

international surveys asking the same question in several countries, but also selecting the most “unbiased” indicators, i.e. those that are more independent from country-specific cultural contexts⁸.

The analysis that follows distinguishes between the “pre-COVID-19” and the “during-COVID-19” periods. For the former, the key sources of well-being indicators for primary and secondary school that are used are the Trends in International Mathematics and Science Study (TIMSS)⁹ 2019 and the PISA 2018 surveys, which gather data on educational aspirations, absenteeism and learning outcomes in mathematics. More subjective data from the PISA survey are also analysed, notably on bullying and feelings of well-being. Teacher’s views are taken into account in a third subsection. For the during-COVID-19 period, the analysis looks at the impact of the pandemic on well-being indicators for primary, secondary and tertiary students, based on a few recent international surveys that cover a number of EU countries. Specific attention is paid to students in Vocational Education and Training (VET) in a final subsection of the analysis. Unfortunately, due to the lack of cross-country comparable data on learning outcomes after the spread of the pandemic¹⁰, the relationship between well-being and learning outcome indicators at international level cannot yet be investigated for the duration of the COVID-19 period.

Box 1: Well-being as part of education policies in Estonia

In Estonia’s education strategy for 2021-2035, a well-being-focused learning environment is defined as “a combination of mental, social and physical conditions for learning that support the learner’s self-efficacy and self-esteem, the development of life skills and social competences, and mental and physical health in general”. Since 2018, the well-being of students and teachers is regularly monitored through a satisfaction survey targeted at students, teachers and parents. Each school receives feedback on areas for improvement. This year’s well-being survey focused on distance learning and self-management.

1.2 What we know about well-being before COVID-19: an analysis of data from PISA 2018 and TIMSS 2019

A sense of belonging is a fundamental human need. It includes a desire for social approval and to be accepted, respected and liked by others. A sense of belonging helps people make sense of their lives and contributes to their overall well-being¹¹.

This also applies in a school context¹². Since students spend a considerable part of their lives in school, interactions with their peers and teachers affect their overall well-being as well as school

⁸ Life satisfaction can suffer from cultural biases, which makes it unsuitable for international comparisons, Cf. OECD (2019). [PISA 2018 Results \(Volume III\): What School Life Means for Students’ Lives](#), p. 36.

⁹ TIMSS is carried out every four years by the International Association for the Evaluation of Educational Achievement (IEA). It is an international assessment of student achievement in mathematics and science at fourth and eighth grades.

¹⁰ There are country-specific studies estimating the negative impact of the spring 2020 COVID-19-induced lockdowns on student learning outcomes.

Cf. Engzell, P., Frey, A. and Verhagen, M.D. (2020). [Learning Loss Due to School Closures During the COVID-19 Pandemic](#). SocArXiv (on the Netherlands);

Maldonado, J. and De Witte, K. (2020). [The Effect of School Closures on Standardised Student Test Outcomes](#). KU Leuven Faculty of Economics and Business Discussion Paper Series 20.17 (on Belgium-Flemish Community);

French Ministry of National Education, Youth and Sports (2021). [Évaluations repères 2020 de début de CP et de CE1: baisse des performances par rapport à 2019, notamment en français en CE1, et hausse des écarts selon les secteurs de scolarisation](#), an information note N. 21.02 (on France).

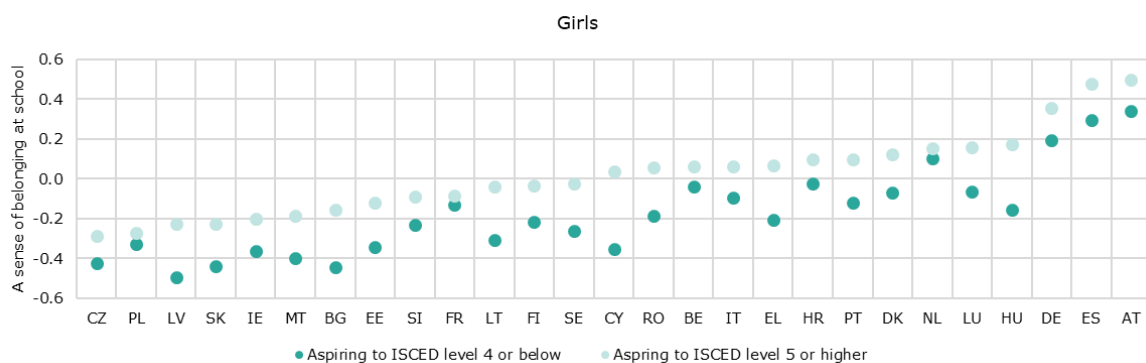
¹¹ Greenaway, K. H., Haslam, S. A., Cruwys T, Branscombe, N. R., Ysseldyk, R. and Heldreth C. (2015). [From “we” to “me”: Group identification enhances perceived personal control with consequences for health and well-being](#). In: *Journal of Personality and Social Psychology* 109 (1): 53.

motivation, and performance at school. In this section, a student's sense of belonging at school as an indicator of their well-being is analysed in relation to three types of academic outcomes, namely educational aspirations, absenteeism and performance on standardised tests¹³. This analysis is based on data from two large cross-national surveys: PISA¹⁴ and TIMSS¹⁵. Both surveys used a similar approach, calculating a single scale of well-being on the basis of responses to several statements (for details, cf. Box 3 and Box 4). These surveys were last carried out in 2018 and 2019, respectively.

1.2.1 Sense of belonging at school and educational aspirations

PISA data (Figure 1) shows that 15-year-old boys and girls in the EU with a stronger sense of belonging at school have higher educational aspirations, as measured by the highest level of education they expect to complete: ISCED level 5¹⁶ or above and ISCED level 4 or below. Magnitudes of difference between the variables vary considerably across EU countries. For example, among girls, the difference in the sense of belonging is relatively large in Bulgaria, Hungary, Romania and Sweden, and relatively small in France, Poland and the Netherlands. Among boys, relatively large differences are observed in Portugal, Hungary, Luxembourg and Greece, and rather small differences in Sweden, France and the Netherlands.

Figure 1: Sense of belonging at school by educational aspirations and sex – “What level of education do you expect to complete?” (PISA)



¹² Osterman, K. F. (2000). [Students' Need for Belonging in the School Community](#). In: Review of Educational Research 70 (3): 323–67.

¹³ Causal interpretation of our results cannot be guaranteed, but they are largely consistent with findings from other studies which established a causal effect of sense of belonging at school on education-related outcomes. E.g.

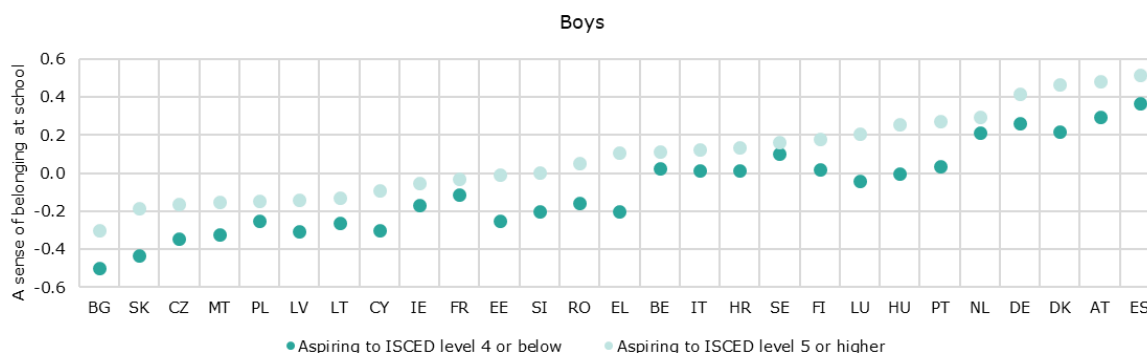
Walton, G. M., and Cohen, G. L. (2011). [A Brief Social-Belonging Intervention Improves Academic and Health Outcomes of Minority Students](#). In: Science 331 (6023): 1447–51;

Walton, G. M., Cohen, G. L., Cwir, D., and Spencer S. J. (2012). [Mere Belonging: The Power of Social Connections](#). In: Journal of Personality and Social Psychology 102 (3): 513.

¹⁴ PISA is targeted at 15-year-olds and aims at assessing their achievement in three main areas: reading, mathematics, and science. In 2018, PISA was carried out in nearly 80 countries and economies, including all member states of EU.

¹⁵ TIMSS is concerned with mathematics and science achievements of students in grades 4 and 8. In 2019, TIMSS was administered to grade 4 students in 64 countries, including 22 members of EU, and to grade 8 students in 46 countries, including 10 members of EU.

