

1. Attainment in PIRLS and TIMSS 2011 in Northern Ireland

Chapter outline

This chapter summarises pupils' attainment in reading, mathematics and science in Year 6 (Y6) at ages 9-10 in 2011. In each section, the relevant tables of data are presented, accompanied by discussion of the outcomes. Findings for reading are discussed first, followed by findings for mathematics and then science. Outcomes for Northern Ireland are compared with those of other relevant nations.

Key findings

- In PIRLS, Northern Ireland is outperformed by only four of the 45 participating countries. The mean score for reading is not significantly¹ different from that of a further four countries, and is significantly higher than all other countries participating in PIRLS 2011.
- Pupils in Northern Ireland performed very well in TIMSS 2011 mathematics, significantly outperforming 44 of the 50 participating countries and being significantly outperformed by only five countries.
- The average score for science is lower than for mathematics, although still above the TIMSS science international average. Northern Ireland is outperformed by 17 countries in science and is in a band of 10 countries scoring similarly.
- Pupils in Northern Ireland performed comparatively better on PIRLS reading and TIMSS mathematics than on PISA reading and PISA mathematics. Their scores on TIMSS and PISA science were more similar.²

1.1 Summary of attainment, PIRLS and TIMSS 2011

Tables 1.1 to 1.3 below summarise Northern Ireland's attainment in each subject in turn, taking account of the significance of any apparent differences in attainment. The tables for reading, mathematics and science are presented consecutively and then discussed in turn.

1 Throughout this report, the term 'significant' refers to statistical significance.

2 Although scores on PIRLS, TIMSS and PISA all have a mean of 500 scale points, they cannot be compared directly as they are derived from different assessments representing different constructs. However, Northern Ireland's scale score on each survey can be compared directly with the international mean scale score for each survey. The comparisons summarised here, therefore, relate to Northern Ireland's distance from the international mean score in each case.

Interpreting the data: performance groups

The PIRLS and TIMSS achievement scales have a centre point of 500 and a standard deviation of 100. The scales are 'standardised' in this way to facilitate comparisons between countries and over time. The summaries below compare the average performance in Northern Ireland in the scale for each subject with that of the other participating countries (45 countries in total took part in PIRLS and 50 in TIMSS). The summaries indicate whether average scores, which may appear similar, are statistically significantly different from each other.

Countries participating in PIRLS and TIMSS follow guidelines and strict sampling targets to provide samples that are nationally representative. In addition to the participating countries shown in these tables, PIRLS and TIMSS include 'benchmarking participants'. These are regional entities which follow the same guidelines and targets to provide samples that are representative at regional level. Their results are not reported here but are included in the PIRLS and TIMSS international reports.

Table 1.1 PIRLS 2011 performance groups: reading at ages 9-10

HIGHER performance compared with Northern Ireland Participants performing at a significantly higher level than Northern Ireland	SIMILAR performance compared with Northern Ireland Participants performing at a similar level to Northern Ireland (not significantly different statistically)	LOWER performance compared with Northern Ireland Participants performing at a significantly lower level than Northern Ireland
4 countries (with their scale scores)	4 other countries (with their scale scores)	36 countries <i>including...</i> (with their scale scores)
Hong Kong 571	Northern Ireland 558	Rep. of Ireland 552
Russian Federation 568	United States 556	England 552
Finland 568	Denmark 554	New Zealand 531
Singapore 567	Croatia 553	Australia 527
	Chinese Taipei 553	

Source: Exhibit 1.3, international PIRLS report

Table 1.2 TIMSS 2011 performance groups: mathematics at ages 9-10

HIGHER performance compared with Northern Ireland Participants performing at a significantly higher level than Northern Ireland	SIMILAR performance compared with Northern Ireland Participants performing at a similar level to Northern Ireland (not significantly different statistically)	LOWER performance compared with Northern Ireland Participants performing at a significantly lower level than Northern Ireland
5 countries (with their scale scores)	0 other countries	44 countries <i>including...</i> (with their scale scores)
Singapore 606 Korea 605 Hong Kong 602 Chinese Taipei 591 Japan 585	Northern Ireland 562	Finland 545 England 542 Rep. of Ireland 527 Australia 516 New Zealand 486

