Scottish Government
Riaghaltas na h-Alba

Programme for International Student Assessment (PISA 2022): Highlights from Scotland's Results

CHILDREN, EDUCATION AND SKILLS

social research

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Executive Summary

What is PISA?

1. The Programme for International Student Assessment (PISA) is an assessment of 15 year-olds' skills in mathematics, reading and science. Eighty-one countries and around 690,000 students participated in PISA 2022. The survey was carried out in Scotland between 18 October and 22 December 2022.

2. PISA is a sample survey and the scores presented are estimates. Confidence intervals are presented around mean scores; we can be 95% sure that the true value lies within this range.

3. It is not possible to produce individual country rankings based on the mean score. Significance tests are used to assess the statistical significance of comparisons made and the report shows results divided into those countries whose scores are statistically significantly higher than, similar to or lower than Scotland (with a confidence level of 95%).

The Survey in Scotland

Table 1.1

Participating schools	Participating students	School response rate	Student response rate
117 schools	3,257	96.4%	79.4%

4. In total, 117 secondary schools participated in the survey, representing a school response rate of 96.4 per cent; exceeding the OECD's minimum standard of 85 per cent. 3,257 students took part giving a weighted student participation rate of 79.4 per cent, slightly below the student participation technical standard of 80 per cent. Therefore Scotland completed a student level non-response bias analysis (NRBA); from this the OECD concluded that more than minimal bias was most likely introduced but that the results were comparable to previous cycles.

5. Lower student participation proved to be an issue internationally in this post-Covid-19 survey. Twelve other countries/economies did not meet the school and/or student technical standard response rates.

6. The PISA survey also includes background questionnaires. Pupils are asked about their motivations for study, attitudes to school, beliefs about maths, studying and their socio-economic background. Headteachers are asked about the challenges facing their schools, organisation and factors that they believe affect their students' performance.

7. For more detailed methodological background please see Annex 1 and the PISA 2022: Study Administration in Scotland Report and NRBA at PISA Research - NFER

Learning during Covid

PISA 2022 was conducted during or immediately following the COVID-19 pandemic. The findings provide important context to the learning experiences of this cohort of students prior to the PISA assessments.

8. In Scotland, assessments took place in Autumn 2022, around 7 months after in-school Covid restrictions were lifted. Students will have been aged between 13 and 14 during the periods of school building closures, and in the early years of high school education.

9. PISA 2022 took the opportunity to examine how education systems, schools, teachers and students responded to Covid and school building closures through new questions in the student and headteacher questionnaires. The responses show a mixed picture. The majority of students in Scotland agreed that their teachers were well prepared to provide instruction remotely and were available when they needed help. Students in Scotland were also less likely than the OECD average to experience problems accessing the internet, digital devices, and learning materials. However, students in Scotland were less likely than the OECD average to agree that they were prepared for learning on their own and that that they had felt motivated to learn.

10. The majority of Scottish students felt that they learnt less at home than they would have done at school. However, the findings also show evidence of resilience, with students reporting higher life satisfaction and being more likely to report a sense of belonging in school than in PISA 2018.

Overall performance

Scotland's overall performance in 2022 was lower than in 2018 in mathematics and reading, and similar in science. The OECD average for mathematics and reading also fell, with 31 OECD countries achieving a lower score in mathematics than in 2018.

11. Scotland's scores in the 2022 PISA assessments were **above** the OECD average in reading and **similar** to the OECD average in mathematics and science. This was also the case in the PISA 2018 assessments.

12. Scotland's relative performance, when measured by the number of comparator countries that were above and below Scotland, stayed similar in reading and mathematics compared to PISA 2018, and declined in science.

Table 1.2: PISA scores in PISA 2018 and 2022

	PISA 2018		PISA 2022		Trend since 2018	
	Scotland	OECD average	Scotland	OECD average	Scotland	OECD average
Mathematics	489	487	471	472	Lower	Lower
Reading	504	486	493	476	Lower	Lower
Science	490	487	483	485	Similar	Similar

13. The proportion of pupils performing at the highest levels of achievement ("Level 5 and above") was higher in Scotland than the OECD average in reading, and similar in maths and science. The proportion of pupils performing at the lowest levels of achievement ("below Level 2") was lower in Scotland than the OECD average in reading, and similar in maths and science. This is the same as in the PISA 2018 assessments.

Table 1.3 PISA levels by domain: Scotland compared to the OECD average

		PISA 2018	PISA 2022
		Scotland compared to the OECD average	Scotland compared to the OECD average
Reading	Level 5 or higher	Higher	Higher
	Level 2 or lower	Lower	Lower
Mathematics	Level 5 or higher	Similar	Similar
	Level 2 or lower	Similar	Similar
Science	Level 5 or higher	Similar	Similar
	Level 2 or lower	Similar	Similar

14. Performance among boys was higher than among girls in mathematics; girls outperformed boys in reading; while scores in science were similar between boys and girls.

15. PISA measures the strength of the relationship between social background and performance by the share of variation in scores explained by the index of Economic, Social and Cultural Status (ESCS). In mathematics the share of variation was higher in 2022 than in 2018, but remained similar to the OECD average, therefore the connection between mathematics performance and social background in Scotland is stronger than before. For reading and science, the variation explained by social background was similar to 2018.

Scotland's performance in mathematics

Scotland's mean score in mathematics in 2022 was similar to the OECD average and was lower than all previous PISA cycles (2003-2018).

16. In 2022 in Scotland, performance among boys was higher than among girls in mathematics. This was also the case in 2006, 2009, 2012, 2018 but not in 2015 where their performance was similar.

17. Achievement of Level 2 is considered by OECD to be the baseline at which students begin to demonstrate the knowledge and skill to enable them to participate actively in life situations related to maths. In 2022, 30.7 per cent of students in Scotland performed below PISA Level 2 in mathematics. This was similar to the OECD average (31.1 percent). This proportion was higher in Scotland in 2022 than in 2018, 2015, 2012, 2009 and 2006.

18. In 2022, 7.7 per cent of students in Scotland performed at PISA Level 5 or better in mathematics, which was similar to the OECD average (8.7 per cent). This proportion was lower in Scotland in 2022 than it was in 2018, 2012, 2009 and 2006 but was similar to 2015.

19. A greater proportion of girls (33.3 per cent) than boys (28.3 per cent) performed below Level 2 in Mathematics. 9.4 per cent of boys performed at PISA Level 5 or better in mathematics, which was higher than the proportion of girls (6.1 per cent).

20. The strength of the relationship between students' background and mathematics test scores (share of variation) in 2022 was almost double what it was in 2018 (15.9 per cent compared to 7.9 per cent). It was also higher than in 2015 (11.1 per cent) but was similar to 2006, 2009 and 2012.

Scotland's performance in reading

Scotland's mean score in reading in 2022 was higher than the OECD average. It was similar to 2006, 2009, 2012 and 2015 and lower than 2000, 2003 and 2018.

21. In 2022 in Scotland, performance among girls was higher than among boys in reading. This was also the case in all previous PISA cycles.

22. Achievement of PISA Level 2 is considered by OECD to be the baseline at which students begin to demonstrate sufficient skill to enable them to participate actively in life situations involving reading. In 2022, 20.3 per cent of students in Scotland performed below PISA Level 2 in reading, which was lower than the OECD average (26.3 per cent). This proportion was higher than in 2018 (15.5 per cent) and 2012 and similar to 2015, 2009 and 2006.

23. In 2022, 9.6 per cent of students in Scotland performed at PISA level 5 or better in reading (defined by the OECD as top performers). This was higher than the OECD average (7.2 per cent). This proportion was higher in Scotland in 2022 than in 2015 (6.4 per cent) but similar to 2006, 2009, 2012 and 2018.

24. A greater proportion of boys (23.2 per cent) than girls (17.3 per cent) performed below Level 2 in reading. The proportion of girls and boys performing at PISA Level 5 or better in reading was similar (10.8 per cent of girls and 8.4 per cent of boys).

25. The strength of the relationship (share of variation) between students' background and reading test scores in 2022 was similar to 2006, 2009, 2012, 2015 and 2018. For more information on ESCS please see Annex 3.

Scotland's performance in science

Scotland's mean score in science in 2022 was similar to the OECD average. Scotland's mean score was similar to 2018, but lower than PISA cycles 2006-2015 .

26. In 2022 in Scotland, girls and boys had a similar performance in science. This was also the case in all previous PISA cycles.

27. Achievement of Level 2 is considered by the OECD to be the baseline at which students begin to demonstrate the knowledge and skill to enable them to participate actively in life situations related to science. In 2022, 24.0 per cent of students in Scotland performed below PISA Level 2 in science. This was similar to the OECD average (24.5 per cent). This proportion was similar to 2018 but higher than 2006, 2009, 2012 and 2015.

28. In 2022, 6.8 per cent of students in Scotland performed at PISA Level 5 or better in science (defined by the OECD as top performers), which was similar to the OECD average (7.5 per cent). This was similar to 2018, 2015 and 2012 but lower than 2009 and 2006.

29. In 2022 the proportion of girls and boys performing below PISA Level 2 in science was similar (23.9 per cent of girls and 24.1 per cent of boys). The proportion performing at PISA Level 5 or better was also similar (6.2 per cent of girls and 7.4 per cent of boys).

30. The strength of the relationship between students' background and science test scores in 2022 was similar to 2006, 2009, 2012, 2015 and 2018. For more information on ESCS please see Annex 3.

How students view themselves and their school

In PISA 2022, students in Scotland were more likely than in PISA 2018 to agree that they feel like they belong at school, and less likely to report experience bullying acts. However, they were more likely than in 2018 to report having skipped a day of school recently.

31. Two-thirds of students (67 per cent) feel like they belong at their school. This is below the OECD average (74.6 per cent), but is higher than for students in Scotland in PISA 2018 (64.7 per cent).

32. Students reported a higher life satisfaction in PISA 2022 (an average of 6.48 on a scale of 1-10) than in PISA 2018 (6.25). However, this was below the OECD average of 6.75.

33. Students in Scotland were less than likely than in PISA 2018 to report that they experienced frequent bullying acts, including being made fun of, being left out of things, and being hit or pushed around by other students. However, a higher proportion of students in Scotland reported experiencing a bullying act on at least a weekly basis (10.6 per cent) than the OECD average (9.4 per cent).

34. Students in Scotland were more likely to say that they had skipped at least a whole day of school in the last two weeks (21.9 per cent) compared to PISA 2018 (16.8 per cent), and this was higher than the OECD average (14.6 per cent). However, a similar proportion to PISA 2018 reported skipping some classes.

35. Students in Scotland spent a similar amount of time using digital resources for learning activities and leisure compared to the OECD average. However, students in Scotland were more likely to feel nervous when they didn't have their digital devices near them (49.7 per cent).

1. Learning during Covid: school closures, learning and wellbeing

36. PISA 2022 was conducted during or immediately following the COVID-19 pandemic. The programme thus took the opportunity to examine how education systems, schools, teachers and students in the 81 participating countries/economies responded to this global challenge.

37. In Scotland, assessments took place in Autumn 2022, around seven months after in school Covid restrictions were lifted. Students will have been aged between 13 and 14 during the periods of school building closures, and in the early years of high school education.

38. Students and headteachers were asked a range of questions regarding their experiences during periods of school building closures, including learning arrangements, problems experienced at home, and their wellbeing. The results provide important context to the learning experiences of this cohort of students prior to the PISA assessments.

Summary of findings

39. The findings show a mixed picture. The majority agreed that their teachers were well prepared to provide instruction remotely and were available when they needed help, while students in Scotland were less likely than the OECD average to experience problems accessing the internet, digital devices, and learning materials. However, students in Scotland were less likely than the OECD average to agree that they were prepared for learning on their own and that that they had felt motivated to learn.

40. The majority of students felt that they learnt less at home than they would have done at school. However, the findings also show evidence of resilience, with students reporting higher life satisfaction and being more likely to report a sense of belonging in school than PISA 2018.

Student experiences of home learning

41. Students in Scotland were less likely than the OECD average to report that they experienced problems with access to learning materials, including access to a digital device, internet access, school supplies, and having a quiet place to study.

42. Students in Scotland were more likely than the OECD average (59.8 per cent compared to 50.7 per cent) to agree that their teachers were well prepared to provide instruction remotely, while two thirds of students agreed that teachers were available when they needed help (similar to the OECD average).

43. Students in Scotland were less likely than the OECD average to agree that they were well prepared to learn on their own (45.2 per cent compared to 54.6 per cent) and were less likely to agree that they were motivated to learn (25.7 per cent compared to 38.5 per cent), while more than half (55.6 per cent) agreed that they had fallen behind on their school work.

44. Compared to the OECD average, students in Scotland were more likely to report that the school sent them learning materials to study on their own, sent them assignments and asked for them to be submitted, and uploaded material on a school management system.

45. The only activity that students in Scotland were less likely to report was the school checking in with them to ask how they were feeling, with 18.7 per cent reporting that this happened at least once per week. Over half of students (55.3 per cent) reported that this had never happened, compared to the OECD average of 38.2 per cent.

46. Students were asked whether they felt that they had learnt more, less, or about as much, when their school building was closed. Seventy-seven per cent of students felt that they had learnt less when their school building was closed.

Student wellbeing

47. The PISA student questionnaire asks students a range of wellbeing questions which can be used to measure wellbeing before and after the pandemic. The findings show that students answered more positively on the majority of these measures in PISA 2022 than they did in PISA 2018.

48. Compared to 2018, students in Scotland were more likely to report that they feel like they belong at school and that they make friends easily at school in 2022; students in Scotland were less likely than in 2018 to say that they feel like an outsider (or left out of things) at school.

49. Compared to the OECD average, students in Scotland were less likely to say that they feel lonely at school and more likely to say that they make friends easily. However, students in Scotland were less likely to report they feel like they belong at school than the OECD average.

50. The PISA student questionnaire asks students to rate their current life satisfaction on a scale of 1-10. Students in Scotland had an average rating of 6.48, which was higher than the Scotland average of 6.25 in 2018. However, this was lower than the OECD average of 6.75 in 2022.

2. Performance in mathematics

2.1 Scotland's performance in mathematics

51. Scotland's mean score in mathematics in 2022 (471) was similar to the OECD average (472). This was lower than all previous PISA cycles (2003-2018). See Chart 2.1.1 for more information.

52. Scotland's standard deviation in mathematics in 2022 was 94 points. This was similar to 2018 (95 points) and 2009 (93 points) but higher than in 2015 (84 points), 2012 (86 points) and 2006 (85 points). This means there was more variation between students' maths performance in 2022 than in 2015, 2012 and 2006.

53. In 2022 in Scotland, performance among boys was higher than among girls in mathematics (478 vs. 463). This was also the case in 2006, 2009, 2012, 2018 but not in 2015 where their performance was similar (Chart 2.1.2 and Chart 2.1.3).

54. The OECD define second generation immigrants as students where one or both parents were born in another country (i.e. not in the UK). First generation immigrants are where the student was born in another country (i.e. not in the UK). Non-immigrants are where the student and both parents were born in the UK. In 2022 in Scotland, the performance of second generation immigrant students (492) was higher than non-immigrant students (472) in mathematics. The performance of first generation immigrant students (473) was similar to that of non-immigrant students and second generation immigrant students.

55. OECD categorise student performance into levels. Achievement of Level 2 is considered by the OECD to be the baseline at which students begin to demonstrate the knowledge and skill to enable them to participate actively in life situations related to maths. In 2022, 30.7 per cent of students in Scotland performed below PISA Level 2 in mathematics. This was similar to the OECD average (31.1 per cent). The proportion of students performing below PISA Level 2 in mathematics in Scotland was higher in 2022 than it was in 2018, 2015, 2012, 2009 and 2006.

56. PISA defines students attaining above Level 5 as top performers. In 2022, 7.7 per cent of students in Scotland performed at PISA Level 5 or better in mathematics. This was similar to the OECD average (8.7 per cent). The proportion of students performing at PISA Level 5 or better in mathematics in Scotland was lower in 2022 than in 2018, 2012, 2009 and 2006 but similar to 2015 (Chart 2.1.4).

57. In 2022 a greater proportion of girls (33.3 per cent) than boys (28.3 per cent) performed below Level 2 in mathematics. A greater proportion of boys (9.4 per cent) than girls (6.1 per cent) performed at PISA Level 5 or better in mathematics.

58. The strength of the relationship between students' background and mathematics test scores (share of variation) in 2022 was almost double what it was in 2018 (15.9 per cent compared to 7.9 per cent). It was also higher than in 2015 (11.1 per cent) but similar to 2006, 2009 and 2012.

59. The ESCS gradient shows how much maths scores varies on average with each step (one point) in social background scale. The ESCS gradient was 41 points in the mathematics assessment for Scotland. This was similar to 2006 (41 points), 2009 (45 points) and 2012 (37 points), and higher than 2015 (33 points) and 2018 (31 points).

60. In 2022 the average scores in mathematics in Scotland of students from less affluent backgrounds (i.e. those at the 5th percentile by ESCS) and those from more affluent backgrounds (i.e. those at the 95th percentile by ESCS) are apart by 118 points, which implies a difference of just under four years' schooling.