¹⁶ ISCED is the International Standard Classification of Education. Cf. Eurostat's [“Statistics Explained”](#) for details.



Source: DG JRC calculations based on OECD PISA 2018 data.

Note: The sense of belonging at school is represented by a composite index built from responses to questions asking students about how they feel when they are in school and relationships with their schoolmates. It is scaled so as to have a mean of 0 and standard deviation of 1 across equally weighted OECD countries. Negative values indicate a sense of belonging at school lower than the OECD average. Positive values indicate a sense of belonging at school above the OECD average.

Box 2: The sense of school belonging in PISA 2018

In PISA 2018, responses to the following questions were used to build a composite index of the sense of school belonging:

1. I feel like an outsider (or left out of things) at school
2. I make friends easily at school
3. I feel like I belong at school
4. I feel awkward and out of place in my school
5. Other students seem to like me
6. I feel lonely at school

It is assumed that all these questions actually represent a single underlying construct — the sense of belonging at school — which influences students' responses. Specifically, the responses were coded on a 4-point scale ranging from "Strongly agree" to "Strongly disagree". Thus, students¹⁷ with a strong sense of belonging are expected to generally agree with the positively worded questions (i.e., questions 2, 3, and 5) and disagree with the negatively worded ones (i.e., questions 1, 4, and 6). For students with a weaker sense of belonging, a reverse pattern of responses is predicted. That is, such students are expected to disagree with the positively worded questions and agree with the negatively worded ones. The responses are then aggregated and scaled to have a mean of 0 and a standard deviation of 1 across equally weighted OECD countries. Thus, a typical student in an OECD country has a score of 0 on the scale of school belonging. Also, roughly two thirds of all OECD students are expected to have belonging scores between -1 and 1. Similarly, about 95% of all students in OECD countries are expected to have belonging scores ranging from -2 to 2.

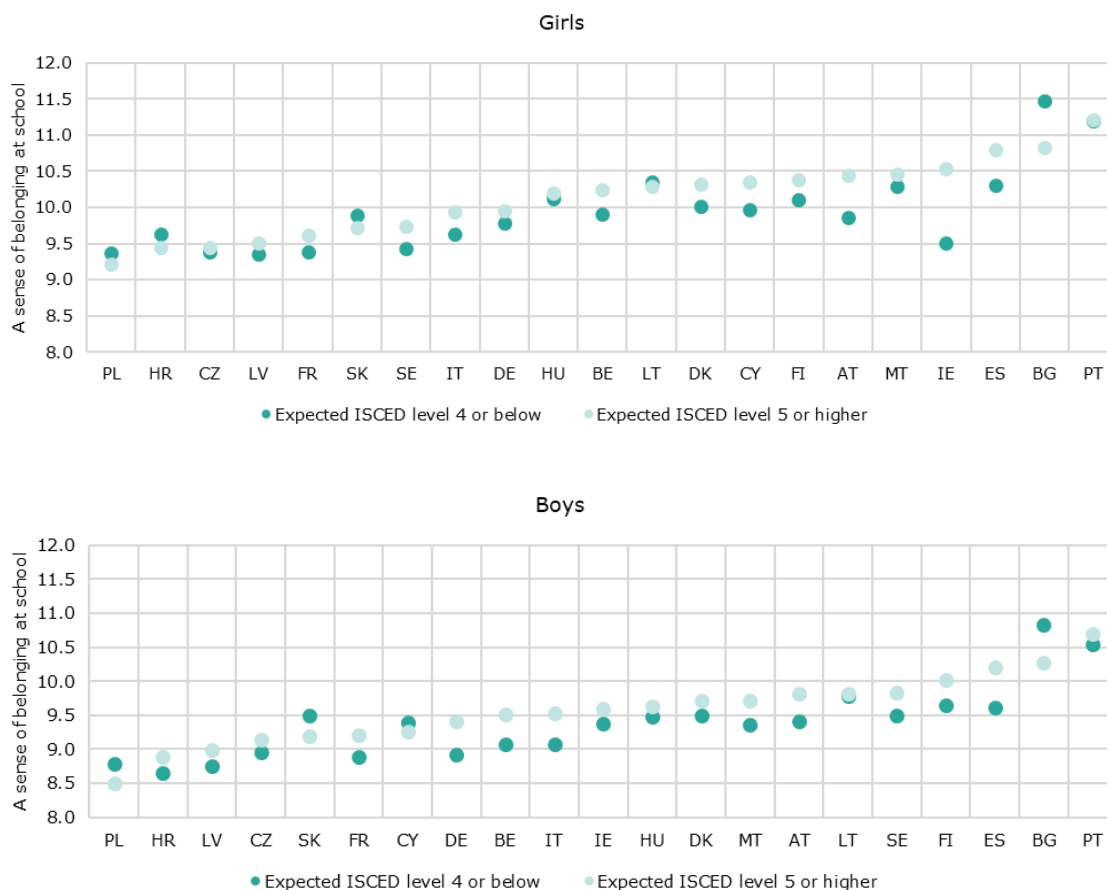
In other words, a negative value on the scale of sense of belonging at school in a given country doesn't mean that students in this country have a poor sense of belonging at school. Instead, it means that the average sense of school belonging at school is below the OECD average. For instance, the average sense of belonging at school in Czechia is equal to 0.28. It means that an average student in Czechia has a somewhat weaker sense of belonging at school than their

¹⁷ Note that by "students" we mean here "15-year-olds" because this is the target population of PISA.

average OECD peer. Similarly, the average value of the index of the sense of school belonging in Germany is 0.28. This means that an average German student has a stronger sense of school belonging than their average OECD peer. At the same time, the results suggest that the average students in Czechia and Germany are among two-thirds of their OECD peers when it comes to the sense of belonging at school.

TIMSS 2019 (Figure 2) illustrates the aspirations of grade four students, as answered by their parents on their behalf. Among this younger sample, students with higher educational aspirations tend to have, on average, a stronger sense of belonging at school. However, among girls in Poland, Croatia, Slovakia and Bulgaria, this pattern is reversed. In Lithuania, Czechia and Hungary, the difference in the sense of belonging by level of aspiration is virtually non-existent. Furthermore, boys in Poland, Slovakia, Cyprus and Bulgaria who are not expected to complete tertiary education have a stronger sense of belonging at school.

Figure 2: Sense of belonging at school by parental educational expectations towards children by sex of the children – “What level of education do you expect your child to complete?” (TIMSS)



Source: DG JRC calculations based on IEA TIMSS 2019 data.

Note: Data not available for: EE, EL, LU, NL, RO and SI.

The sense of belonging at school is represented by a composite index built from responses to questions asking students about how they feel when they are in school and relationships with their teachers. It is assumed only positive values. Values below 7.2 indicate a weak sense of belonging at school. Values equal to or higher than 9.6 indicate a strong sense of belonging at school. Values between 7.2 and 9.6 indicate a moderate sense of belonging at school.

Box 3: Ireland – integration of well-being and mental health measures of education staff and students at system-level

Ireland's well-being Policy Statement and Framework for Practice (2018-2023)¹⁸ sets out the definition of well-being and establishes an overarching structure encompassing the existing, ongoing and developing work on well-being in education. In recent years, Ireland has focused strongly on the well-being of its students and educational personnel, particularly with the onset of COVID-19. At the ECEC (early childhood education and care) level, *Aistear*, the early childhood curriculum framework, strongly emphasises the relationship between education and care. It promotes a "nurturing pedagogy" that is sensitive to children's feelings and dispositions such as motivation, confidence, perseverance, and how they see themselves as learners. In primary education, the Social Personal and Health Education (SPHE) programme supports the development of strong and positive mental health and well-being among children. Well-being is one of the eight key principles of the junior cycle given that a student's school experience contributes directly to their physical, mental, emotional, and social well-being and resilience. At upper secondary level, the SPHE programme aims to help learners make choices to ensure their health and well-being now and in the future. The Professional Development Service for Teachers (PDST) provides resources for individual primary and secondary teachers and schools. In relation to COVID-19, a range of advice and resources were developed and made available to parents, students and school staff. They include a dedicated well-being advice and resources website¹⁹ and well-being guidance and advice for parents from the National Educational Psychological Service of the Department of Education. An example of resources provided is a booklet on "Supporting Children to Cope with Loss and Grief". Health Service Executive (HSE) online resources were also available including "Minding Your Well-being" programme²⁰ and a booklet on "Understanding Self-Harm"²¹ with advice to parents, carers and teachers who are concerned about a young person self-harming. In addition, the National Council for Special Education has developed resources for parents and children with special educational needs, in particular to support well-being and learning during school building closures²² due to COVID-19. In higher education, the National Student Mental Health and Suicide Prevention Framework (2020) provides a framework to address the issues of student mental health and suicide prevention in a structured and planned way. A "Connecting for Life" group has been established to support implementation across Irish higher education institutions. The Framework for Consent in Higher Education Institutions: Safe, Respectful, Supportive and Positive – Ending Sexual Violence and Harassment in Irish Higher Education Institutions (2019) promotes an institutional campus culture which is safe, respectful and supportive. Institutions have developed individual action plans, aligned with the framework, aimed at tackling sexual violence and harassment in higher education and a number of initiatives are in place to support this.

