefficients	2.330* (1.200)	-22.93*** (1.196)	-19.54*** (1.421)
Interaction	2.249** (0.888)	1.370 (0.910)	1.846** (0.806)
Endowments			
ISCED 1	-0.0214 (0.0165)	-0.0297* (0.0174)	-0.0137 (0.0133)
ISCED 2	-0.0479 (0.0362)	-0.0486 (0.0368)	-0.0473 (0.0355)
ISCED 3B, C	-0.0746 (0.0458)	-0.0761 (0.0485)	-0.0752* (0.0452)
ISCED 3A, ISCED 4	-0.309** (0.123)	-0.319** (0.131)	-0.289** (0.120)
ISCED 5B	-0.171* (0.0983)	-0.207* (0.118)	-0.169* (0.0987)
ISCED 5A, 6	1.200*** (0.296)	1.380*** (0.344)	1.131*** (0.289)
Socioeconomic, social and cultural	-0.449** (0.205)	-0.526** (0.240)	-0.430** (0.196)
Immigrants	-0.0286 (0.0254)	-0.0373 (0.0327)	-0.0281 (0.0256)
Computer	0.0122 (0.0765)	0.0115 (0.0720)	0.0102 (0.0641)
Internet acces	-0.0196 (0.0565)	-0.0173 (0.0498)	-0.0140 (0.0404)
Number of books	1.140*** (0.188)	1.332*** (0.217)	1.270*** (0.204)
Learning Time (mins)	0.523*** (0.135)	0.571*** (0.151)	0.463*** (0.122)

Table A5: Extended models of gender differences in reading, math, and science) (continued)

Enjoy reading index	5.805*** (0.964)	1.416* (0.745)	4.121*** (0.816)
Studying hard- Good job	-0.220*** (0.0621)	-0.233*** (0.0656)	-0.202*** (0.0586)
Competition competitiveness	-0.540*** (0.138)	-0.582*** (0.178)	-0.455*** (0.139)
Fear of failure	0.170 (0.352)	0.00186 (0.394)	0.0859 (0.362)
Parents' emotional support	0.750*** (0.110)	0.292*** (0.0990)	0.464*** (0.103)
Resilience index	0.0881* (0.0472)	0.109* (0.0559)	0.0877* (0.0466)
Expectations Future career	5.868*** (0.469)	4.824*** (0.483)	5.233*** (0.459)
Easy to make Friends	0.146*** (0.0463)	0.136*** (0.0416)	0.191*** (0.0500)
Feel that belong to school	0.122** (0.0529)	0.119** (0.0519)	0.104** (0.0478)
Aware of gender differences	1.675*** (0.147)	1.355*** (0.157)	1.537*** (0.158)
Number of language taught at school	-0.139 (0.113)	-0.0454 (0.0455)	-0.107 (0.0887)
Number of language classes	-0.0662 (0.0739)	-0.0546 (0.0658)	-0.0490 (0.0564)
Number of math classes	-0.143 (0.0991)	-0.178 (0.121)	-0.131 (0.0921)
Number of science classes	0.0160 (0.153)	0.0183 (0.176)	0.0185 (0.177)
Participation on class	1.102*** (0.146)	0.783*** (0.121)	0.998*** (0.136)
Analyze global Issues at classroom	0.169* (0.0900)	0.121* (0.0655)	0.145* (0.0776)
OECD	-0.561*** (0.191)	-0.433** (0.174)	-0.535*** (0.186)
Coefficients			
ISCED 1	0.0957 (0.110)	0.250** (0.115)	0.178 (0.115)
ISCED 2	0.225 (0.299)	0.553* (0.302)	0.399 (0.305)
ISCED 3B, C	0.165 (0.265)	0.331 (0.255)	0.272 (0.251)
ISCED 3A, ISCED 4	-0.283 (1.004)	0.897 (0.979)	0.169 (1.005)
ISCED 5B	-0.168 (0.723)	0.409 (0.692)	0.0375 (0.697)
ISCED 5A, 6	0.614 (2.067)	2.576 (1.983)	1.389 (1.993)
Socioeconomic, social and cultural	-1.225*** (0.415)	-1.017*** (0.393)	-1.012*** (0.372)
Immigrants	-0.0720 (0.105)	-0.260** (0.110)	-0.196* (0.107)
Computer	-3.363*** (1.300)	-4.111*** (1.164)	-3.959*** (1.196)
Internet acces	-0.644 (1.407)	-5.099*** (1.880)	-1.928 (1.480)
Number of books	-4.863*** (1.161)	-3.689*** (1.162)	-4.660*** (1.153)