Chart 2.1.1 Scotland's PISA mathematics scores, 2003-2022

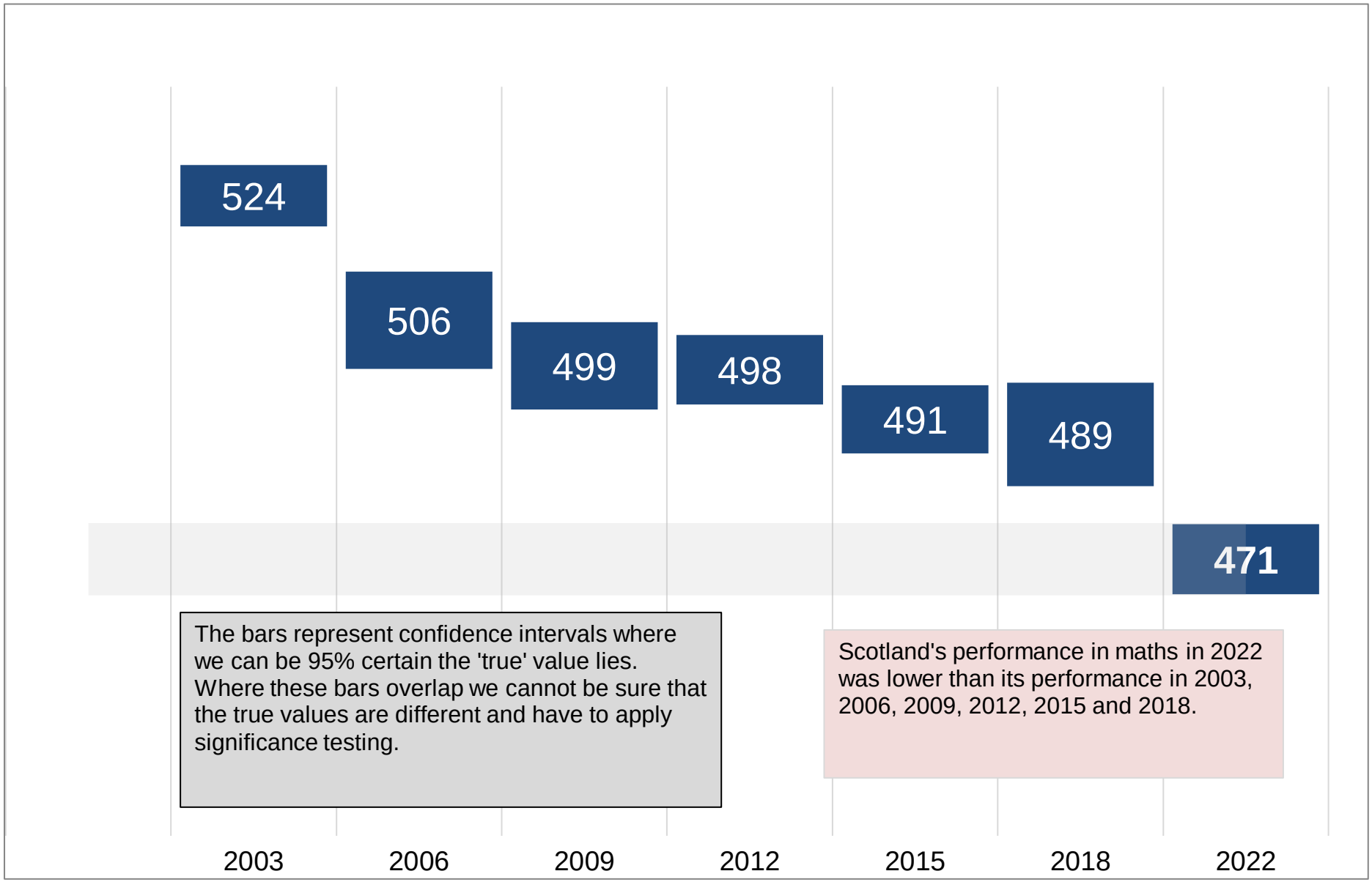


Chart 2.1.2 Scotland’s PISA mathematics scores among **girls**, 2006-2022

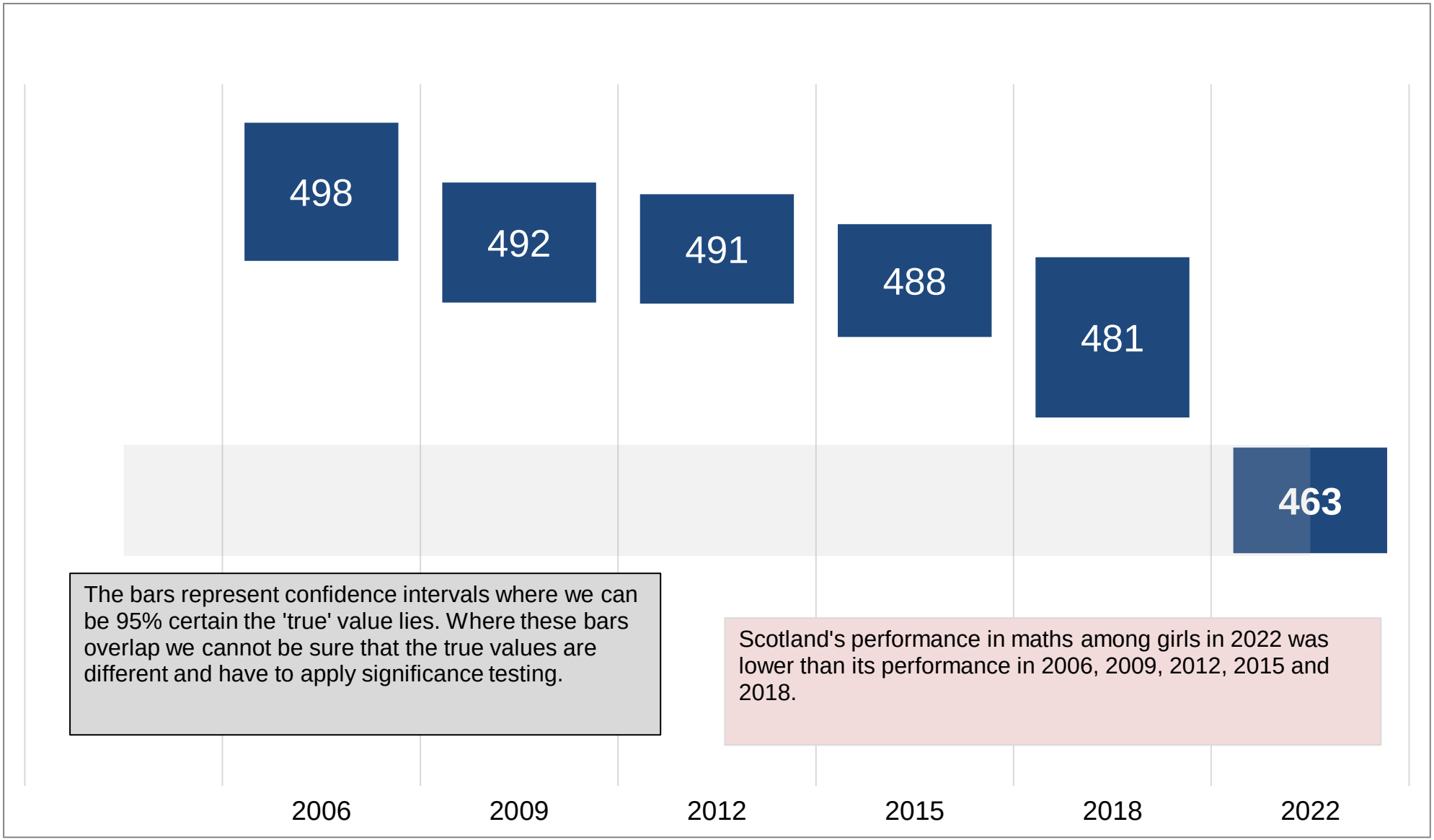


Chart 2.1.3 Scotland’s PISA mathematics scores among **boys**, 2006-2022

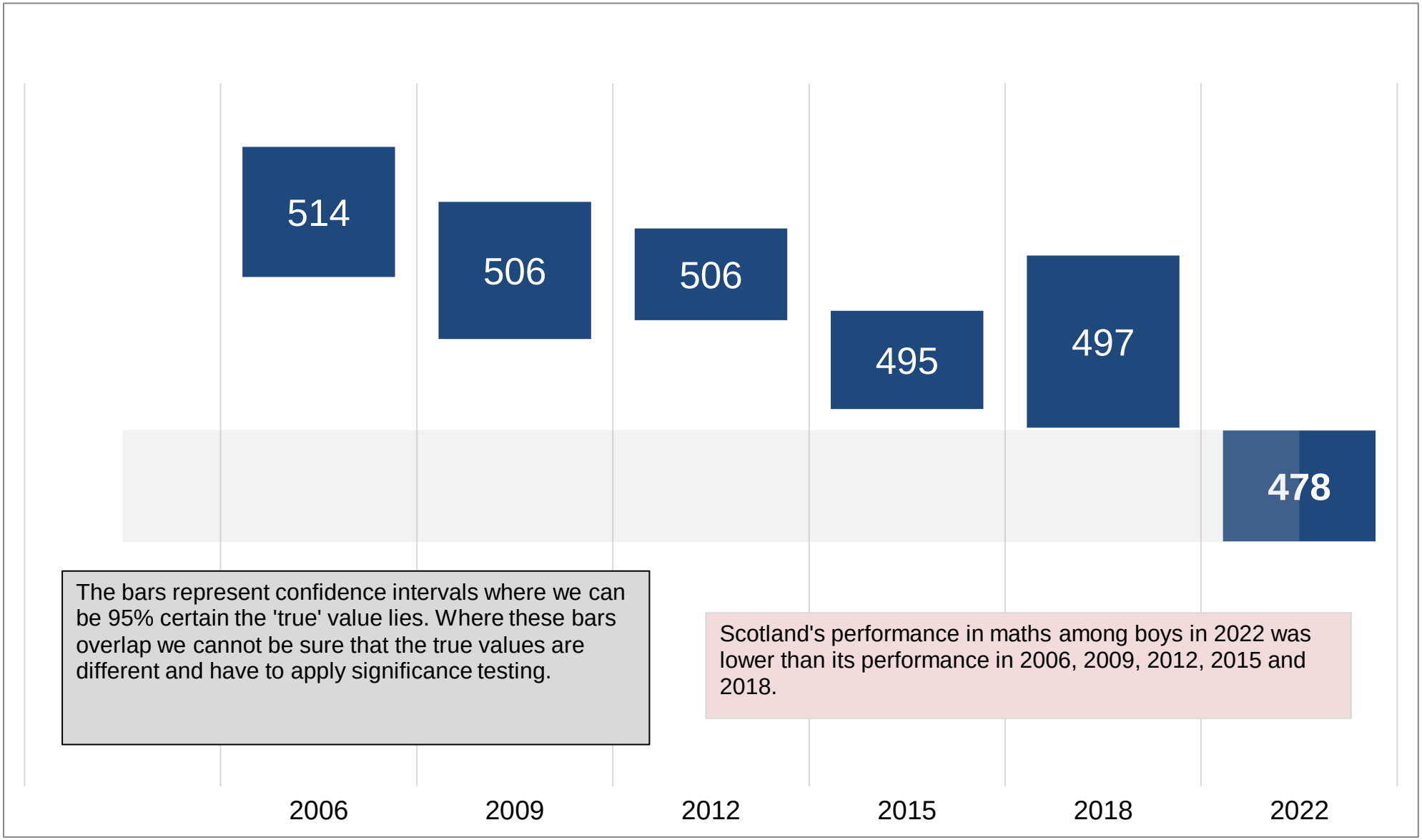
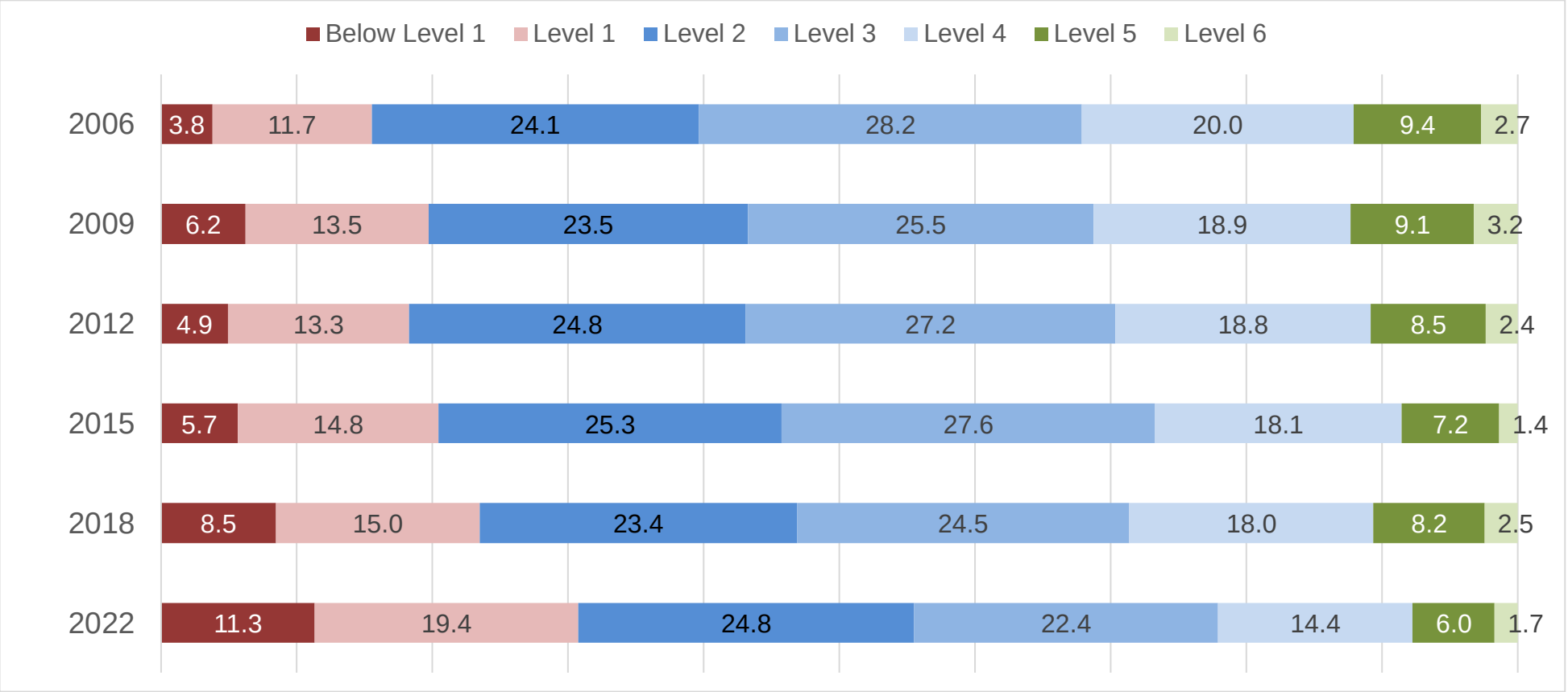


Chart 2.1.4 Scotland's mathematics scores, by **PISA Proficiency Level**, 2006-2022



61. As set out in Annex 2, the OECD categorise students into levels according to their ability to undertake certain tasks. However the group below Level 2 merits particular attention, as the OECD consider that Level 2 is the baseline of proficiency in mathematics.

62. In 2022, 30.7 per cent of students in Scotland performed below PISA Level 2 in mathematics. This was higher than in 2018, 2015, 2012, 2009 and 2006. In 2022, 7.7 per cent of students in Scotland performed at PISA Level 5 or better in mathematics. This was lower than 2018, 2012, 2009 and 2006 and similar to 2015.

2.2 Scotland's performance in mathematics relative to countries in the OECD and UK administrations

63. Scotland's mean score in mathematics in 2022 (471) was similar to the OECD average (472). It was higher than eight countries, similar to 12 countries, including Northern Ireland (475) and Wales (466), and lower than 19 countries, including England (492). See Chart 2.2.1 for more information.

64. Scotland's mean score in mathematics among girls in 2022 (463) was similar to the OECD average (468). It was higher than seven countries, similar to 12 countries and lower than 20 countries and the UK as a whole (482) (Chart 2.2.2).

65. Scotland's mean score in mathematics among boys in 2022 (478) was similar to the OECD average (477). It was higher than 10 countries, similar to 14 countries and lower than 15 countries and the UK as a whole (496) (Chart 2.2.3).

66. In 2022 in mathematics, second generation immigrant students in Scotland performed higher (492) than the OECD average (459). Their performance was higher than 21 countries (459), similar to 12 countries and the UK as a whole (507), and lower than one country (Canada). Performance among first generation immigrant students in Scotland (473) was higher than the OECD average (435) and 24 countries, similar to 11 countries and the UK as a whole (483), and lower than two countries (Australia and Canada). This means that both first and second generation immigrant students in Scotland performed as well as – or better than – in most other OECD countries.

67. In 2022, 30.7 per cent of students in Scotland performed below PISA Level 2 (which is considered by the OECD to be the baseline of proficiency) in mathematics. This proportion was similar to the OECD average (31.1 per cent) and 16 other countries, higher than 16 countries, and lower than seven countries (Chart 2.2.4). 7.7 per cent of students in Scotland performed at PISA Level 5 or better in mathematics (defined by the OECD as top performers). This proportion was similar to the OECD average (8.7 per cent) and 17 other countries, lower than 14 countries and the UK as a whole (11.3 per cent), and higher than eight countries (Chart 2.2.5).

68. The share of variation in mathematics test scores that was explained by students' background was 15.9 per cent (Chart 2.2.6). This was similar to the OECD average (15.5 per cent) and 24 countries, lower than six countries and higher than eight countries.

69. The ESCS gradient shows how much score varies on average with each step (one point) in social background (Chart 2.2.7). The ESCS gradient was 41 points in the mathematics assessment for Scotland, which was similar to the OECD average (39 points). This was lower than six countries, similar to 20 countries and the UK as a whole (36 points), and higher than 12 countries. This means that the effect of social background on score in

Scotland is as great as – or greater than – the majority of other OECD countries.

Chart 2.2.1 PISA mathematics scores of OECD countries (plus three other UK administrations), relative to Scotland, 2022

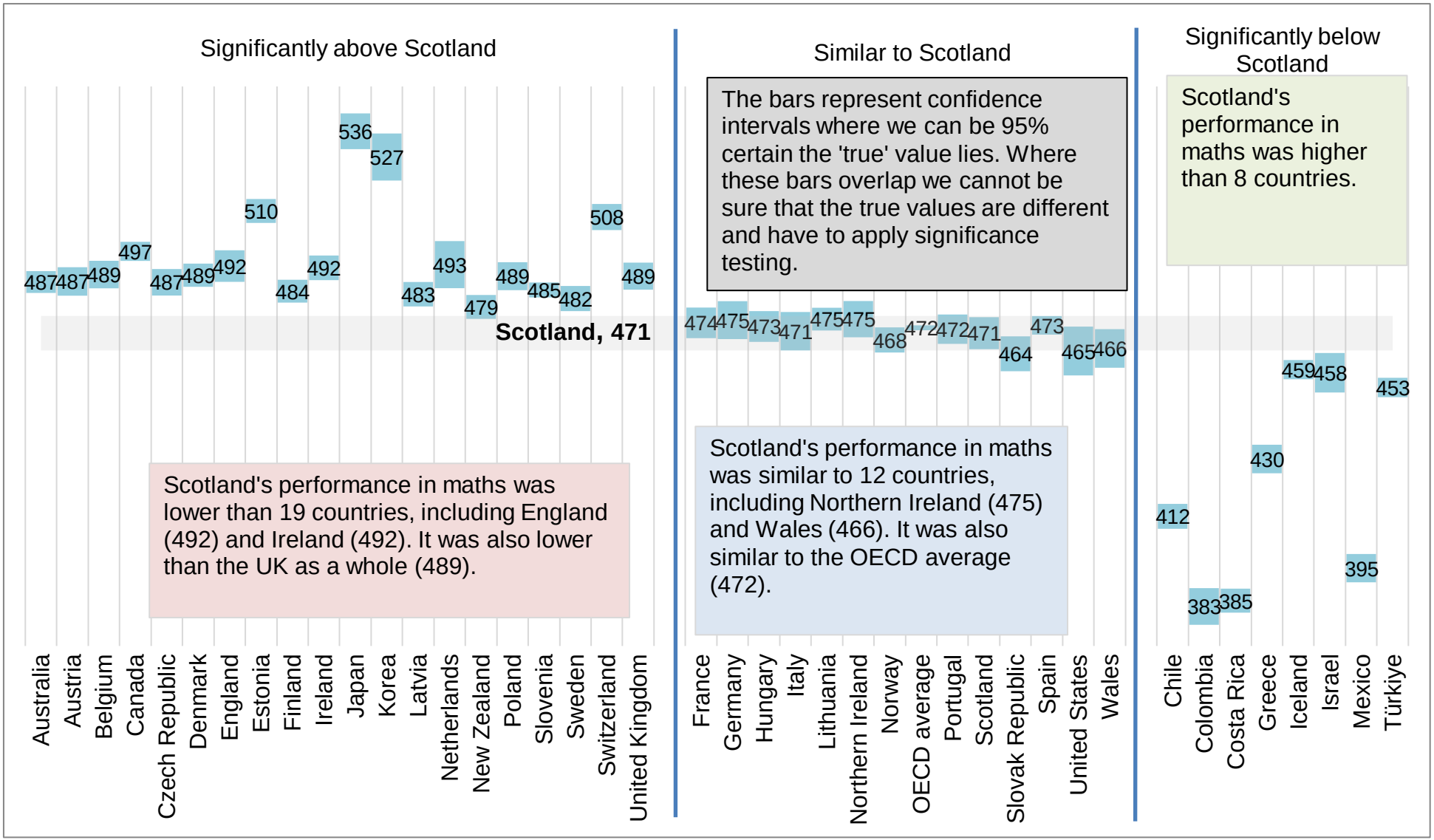


Chart 2.2.2 PISA mathematics scores among girls in OECD countries, relative to Scotland, 2022

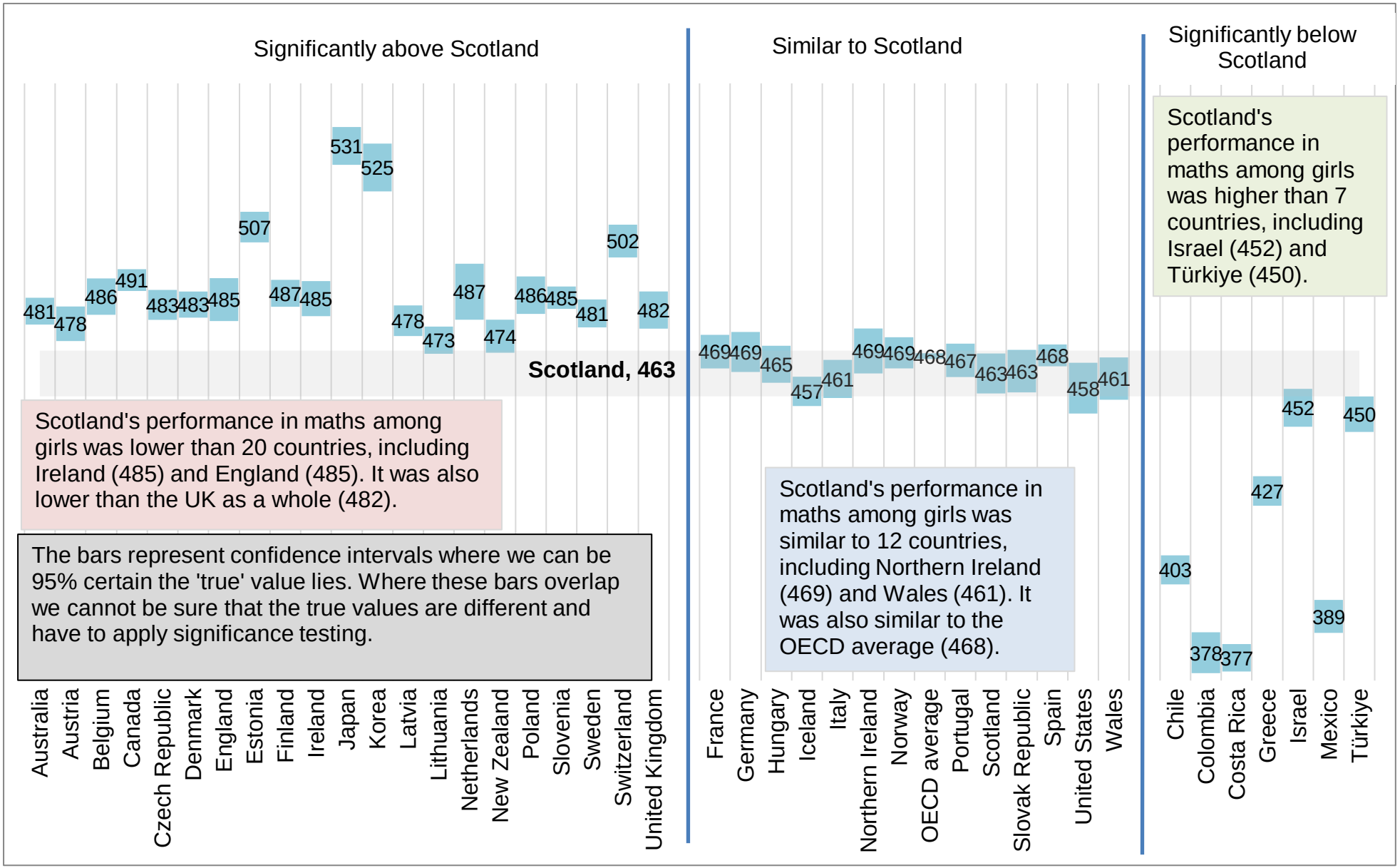


Chart 2.2.3 PISA mathematics scores among boys in OECD countries, relative to Scotland, 2022

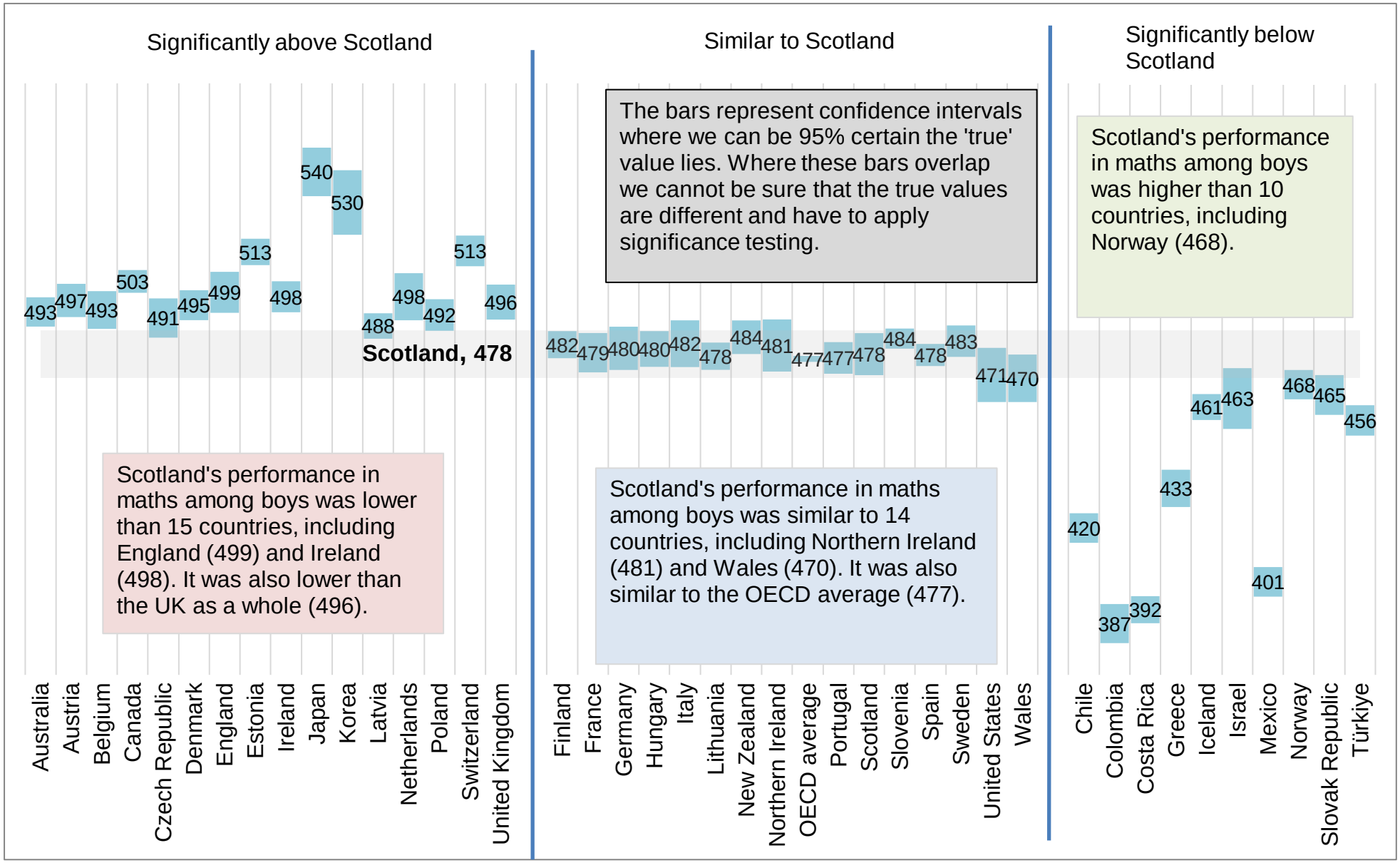
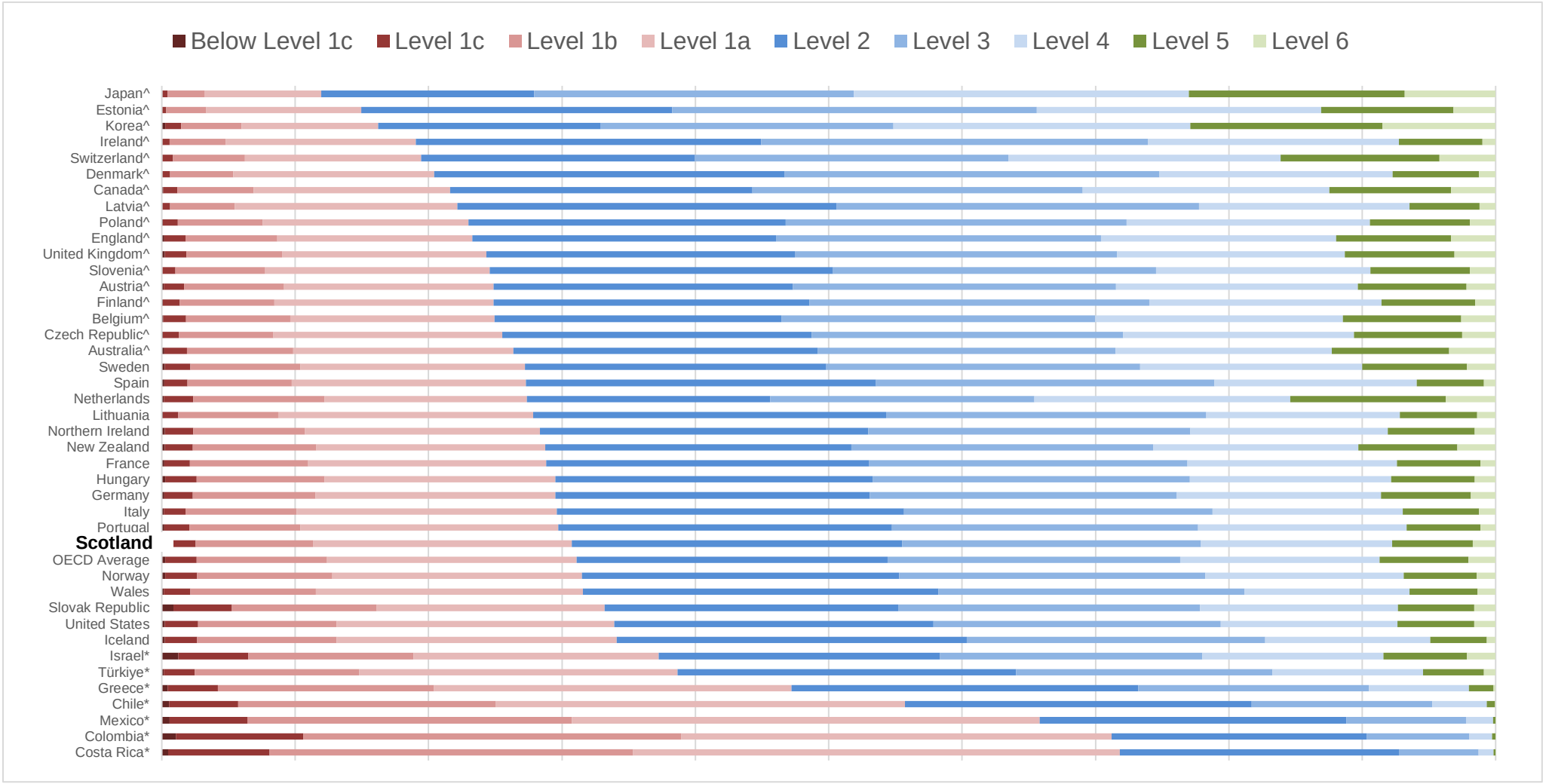
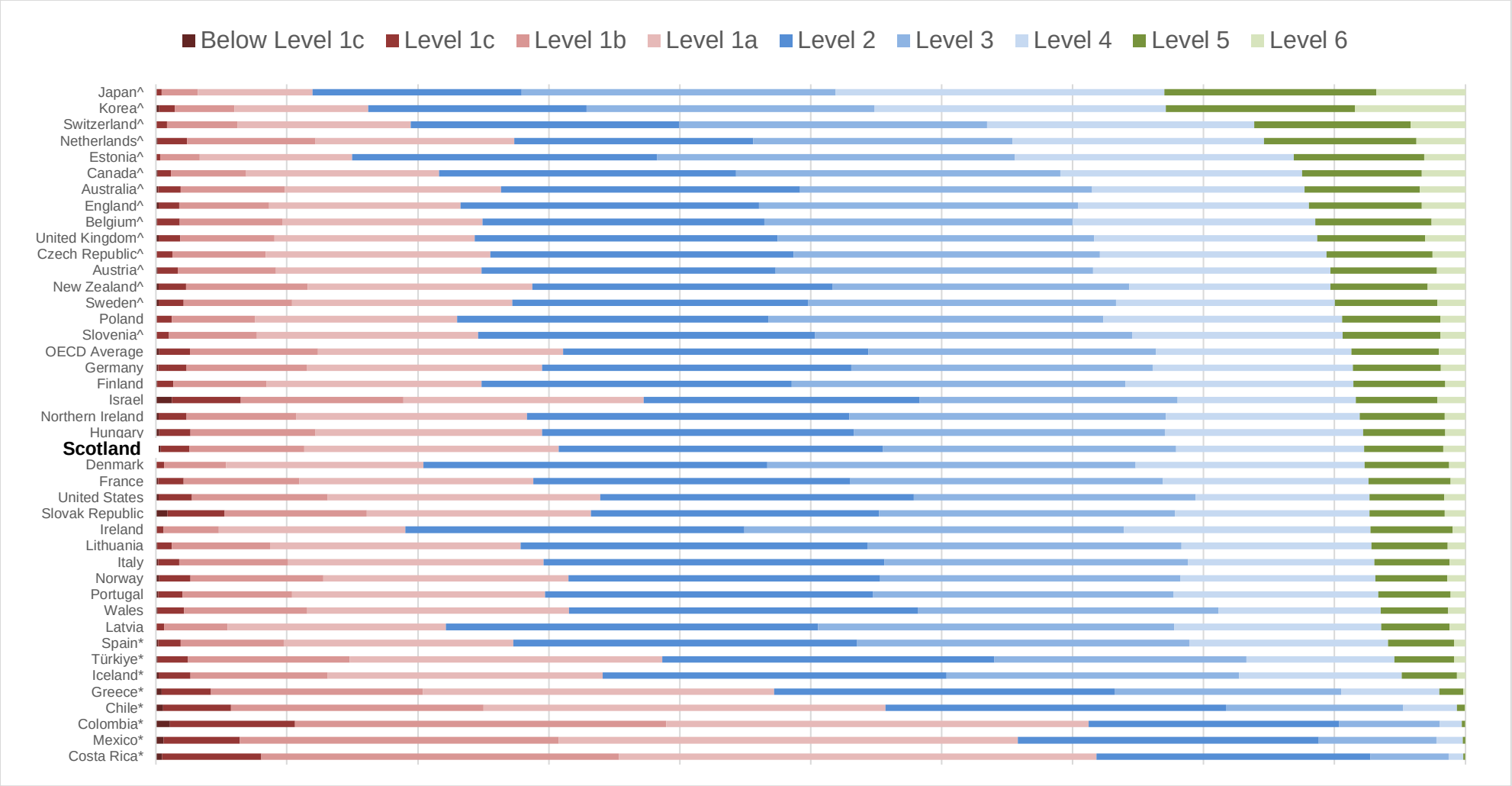