Students from advantaged socio-economic backgrounds and from families with higher educational attainment are likely to have a stronger sense of belonging at school, while parental educational attainment also has an impact on educational aspirations of students²³. The link between

¹⁸ Government of Ireland/Department of Education (2019). [Wellbeing Policy Statement and Framework for Practice 2018-2023](#).

¹⁹ Government of Ireland / Department of Education (2021). [Wellbeing advice and resources during COVID-19](#).

²⁰ Government of Ireland / Health Service Executive (2021). [Minding Your Wellbeing](#).

²¹ Government of Ireland / Health Service Executive (2021). [Self-Harm and Young People](#).

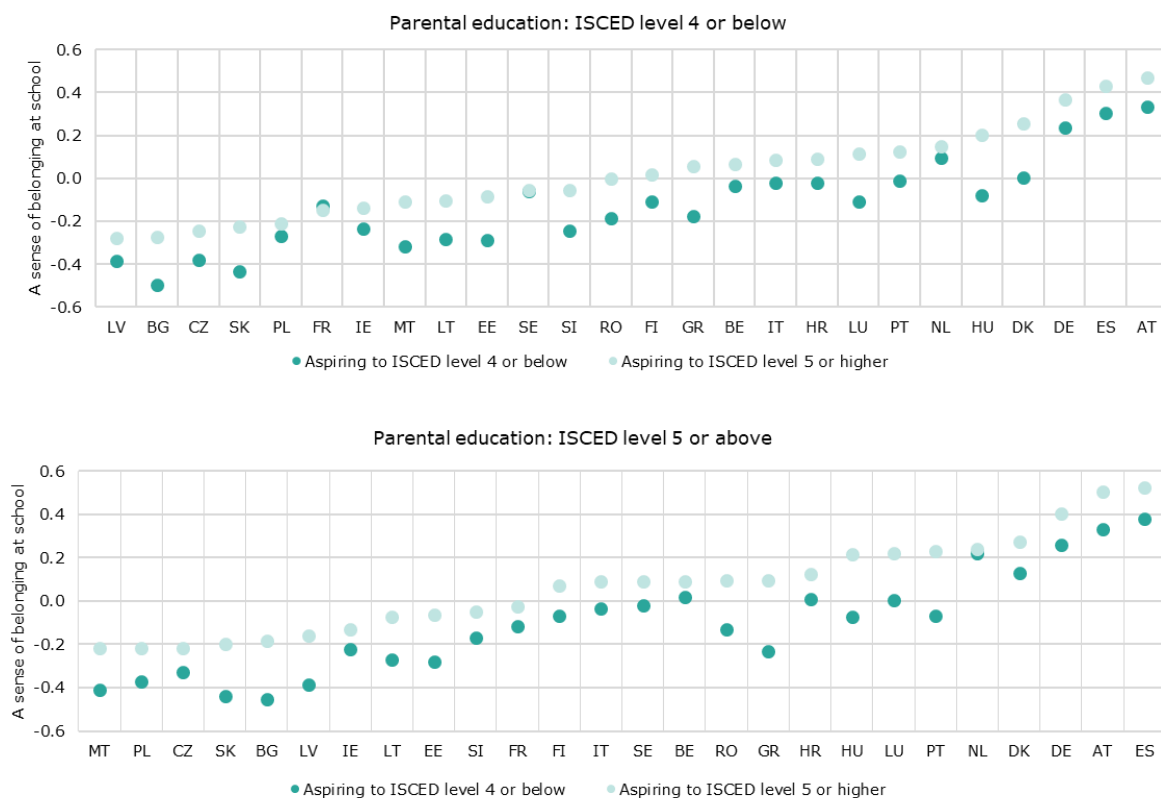
²² Government of Ireland / National Council for Special Education (2021). [Remote Teaching – Support for Teachers](#).

²³ An established line of research in sociology argues that a primary motivation for students (and their families) when making educational decisions is to avoid *downward social mobility*, or to reach a social position at least as high as that of their parents:

Breen, R and Yaish, M. (2006). [Testing the Breen-Goldthorpe Model of Educational Decision Making](#). In *Mobility and Inequality*, 232–58;

educational aspirations and a sense of school belonging may therefore simply be due to socio-economic status alone. However, PISA 2018 data show that students with higher aspirations have a stronger sense of belonging at school even when the parental education level is held constant (Figure 3). However, there are considerable variations between countries. Among students with at least one university-educated parent, differences in the sense of belonging by level of aspiration are relatively large in Greece, Portugal and Hungary, and rather small in Belgium and the Netherlands. Similarly, among students whose parents do not have a university education, the difference is quite large in Denmark and Hungary but practically non-existent in France and Sweden.

Figure 3: Sense of belonging at school by parental educational expectations towards children by parental education – “What level of education do you expect your child to complete?” (PISA)



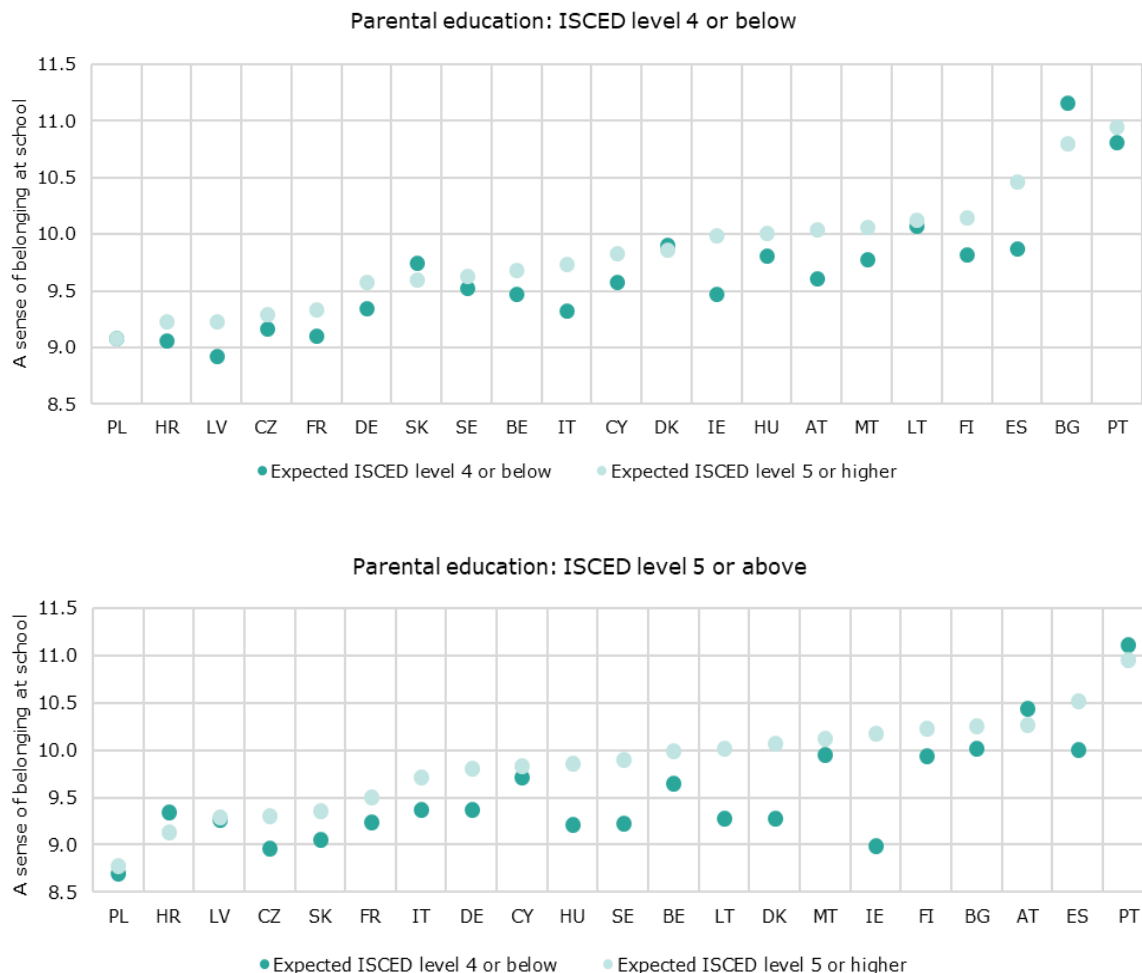
Source: DG JRC calculations based on the 2018 PISA data.