Table A5: Extended models of gender differences in reading, math, and science) (continued)

Learning Time (mins)	3.864***	4.454***	3.945***
	(1.451)	(1.274)	(1.431)
Enjoy reading index	-0.332	-0.267	-0.322
	(0.289)	(0.234)	(0.281)
Studying hard- Good job	1.400	2.483**	1.338
	(1.045)	(1.108)	(1.081)
Competition competitiveness	-0.603***	-0.195	-0.222*
	(0.174)	(0.153)	(0.127)
Fear of failure	-0.899***	-0.760***	-0.782***
	(0.210)	(0.187)	(0.189)
Parents' emotional support	0.0866*	0.0270	0.0710
	(0.0518)	(0.0204)	(0.0436)
Resilience index	-0.118	-0.177**	-0.123*
	(0.0813)	(0.0889)	(0.0731)
Expectations future career	-26.13***	-23.70***	-23.51***
	(2.180)	(2.586)	(2.177)
Easy to make friends	-2.188**	-1.011	-1.547
	(1.021)	(1.093)	(1.088)
Feel that belong to school	-1.012	0.612	-0.497
	(0.908)	(0.806)	(0.832)
Aware of gender differences	1.328	-1.197	-0.463
	(1.121)	(1.019)	(1.116)
Number of language taught at school	2.919**	4.199***	3.372***
	(1.197)	(1.039)	(1.044)
Number of language classes	1.672	-2.289	-0.279
	(2.323)	(2.243)	(2.794)
Number of math classes	-3.918*	2.013	-0.238
	(2.024)	(2.111)	(1.922)
Number of science classes	-1.500	-0.867	-0.515
	(1.047)	(1.092)	(0.922)
Participation on class	3.379***	2.642***	3.029***
	(0.542)	(0.540)	(0.503)
Analyze global Issues at classroom	1.248***	1.676***	1.856***
	(0.451)	(0.494)	(0.438)
OECD	-0.268	-1.158	-1.607*
	(0.803)	(0.794)	(0.842)
Constant	32.92***	-0.254	6.269
	(6.488)	(6.152)	(6.186)
Interaction			
ISCED 1	0.0135	0.0352*	0.0250
	(0.0161)	(0.0202)	(0.0183)
ISCED 2	0.00797	0.0196	0.0141
	(0.0119)	(0.0173)	(0.0146)
ISCED 3B, C	0.0127	0.0255	0.0210
	(0.0212)	(0.0224)	(0.0213)
ISCED 3A, ISCED 4	-0.0189	0.0598	0.0113
	(0.0671)	(0.0667)	(0.0671)
ISCED 5B	-0.00648	0.0158	0.00145
	(0.0282)	(0.0280)	(0.0269)
ISCED 5A, 6	-0.0487	-0.204	-0.110
	(0.164)	(0.159)	(0.159)
Socioeconomic, social and cultural	-0.100**	-0.0831*	-0.0827*
	(0.0506)	(0.0448)	(0.0435)

Table A5: Extended models of gender differences in reading, math, and science) (continued)