Chart 2.2.4 Proficiency Levels in mathematics in OECD countries, arranged by percentage of students below Level 2, 2022



70. In 2022, 30.7 per cent of students in Scotland performed below PISA Level 2 in mathematics. This was similar to the OECD average and 16 countries, higher (^) than 16 countries and the UK as a whole and lower (*) than seven countries.

Chart 2.2.5 **Proficiency Levels** in mathematics in OECD countries, arranged by percentage of students at **Level 5 or better,** 2022



71. In 2022, 7.7 per cent of students in Scotland performed at PISA Level 5 or better in mathematics. This was similar to the OECD average and 17 countries, higher (*) than eight countries and lower (^) than 14 countries and the UK as a whole.

Chart 2.2.6 **Share of variation** in mathematics performance explained by ESCS in OECD countries, relative to Scotland, 2022

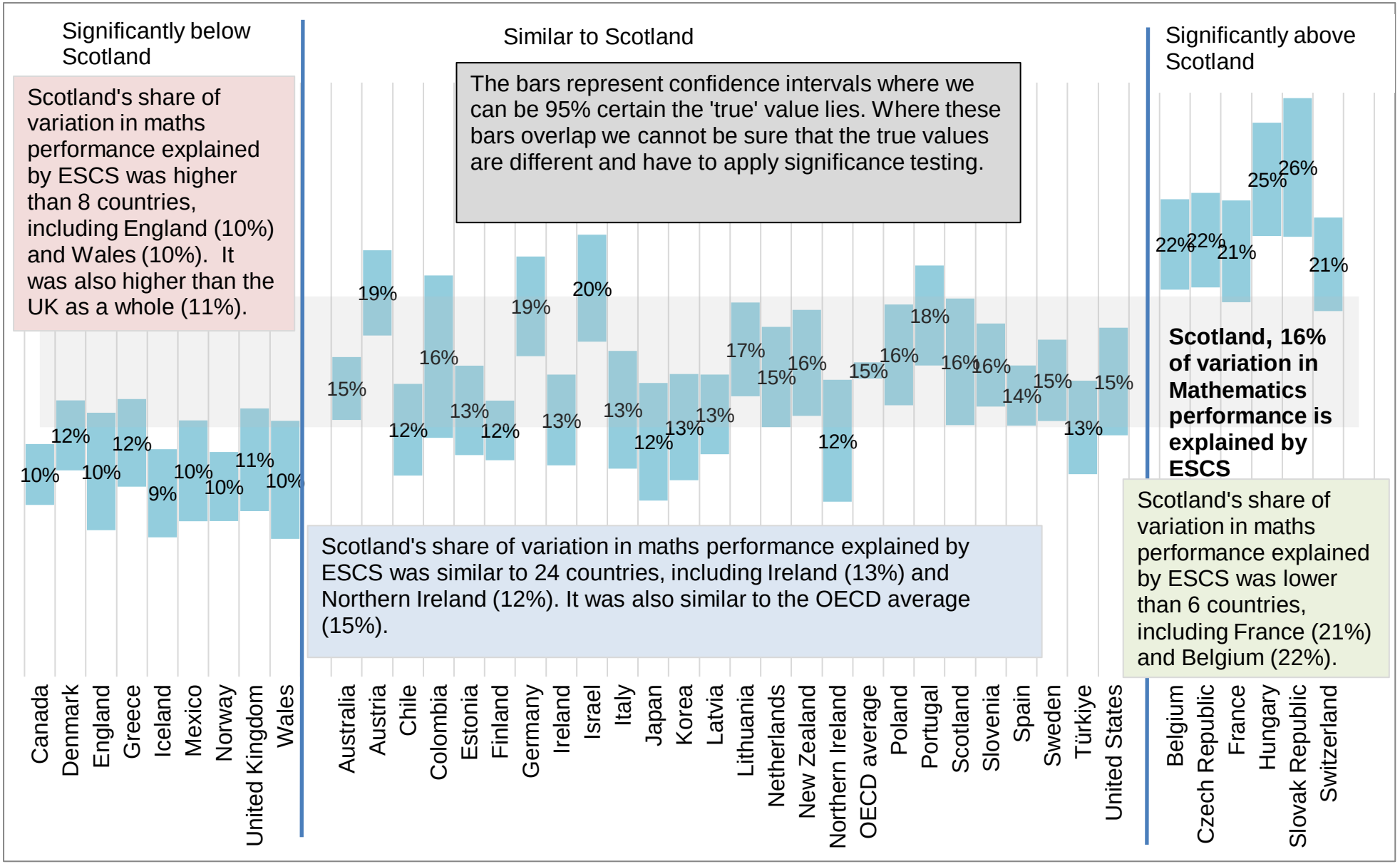
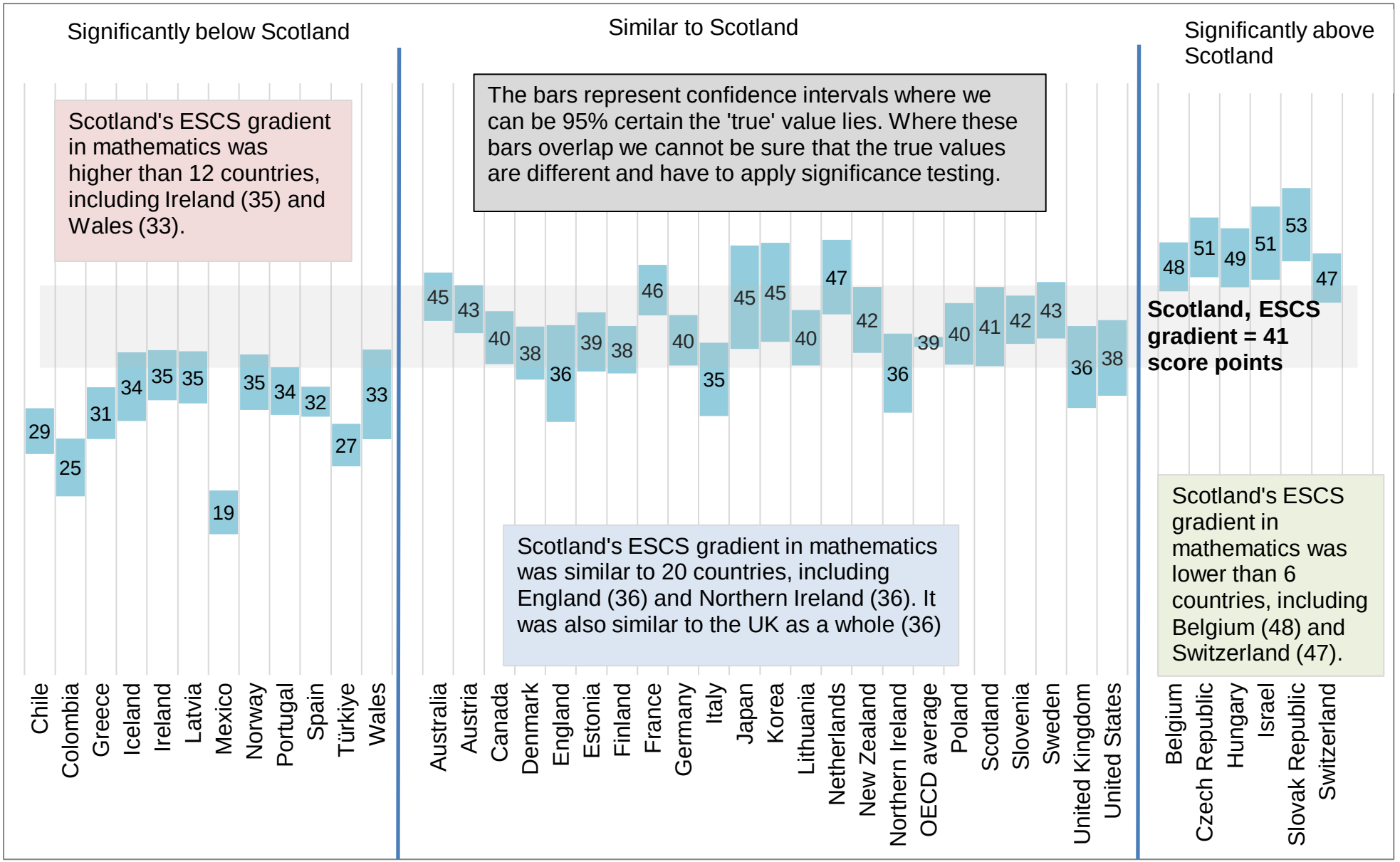


Chart 2.2.7 **ESCS gradient** in mathematics in OECD countries, relative to Scotland



3. Performance in reading

3.1 Scotland's performance in reading

72. Scotland's mean score in reading in 2022 (493) was higher than the OECD average (476) . It was similar to 2006, 2009, 2012 and 2015 and lower than 2000, 2003 and 2018 (Chart 3.1.1).

73. Scotland's standard deviation in reading in 2022 was 103 points. This was higher than 2018 (95 points), 2015 (91 points), 2012 (87 points) 2009 (94 points) and 2006 (96 points). This means there was more variation between students' reading performance in 2022 than there was in previous years.

74. In 2022 in Scotland, girls' reading performance was higher than boys' (502 vs. 484). This is a consistent historic trend (Chart 3.1.2 and Chart 3.1.3).

75. The OECD define second generation immigrants as students where one or both parents were born in another country (i.e. not in the UK). First generation immigrants are where the student was born in another country (i.e. not in the UK). Non-immigrants are where the student and both parents were born in the UK. In 2022, the performance of first generation immigrant students (475) was lower than non-immigrant students (498) in reading. The performance of second generation immigrant students (500) was similar to non-immigrant students and first generation immigrant students.

76. Achievement of PISA Level 2 is considered by the OECD to be the baseline at which students begin to demonstrate sufficient skill to enable them to participate actively in life situations involving reading. In 2022, 20.3 per cent of students in Scotland performed below PISA Level 2 in reading, which was lower than the OECD average (26.3 per cent). This was higher than 2018 (15.5 per cent) and 2012 but similar to 2006, 2009 and 2015.

77. PISA defines students attaining above Level 5 as top performers. In 2022, 9.6 per cent of students in Scotland performed at PISA Level 5 or better in reading, which was higher than the OECD average (7.2 per cent). The proportion of students performing at PISA Level 5 or better in Scotland was higher in 2022 than in 2015 (6.4 per cent) and similar to 2006, 2009, 2012 and 2018 (Chart 3.1.4).

78. In 2022, a greater proportion of boys (23.2 per cent) than girls (17.3 per cent) performed below PISA Level 2 in reading. In 2022 the proportions of girls and boys performing at PISA Level 5 or better in reading were similar (10.8 per cent of girls and 8.4 per cent of boys).

79. The strength of the relationship between students' background and reading test scores (share of variation) in 2022 (11.1 percent) was similar to all previous years. For more information on ESCS please Annex 3.

80. The ESCS gradient shows how much score varies on average with each step (one point) in social background. The ESCS gradient was 37 points in the reading assessment for Scotland in 2022. This was similar to 2006 (42 points), 2009 (44 points), 2012 (34 points), 2015 (32 points) and 2018 (32 points).

81. The average scores in reading in Scotland of students from less affluent backgrounds (i.e. those at the 5th percentile by ESCS) and those from more affluent backgrounds (i.e. those at the 95th percentile by ESCS) are apart by 107 points, which implies a difference of around three-and-a-half years' of schooling.