Note: The sense of belonging at school is represented by a composite index built from responses to questions asking students about how they feel when they are in school and relationships with their schoolmates. It is scaled so as to have a mean of 0 and standard deviation of 1 across equally weighted OECD countries. Negative values indicate a sense of belonging at school lower than the OECD average. Positive values indicate a sense of belonging at school above the OECD average.

A similar tendency is clear among fourth-graders in TIMSS 2019 (Figure 3): the overall sense of belonging at school is stronger among students with higher educational aspirations, even when their parents' education level is held constant. The relationship seems to be more pronounced at the higher level of parental education with some exceptions. For example, among students whose

parents did not complete university education, the trend is reversed in Bulgaria and Sweden. In Poland, Denmark and Lithuania, there is little difference in the sense of belonging by educational aspiration.

Figure 4: Sense of belonging at school by parental educational expectations towards children and parental education – “What level of education do you expect your child to complete?” (TIMSS)



Source: DG JRC calculations based on IEA TIMSS 2019 data.

Note: Data not available for: EE, EL, LU, NL, RO and SI.

The sense of belonging at school is represented by a composite index built from responses to questions asking students about how they feel when they are in school and relationships with their teachers. It is assumed only positive values. Values below 7.2 indicate a weak sense of belonging at school. Values equal to or higher than 9.6 indicate a strong sense of belonging at school. Values between 7.2 and 9.6 indicate a moderate sense of belonging at school.

Box 4: The sense of school belonging in TIMSS 2019

In TIMSS 2019, responses to the following questions were used to build a composite index of the sense of school belonging:

1. I like being in school
2. I feel safe when I am at school
3. I feel like I belong at this school
4. Teachers at my school are fair to me
5. I am proud to go to this school

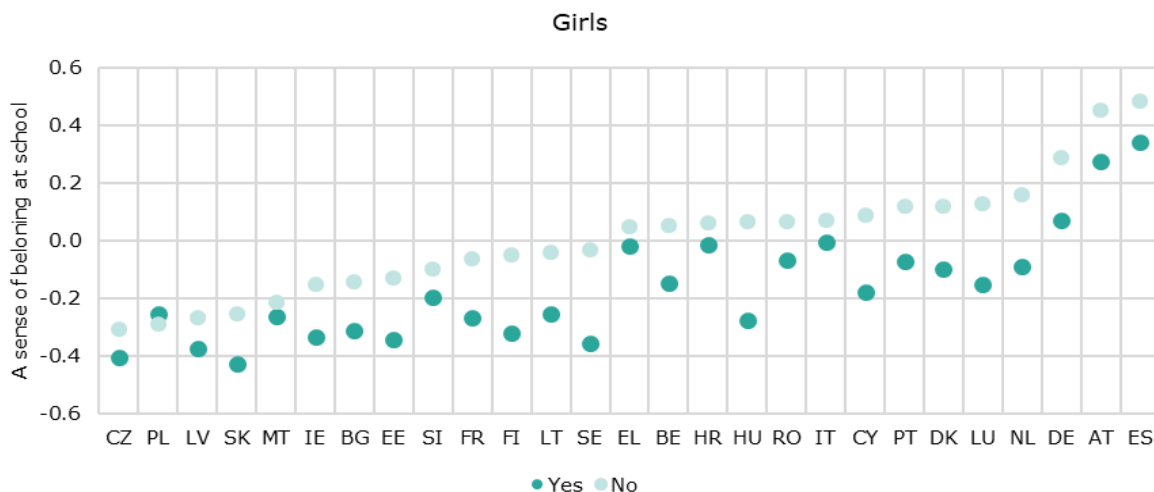
Responses were coded on a 4-point scale ranging from “Agree a lot” to “Disagree a lot”. Again, it is assumed that responses to these questions are driven by the single underlying construct. Thus, the responses are aggregated and scaled to form a composite index of the sense of school belonging. The index is, however, slightly different from the one in PISA 2018. First, it assumes only positive values. Second, threshold values are defined to distinguish students²⁴ with a strong, moderate, and weak sense of belonging at school. Students with a score of 9.6 or higher on the composite index are classified as having a strong sense of belonging. Students with a score below 7.2 on the index are classified as having a weak sense of belonging. Finally, all other students are classified as having a moderate sense of belonging. Alternatively, one can think of the TIMSS 2019 index of the sense of school belonging as follows. A student with a strong sense of school belonging (i.e., with a score of 9.6 or higher on the index) would answer “Agree a lot” to all the items making up the index. Similarly, a student with a moderate sense of school belonging (i.e., with a score of at least 7.2 but lower than 9.6) would respond “Agree a little” to these questions. Finally, students with a weak sense of school belonging would respond “Disagree a little” or “Disagree a lot” to these questions.

1.2.2 Sense of belonging at school and absenteeism

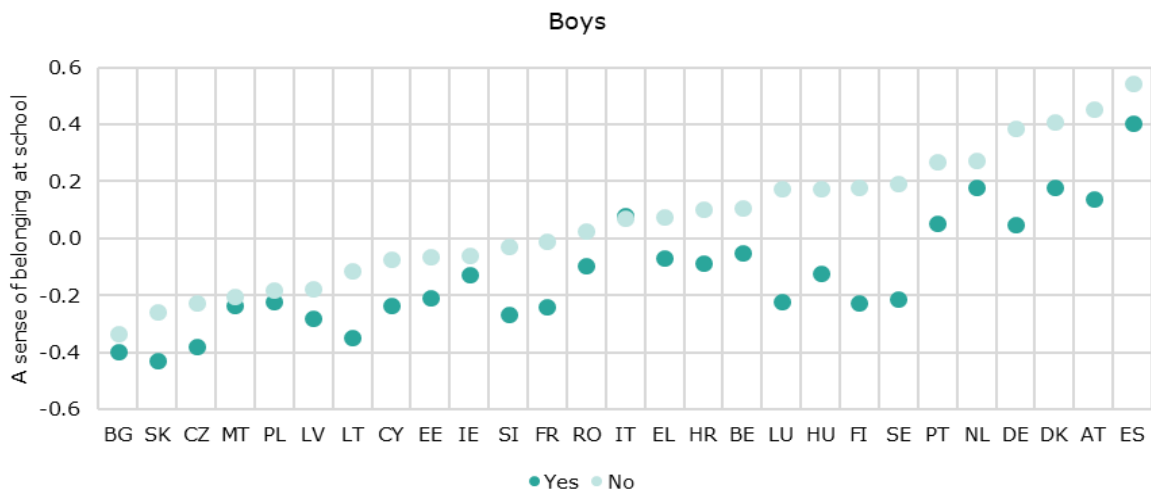
Absenteeism is also likely to be associated with low sense of belonging at school. It can reflect underlying school engagement or motivation, although factors other than motivation (e.g. recurring health problems) can affect the likelihood of absence as well.

While the degree of absenteeism can vary from arriving late to skipping lessons or entire days at school, PISA data distinguishes between students who skipped at least 1 day and those who skipped none when, comparing the average sense of belonging at school between these two groups. As the evidence points to systematic differences between girls and boys (in favour of the former) with respect to learning motivation, results are broken down by sex.

Figure 5: Sense of belonging at school by absenteeism and sex – “Skipped at least 1 day of school within the past 2 weeks?” (PISA)



²⁴ Here, by “students” we mean 4-graders, as this is the target population in TIMSS 2019. More precisely, TIMSS is targeted at students in grades 4 and 8. However, in the report we use only data on the former.