Immigrants	0.00166 (0.00269)	0.00601 (0.00501)	0.00453 (0.00408)
Computer	-0.00245 (0.0154)	-0.00300 (0.0188)	-0.00289 (0.0181)
Internet acces	0.000615 (0.00222)	0.00487 (0.0141)	0.00184 (0.00547)
Number of books	-0.174*** (0.0485)	-0.132*** (0.0458)	-0.167*** (0.0478)
Learning Time (mins)	-0.103** (0.0448)	-0.119*** (0.0428)	-0.105** (0.0446)
Enjoy reading index	3.583*** (0.637)	2.885*** (0.587)	3.485*** (0.586)
Studying hard- Good job	0.0613 (0.0461)	0.109** (0.0495)	0.0586 (0.0476)
Competition competitiveness	0.517*** (0.142)	0.167 (0.130)	0.190* (0.108)
Fear of failure	1.631*** (0.177)	1.379*** (0.183)	1.419*** (0.176)
Parents' emotional support	-0.313*** (0.0600)	-0.0977** (0.0488)	-0.256*** (0.0604)
Resilience index	0.0338 (0.0260)	0.0507* (0.0307)	0.0352 (0.0241)
Expectations future career	-2.683*** (0.266)	-2.433*** (0.296)	-2.413*** (0.258)
Easy to make friends	0.0796** (0.0395)	0.0368 (0.0402)	0.0563 (0.0407)
Feel that belong to school	-0.0240 (0.0227)	0.0145 (0.0196)	-0.0118 (0.0200)
Aware of gender differences	0.126 (0.106)	-0.113 (0.0966)	-0.0438 (0.106)
Number of language taught at school	0.0364 (0.0323)	0.0524 (0.0433)	0.0421 (0.0356)
Number of language clases	-0.00841 (0.0146)	0.0115 (0.0164)	0.00140 (0.0141)
Number of math clases	0.0357 (0.0293)	-0.0183 (0.0225)	0.00217 (0.0176)
Number of science clases	-0.00181 (0.0175)	-0.00105 (0.0102)	-0.000622 (0.00608)
Participation on class	-0.392*** (0.0737)	-0.306*** (0.0695)	-0.351*** (0.0679)
Analyze global issues at classroom	-0.0249 (0.0158)	-0.0334* (0.0200)	-0.0370* (0.0212)
OECD	0.00982 (0.0295)	0.0424 (0.0305)	0.0588* (0.0334)
N	251,282	251,282	251,282
Tests			
Adjusted R2	0.3795	0.3622	0.3672
Root MSE	74.292	71.704	69.887
Multicolinearity+	5.09	5.09	5.09
Heteroscedasticity			
Breusch-Pagan+	821.00	1006.45	1490.53
Prob > Chi2	0.000	0.000	0.000

Notes: Standard robust errors in parentheses. Significance levels * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Tests results calculated from the Ordinary Least Squares Models. Coefficients shown are corrected for heteroscedasticity using country-level cluster robust standard errors. Coefficients shown on Figure 4.

Source: Author's own calculations based on microdata from PISA 2018. <https://www.oecd.org/pisa/data/>

Table A6: List of variables included in the models

Group	Variables
Socioeconomic	Parents' highest level of education (seven categorical variables) Socioeconomic, social, and cultural status index Immigrants (Native/First or Second generation) (Yes/No) Have computer at home (Yes/No) Have internet at home (Yes/No) Number of books at home (number) Learning time (in minutes)
Attitudes	Enjoy reading index (continuous) Think that "studying hard will get me a good job" (Yes/No) Competitiveness index (continuous) General fear of failure index (continuous) Parents' emotional support perceived by the student index (continuous) Resilience index (continuous) Students expected occupational status index (continuous)
Extended models	It is easy to make friends (Yes/No) I feel belong to the school (Yes/No) I am aware of the gender differences (Yes/No) Number of languages taught at school (continuous) Number of language lessons per week (continuous) Number of math lessons per week (continuous) Number of science lessons per week (continuous) Participation in the classroom (Yes/No) Analysis in group discussions on global issues (Yes/No)

Source: Author's own elaboration.