Chart 3.1.1: Scotland's PISA reading scores, 2000-2022

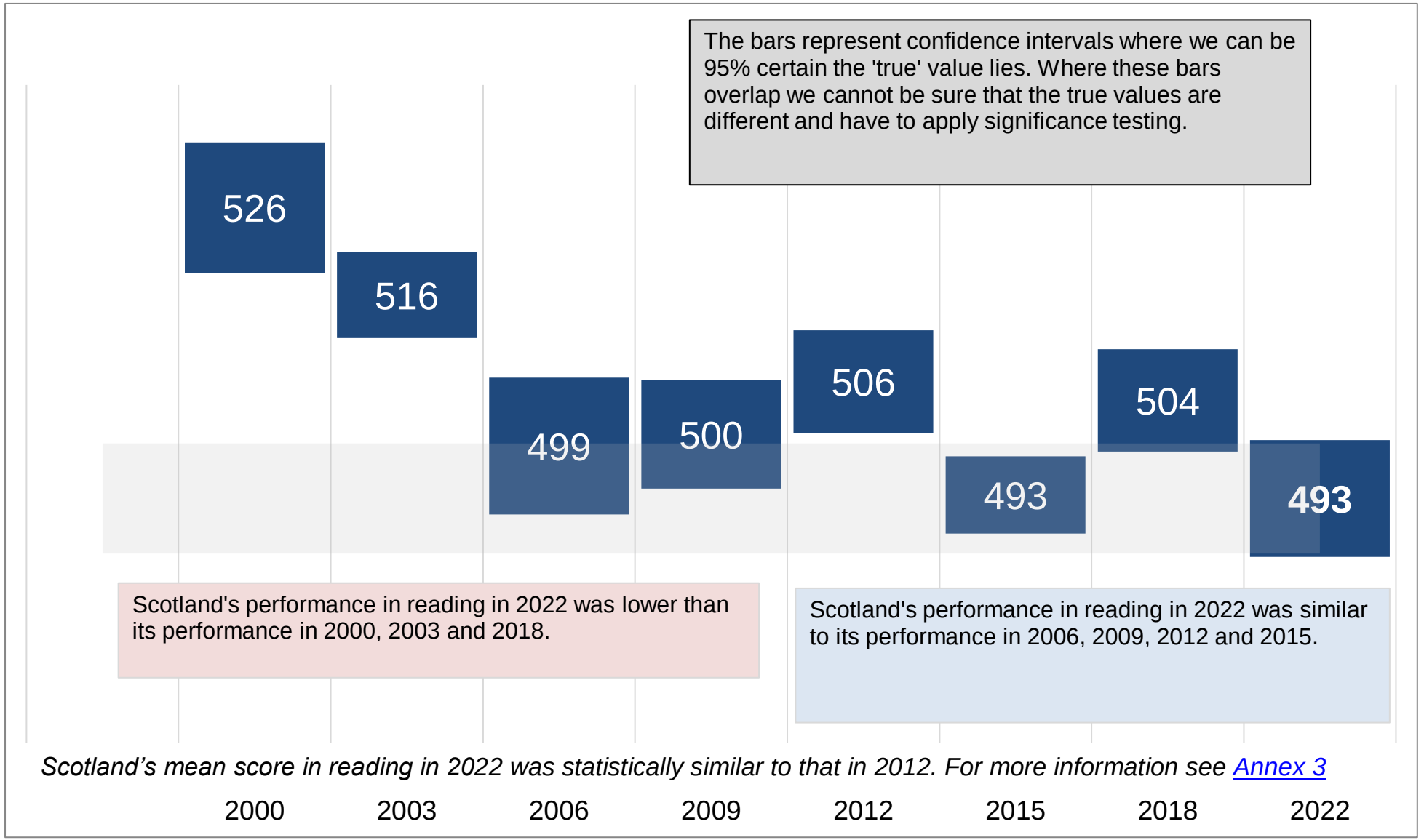


Chart 3.1.2 Scotland’s PISA reading scores among **girls**, 2006-2022

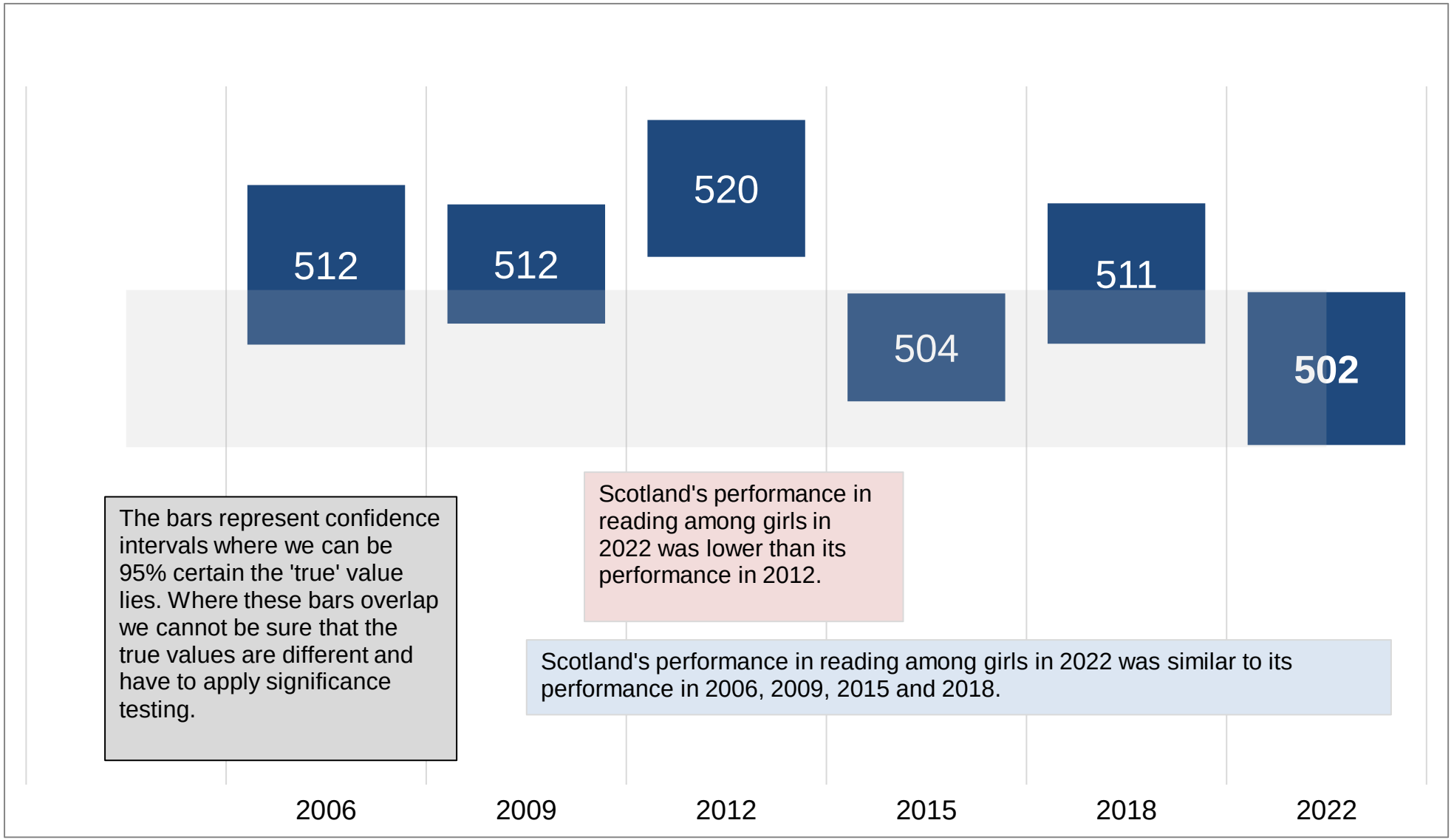


Chart 3.1.3 Scotland’s PISA reading scores among **boys**, 2006-2022

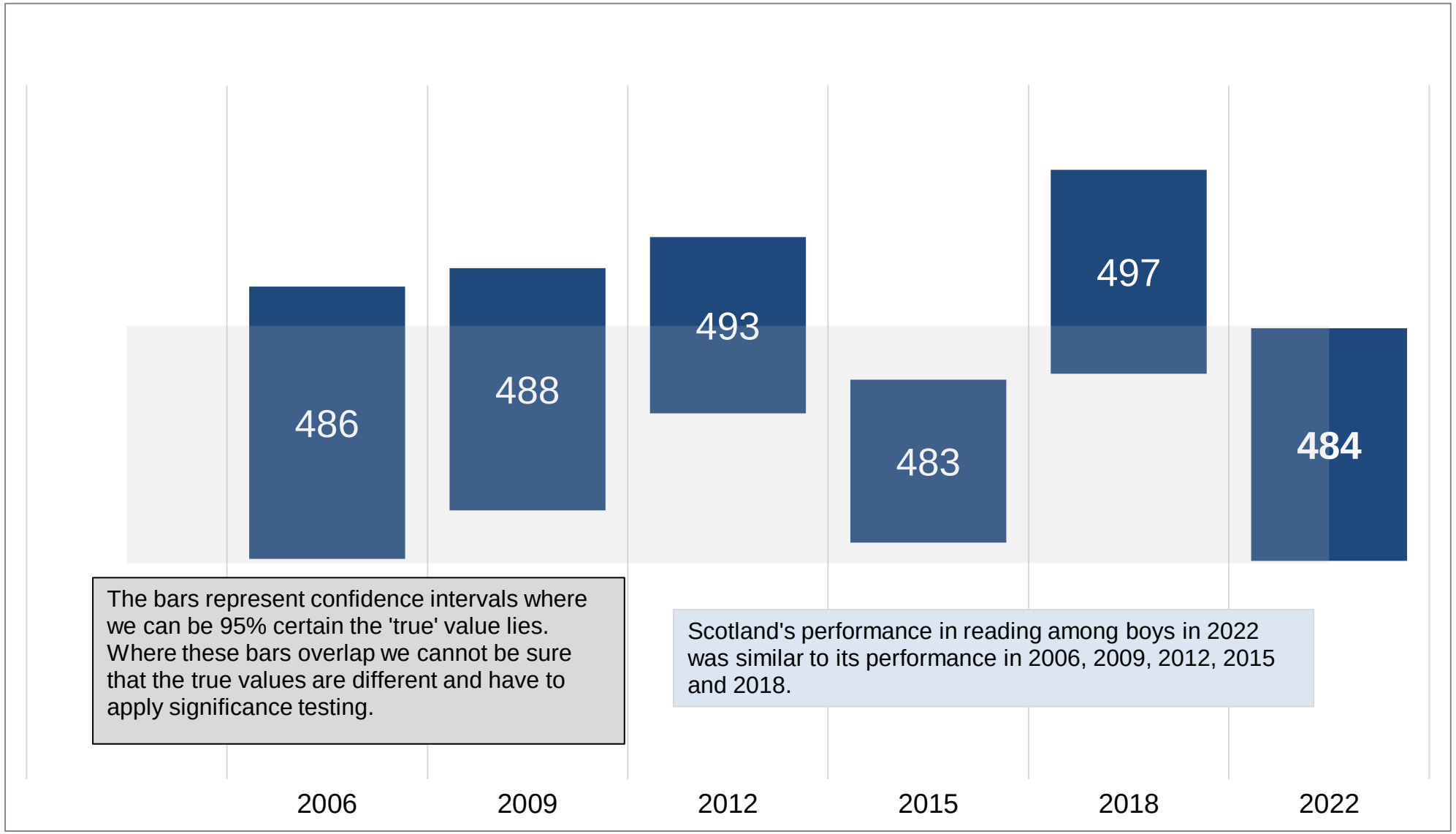
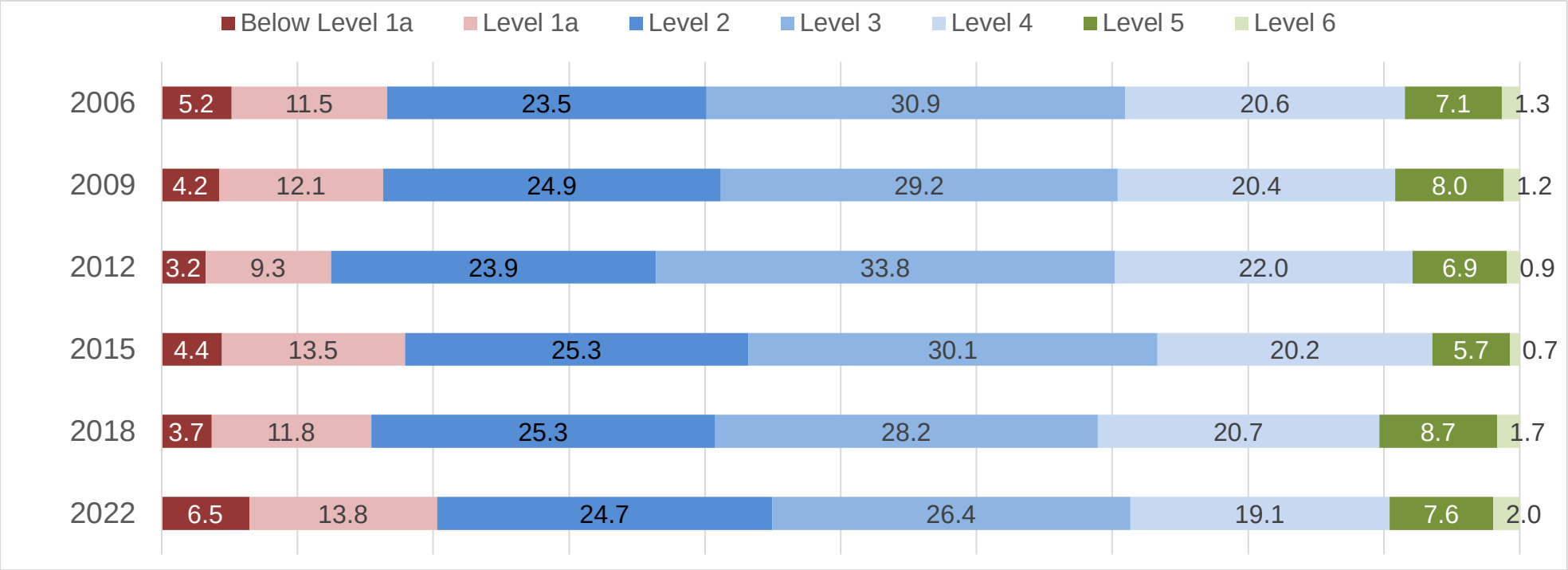


Chart 3.1.4 Scotland's reading scores, by **PISA Proficiency Level**, 2006-2022



82. As set out in Annex 2, the OECD categorise students into Levels according to their ability to undertake certain tasks. However the group below Level 2 merits particular attention, as the OECD consider that Level 2 is the baseline of proficiency in reading.

83. In 2022, 20.3 per cent of students in Scotland performed below PISA Level 2 in reading. This was higher than 2018 (15.5 per cent) and 2012 but similar to 2015, 2009 and 2006. In 2022, 9.6 per cent of students in Scotland performed at PISA Level 5 or better in reading. This was higher than in 2015 (6.4 per cent) and similar to 2006, 2009, 2012 and 2018.

3.2 Scotland's performance in reading relative to countries in the OECD and UK administrations

84. Scotland's mean score in reading in 2022 (493) was higher than the OECD average (476). It was higher than 24 countries, including Wales (466), similar to eight countries, including England (496) and Northern Ireland (485), and lower than seven countries, including Ireland (516). See Chart 3.2.1 for more information.

85. Scotland's mean score in reading among girls in 2022 (502) was higher than the OECD average (488). It was higher than 21 countries, similar to 10 countries and the UK as a whole (503), and lower than eight countries (Chart 3.2.2).

86. Scotland's mean score in reading among boys in 2022 (484) was higher the OECD average (464). It was higher than 26 countries, similar to eight countries and the UK as a whole (486) and lower than five countries (Chart 3.2.3).

87. In 2022 in reading, second generation immigrant students in Scotland performed higher (500) than the OECD average (461). They performed higher than 20 countries, similar to 13 countries and the UK as a whole (502) and lower than one country (Canada). Performance among first generation immigrant students in Scotland (475) was higher than the OECD average (425) and 25 countries, similar to nine countries and the UK as a whole (481), and lower than three countries. This means that both first and second generation immigrant students in Scotland performed as well as – or better than – in most other OECD countries.

88. In 2022, 20.3 per cent of students in Scotland performed below PISA Level 2 (considered by the OECD to be the baseline of proficiency) in reading. This proportion was lower than the OECD average (26.3 per cent) and 17 countries, higher than four countries, and similar to 18 countries and the UK as a whole (20.1 per cent) (Chart 3.2.4). 9.6 per cent of students in Scotland performed at PISA Level 5 or better in reading (defined by the OECD as top performers). This proportion was higher than the OECD average (7.2 per cent) and 18 countries, lower than four countries, and similar to 17 countries and the UK as a whole (10.1 per cent) (Chart 3.2.5).

89. The share of variation in reading test scores that was explained by students' background was 11.1 per cent (Chart 3.2.6). This was similar to the OECD average and 26 countries (and the UK as a whole), lower than 10 countries, and higher than two countries.

90. The ESCS gradient shows how much reading score varies on average with each step (one point) in social background scale. The ESCS gradient was 37 points in the reading assessment for Scotland (Chart 3.2.7) which was similar

to the OECD average (39 points). This was lower than 10 countries, similar to 23 countries (as well as the UK as a whole), and higher than five countries.

Chart 3.2.1 PISA reading scores of OECD countries (plus three other UK administrations), relative to Scotland, 2022

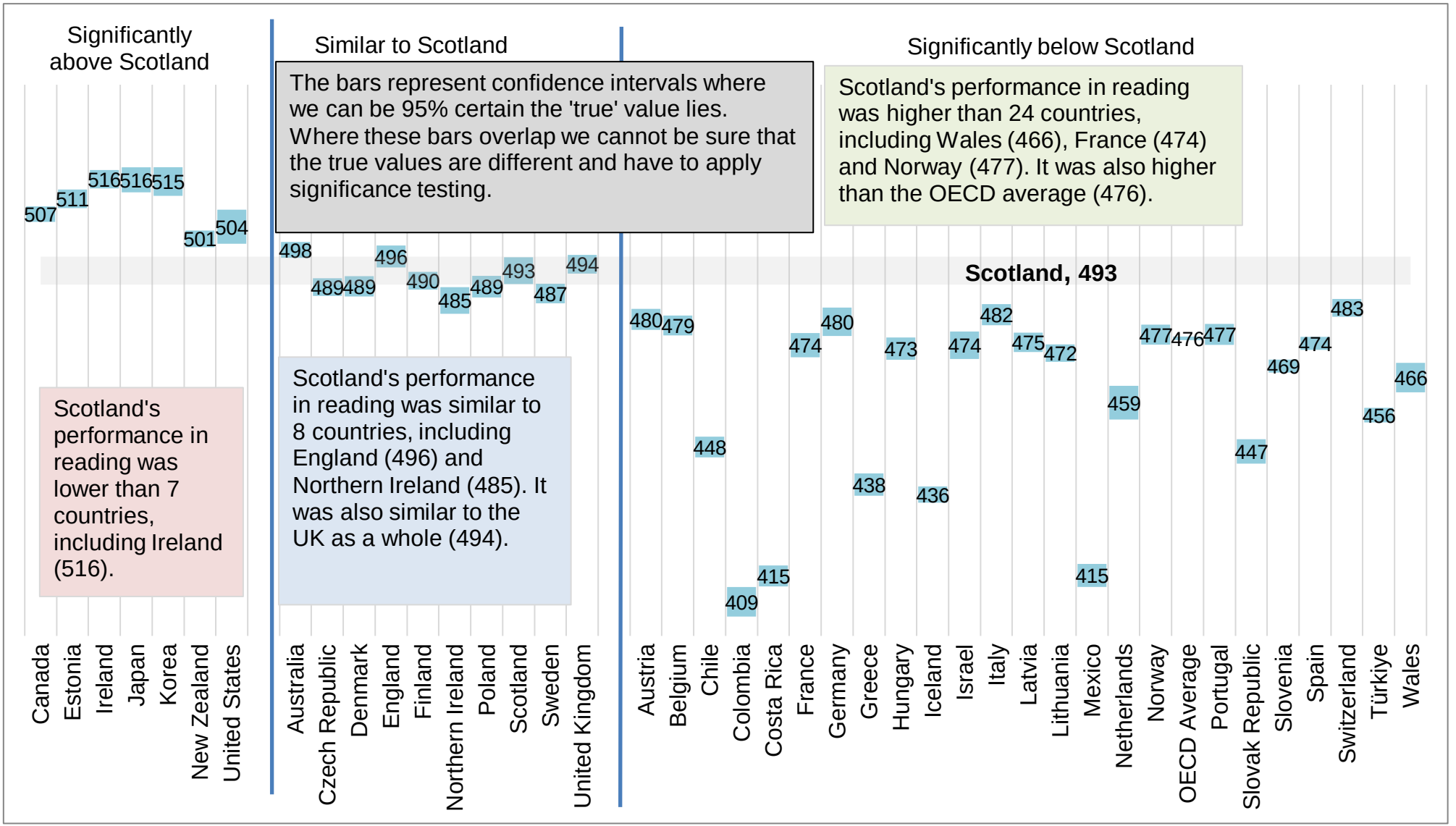


Chart 3.2.2 PISA reading scores among girls in OECD countries, relative to Scotland, 2022

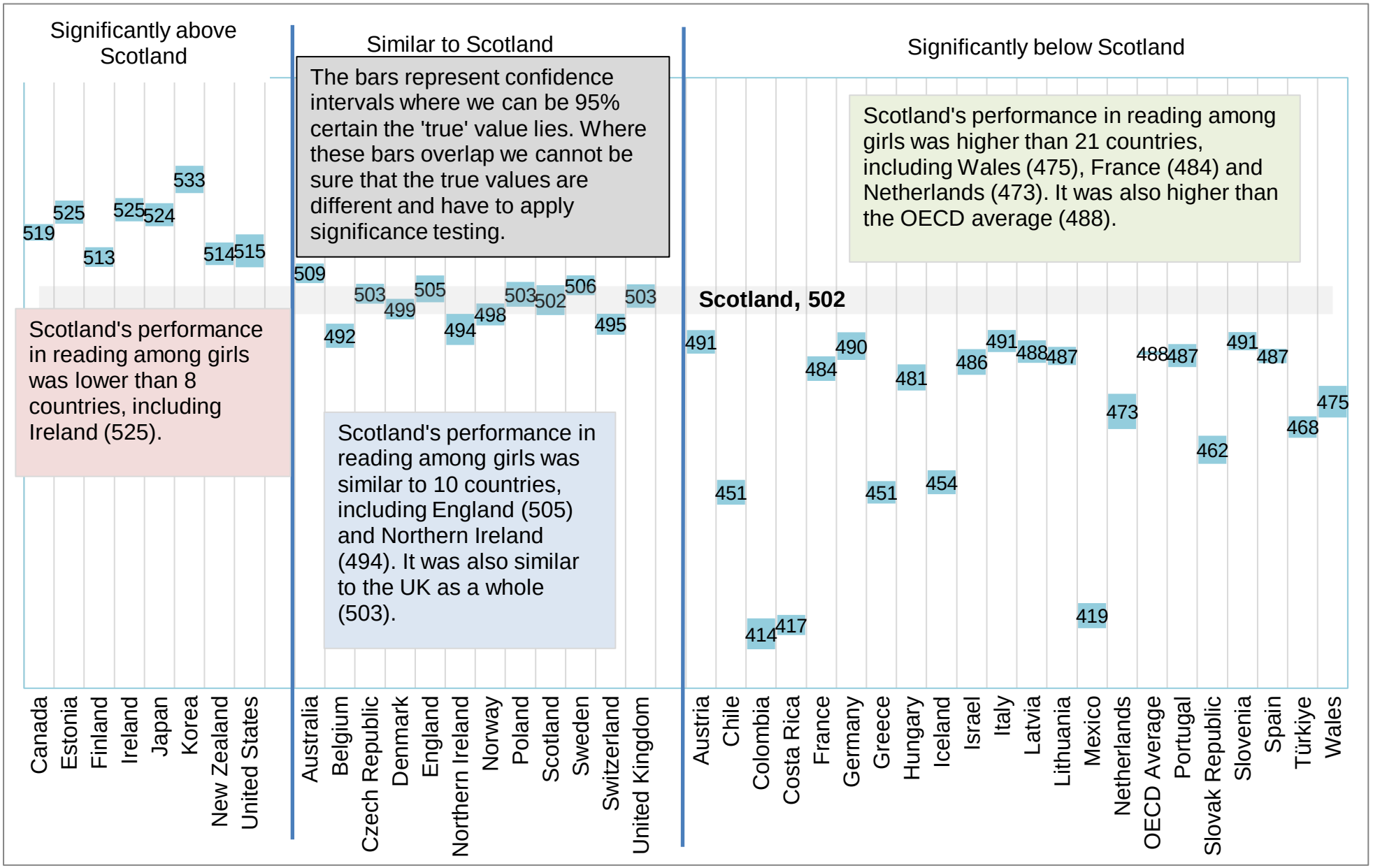


Chart 3.2.3 PISA reading scores among boys in OECD countries, relative to Scotland, 2022

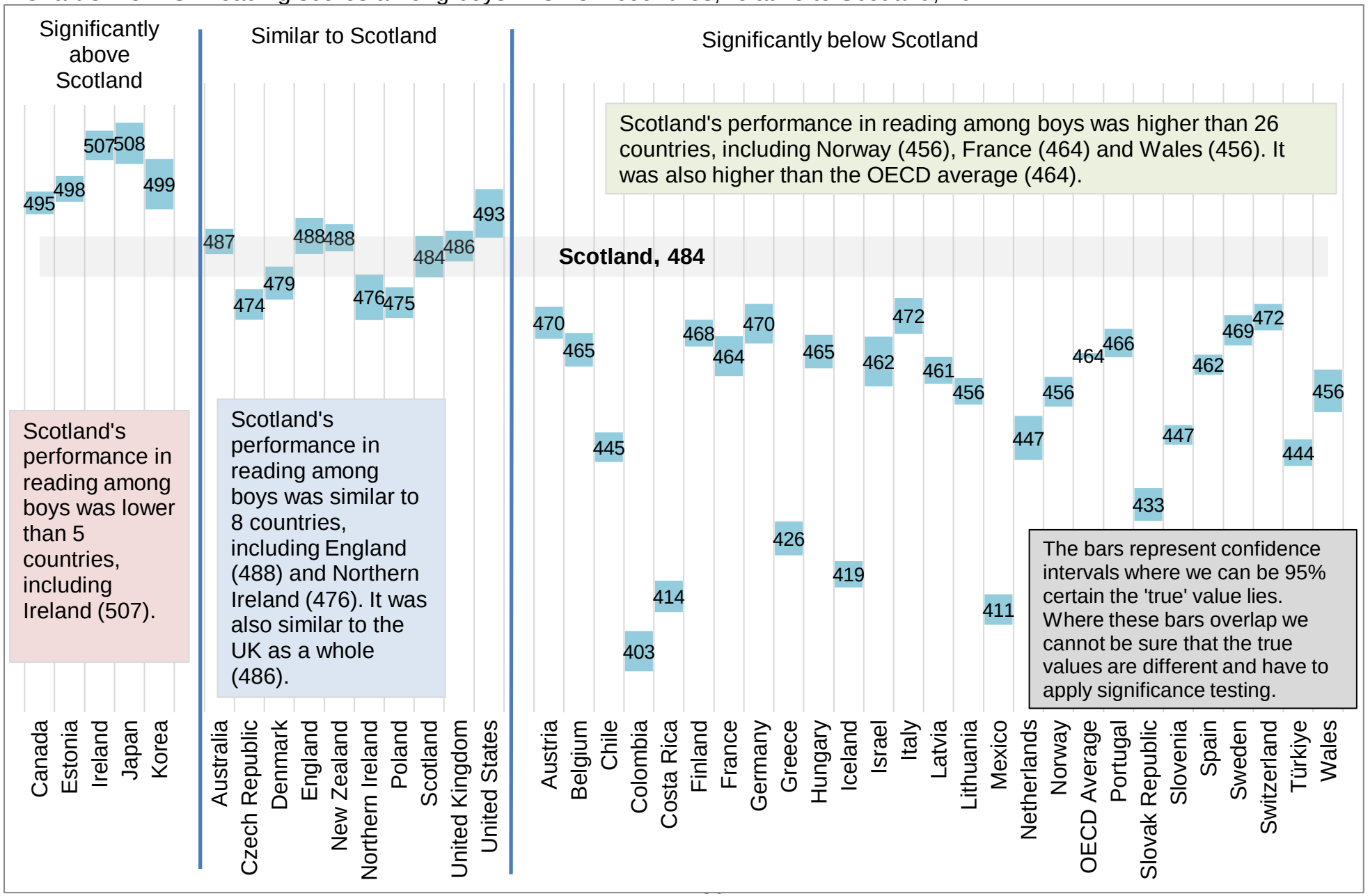
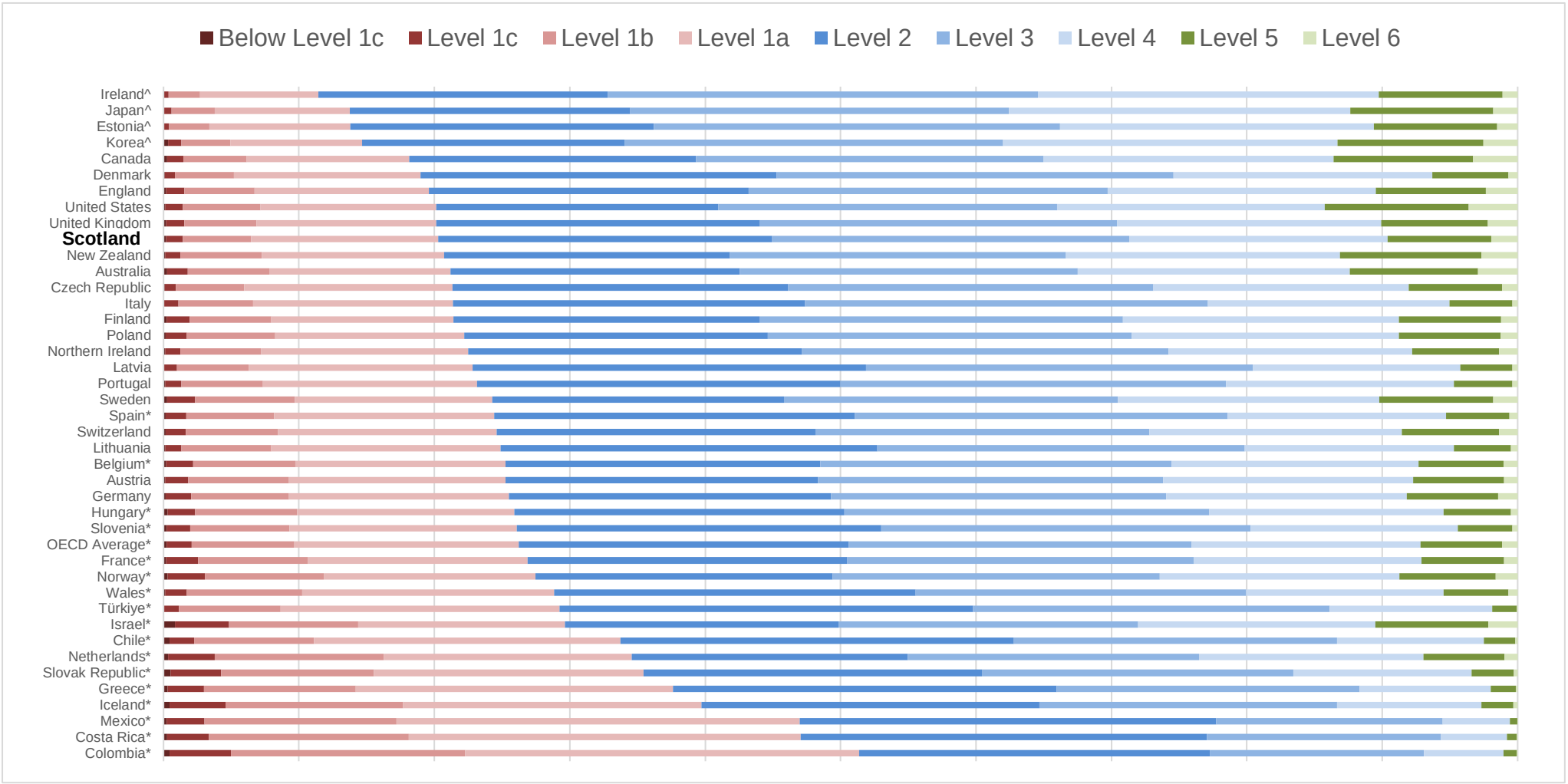
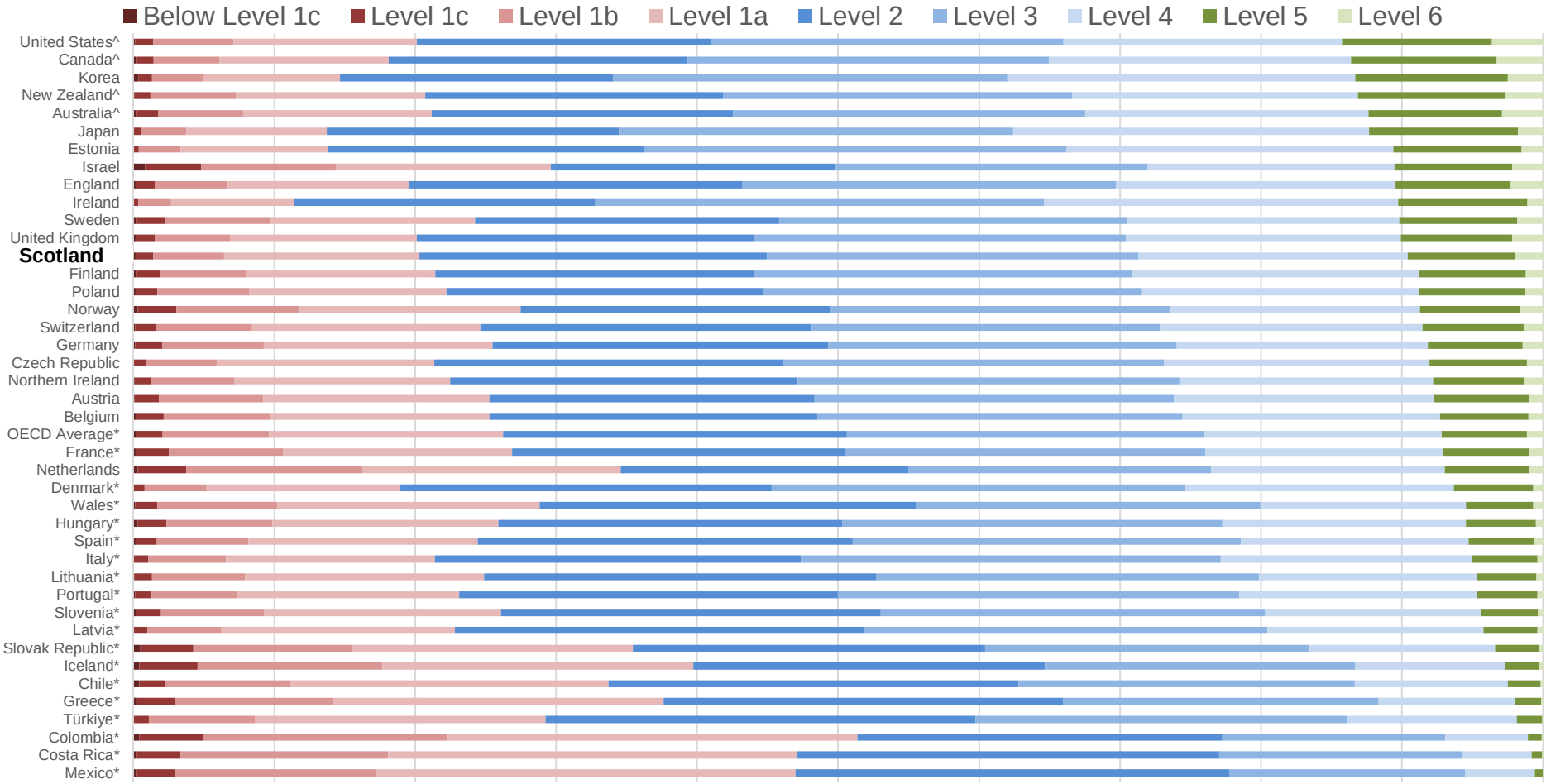