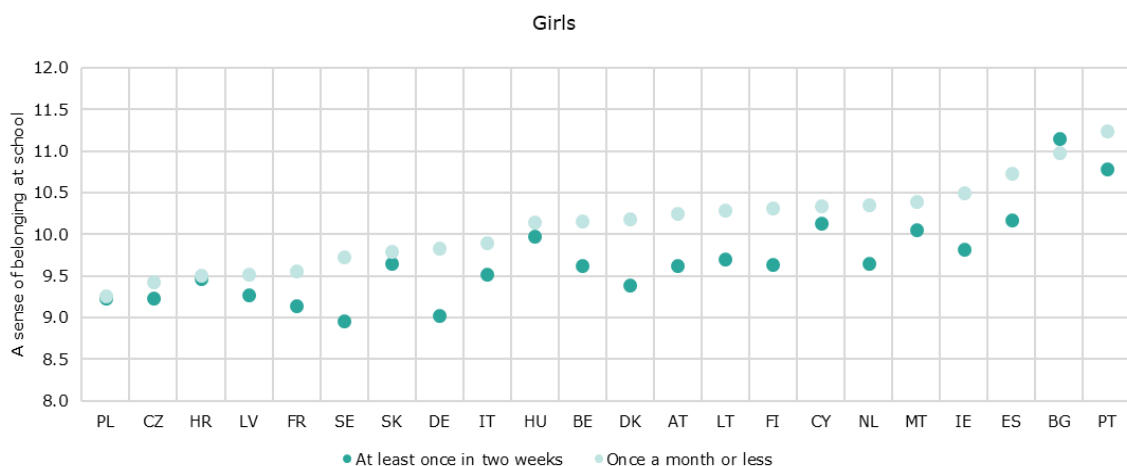
Source: DG JRC calculations based on OECD PISA 2018 data.

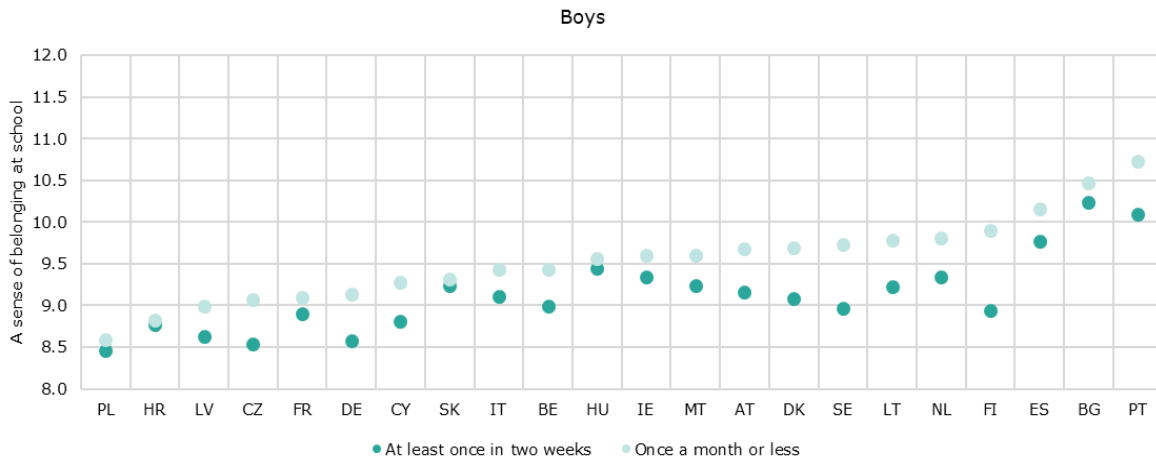
Note: The sense of belonging at school is represented by a composite index built from responses to questions asking students about how they feel when they are in school and relationships with their schoolmates. It is scaled so as to have a mean of 0 and standard deviation of 1 across equally weighted OECD countries. Negative values indicate a sense of school belonging lower than the OECD average. Positive values indicate a sense of belonging at school above the OECD average.

The result is generally consistent with expectations: the sense of belonging is, on average, stronger among students who did not skip a single day of class than among those who skipped at least one. The magnitude of the difference in the sense of belonging by absenteeism varies considerably across countries. Among girls, for instance, the difference is quite large in Sweden, Finland, Luxembourg and Hungary, and quite small in Malta, Greece and Italy. Among boys, the difference in the sense of belonging between students with at least one absence and students with no absences is the largest in Sweden, Finland, and Luxembourg. It is also substantial in Austria, Germany and Hungary. On the other hand, in Italy, Malta and Poland, it is virtually non-existent.

In TIMSS 2019, fourth grade students were asked how often they missed school, with answers ranging from "once a week" to "never or almost never". As occasional absences from school may result from random events such as illness, Figure 6 shows average levels of the sense of belonging at school by two categories of absenteeism ("at least once every 2 weeks", and "once a month or less") among fourth grade boys and girls who participated in TIMSS 2019. Students who have fewer absences have a stronger sense of belonging at school, on average, than students with more absences, with a variation across countries.

Figure 6: Sense of belonging at school by degree of absenteeism and sex – "How often are you absent from school?" (TIMSS)





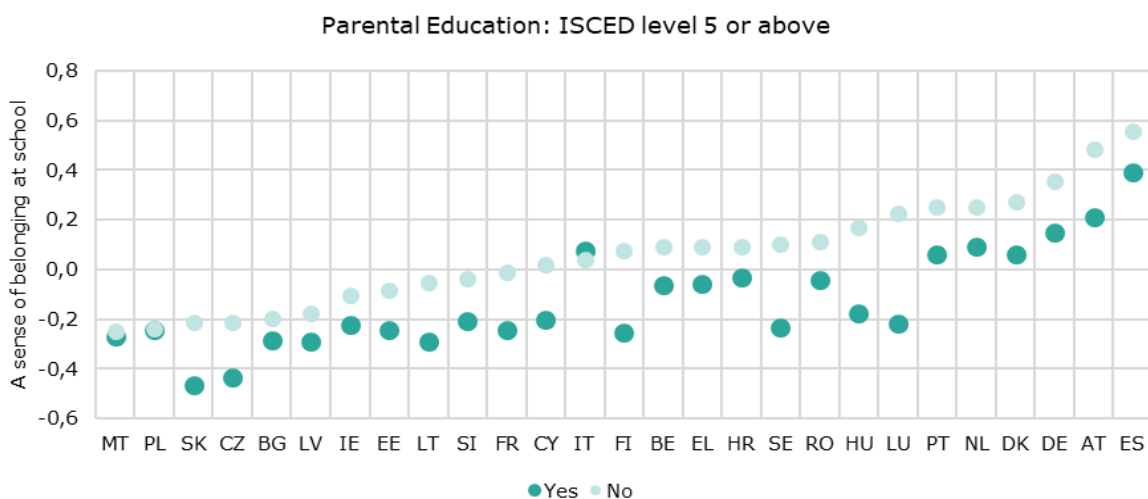
Source: DG JRC calculations based on IEA TIMSS 2019 data.

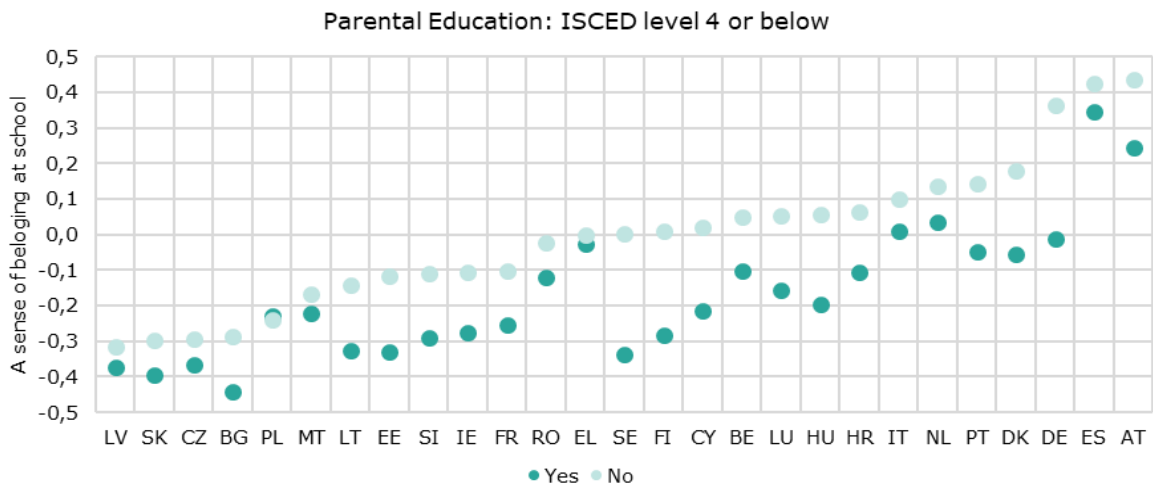
Note: Data not available for: EE, EL, LU, NL, RO and SI.