Source: Exhibit 1.3, international mathematics report

Table 1.3 TIMSS 2011 performance groups: science at ages 9-10

HIGHER performance compared with Northern Ireland Participants performing at a significantly higher level than Northern Ireland	SIMILAR performance compared with Northern Ireland Participants performing at a similar level to Northern Ireland (not significantly different statistically)	LOWER performance compared with Northern Ireland Participants performing at a significantly lower level than Northern Ireland
17 countries (with their scale scores)	9 other countries	23 countries <i>including...</i> (with their scale scores)
Korea 587 Singapore 583 Finland 570 Japan 559 Russian Federation 552 Chinese Taipei 552 United States 544 Czech Republic 536 Hong Kong 535 Hungary 534 Sweden 533 Slovak Republic 532 Austria 532 Netherlands 531 England 529 Denmark 528 Germany 528	Italy 524 Portugal 522 Slovenia 520 Northern Ireland 517 Rep. of Ireland 516 Croatia 516 Australia 516 Serbia 516 Lithuania 515 Romania 505	New Zealand 497

Source: Exhibit 1.3, international science report

1.1.1 Reading attainment, PIRLS 2011

The PIRLS 2011 average scale score for Y6 pupils in Northern Ireland was 558, significantly above the centre point of the international scale (500) and ranking fifth among the participating nations.³

The four countries that outperformed Northern Ireland include three of the countries that also ranked higher in PISA 2009: Hong Kong, Finland and Singapore. Northern Ireland did significantly better than all other English-speaking participants including the four comparator countries of the Republic of Ireland, England, New Zealand and Australia.

1.1.2 Mathematics attainment: TIMSS 2011

The TIMSS 2011 score for Y6 pupils in Northern Ireland was 562, well above the centre point of the international scale (500) and ranking sixth among participating nations.

Table 1.2 shows that pupils in Northern Ireland did well at mathematics at ages 9-10. They were significantly outperformed by only five of the 50 participating countries (all Asian Pacific Rim countries) and they significantly outperformed the remaining 44 participating countries.

1.1.3 Science attainment: TIMSS 2011

The TIMSS 2011 score for Y6 pupils in Northern Ireland was 517, above the centre point of the international scale (500) and ranking 21st among participating nations.⁴

Although Northern Ireland's average scale score was significantly above the international average, its pupils did less well comparatively in science than in mathematics at ages 9-10. Whereas only five countries outperformed Northern Ireland in TIMSS mathematics, 17 did so in science.

Although the curriculum in Northern Ireland⁵ does not include science as a discrete subject, it is covered as part of 'The World Around Us'.⁶ A comparison was made between the key stage 2 curriculum in Northern Ireland and the TIMSS Assessment Framework for science. It showed that all of the TIMSS science topics are in the Northern Ireland curriculum and almost two thirds of Northern Ireland's pupils had been taught these topics before or during the TIMSS assessment (a similar proportion to the average internationally).⁷

3 Rankings should be treated with caution as some apparent differences in attainment may not be significant. See 'Interpreting the data: international rankings' in section 1.2 for more information.

4 As noted earlier, rankings should be treated with caution: in absolute terms, Northern Ireland is ranked 21st, but the countries ranked 18th to 20th have achievement scores that are not significantly different from that of Northern Ireland (see Table 1.3).

5 See CCEA (2007) *The Northern Ireland Curriculum: KS1 and 2*.

6 See the TIMSS 2011 encyclopaedia (Mullis *et al*, 2012a).

7 See chapter 8 of this report for more information.

1.2 Attainment rankings: PIRLS and TIMSS 2011

Tables 1.4 to 1.6 below show the full rankings for each subject in turn, indicating Northern Ireland's ranking in terms of international attainment in the subject concerned. The tables are presented consecutively and then discussed in turn.