Chart 3.2.4 Proficiency Levels in reading in OECD countries, arranged by percentage of students below Level 2, 2022



91. In 2022, 20.3 per cent of students in Scotland performed below PISA Level 2 in reading. This was lower (*) than the OECD average and 17 countries, higher (^) than four countries and similar to 18 countries and the UK as a whole.

Chart 3.2.5 Proficiency Levels in reading in OECD countries, arranged by percentage of students at Level 5 or better, 2022



92. In 2022, 9.6 per cent of students in Scotland performed at PISA Level 5 or better in reading. This was higher (*) than the OECD average and eighteen countries, similar to 17 countries and the UK as a whole and lower (^) than four countries.

Chart 3.2.6 Share of variation in reading performance explained by ESCS in OECD countries, relative to Scotland, 2022

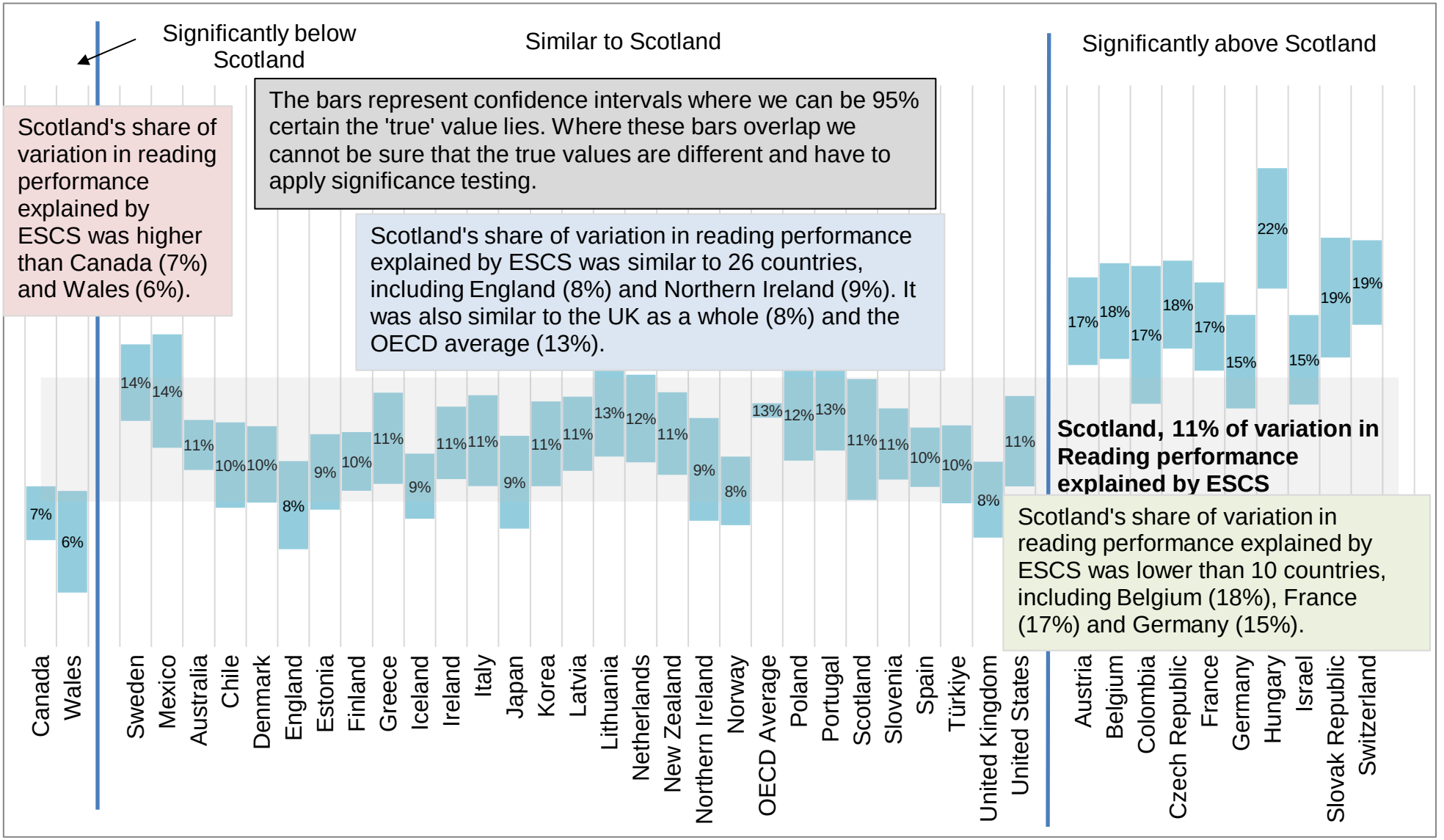
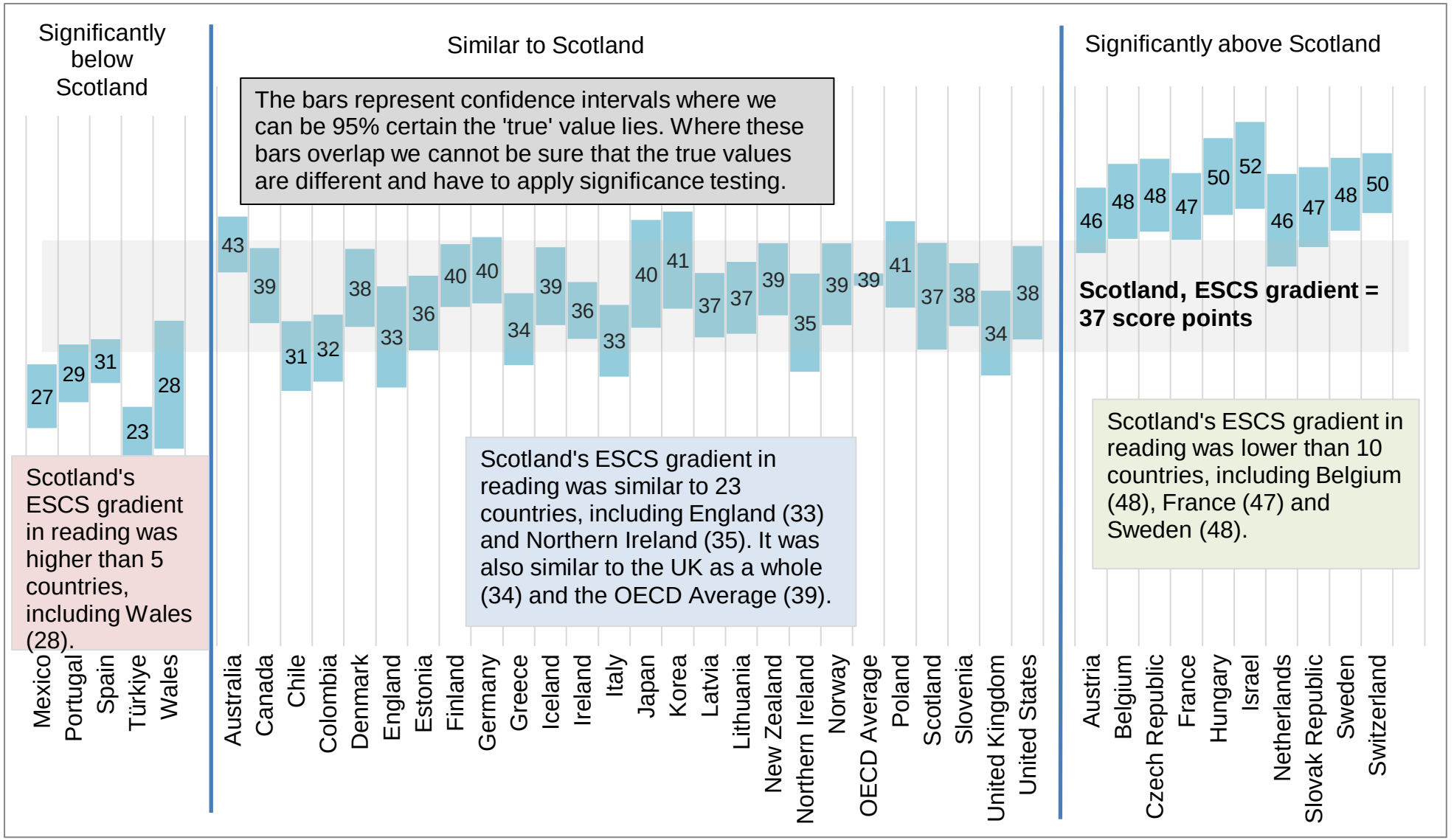


Chart 3.2.7 ESCS gradient in reading in OECD countries, relative to Scotland, 2022



4. Performance in science

4.1 Scotland's performance in science

93. Scotland's mean score in science in 2022 (483) was similar to the OECD average (485). This was similar to 2018, but lower than all previous PISA cycles 2006-2015. See Chart 4.1.1 for more information.

94. Scotland's standard deviation in science in 2022 was 101 points. This was similar to 2018 (98 points) and 2006 (100 points) but higher than 2015 (95 points), 2012 (89 points) and 2009 (96 points). This means there was more variation between students' science performance in 2022 than 2009, 2012 and 2015.

95. In 2022 in Scotland, girls and boys had a similar performance in science (481 vs. 485). This was also the case in all previous years (Chart 4.1.2 and Chart 4.1.3).

96. The OECD define second generation immigrants as students where one or both parents were born in another country (i.e. not in the UK). First generation immigrants are where the student was born in another country (i.e. not in the UK). Non-immigrants are where the student and both parents were born in the UK. In 2022, the performance of first generation immigrant students (484), second generation immigrant students (501) and non-immigrant students (486) in Scotland was similar in science.

97. PISA level 2 is considered by the OECD to be the baseline at which students begin to demonstrate the knowledge and skills to enable them to participate actively in life situations related to science. In 2022, 24.0 per cent of students in Scotland performed below PISA Level 2 in science. This was similar to the OECD average (24.5 per cent). The proportion of students performing below PISA level 2 in Scotland in 2022 was similar to 2018 but higher than 2006, 2009, 2012 and 2015.

98. PISA defines students attaining above Level 5 as top performers. In 2022, 6.8 per cent of students in Scotland performed at PISA Level 5 or better in science. This was similar to the OECD average (7.5 per cent). The proportion of students performing at PISA Level 5 or better in Scotland in 2022 was similar to 2018, 2015 and 2012 but lower than 2009 and 2006 (Chart 4.1.4).

99. In 2022 the proportion of girls and boys performing below PISA Level 2 in science was similar (23.9 per cent of girls and 24.1 per cent of boys). The proportion performing at PISA Level 5 or better was also similar (6.2 per cent of girls and 7.4 per cent of boys).

100. The strength of the relationship between students' background and science test scores (share of variation) in 2022 was 12.2 per cent. This was similar to 2018, 2015, 2012, 2009 and 2006.

101. The ESCS gradient shows how much score varies on average with each step (one point) in social background. The ESCS gradient was 39 points in the science assessment for Scotland. This was similar to 2012 (36 points), 2015 (37 points) and 2018 (36 points), but lower than in 2006 (50 points) and 2009 (47 points).

102. In 2022 in Scotland, the average scores in science of students from less affluent backgrounds (i.e. those at the 5th percentile by ESCS) and those from more affluent backgrounds (i.e. those at the 95th percentile) are apart by 111 points, which implies a difference of just over three-and-a-half years' schooling.