The sense of belonging at school is represented by a composite index built from responses to questions asking students about how they feel when they are in school and relationships with their teachers. It is assumed only positive values. Values below 7.2 indicate a weak sense of belonging at school. Values equal to or higher than 9.6 indicate a strong sense of belonging at school. Values between 7.2 and 9.6 indicate a moderate sense of belonging at school.

Breaking down the results by parental education, data from PISA 2018 (Figure 7) show that in both groups of students (girls and boys), the average sense of belonging at school is stronger among students with no absences than with students who have at least one absence. In other words, the relationship between school absenteeism and the sense of belonging appears to hold regardless of students' socioeconomic background. To be sure, the magnitude of the difference is not uniform across countries. In Poland and Malta, the difference is very small at both levels of socio-economic status. In Greece, there is no difference in belonging at school by absenteeism in the lower socio-economic category.

Figure 7: Sense of belonging at school by absenteeism and parental education – “Skipped at least 1 day of school within the past two weeks?” (PISA)



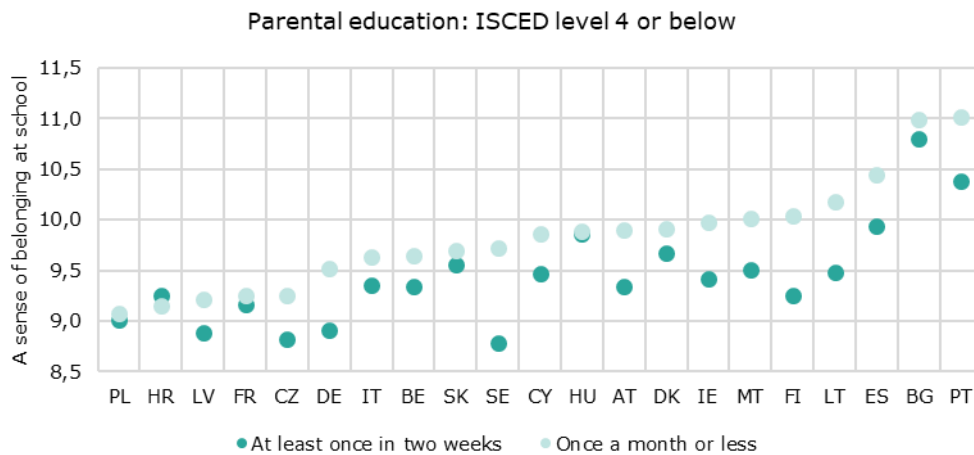


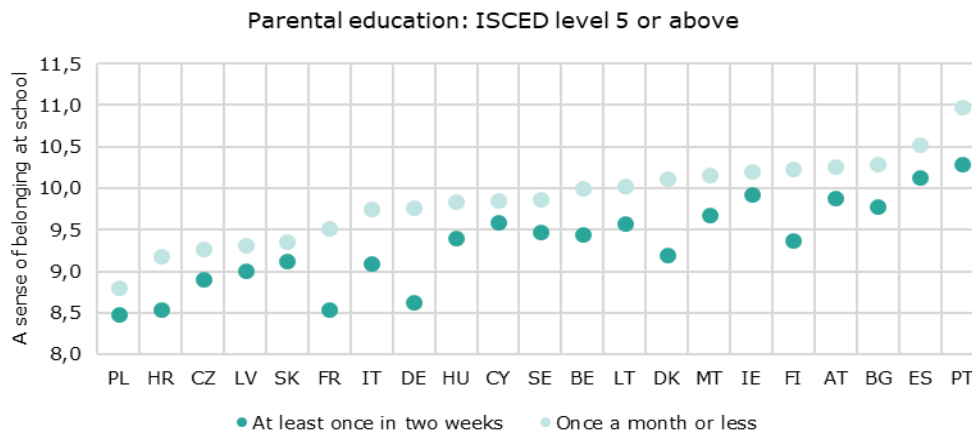
Source: DG JRC calculations based on OECD PISA 2018 data.

Note: The sense of belonging at school is represented by a composite index built from responses to questions asking students about how they feel when they are in school and relationships with their schoolmates. It is scaled so as to have a mean of 0 and standard deviation of 1 across equally weighted OECD countries. Negative values indicate a sense of belonging at school lower than the OECD average. Positive values indicate a sense of belonging at school above the OECD average.

Also among the fourth graders who participated in TIMSS 2019 (Figure 8) a link between absenteeism and the sense of belonging at school holds when students’ socio-economic background is accounted for: the sense of belonging at school continues to be stronger among those with fewer absences.

Figure 8: Sense of belonging at school by degree of absenteeism and parental education – “About how often are you absent from school?” (TIMSS)





Source: DG JRC calculations based on IEA TIMSS 2019 data.

Note: Data not available for: EE, EL, LU, NL, RO and SI.

The sense of belonging at school is represented by a composite index built from responses to questions asking students about how they feel when they are in school and relationships with their teachers. It is assumed only positive values. Values below 7.2 indicate a weak sense of belonging at school. Values equal to or higher than 9.6 indicate a strong sense of belonging at school. Values between 7.2 and 9.6 indicate a moderate sense of belonging at school.

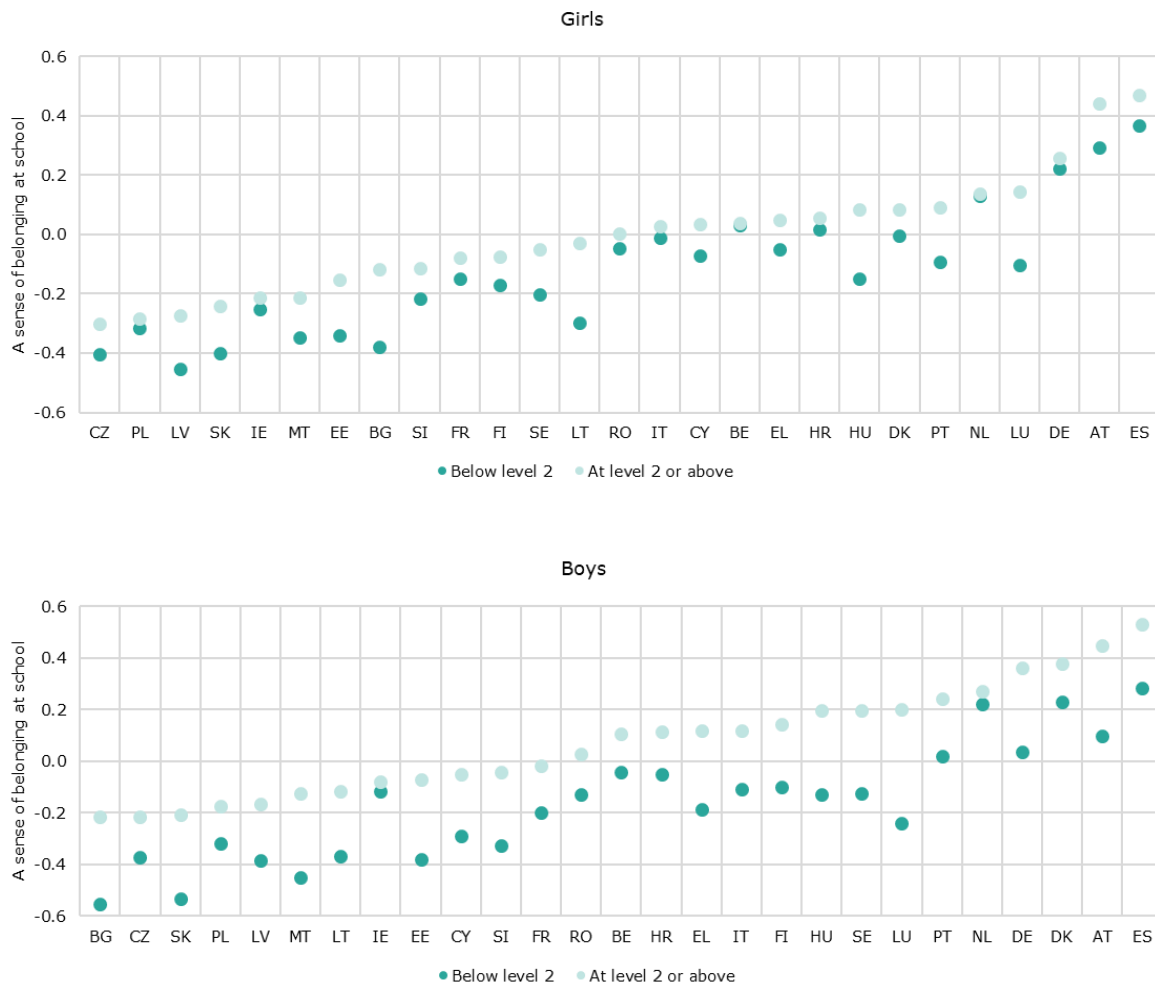
1.2.3 Sense of belonging at school and academic performance

In this section, we look at how academic performance is related to the sense of belonging at school. Academic performance is represented by scores on standardised tests in mathematics and science, two areas covered by both PISA and TIMSS.