Interpreting the data: international rankings

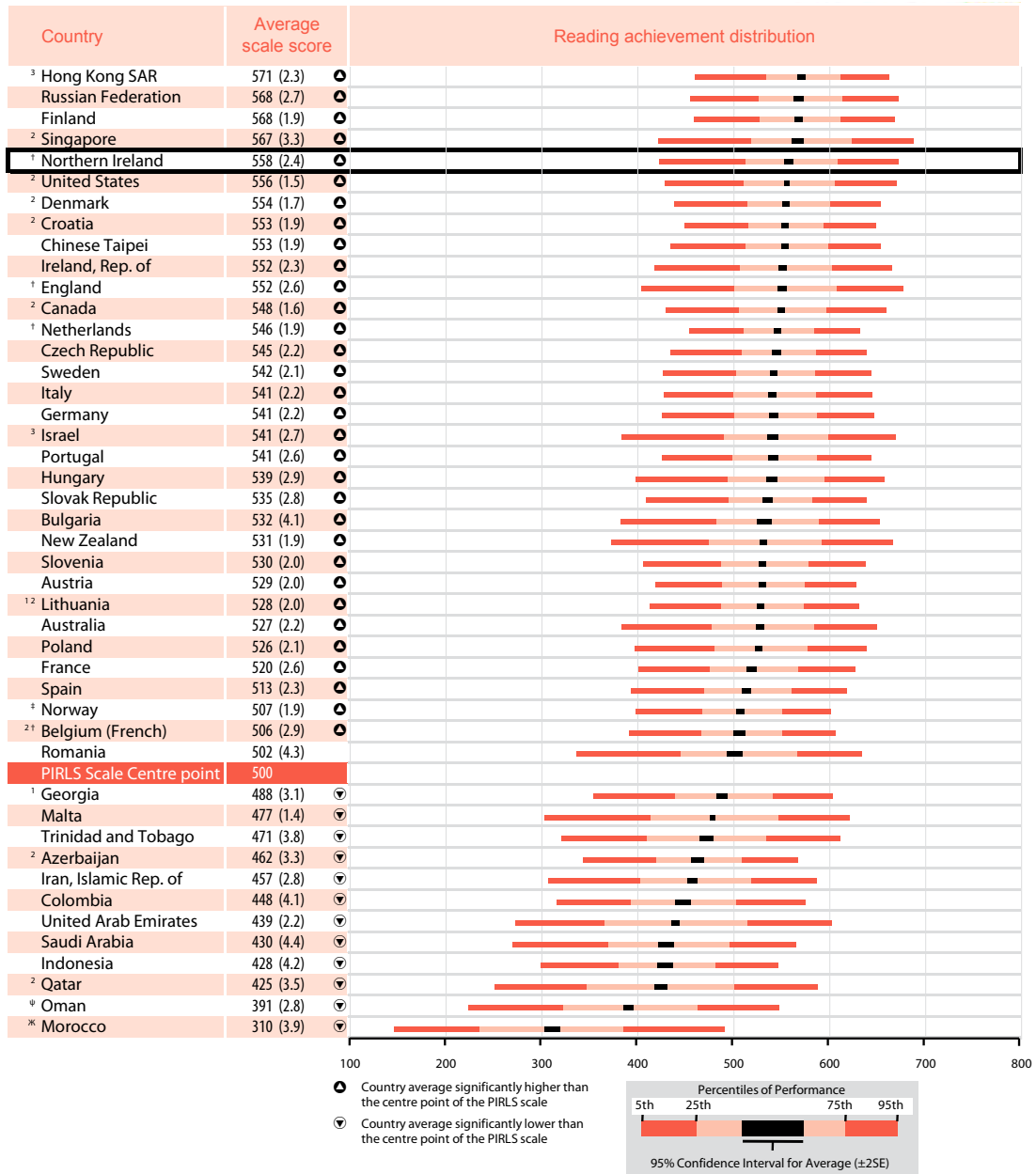
The mean scores on the PIRLS and TIMSS achievement scales (with 95 per cent confidence intervals) are shown graphically as the darkened areas on the achievement distributions, and listed (together with their standard errors) in the 'Average Scale Score' column of the tables. Arrows beside the scores indicate whether the average achievement in that country is significantly higher (upward arrow) or lower (downward arrow) than the scale mean of 500. The standard error refers to uncertainty in estimates resulting from random fluctuations in samples. The smaller the standard error, the better the score is as an estimate of the population's score. The distribution of attainment is discussed further in Chapter 3.