Chart 4.1.1 Scotland's PISA science scores, 2006-2022

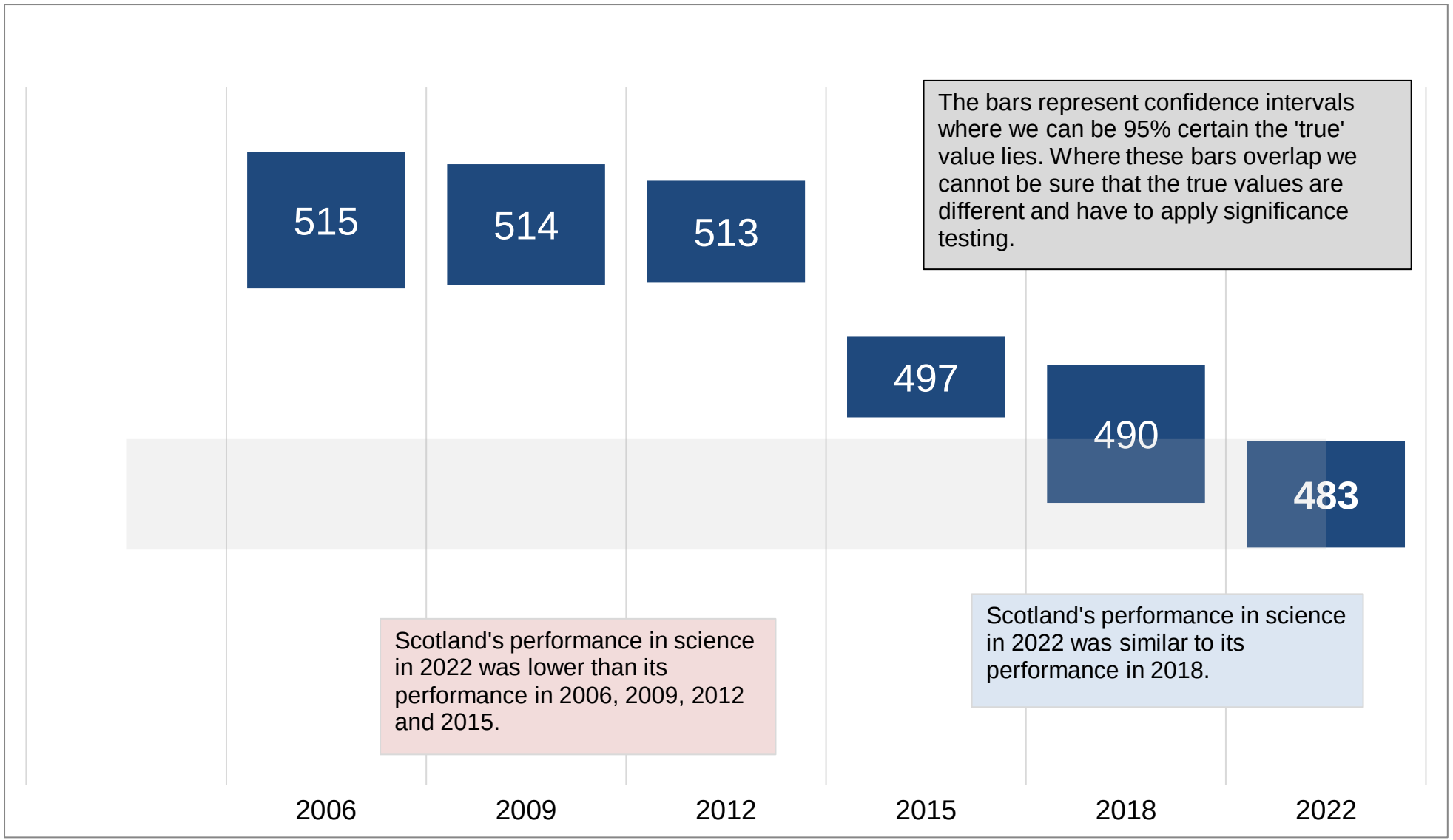


Chart 4.1.2 Scotland’s PISA science scores among girls, 2006-2022

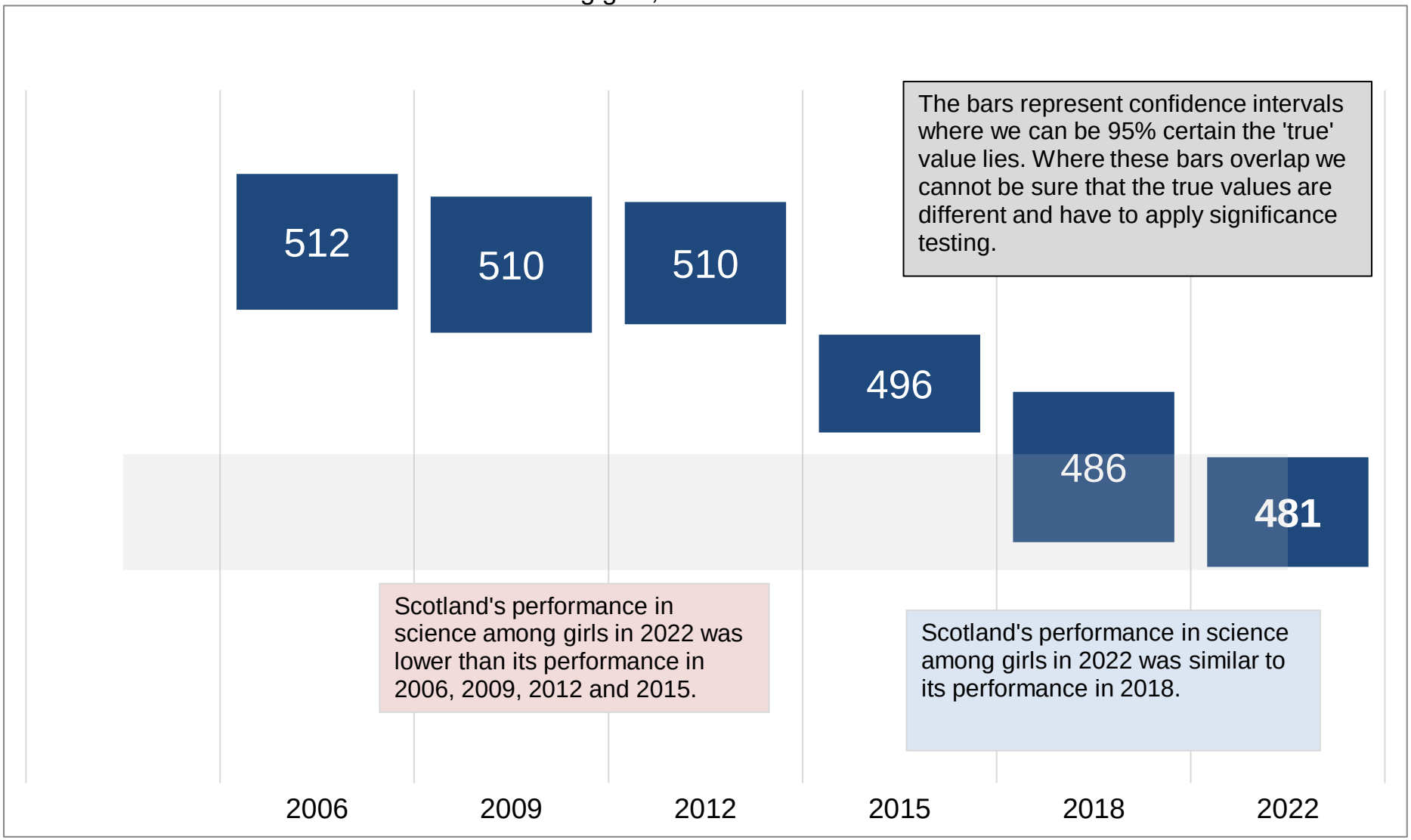


Chart 4.1.3 Scotland’s PISA science scores among **boys**, 2006-2022

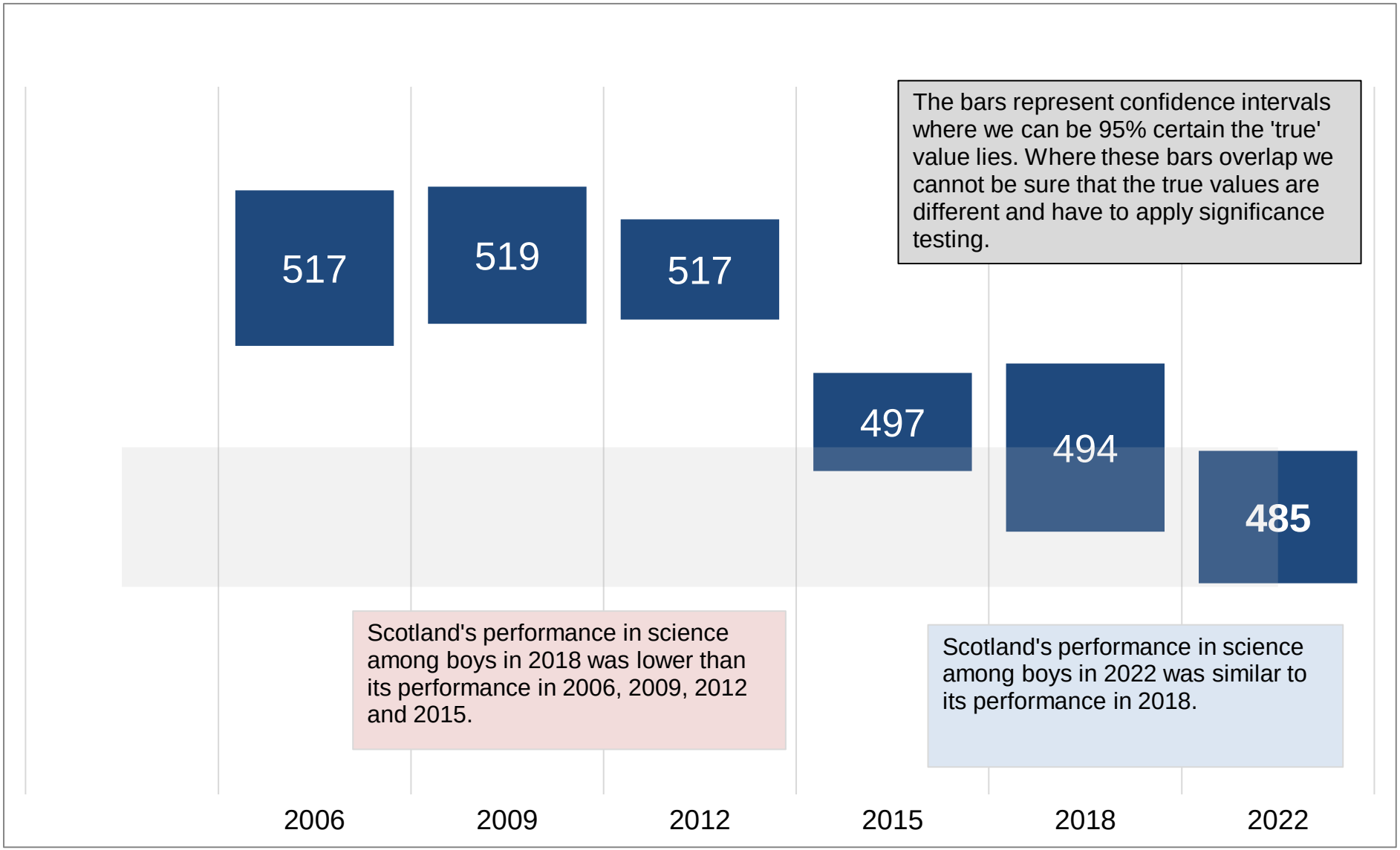
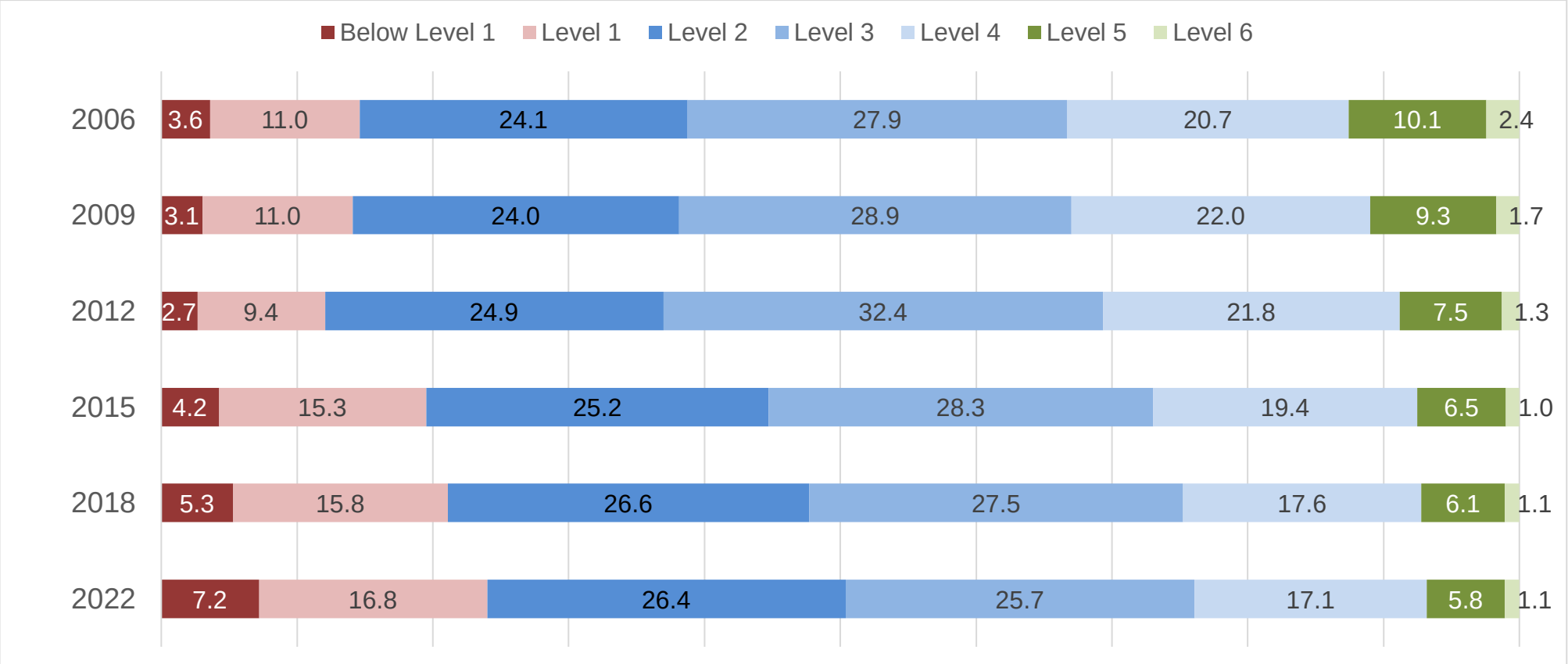


Chart 4.1.4 Scotland's science scores, by **PISA Proficiency Level**, 2006-2022



103. As set out in Annex 2, the OECD categorise students into levels according to their ability to undertake certain tasks. However the group below Level 2 merits particular attention, as the OECD consider that Level 2 is the baseline of proficiency in science. In 2022, 24.0 per cent of students in Scotland performed below PISA Level 2 in science. This was similar to 2018, but higher than 2006, 2009, 2012 and 2015.

104. In 2022, 6.8 per cent of students in Scotland performed at PISA Level 5 or better in science. This was similar to 2012, 2015 and 2018 but lower than 2006 and 2009.

4.2 Scotland's performance in science relative to countries in the OECD and UK administrations

105. Scotland's mean score in science in 2022 (483) was similar to the OECD average (485). It was higher than 10 countries, including Wales (473), similar to 12 countries, including Northern Ireland (488), and was lower than 17 countries, including England (503). See Chart 4.2.1 for more information.

106. Scotland's mean score in science among girls in 2022 (481) was similar to the OECD average (485). It was higher than nine countries, similar to 11 countries and lower than 19 countries (and the UK as a whole) (Chart 4.2.2).

107. Scotland's mean score in science among boys in 2022 (485) was similar to the OECD average (485). It was higher than 10 countries, similar to 14 countries and lower than 15 countries (and the UK as a whole) (Chart 4.2.3).

108. In 2022 in science, second generation immigrant students in Scotland (501) performed higher than the OECD average (466). They performed higher than 20 countries, similar to 12 countries and the UK as a whole, and lower than two countries. Performance among first generation immigrant students in Scotland (484) was higher than the OECD average (438) and 24 countries, similar to 10 countries and the UK as a whole, and lower than three countries. This means that both first and second generation immigrant students in Scotland performed as well as – or better than – in most other OECD countries.

109. In 2022, 24.0 per cent of students in Scotland performed below PISA Level 2 (which is considered by the OECD to be the baseline of proficiency) in science. This proportion was similar to the OECD average (24.5 per cent) and 22 other countries, higher than nine countries, and lower than eight countries (Chart 4.2.4). 6.8 per cent of students in Scotland performed at PISA Level 5 or better (defined by the OECD as top performers) in science. This proportion was similar to the OECD average (7.5 per cent) and 13 other countries, higher than 12 countries, and lower than 14 countries (Chart 4.2.5).

110. The share of variation in science test scores that was explained by students' background was 12.2 per cent (Chart 4.2.6). This was similar to the OECD average (14.2 per cent) and 28 other countries, lower than nine countries, and higher than one country (Canada).

111. The ESCS gradient shows how much score varies on average with each step (one point) in social background. The ESCS gradient was 39 points in the science assessment for Scotland (Chart 4.2.7), which was similar to the OECD average (41 points). This was lower than 11 countries, similar to 22 countries and higher than five countries.

Chart 4.2.1 PISA science scores of OECD countries (plus three other UK administrations), relative to Scotland, 2022

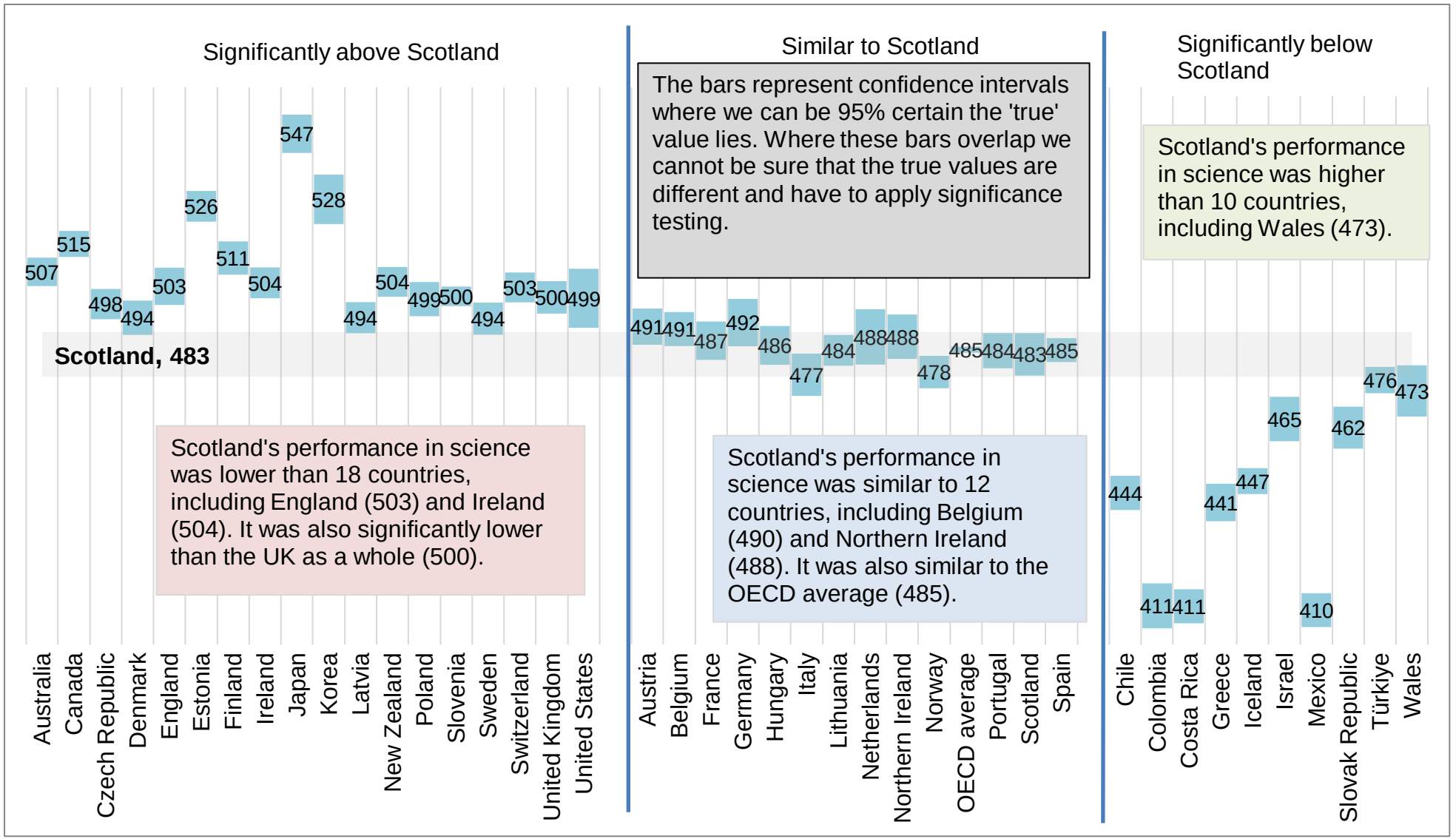


Chart 4.2.2 PISA science scores among **girls** in OECD countries, relative to Scotland, 2022

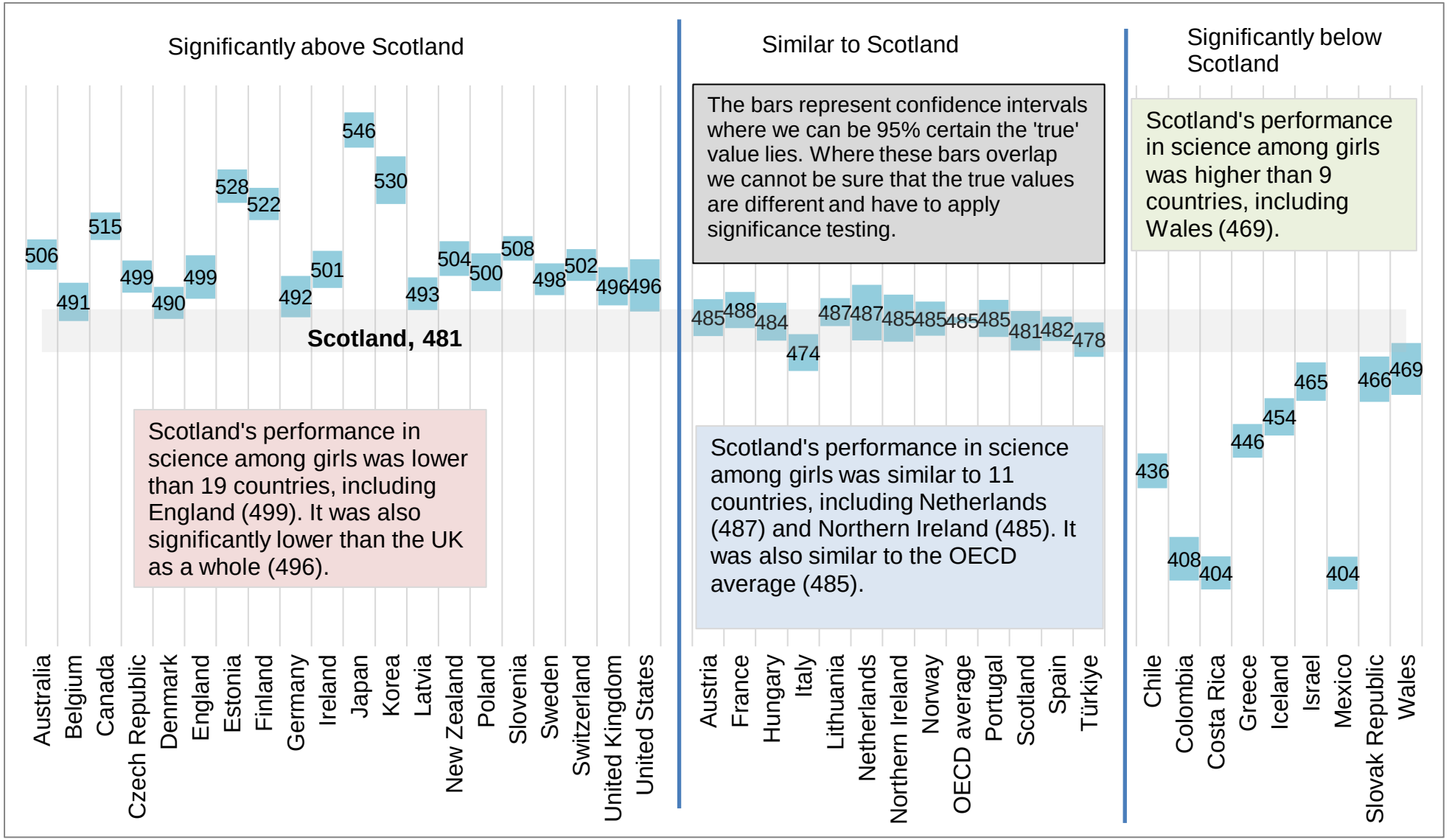


Chart 4.2.3 PISA science scores among **boys** in OECD countries, relative to Scotland, 2022

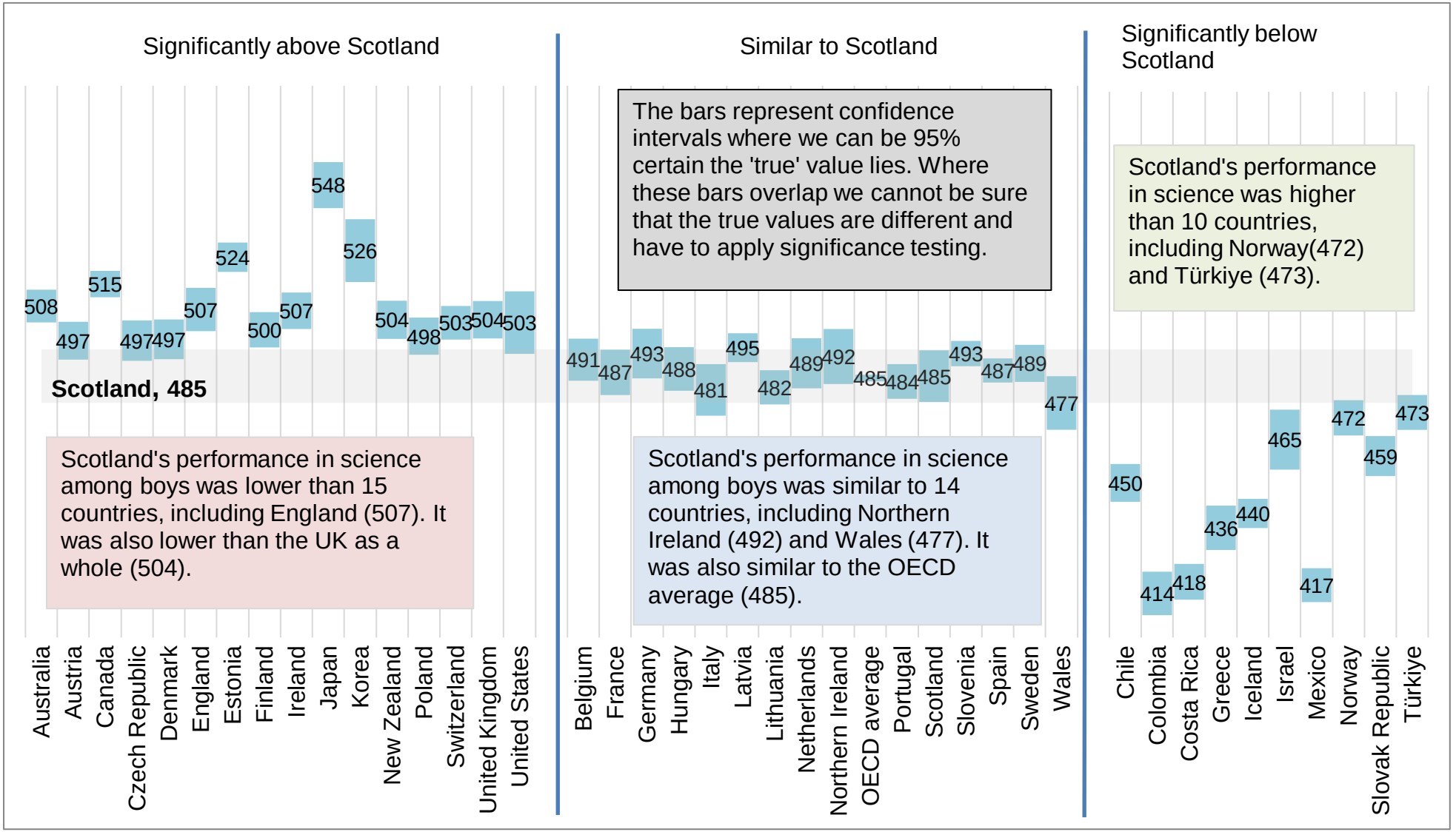
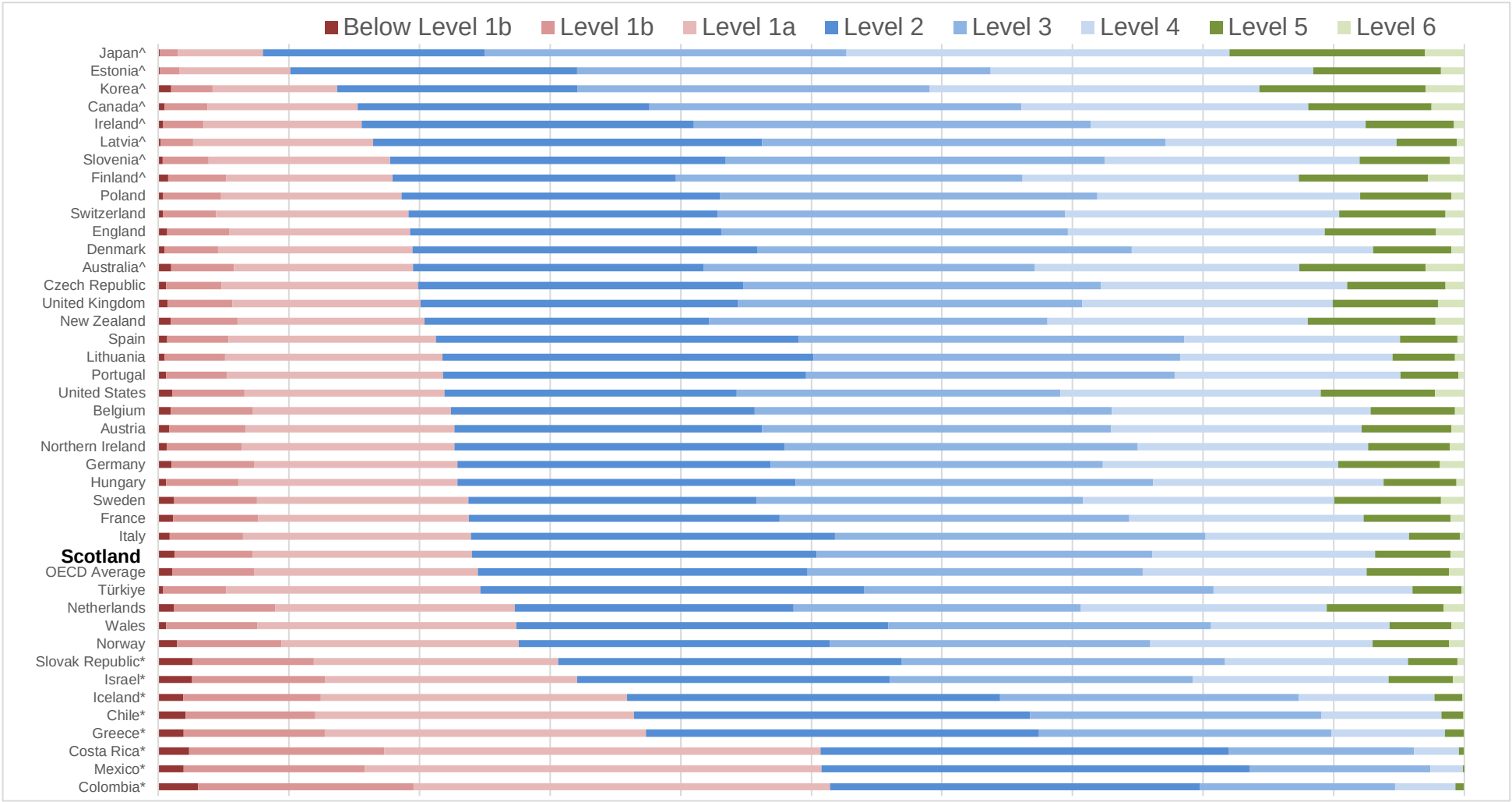
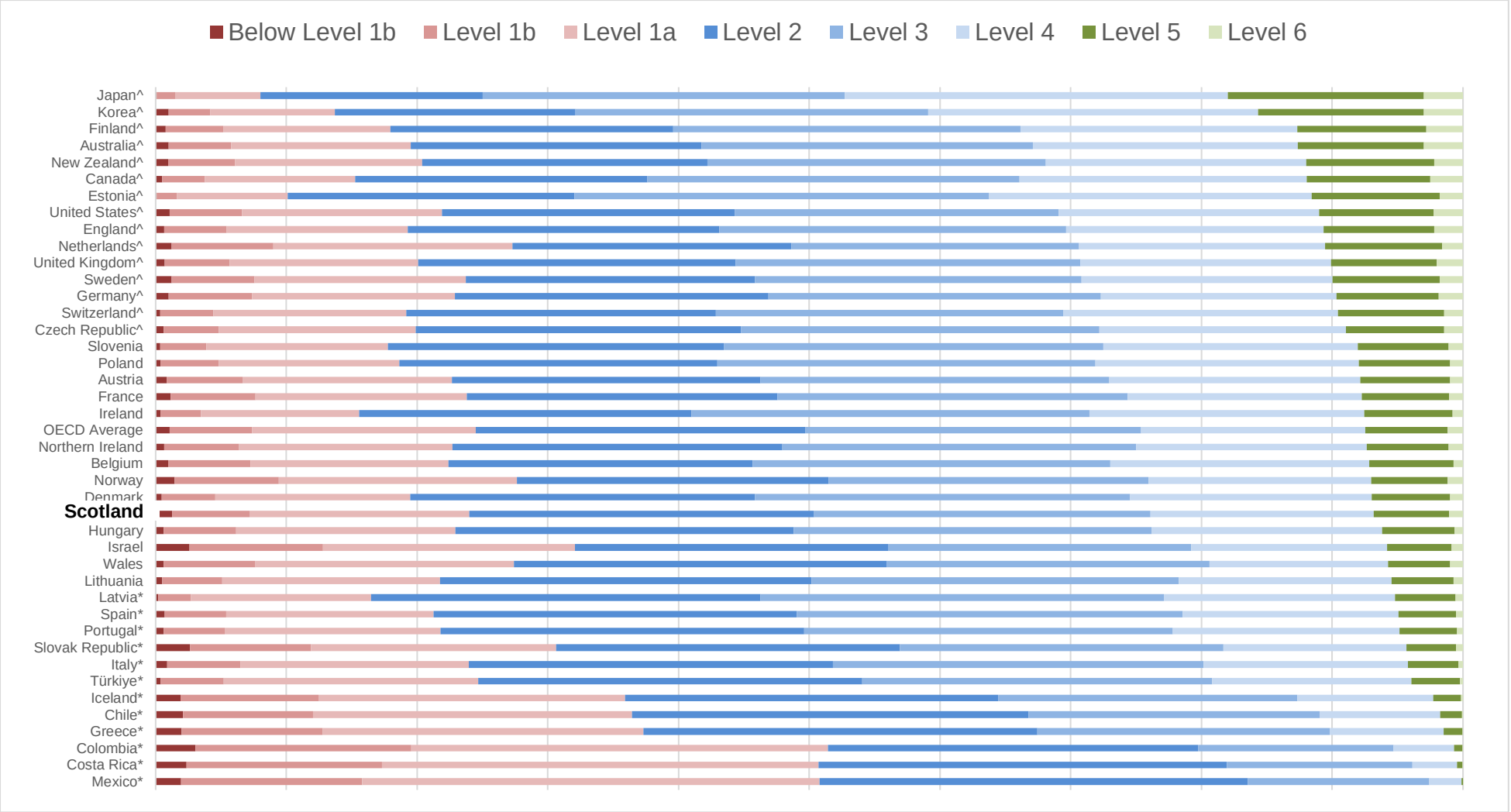


Chart 4.2.4 **Proficiency Levels** in science in OECD countries, arranged by percentage of students **below Level 2**, 2022



112. In 2022, 24.0 per cent of students in Scotland performed below PISA Level 2 in science. This was higher (^) than nine countries, similar to 22 countries, the United Kingdom as a whole and the OECD average, and lower (*) than eight countries.