For mathematics performance, Figure 9 shows differences in the average sense of belonging at school of boys and girls by performance at level 2 or above on the one hand and below level 2 on the other hand²⁵.

²⁵ Students' performance on the PISA 2018 mathematics test was originally represented in the form of numerical scores with the mean of 500 and the standard deviation on 100, the scores were then divided into discrete "levels" to make interpretation of the test a little easier. In the original PISA 2018 report, students below Level 2 (with scores lower than 420 points) are considered as "low achieving students." Level 2, out of six levels of proficiency in mathematics, represents the "minimum level of proficiency" in mathematics that all students should acquire by the end of secondary education (even though it may not be sufficient for making well-founded decisions in everyday situations); see chapter 6 of OECD (2019). [PISA 2018 Results \(Volume I\): What Students Know and Can Do](#).

Figure 9: Sense of belonging at school by performance in the PISA 2018 mathematics test and by sex



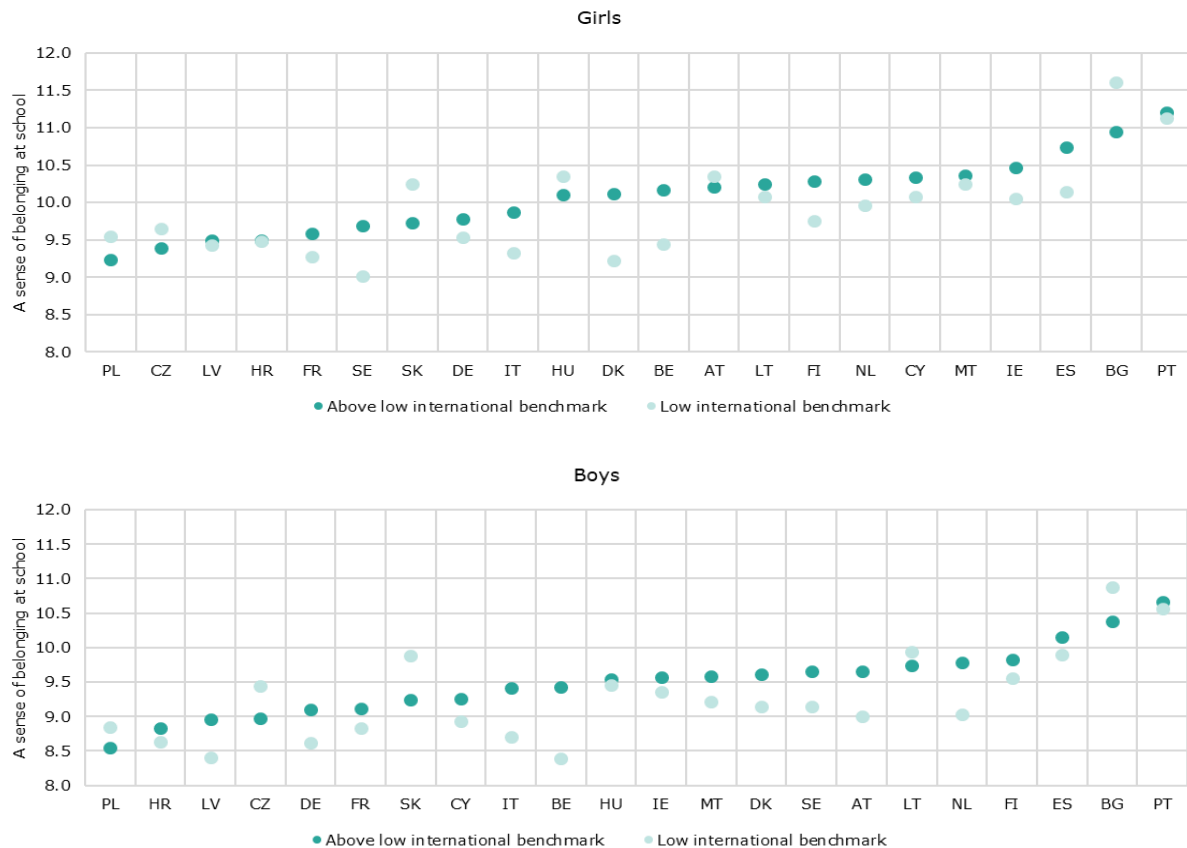
Source: DG JRC calculations based on OECD PISA 2018 data.

Note: The sense of belonging at school is represented by a composite index built from responses to questions asking students about how they feel when they are in school and relationships with their schoolmates. It is scaled so as to have a mean of 0 and standard deviation of 1 across equally weighted OECD countries. Negative values indicate a sense of belonging at school lower than the OECD average. Positive values indicate a sense of belonging at school above the OECD average.

Sense of belonging at school is lower, on average, among low performing students than among students at level 2 or higher. This applies to both boys and girls, although the magnitude of the difference among girls appears to be slightly smaller than among boys and the magnitude of the differences varies significantly across countries.

Similarly, TIMSS 2019²⁶ data show that in the majority of countries the sense of belonging at school is stronger among students who performed better on the mathematics test. The trend is not as pronounced as in PISA 2018 however. One explanation for the less pronounced relationship between mathematics performance and the sense of belonging among fourth graders participating in TIMSS 2019 may be the small percentage of students at the lower performance level: below 10% in nearly all the EU Member States that participated in TIMSS 2019 and even below 5% in about half of them²⁷. It is also likely that different age groups react differently to low performance.

Figure 10: Sense of belonging at school by performance in the TIMSS 2019 mathematics test and by sex



Source: DG JRC calculations based on IEA TIMSS 2019 data.

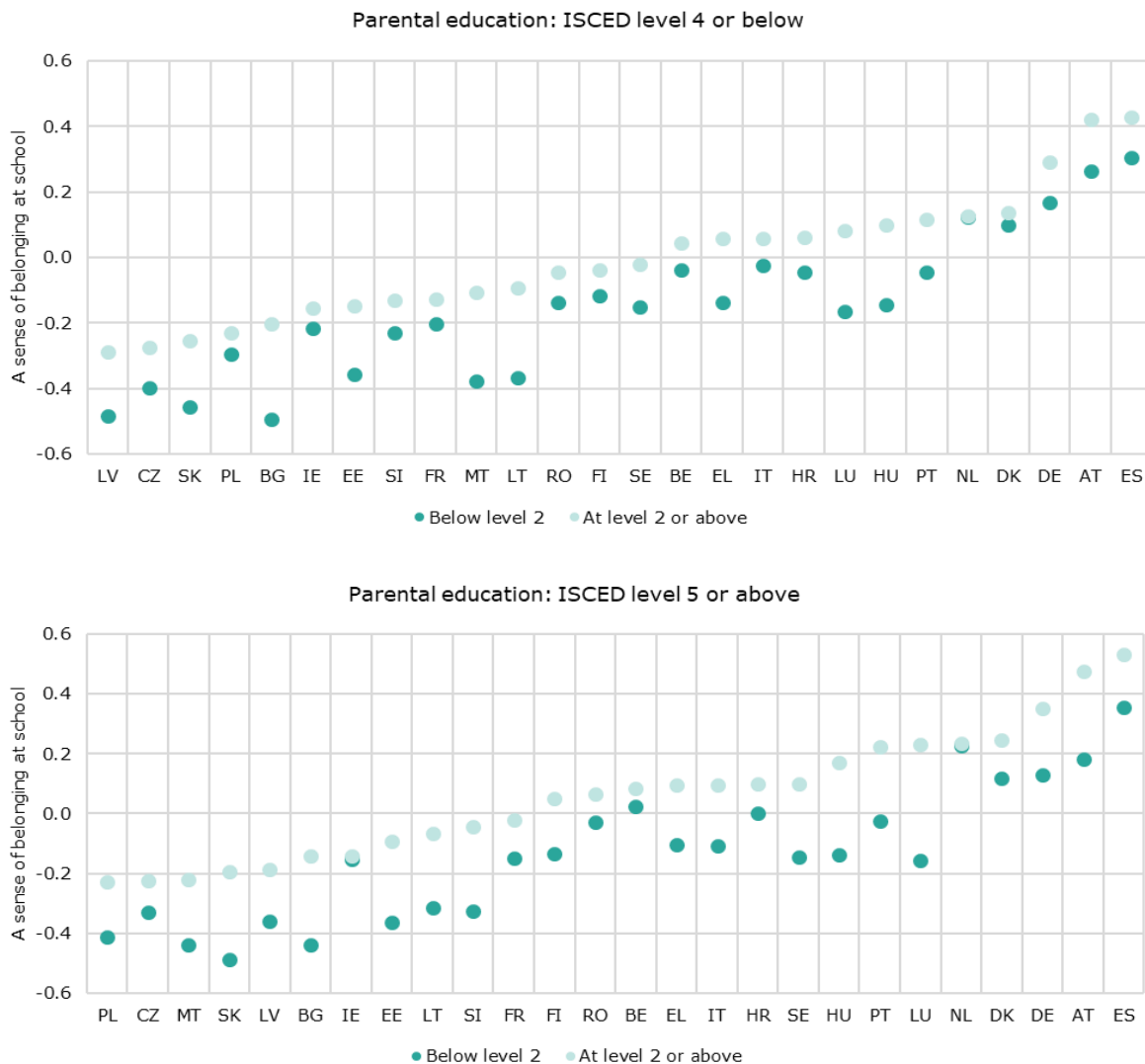
Note: Data not available for: EE, EL, LU, NL, RO and SI.