It is important to bear in mind that small differences may or may not be statistically significant, depending on the size of the standard error for each country. Tables 1.1 to 1.3 identified whether any given difference between Northern Ireland's scores and those of other countries is, or is not, statistically significant. More information can be found in chapter 1 of the international reports.

Interpreting the data: participation notes

Northern Ireland met the sampling guidelines for participation rates only after replacement schools were included. Since the replacement schools are matched to the originally sampled schools, this results in a sample that is nationally representative of pupils in the target age group.

Table 1.4 Mean scores and distribution of reading achievement at ages 9-10, PIRLS 2011



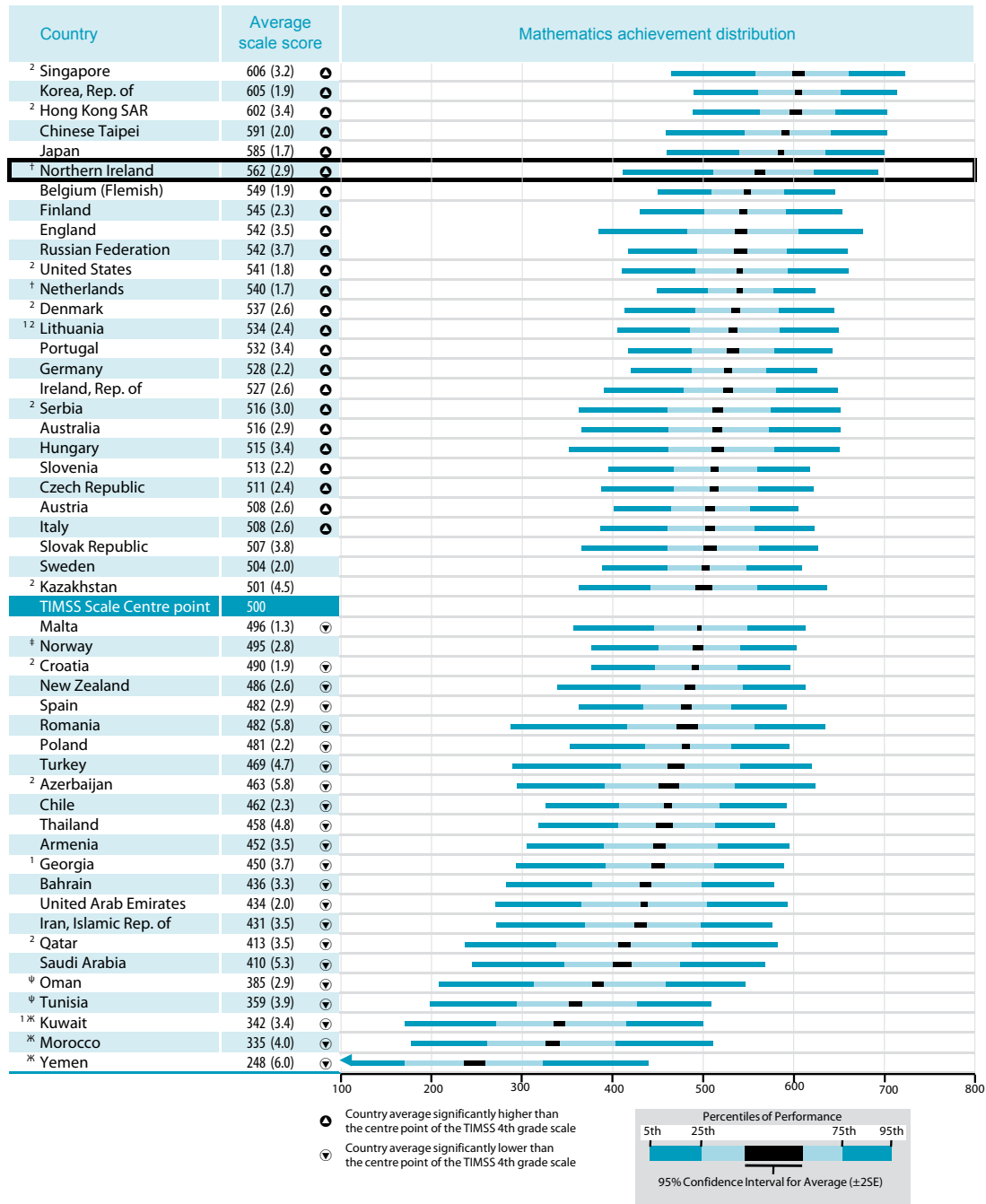
⌘ Average achievement not reliably measured because the percentage of students with achievement too low for estimation exceeds 25%.