Chart 4.2.5 **Proficiency Levels** in science in OECD countries, arranged by percentage of students at **Level 5 or better**, 2022



113. In 2022, 6.8 per cent of students in Scotland performed at PISA Level 5 or better in science. This was higher (*) than 12 countries, similar to 13 countries and the OECD average and lower (^) than 14 countries and the UK as a whole.

Chart 4.2.6 Share of variation in science performance explained by ESCS in OECD countries, relative to Scotland, 2022

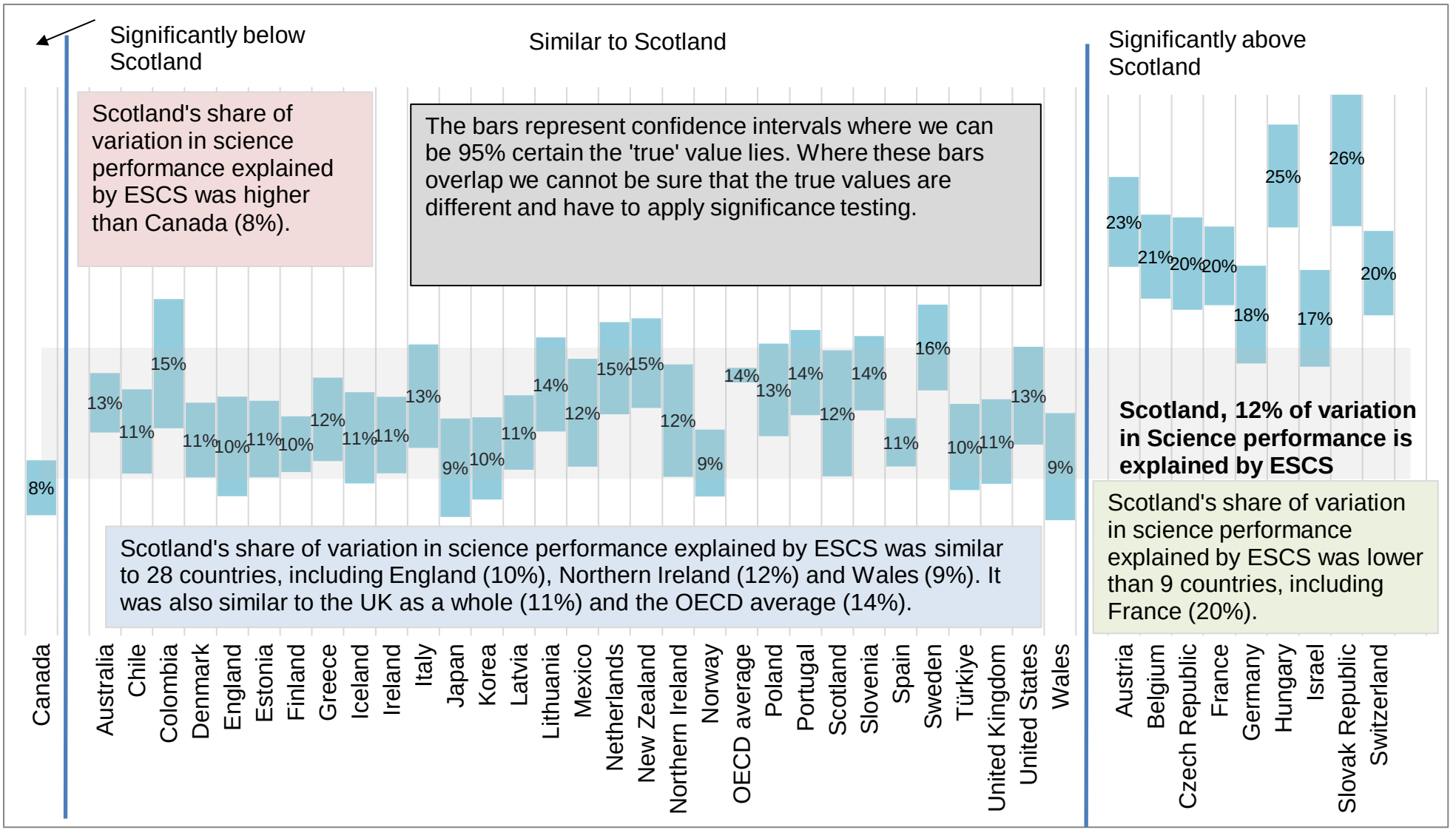
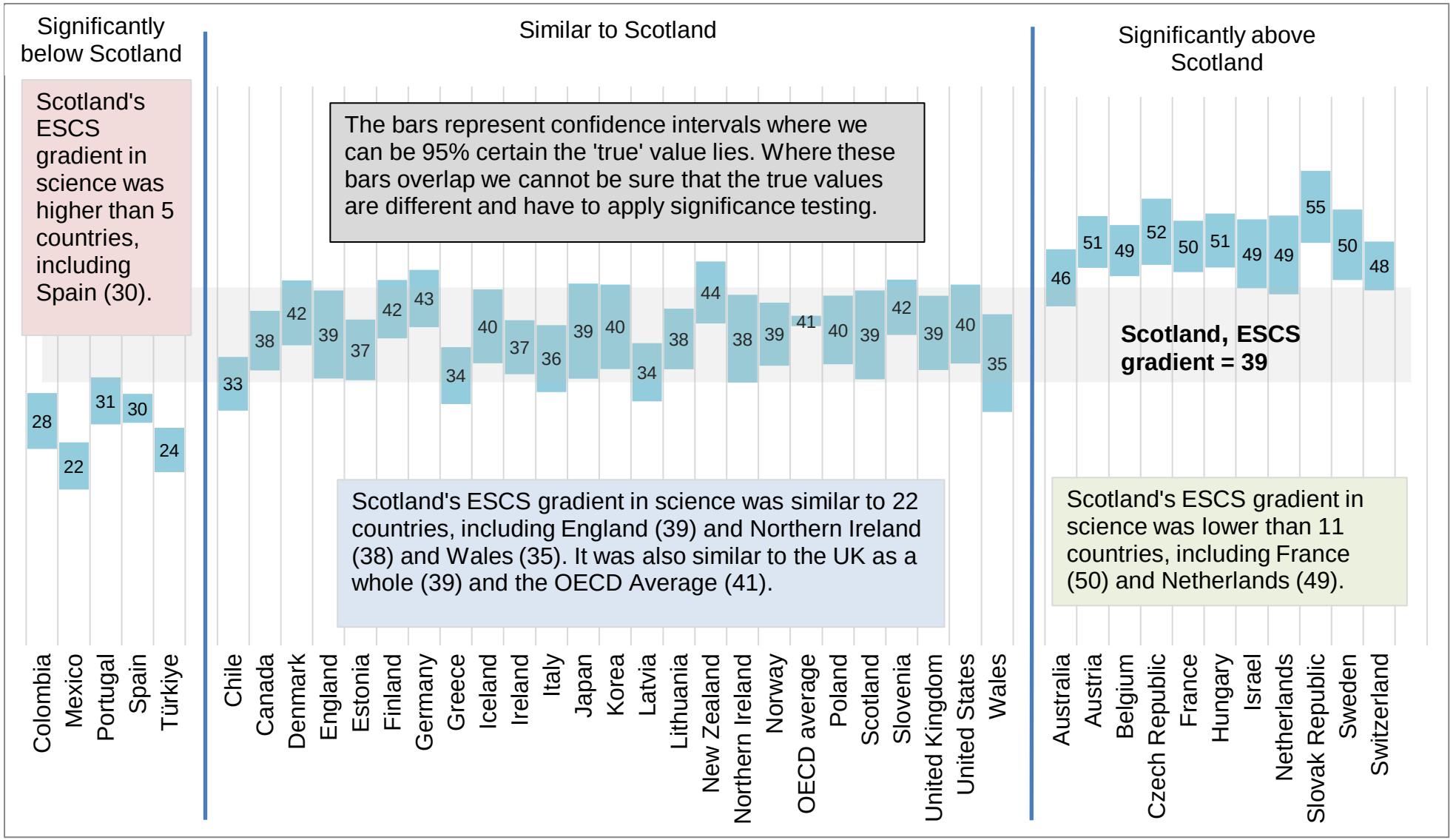


Chart 4.2.7 **ESCS gradient** in science in OECD countries, relative to Scotland, 2022



5. How students view themselves and their schools

114. The PISA assessments are supplemented by background questionnaires. Pupils are asked questions about their experiences of school, wellbeing, and socio economic status, among other topics. Key findings included:

- Two-thirds of students (67 per cent) feel like they belong at their school. This is below the OECD average (74.6), but is higher than was the case in Scotland in PISA 2018 (64.7 per cent).
- Students reported a higher life satisfaction in PISA 2022 (an average of 6.48 on a scale of 1-10) than in PISA 2018 (6.25). However, this was below the OECD average of 6.75.
- Students in Scotland were more likely to report that their parents or family provide support with their learning than the OECD average.
- Experience of frequent bullying was less prevalent in Scotland in 2022, compared to 2018. Bullying includes being made fun of, being left out of things, and being hit or pushed around by other students. However, a higher proportion of students in Scotland reported experiencing a bullying act on at least a weekly basis (10.6 per cent) than the OECD average (9.4 per cent).
- Students in Scotland were more likely to feel safe in school and travelling to and from school than the OECD average. Students in Scotland were more likely to report experiencing vandalism and witnessing fights on school grounds than the OECD average, but less likely to see gangs or a student carrying a weapon at school.
- Students in Scotland were more likely to say that they had skipped at least a whole day of school in the last two weeks (28.9 per cent) compared to PISA 2018 (19.8 per cent), which was higher than the OECD average (14.6 per cent). However, a similar proportion to PISA 2018 reported skipping some classes.
- Students in Scotland spent a similar amount of time using digital resources for learning activities and leisure compared to the OECD average. However, students in Scotland were more likely to feel nervous when they didn't have their digital devices near them (49.7 per cent) compared to the OECD average (44.5 per cent).

Student wellbeing

115. The PISA student questionnaire asks students a range of questions that are designed to measure changes in wellbeing over time. These questions can be used to measure wellbeing before and after the period of school building closures.

116. Students were asked whether they agreed with a series of statements around their sense of belonging in school. Table 5.1 outlines these responses in 2018 and 2022, for both Scotland and the OECD average.

Table 5.1: Proportion of students who 'agree' or 'strongly agree' with the following statements

	Scotland		OECD	
	2018	**2022**	**2018**	**2022**
I feel like an outsider (or left out of things) at school	**25.0**	16.5	**19.6**	16.7
I make friends easily at school	75.1	**77.2**	75.1	**76.1**
I feel like I belong at school	64.7	**67.0**	71.2	**74.6**
I feel awkward and out of place in my school	25.0	24.1	19.9	**20.6**
Other students seem to like me	86.8	87.1	80.7	**81.9**
I feel lonely at school	15.5	14.4	**16.6**	16.2

*Figures in **bold** represent the figure which is statistically significantly higher between 2018 and 2022 (where a statistically significant difference exists)*

117. Compared to 2018, students in Scotland were more likely in 2022 to report that they feel like they belong at school and that they make friends easily at school. In 2022, students in Scotland were less likely than in 2018 to say that they feel like an outsider (or left out of things) at school.

118. Compared to the OECD average, students in Scotland were less likely to say that they feel lonely at school and more likely to say that they make friends easily. However, students in Scotland were less likely to report they feel like they belong at school.

119. The PISA student questionnaire asks students to rate their current life satisfaction on a scale of 1-10. Students in Scotland had an average rating of 6.48, which was higher than the average of 6.25 in 2018. However, this was lower than the OECD average of 6.75 in 2022.

120. PISA assesses a student to be 'satisfied' with their life if they report between 7 and 10 on the life satisfaction scale. In Scotland, this was 55.9 per cent of students, compared with 61.4 per cent on average across the OECD.

Experiences of bullying and school safety

121. Students were asked about types of bullying in their school, and whether and how frequently they experience them. The options for answering were 'never or almost never', 'a few times a year', 'a few times a month', and 'once a week or more'. The percentage of students who reported experiencing bullying at least once per week is outlined in Table 5.3.

122. 10.6 per cent of students reported experiencing any type of bullying at least once a week, which was higher than the OECD average of 9.4 per cent. Conversely, 40.6 per cent of students in Scotland 'never or almost never' experienced any type of bullying, compared to an OECD average of 49.0 per cent. Using these data, PISA constructs a measure of the percentage of students who are frequently bullied[1]. In Scotland, this was 10.8 per cent compared to an OECD average of 8.3 per cent.

Table 5.3: Percentage of students who reported the following (at least once per week):

	Scotland		OECD	
	2018	**2022**	**2018**	**2022**
Any type of bullying act	**11.8**	10.6	9.3	9.4
Other students left me out of things on purpose	**3.8**	2.5	**3.0**	2.7
Other students made fun of me	**8.1**	7.2	5.0	5.2
I was threatened by other students	2.6	2.2	**1.8**	1.3
Other students took away or destroyed things that belong to me	**1.8**	0.8	**2.1**	1.3
I got hit or pushed around by other students	**2.7**	1.7	**2.3**	1.7
Other students spread nasty rumours about me	**3.9**	1.8	**3.6**	2.6
I was in a physical fight on school property	-	0.8	-	1.0
I stayed home from school because I felt unsafe	-	1.1	-	1.7
Percentage of frequently bullied students	*11.4*	*10.8*	*7.8*	*8.3*

*Figures in **bold** represent the figure which is statistically significantly higher between 2018 and 2022 (where a statistically significant difference exists)*

[1] A student is frequently bullied if he or she is in the top 10% of the index of exposure to bullying across all countries/economies.

123. Table 5.3 shows that students in Scotland were more likely than the OECD average to report experiencing, on at least a weekly basis, other students making fun of them and being threatened by other students. Conversely, students in Scotland were less likely than the OECD average to report that other students took away or destroyed things that belonged to them, that other students spread rumours about them, or that they stayed home because they felt unsafe.

124. Students were asked whether they felt safe at school or travelling to or from school. This is outlined in Table 5.4. The vast majority of students felt safe in these settings, and students in Scotland were more like to report feeling safe travelling to and from school and in their classrooms than the OECD average. However, students in Scotland were slightly less likely to report feeling safe in other places at school than the OECD average.

Table 5.4: Percentage of students who agreed with the following statements:

	Scotland	OECD
I feel safe on my way to school	**95.8**	91.7
I feel safe on my way home from school	**94.2**	91.5
I feel safe in my classrooms at school	**95.4**	93.1
I feel safe at other places at school	87.3	**89.9**

- *Figures in **bold** represent the figure which is statistically significantly higher (where a statistically significant difference exists)*

125. Students were also asked whether they had witnessed different behaviours in their school in the four weeks prior to the assessment. Students in Scotland were more likely to have witnessed their school being vandalised or to have witnessed a fight on school property in which someone got hurt, but less like to have witnessed gangs or a student carrying a weapon.

Table 5.5: Percentage of students who reported the following had happened during the four weeks before the PISA assessment at school:

	Scotland	OECD
Our school was vandalized	**40.0**	19.8
I witnessed a fight on school property in which someone got hurt	**35.8**	17.0
I saw gangs in school	9.4	**12.1**
I heard a student threaten to hurt another student	**35.7**	20.2
I saw a student carrying a gun or knife at school	4.9	**10.6**

- *Figures in **bold** represent the figure which is statistically significantly higher (where a statistically significant difference exists)*

Disciplinary climate in lessons

126. Students were asked whether and how often there is disruption in mathematics lessons. The same question was asked in PISA 2018, but for English lessons as reading was the major domain in 2018. A comparison between 2018 and 2022 is provided below.

127. Compared to 2018, a lower proportion of students in Scotland reported that students do not listen to what the teacher said, that there was noise and disorder, and that the teacher has to wait a long time for students to quiet down. However, a higher proportion of students said that students cannot work well and that students do not start working for a long time after the lesson begins.

128. Compared to the OECD average, a lower proportion of students in Scotland reported that students do not listen to what the teacher said, that students cannot work well, and that students do not start working for a long time after the lesson begins. However, a higher proportion of students in Scotland reported that students get distracted by using digital devices, both their own and by other students using them.

Table 5.6: Percentage of students who reported the following things happen in their English lessons (2018) and Maths lessons (2022) ('every lesson' or 'most lessons'):

	Scotland		OECD	
	2018	**2022**	**2018**	**2022**
Students do not listen to what the teacher said	**31.7**	26.9	29.5	**30.4**
There is noise and disorder	**34.6**	30.1	**31.5**	30.3
The teacher has to wait a long time for students to quiet down	**25.0**	22.9	**26.5**	25.0
Students cannot work well	16.5	**20.2**	18.5	**22.6**
Students do not start working for a long time after the lesson begins	21.1	**24.2**	24.5	**25.6**
Students get distracted by using digital devices	-	31.1	-	30.4
Students get distracted by other students who are using digital devices	-	27.4	-	25.2

*Figures in **bold** represent the figure which is statistically significantly higher between 2018 and 2022 (where a statistically significant difference exists)*

Student truancy

129. Students were asked whether they had either skipped at least one class or one day at school in the two weeks prior to the PISA test. In Scotland, 39.2 per cent of students reported that they had, which was higher than the OECD average of 31.3 per cent.

130. Around seven per cent of students in Scotland had skipped a day of school at least three times in this period, compared to an OECD average of 5.2 per cent. This was similar to the proportion of students (6.7 per cent) who reported that they skipped classes at least three times, which was similar to the OECD average of 6.3 per cent. There may be some overlap between pupils answering that they skipped a day of school and those saying they had skipped classes.

131. Students in Scotland were more likely to say they had never skipped a class in this period (78.2 per cent) than to report never skipping a whole day of school (71.1 per cent). The opposite was true for the OECD averages.

132. Compared to 2018, pupils in Scotland were more likely to report that they had skipped a whole day of school. However, the proportion of pupils reporting that they had skipped some classes in 2022 was similar to 2018.

Table 5.7: Percentage of students who reported that the following happened in the two weeks prior to the PISA test:

	Scotland		OECD	
	2018	**2022**	**2018**	**2022**
I skipped a whole day of school				
Never	**77.9**	71.1	78.7	**80.2**
Once or twice	16.8	**21.9**	**15.4**	14.6
Three or four times	3.3	**4.2**	**3.1**	2.7
Five or more times	2.0	**2.8**	**2.7**	2.5
I skipped some classes				
Never	77.9	78.2	72.7	**77.5**
Once or twice	15.4	15.1	**19.5**	16.2
Three or four times	3.8	3.8	**4.7**	3.5
Five or more times	2.8	2.9	**3.1**	2.8

*Figures in **bold** represent the figure which is statistically significantly higher between 2018 and 2022 (where a statistically significant difference exists)*

School resources

133. Headteachers in participating schools answered questions on the school context, including whether a range of factors hindered learning in their schools. Table 5.8 outlines the extent to which they reported that a shortage of education staff hindered teaching, and the proportion of students affected by this.

134. Compared to the OECD average, students in Scotland were less likely to be in a school where the headteacher reported that a lack of teaching staff was a factor. However, over half of students were in schools where the headteacher reported this, which was higher than in 2018.

Table 5.8: Proportion of students in schools whose principal reported that the school's capacity to provide instruction is hindered by the following factors ('to some extent' or 'a lot':

	Scotland		OECD	
	2018	**2022**	**2018**	**2022**
A lack of teaching staff	46.3	**53.8**	32.6	**56.7**
Inadequate or poorly qualified teaching staff	8.4	10.6	**26.1**	25.4
A lack of assisting staff	47.0	**54.5**	32.6	**37.3**
Inadequate or poorly qualified assisting staff	8.4	**24.7**	15.1	**19.4**

*Figures in **bold** represent the figure which is statistically significantly higher between 2018 and 2022 (where a statistically significant difference exists)*

135. Headteachers were asked whether a range of factors hindered learning in their schools. Table 5.9 outlines the extent to which they reported that a shortage of educational material hindered teaching, and the proportion of students affected by this.

Table 5.9: Percentage of students in schools whose principal reported that the school's capacity to provide instruction is hindered (to some extent or a lot) by:

	Scotland		OECD	
	2018	**2022**	**2018**	**2022**
A lack of educational material (e.g. textbooks, ICT equipment, library or laboratory material)	19.4	18.7	**27.3**	23.8
Inadequate or poor quality educational material (e.g. textbooks, ICT equipment, library or laboratory material)	19.5	18.5	**25.3**	21.7
A lack of physical infrastructure (e.g. building, grounds, heating/cooling systems, lighting and acoustic systems)	21.1	**26.2**	**33.1**	29.0
Inadequate or poor quality physical infrastructure (e.g. building, grounds, heating/cooling systems, lighting and acoustic systems)	26.3	25.2	**32.6**	27.9
A lack of digital resources (e.g. desktop or laptop computers, internet access, learning management systems or school learning platforms)	-	31.1	-	23.9
Inadequate or poor quality digital resources (e.g. desktop or laptop computers, internet access, learning management systems or school learning platforms)	-	32.3	-	24.6

*Figures in **bold** represent the figure which is statistically significantly higher between 2018 and 2022 (where a statistically significant difference exists)*

Family support

136. Students were asked whether their parents or someone in their family do a series of activities with them. This is outlined for Scotland and the OECD average in Table 5.10. On every statement, students in Scotland were more likely than the OECD average to report that a member of family undertook the activity with them at least once a week.