The sense of belonging at school is represented by a composite index built from responses to questions asking students about how they feel when they are in school and relationships with their teachers. It assumes only positive values. Values below 7.2 indicate a weak sense of belonging at school. Values equal to or higher than 9.6 indicate a strong sense of belonging at school. Values between 7.2 and 9.6 indicate a moderate sense of belonging at school.

²⁶ In TIMSS 2019, scores on the mathematics tests were also represented in the form of a numerical scale with the mean of 500 and the standard deviation of 100 points. As in PISA, the TIMSS 2019 mathematics scale was divided into a set of discrete proficiency levels used for international benchmarking. Again, we distinguish between students who were classified as “low achievers” (those who scored below 400 points) and all the rest. For a detailed description on the levels Cf.: Mullis, I. V. S., Martin M. O., Foy, P., Kelly D. L., and Fishbein, B. (2020). [TIMSS 2019 International Results in Mathematics and Science](#).

²⁷ In addition, the low benchmarking level is defined in terms of simple algebraic operations performed on whole numbers smaller than 100. This criterion may not distinguish well between students with necessary mathematics skills and those who lack those skills.

Figure 11: Sense of belonging at school by performance in the PISA 2018 mathematics test and by parental education



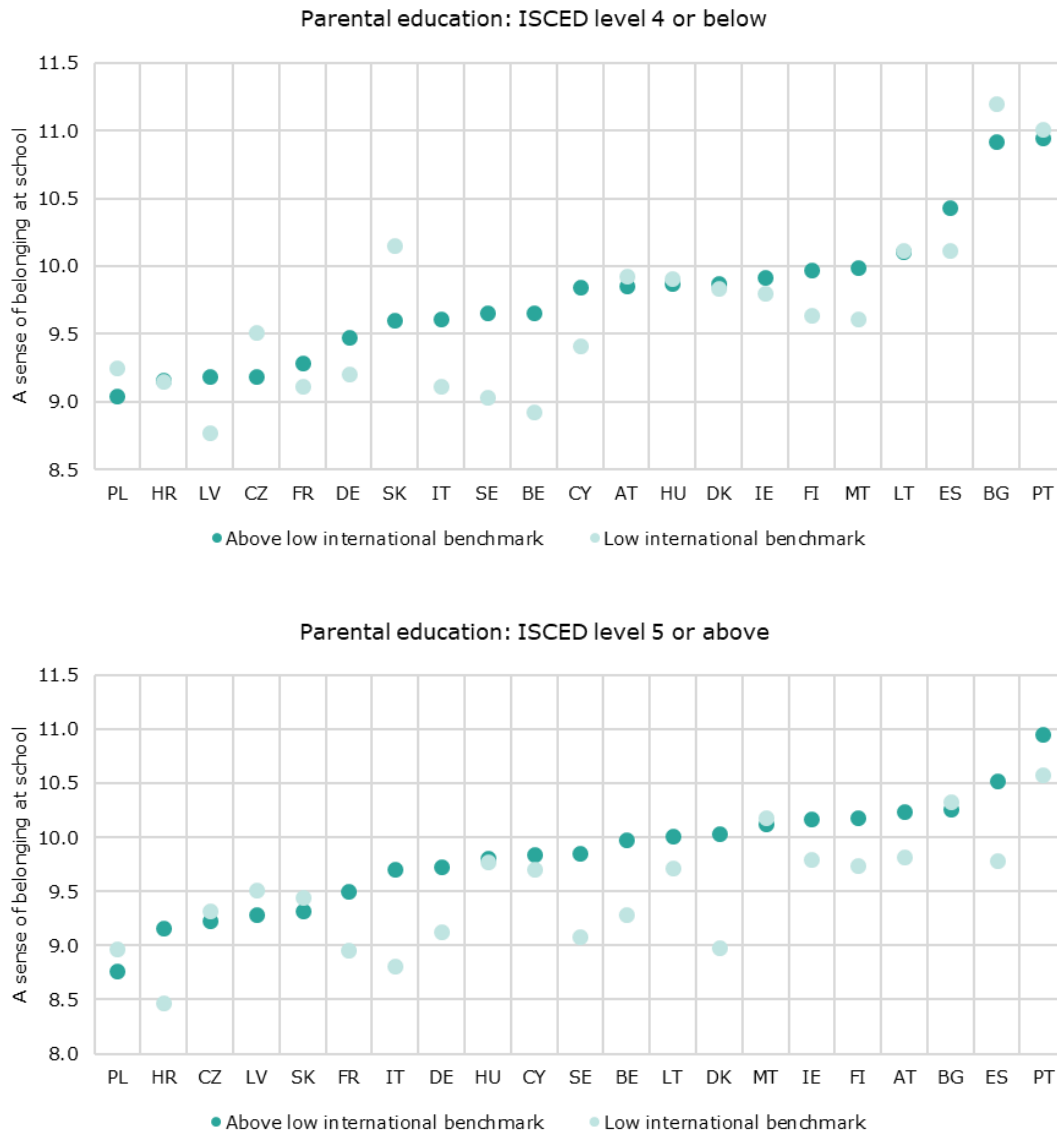
Source: DG JRC calculations based on the OECD PISA 2018 data.

Note: The sense of belonging at school is represented by a composite index built from responses to questions asking students about how they feel when they are in school and relationships with their schoolmates. It is scaled so as to have a mean of 0 and standard deviation of 1 across equally weighted OECD countries. Negative values indicate a sense of belonging at school lower than the OECD average. Positive values indicate a sense of belonging at school above the OECD average.

Research has also demonstrated that academic performance, including in mathematics, correlates with students' socio-economic background and parental attainment (Figure 11). For both levels of parental attainment (ISCED level 4 or below; and ISCED level 5 or above), the sense of belonging at school is, on average, stronger among students who perform better in mathematics. However, the difference appears to be more pronounced among students whose parents have a higher level of education.

Finally, Figure 12 shows the relationship between the performance of fourth graders on the TIMSS 2019 mathematics test and their sense of belonging at school, broken down by parental education. Keeping parental education fixed does not change the overall picture: students who performed better on the mathematics test turn out to have a stronger sense of belonging at school. There are exceptions to this general tendency, however. Among students whose parents do not have university education, the difference in the sense of belonging is either reversed or negligible in nearly half of the countries. Among students whose parents have university education, the pattern is somewhat clearer.

Figure 12: Sense of belonging at school by performance on the TIMSS 2019 mathematics test and parental education



Source: DG JRC calculations based on IEA TIMSS 2019 data.

Note: Data not available for: EE, EL, LU, NL, RO and SI.

The sense of belonging at school is represented by a composite index built from responses to questions asking students about how they feel when they are in school and relationships with their teachers. It is assumed only positive values. Values below 7.2 indicate a weak sense of belonging at school. Values equal to or higher than 9.6 indicate a strong sense of belonging at school. Values between 7.2 and 9.6 indicate a moderate sense of belonging at school.