⌘ Reservations about reliability of average achievement because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds See Appendix C.2 in international report for target population coverage notes 1, 2, and 3. See Appendix C.5 for sampling guidelines and sampling participation notes † and ‡.

() Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

Source: Exhibit 1.1, international PIRLS report

Table 1.5 Mean scores and distribution of mathematics achievement at ages 9-10, TIMSS 2011



* Average achievement not reliably measured because the percentage of students with achievement too low for estimation exceeds 25%.

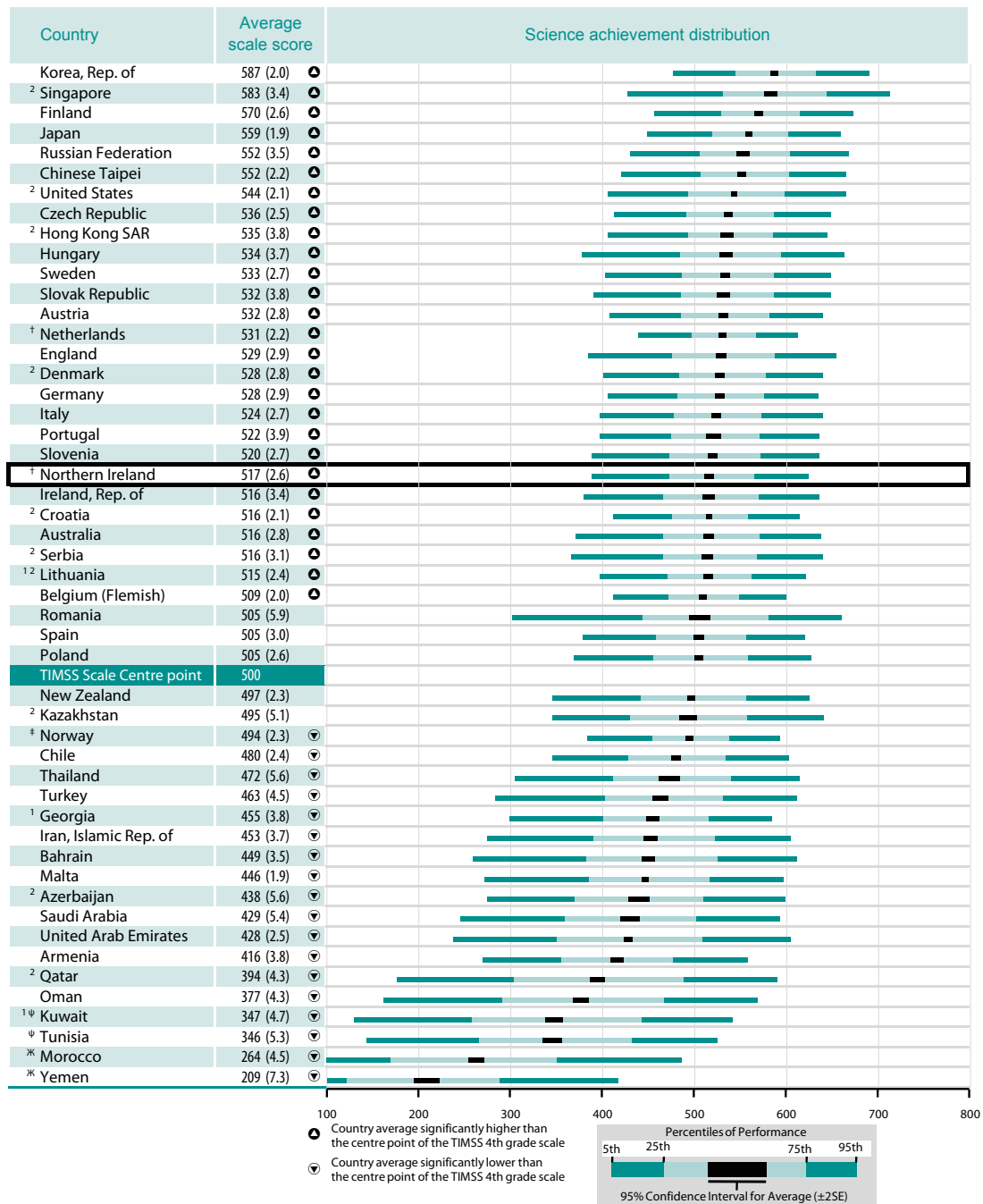
ψ Reservations about reliability of average achievement because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%.