Table 5.10: Proportion of students who reported that their parents or someone in their family do the following with them (at least once a week):

	Scotland	OECD
Discuss how well you are doing at school	**70.3**	66.1
Eat the main meal with you	**86.0**	83.7
Spend some time just talking to you	**86.7**	77.0
Talk to you about the importance of completing upper secondary education	**67.5**	50.7
Talk to you about any problems that you might have at school	**63.9**	56.5
Ask you about how well you are getting along with other students at school	**63.6**	56.0
Encourage you to get good marks	**80.8**	69.0
Take an interest in what you are learning at school	**74.1**	66.3
Talk to you about your future education	**65.9**	58.3
Ask you what you did in school that day	**84.9**	77.4

- *Figures in **bold** represent the figure which is statistically significantly higher (where a statistically significant difference exists)*

Digital

137. Students were asked a range of questions on their use of digital devices in and outside of school. Table 5.11 below outlines the average number of hours that students in Scotland and on average in the OECD spend on digital devices in different settings.

138. Compared to the OECD average, students in Scotland spent more time on digital devices during learning activities at school, but less time using them for learning activities at the weekend. Students in Scotland spent a similar amount of leisure time on digital devices to the OECD average.

Table 5.11: Time spent on digital resources per day (in hours)

	Scotland	OECD
Learning activities at school	**2.2**	2.0
Learning activities before and after school	1.5	1.5
Learning activities on weekends	1.4	**1.6**
Leisure at school	1.0	1.1
Leisure before and after school	2.7	2.6
Leisure at weekends	3.9	3.9

- *Figures in **bold** represent the figure which is statistically significantly higher (where a statistically significant difference exists)*

139. Students were asked a series of statements on how they feel or act in relation to digital devices. This is outlined in Table 5.12:

Table 5.12: Percentage of students who feel or act the following way (at least half of the time):

	Scotland	OECD
Turn off notifications from social networks and apps on my digital devices during class	70.1	69.7
Turn off notifications from social networks and apps on my digital devices when I go to sleep	66.1	65.3
Keep my digital devices near me to answer messages when I am home	**93.1**	89.7
Have my digital devices open in class so I can take notes or search for information	**68.8**	56.5
Feel pressured to be online and answer messages when I am in class	**37.2**	34.2
Feel nervous/anxious when I don't have my digital devices near me	**49.7**	44.5

- *Figures in **bold** represent the figure which is statistically significantly higher (where a statistically significant difference exists)*

140. Compared to the OECD average, students in Scotland were more likely to report that they keep digital devices open in class in order to take notes and search for information, and also that they keep their digital devices near them at home. Students in Scotland were also more likely to report that they feel nervous or anxious when they don't have their digital device near them, and that they feel pressure to be online and answer messages when they are in class.

141. Students were asked for their views on using digital devices in class. This was part of an optional ICT survey that Scotland participated in, which means that there is not an OECD average.

142. The results show that the majority of students agree that students should collaborate with teachers to decide on the rules regarding the use of digital devices during lessons. However, only a minority of students agreed with the statements suggested limitations to use of digital devices in class.

Table 5.13: Percentage of students who agreed or strongly agreed with the following statements on the use of digital devices in class

	Scotland
Students should not be allowed to bring mobile phones to class	20.8
Students should not be allowed to bring their own laptop (or tablet device) to class	23.2
Students should collaborate with teachers to decide on the rules regarding the use of digital devices during lessons	77.3
The school should set up filters to prevent students from going on social media	24.6
The school should set up filters to prevent students from playing games on line	29.0
Teachers should monitor what students do on their laptops	36.6

Additional Information

Supplementary Tables

The data used in all charts and tables within this publication are available in table form on the Scottish Government website in the supporting files of this report.

Annex 1: Background and Methodology

What is PISA?

143. PISA is an assessment of 15 year-olds' skills carried out under the auspices of the OECD. The programme runs every three years across all OECD members and a variety of partner countries. Scotland has participated in all eight surveys since the first wave of testing in 2000.

144. Each survey cycle focusses on one of three domains: reading, mathematics and science. In 2022 the main domain was maths, with reading and science as subsidiary domains. Data and analysis on creative thinking (the "innovative domain" in PISA 2022) will be published during 2024.

Who participates?

145. Around 690,000 students participated in the study worldwide, representing about 32 million 15 year olds. In 2022, 81 countries and economies participated in PISA.

Fig. 1.1: Global coverage of PISA 2022

OECD member countries in PISA 2022	Partner countries and economies in PISA 2022	Countries and economies in previous cycles
Australia Austria Belgium Canada	Albania Argentina Baku (Azerbaijan) Brazil	Algeria Azerbaijan Beijing (China) Belarus

Chile Colombia Costa Rica Czech Republic Denmark Estonia Finland France Germany Greece Hungary Iceland Ireland Israel Italy Japan Korea Latvia Lithuania Mexico Netherlands New Zealand Norway Poland Portugal Slovak Republic Slovenia Spain Sweden Switzerland Türkiye United Kingdom (excluding Scotland) United States	Brunei Darussalam Bulgaria Cambodia China (People's Republic of) Croatia Dominican Republic El Salvador Georgia Guatemala Hong Kong (China) Indonesia Jamaica Jordan Kazakhstan Kosovo Lebanon Macao (China) Malaysia Malta Moldova (Republic of) Mongolia Montenegro Morocco North Macedonia Palestinian Authority Panama Paraguay Peru Philippines Qatar Romania Saudi Arabia Serbia Singapore Chinese Taipei Thailand Ukraine United Arab Emirates Uruguay Uzbekistan Viet Nam	Bosnia and Herzegovina Guangdong (China) Himachal Pradesh (India) Jangsu (China) Kyrgyzstan Lebanon Liechtenstein Luxembourg Mauritius Miranda (Venezuela) Russian Federation Shanghai (China) Tam il Nadu (India) Trinidad and Tobago Tunisia Zhejiang (China)

146. The United Kingdom is a member state of the OECD and its results are published in the main OECD publication. Scotland participates as an "adjudicated region", meaning that its results have full quality assurance from the survey contractors appointed by the OECD, and can publish its results separately. Within the UK, England, Wales and Northern Ireland have boosted samples as "non-adjudicated regions" which means they are able to produce country-level analysis within their reports. Regional results are published as annexes to the main OECD volumes.

147. Survey fieldwork is carried out separately in each participating state by "National Centres" according to strict quality standards set by the OECD.

What does PISA measure?

148. PISA seeks to measure skills which are necessary for participation in society. Accordingly, it assesses how students apply the skills they have gained to the types of problem they may encounter in work or elsewhere. Pupils are assessed at the age of 15 as this is regarded as a reasonable point at which to test the impact of compulsory education throughout the developed world. After this point students will typically move onto more specialised studies or enter the labour market. Box 1.1 contains the definitions of the domains tested by PISA.

Box 1.1: The PISA domains and their definition

Mathematical literacy is defined an individual's capacity to reason mathematically and to formulate, employ, and interpret mathematics to solve problems in a variety of real-world contexts. It includes concepts, procedures, facts and tools to describe, explain and predict phenomena. It assists individuals to know the role that mathematics plays in the world and to make the well-founded judgments and decisions needed by constructive, engaged and reflective 21st-century citizens.

Reading literacy is defined as understanding, using, evaluating, reflecting on and engaging with texts in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society.

Science literacy is defined as the ability to engage with science-related issues, and with the ideas of science, as a reflective citizen. A scientifically literate person is willing to engage in reasoned discourse about science and technology, which requires the competencies to explain phenomena scientifically, evaluate and design scientific enquiry, and interpret data and evidence scientifically.

149. We have included some details on how mathematics, the main focus of the 2022 PISA survey, was assessed in Annex 2. Further details of how each domain was assessed can be found in the OECD volumes published on the PISA website, www.oecd.org/pisa.

150. The assessments are also supplemented by background questionnaires. Pupils are asked about their motivations for study, attitudes to school, beliefs about science, studying and their socio-economic background. Headteachers are asked about the challenges facing their schools, organisation and factors that they believe affect their students' performance.

The survey in Scotland

151. The PISA survey was managed by an international consortium led by ETS. The Consortium developed the tests, questionnaires and survey documentation and ensured that all participating countries met quality standards. In Scotland, the National Foundation for Educational Research (NFER) was the "National Centre", responsible for local adaptations to the surveys, and administering the test in schools.

152. The school sample was randomly selected by NFER following submission of sampling forms to the consortium. The sample was stratified on the basis of previous exam performance (split into five categories), whether schools were publicly funded or independent, urban/rural location and school size, and whether schools were single-sex or mixed.

153. The survey was carried out in Scotland between 18 October 2022 and 22 December 2022. In total, 117 secondary schools participated in the survey. 106 of these were from the main sample (87.5 per cent response rate), and 11 from the back-up samples (resulting in a 96.4 per cent weighted participation rate after replacements were added in). This exceeded the OECD's minimum standard of 85 per cent participation.

154. Within each school 40 students were randomly sampled by NFER using software supplied by the Consortium. In total 4,652 students were drawn in the sample. Schools were able to withdraw a certain number of students where it was deemed that participation would be difficult due to additional support needs or language issues. Similarly students that had left the school in the interim were not considered part of the target sample. In total 4,115 students were deemed eligible participants. Of these a total of 3,257 students took part, with the balance being those who did not wish to take part (both students and their parents were given the opportunity to opt out of the survey), and those who were absent on the day of the test.

155. Students who participated in the assessments were mainly split between S4 (53.5% of the total sample) and S5 (46.3%). This compares to a 50/50 split between S4 and S5 in PISA 2018, which means that students participating in PISA 2022 are more likely to have been in S4 than in PISA 2018.

156. Test administrations were carried out as specified by the PISA consortium. However, lower than expected levels of student participation proved to be an issue during the main PISA 2022 testing window. This was addressed, with the agreement of the PISA consortium, by extending the period for follow-up sessions to the end of the Christmas term. Nevertheless, Scotland narrowly

missed the student participation technical standard of 80 per cent participation with a weighted student participation rate of 79.4 per cent. Lower student participation proved to be an issue internationally in the PISA 2022 post-Covid-19 survey.

157. In order to establish whether the lower student participation rates in Scotland had an impact on the data, the PISA consortium requested that Scotland, along with other countries[2], perform a student level non-response bias analysis (NRBA). The details and outcome of the NRBA are provided in the Main Survey Conduct Report which can be found here: PISA Research - NFER. The outcome of the NRBA is that the results for Scotland (and for the UK where they are combined) will be annotated in the OECD international report to indicate that Scotland submitted a technically strong analyses, which indicated that more than minimal bias was most likely introduced in the estimates due to low response rates. This bias was in an upward direction and of about 0.1 standard deviations (estimated to approximately equate to 9 or 10 points). The OECD also indicated that the PISA 2022 data for Scotland were comparable to previous cycles.

158. The assessment was administered in Scotland by computer. This was achieved using the existing facilities in schools with the support of school and Local Authority ICT services.

159. The software delivery system was provided by the international consortium. The assessment was administered in two one-hour sessions, with a further 35 minutes for the background questionnaire. Students spent one hour on the mathematics assessment (composed of a core stage followed by two stages of either greater or lesser difficulty) plus one hour on one or two other subjects – mathematics and science.

160. As in all previous cycles, there was a survey of headteachers within schools, which asked about their views on school organisation, teaching staff and resources. 102 headteachers responded – a response rate of 85 per cent.

[2] A total of thirteen countries/entities did not achieve the technical standards in 2022. Ten countries/entities had student response rates of below 80 per cent. This compared to four countries who failed to meet the technical standards in 2018.

Annex 2: How mathematics is Assessed

161. For each of the four mathematical processes examined in PISA 2022, a mathematics subscale was developed. PISA mathematics test item is designed to capture one of the processes, and students are not necessarily expected to use all three to respond to each test item.

Mathematical reasoning: i.e. "thinking mathematically", is the capacity to use mathematical concepts, tools, and logic to conceptualise and create solutions to real-life problems and situations. It involves recognising the mathematical nature inherent to a problem and developing strategies to solve it. This includes distinguishing between relevant and irrelevant information, using computational thinking, drawing logical conclusions, and recognising how solutions can be applied in a real-world context. Mathematical reasoning is also the capacity to construct arguments and provide evidence to support and explain ones' answers and solutions, and to develop awareness of ones' own thinking processes, including decisions made about which strategies to follow. Mathematical reasoning includes deductive and inductive reasoning. While reasoning underlies the other three mathematical processes described below, it nonetheless is different from them in that reasoning requires thinking through the whole problem-solving process rather than focusing on a specific part of it.

Formulating situations mathematically: mathematically literate students are able to recognise or identify the mathematical concepts and ideas underlying problems encountered in the real world, and then provide mathematical structure to the problems (i.e. formulate them in mathematical terms). This translation – from a contextualised situation to a well-defined mathematics problem – makes it possible to employ mathematical tools to solve real-world problems.

Employing mathematical concepts, facts and procedures: mathematically literate students are able to apply appropriate mathematics tools to solve mathematically formulated problems to obtain mathematical conclusions. This process involves activities such as performing arithmetic computations, solving equations, making logical deductions from mathematical assumptions, performing symbolic manipulations, extracting mathematical information from tables and graphs, representing and manipulating shapes in space, and analysing data.

Interpreting, applying, and evaluating mathematical outcomes: mathematically literate students are able to reflect upon mathematical solutions, results or conclusions and interpret them in the context of the real-life problem that started the process. This involves translating mathematical solutions or reasoning back into the context of the problem and determining whether the results are reasonable and make sense in the context of the problem.

Mathematical content

162. PISA 2022 developed a mathematics subscale for each of these four content domains:

Quantity: number sense and estimation; quantification of attributes, objects, relationships, situations and entities in the world; understanding various representations of those quantifications, and judging interpretations and arguments based on quantity.

Uncertainty and data: recognising the place of variation in the real world, including having a sense of the quantification of that variation, and acknowledging its uncertainty and error in related inferences. It also includes forming, interpreting and evaluating conclusions drawn in situations where uncertainty is present. The presentation and interpretation of data are also included in this category, as well as basic topics in probability.

Change and relationships: understanding fundamental types of change and recognising when they occur in order to use suitable mathematical models to describe and predict change. Includes appropriate functions and equations/inequalities as well as creating, interpreting and translating among symbolic and graphical representations of relationships.

Space and shape: patterns; properties of objects; spatial visualisations; positions and orientations; representations of objects; decoding and encoding of visual information; navigation and dynamic interaction with real shapes as well as representations, movement, displacement, and the ability to anticipate actions in space.

Real-world contexts

163. Mathematical reasoning and problem-solving take place in real-world contexts. There are four different contexts used in PISA 2022, which were also used in previous cycles:

Personal context: related to one's self, one's family or one's peer group. For example, food preparation, shopping, games, personal health, personal transportation, recreation, sports, travel, personal scheduling and personal finance, etc.

Occupational context: related to the world of work. For example, measuring, costing and ordering materials for building payroll/accounting, quality control, scheduling/inventory, design/architecture and job-related decision making either with or without appropriate technology, etc.

Societal context: related to one's community, whether local, national or global. For example, voting systems, public transport, government, public policies, demographics, advertising, health, entertainment, national statistics and economics, etc.

Scientific context: related to the application of mathematics to the natural world, and issues and topics related to science and technology. For example, weather or climate, ecology, medicine, space science, genetics, measurement and the world of mathematics itself

Level	Lower score limit	Percentage of students able to perform tasks at each level or above (OECD average)	Characteristics of tasks
6	669	2.0%	At Level 6, students can work through abstract problems and demonstrate creativity and flexible thinking to develop solutions. For example, they can recognise when a procedure that is not specified in a task can be applied in a non-standard context or when demonstrating a deeper understanding of a mathematical concept is necessary as part of a justification. They can link different information sources and representations, including effectively using simulations or spreadsheets as part of their solution. Students at this level are capable of critical thinking and have a mastery of symbolic and formal mathematical operations and relationships that they use to clearly communicate their reasoning. They can reflect on the appropriateness of their actions with respect to their solution and the original situation.
5	607	8.7%	At Level 5, students can develop and work with models for complex situations, identifying or imposing constraints, and specifying assumptions. They can apply systematic, well-planned problem-solving strategies for dealing with more challenging tasks, such as deciding how to develop an experiment, designing an optimal procedure, or working with more complex visualisations that are not given in the task. Students demonstrate an increased ability to solve problems whose solutions often require incorporating mathematical knowledge that is not explicitly stated in the task. Students at this level reflect on their work and consider mathematical results with respect to the real-world context.
4	545	23.6%	At Level 4, students can work effectively with explicit models for complex concrete situations, sometimes involving two variables, as well as demonstrate an ability to work with undefined models that they derive using a more sophisticated computational-thinking approach. Students at this level begin to engage with aspects of critical thinking, such as evaluating the reasonableness of a result by making qualitative judgements when computations are not possible from the given information. They can select and integrate different representations of information, including symbolic or graphical, linking them directly to aspects of real-world situations. At this level, students can also construct and

			communicate explanations and arguments based on their interpretations, reasoning, and methodology.
3	482	45.6%	At Level 3, students can devise solution strategies, including strategies that require sequential decision-making or flexibility in understanding of familiar concepts. At this level, students begin using computational-thinking skills to develop their solution strategy. They are able to solve tasks that require performing several different but routine calculations that are not all clearly defined in the problem statement. They can use spatial visualisation as part of a solution strategy or determine how to use a simulation to gather data appropriate for the task. Students at this level can interpret and use representations based on different information sources and reason directly from them, including conditional decision-making using a two-way table. They typically show some ability to handle percentages, fractions and decimal numbers, and to work with proportional relationships.
2	420	68.9%	At Level 2, students can recognise situations where they need to design simple strategies to solve problems, including running straightforward simulations involving one variable as part of their solution strategy. They can extract relevant information from one or more sources that use slightly more complex modes of representation, such as two-way tables, charts, or two-dimensional representations of three-dimensional objects. Students at this level demonstrate a basic understanding of functional relationships and can solve problems involving simple ratios. They are capable of making literal interpretations of results.
1a	358	87.6%	At Level 1a, students can answer questions involving simple contexts where all information needed is present, and the questions are clearly defined. Information may be presented in a variety of simple formats and students may need to work with two sources simultaneously to extract relevant information. They are able to carry out simple, routine procedures according to direct instructions in explicit situations, which may sometimes require multiple iterations of a routine procedure to solve a problem. They can perform actions that are obvious or that require very minimal synthesis of information, but in all instances the actions follow clearly from the given stimuli. Students at this level can employ basic algorithms, formulae, procedures, or conventions to solve problems that most often involve whole numbers.

1b	295	97.4%	At Level 1b, students can respond to questions involving easy to understand contexts where all information needed is clearly given in a simple representation (i.e., tabular or graphic) and, as necessary, recognize when some information is extraneous and can be ignored with respect to the specific question being asked. They are able to perform simple calculations with whole numbers, which follow from clearly prescribed instructions, defined in short, syntactically simple text.
1c	233	99.7%	At Level 1c, students can respond to questions involving easy to understand contexts where all relevant information is clearly given in a simple, familiar format (for example, a small table or picture) and defined in a very short, syntactically simple text. They are able to follow a clear instruction describing a single step or operation.

Annex 3: How results are displayed in this report

What measures are used

Statistical Significance – This report shows results divided into those countries whose scores are statistically significantly higher than, similar to or lower than Scotland. By “significant” we mean that we are 95 per cent certain that there is a difference (or similarity).

Throughout this report, if one result is described as ‘higher’ than another, it means it is statistically significantly higher. If there is no statistically significant difference between results they are described as ‘similar’ and if one result is described as ‘lower’ than another, it means it is statistically significantly lower.

Link Error – For most of the year on year comparisons in this report, a **link error** is applied to tests for statistical significance. The OECD provide this to quantify the uncertainty when comparing scores over different waves of data (e.g. 2022 v 2018).

In this report, the link error is important when comparing 2022 reading results with 2012 reading results. From Chart 3.1.1 it appears as though 2012 reading results are statistically significantly higher than 2022 reading results, but due to a large link error between 2012 and 2022, the results are statistically similar.

Mean PISA score – this is the overall PISA score and is the main result used to assess how Scotland’s education system is performing. Mean PISA score can be calculated for different characteristics (e.g. gender, immigration background and ESCS group).

Standard Deviation – this is a measure of the spread of the results within a country. A higher standard deviation indicates more variation in the results (i.e. a larger proportion of pupils have a PISA score that is further away from the mean).

Gender – results are generally broken down to show differences between girls and boys and trends of girls and boys over time.

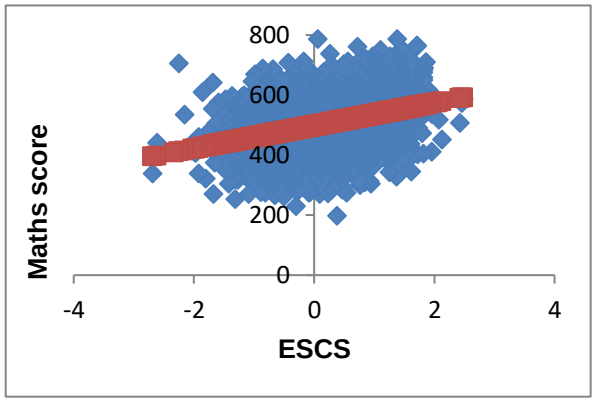
Immigration background – results are broken down by immigration background. The OECD define second generation immigrants as students where one or both parents were born in another country (i.e. not in the UK). First generation immigrants are where the student was born in another country (i.e. not in the UK). Non-immigrants are where the student and both parents were born in the UK.

Proficiency Levels – PISA scores can be grouped into different PISA Levels. It is common to look at the proportion of students performing below PISA Level 2 and at PISA Level 5 or better. PISA defines students attaining below Level 2 as low performers and students attaining above Level 5 as top performers.

ESCS - The OECD analyse social background using the Index of Economic, Social and Cultural Status (ESCS). It is constructed from the responses given by students in their background questionnaire and collects information on parental education and occupation, learning resources in the home and cultural possessions. This index is not comparable to the measure commonly used in Scotland - the Scottish Index of Multiple Deprivation (SIMD). There are two main reasons for this:

1. SIMD is exclusive to Scotland, while ESCS is recorded for all participating countries in PISA. This enables comparative analysis between countries.
2. SIMD is an area based measure, with pupils being allocated to datazones based on their postcode. We talk about pupils living in the '20% most deprived areas' when referring to SIMD. ESCS is generated directly from information provided by the student on their own background, rather than it being based on their home address. This means it avoids issues of more affluent students being resident in areas which are disadvantaged, and vice versa.

The ESCS index is used to derive a number of measures, each of which tell us something different about the impact of social background on performance.



The **percentage share of the variation** in performance explained by social background tells us how strong the relationship is between student performance and ESCS. For example, we can see an illustration of Scotland's students' scores in maths for 2012 plotted against the ESCS on the bottom. In 2012, 12.9 per cent of the variation in maths score was explained by social background, and in fact it is possible to see that many students from less affluent backgrounds (towards the left of the graph) achieved high marks - outperforming the average for their circumstances, and vice versa.

The **ESCS gradient**, shows simply how much score varies on average with each step (one point) in social background and can be seen by the slope of the line on the graph. Despite many students "bucking the trend", there is still a positive relationship between affluence and performance in PISA overall. For maths in 2012, this was a gradient of 37 score points. A higher score would indicate a steeper gradient, and greater increases in score with background prosperity.

The **length of the gradient** looks at the students on the 5th and 95th percentiles to ensure that the very extremes of wealth and poverty don't distort the comparison. In Scotland these two notional students were 2.6 points apart by social background measured by ESCS in 2012.

With a gradient of 37 score points, this implies a difference in their maths performance of 96 score points. Although translating this gap into school years of education is not straightforward, the OECD calculate that this could imply as much as three years'

difference in learning achievement (with 30 points being equivalent to a year). Note that this measure depends on the size of the gap in society as well as the gap in education ability.

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How to access background or source data

The data collected for this social research publication:

☐ are available in more detail through Scottish Neighbourhood Statistics

☒ are available via an alternative route on the OECD PISA webpage at www.oecd.org/pisa

☐ may be made available on request, subject to consideration of legal and ethical factors. Please contact <email address> for further information.

☐ cannot be made available by Scottish Government for further analysis as Scottish Government is not the data controller.

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