See Appendix C.2 in international report for target population coverage notes 1, 2, and 3. See Appendix C.8 for sampling guidelines and sampling participation notes †, ‡, ()

() Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

Source: Exhibit 1.1, international mathematics report

Table 1.6 Mean scores and distribution of science achievement at ages 9-10, TIMSS 2011



✱ Average achievement not reliably measured because the percentage of students with achievement too low for estimation exceeds 25%.
 ψ Reservations about reliability of average achievement because the percentage of students with achievement too low for estimation does not exceed 25% but exceeds 15%.
 See Appendix C.2 in international report for target population coverage notes 1, 2, and 3. See Appendix C.8 for sampling guidelines and sampling participation notes † and ‡.
 () Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

Source: Exhibit 1.1, international science report

Although the scores for all three subjects in Northern Ireland are significantly above the international average in each case, rankings are notably higher for reading and mathematics than for science. Sections 1.2.1 to 1.2.3 below outline this difference in more detail.

1.2.1 Reading attainment: PIRLS 2011

Table 1.4 illustrates Northern Ireland's standing well above the international average in reading and just 13 scale points behind Hong Kong, the highest achieving country in PIRLS 2011. The lowest achieving country, Morocco, has a scale score 248 points below that of Northern Ireland.

In addition to Hong Kong, two further comparator countries, Finland and Singapore, had significantly higher achievement than Northern Ireland. All other comparator countries achieved significantly less well, with Australia, the lowest performing of the comparator countries, having an average scale score of 527, a total of 31 scale points lower.

1.2.2 Mathematics attainment: TIMSS 2011

Table 1.5 emphasises how well Northern Ireland performed in TIMSS 2011 mathematics. Its mean scale score of 562 is 44 scale points behind that of the highest performing country, Singapore, and 314 scale points ahead of the lowest performing country.

Two of the comparator countries outperformed Northern Ireland (Singapore and Hong Kong at 606 and 602 respectively). Among the countries doing significantly less well than Northern Ireland in mathematics, the nearest scoring comparator country was Finland (545). The lowest scoring comparator country was New Zealand (486, 14 scale points below the international average).

1.2.3 Science attainment: TIMSS 2011

Table 1.6 shows that, although Northern Ireland's average scale score for science of 517 is significantly above the international average, its performance in science compares somewhat less favourably than mathematics in international terms. In this instance, Northern Ireland is 70 scale points behind the highest performing country (Korea), although still 308 scale points ahead of the lowest performing country.

In this case, Northern Ireland was outperformed by four of the comparator countries (Singapore, Finland, Hong Kong and England, with scores between 583 and 529 inclusive). Australia and the Republic of Ireland scored similarly to Northern Ireland (516 each, compared with Northern Ireland's 517), while New Zealand again did less well at 497.

1.3 Attainment in PIRLS and TIMSS 2011 compared with PISA 2009

Although the PIRLS and TIMSS surveys are not directly comparable with PISA 2009, some useful insight can be gained from comparisons of scores on each. The key differences of relevance here are that:

- PISA surveys 15 year olds, whereas PIRLS and TIMSS 2011 in Northern Ireland surveyed 9-10 year olds.
- PISA's prime focus is to investigate literacy in reading, mathematics and science, in order to investigate the skills of future citizens. The prime focus for PIRLS and TIMSS is to explore curriculum-based concepts, in order to evaluate school systems.

- While all three surveys use a scale with a mid-point of 500, the scales mean something different in each case (based on the content of each assessment and the different countries participating).
- While TIMSS and PIRLS assess their target subject domains in each cycle, PISA assesses one element in more detail than the others (i.e. each cycle has one ‘major domain’ and two ‘minor domains’). The major domain for the most recently published PISA cycle, 2009, was mathematics. As a result, the PISA 2009 assessment contained more mathematics items and a subset of the available PISA reading and science items.

These differences mean that it would not be valid to say that a score of 500 on PIRLS, for example, means the same as a score of 500 on PISA. However, comparing the two sets of scores gives some indication of the extent to which a country may perform similarly between primary and secondary education on the subjects compared, relative to the comparative performance of the other participating countries on each survey. The three charts below (Figures 1.1 to 1.3) plot Northern Ireland’s scores on each subject in PISA (attainment at age 15) against those for each relevant subject from PIRLS and TIMSS (attainment at primary school). As well as the scores for Northern Ireland, the charts include the scores for the comparator countries and for the OECD countries which participate in PISA. The charts are presented consecutively and discussed below.⁸

1.3.1 PIRLS and TIMSS 2011 compared with PISA 2009 outcomes

Figure 1.1 shows that, for reading, there is a cluster of countries, including Northern Ireland, showing similar trends in performance on PIRLS and PISA reading. These countries tended to score comparatively better on PIRLS than on PISA reading. Outliers for reading include Hong Kong, Finland and Singapore (which performed well in both surveys) and Spain and Norway (which performed less well relative to the other countries on both surveys).

For mathematics, there is some clustering at the lower end of each scale (Figure 1.2). Singapore and Hong Kong are, again, outliers, having performed well on both surveys, with Finland and the Netherlands also having performed relatively well on both. Northern Ireland is also an outlier, having performed relatively well on TIMSS Y6 mathematics and less well on PISA mathematics at age 15. A similar trend applies to the United States, Portugal, Republic of Ireland, Denmark and England. The converse applies in Poland and New Zealand, which did relatively less well on TIMSS 2011 mathematics than on PISA 2009 mathematics.

Science performance was more variable. Figure 1.3 shows two main clusters, one of countries having performed similarly on both TIMSS 2011 and PISA 2009 science and the other having done better on TIMSS science than PISA. Northern Ireland is in the first of these clusters, with similar relative scores in TIMSS and PISA. The main outliers for science are New Zealand (better performance on PISA science than TIMSS), Hong Kong (somewhat better on PISA science than TIMSS), and Finland and Singapore (better performance on TIMSS science than PISA, and much better performance than other countries on science in both surveys).

⁸ The range on the scales for the axes on each chart are determined by the range of scores on the assessments summarised in each chart. Therefore, they vary across the three charts.

Figure 1.1 Reading comparison: reading scores on the PIRLS 2011 and PISA 2009 scales

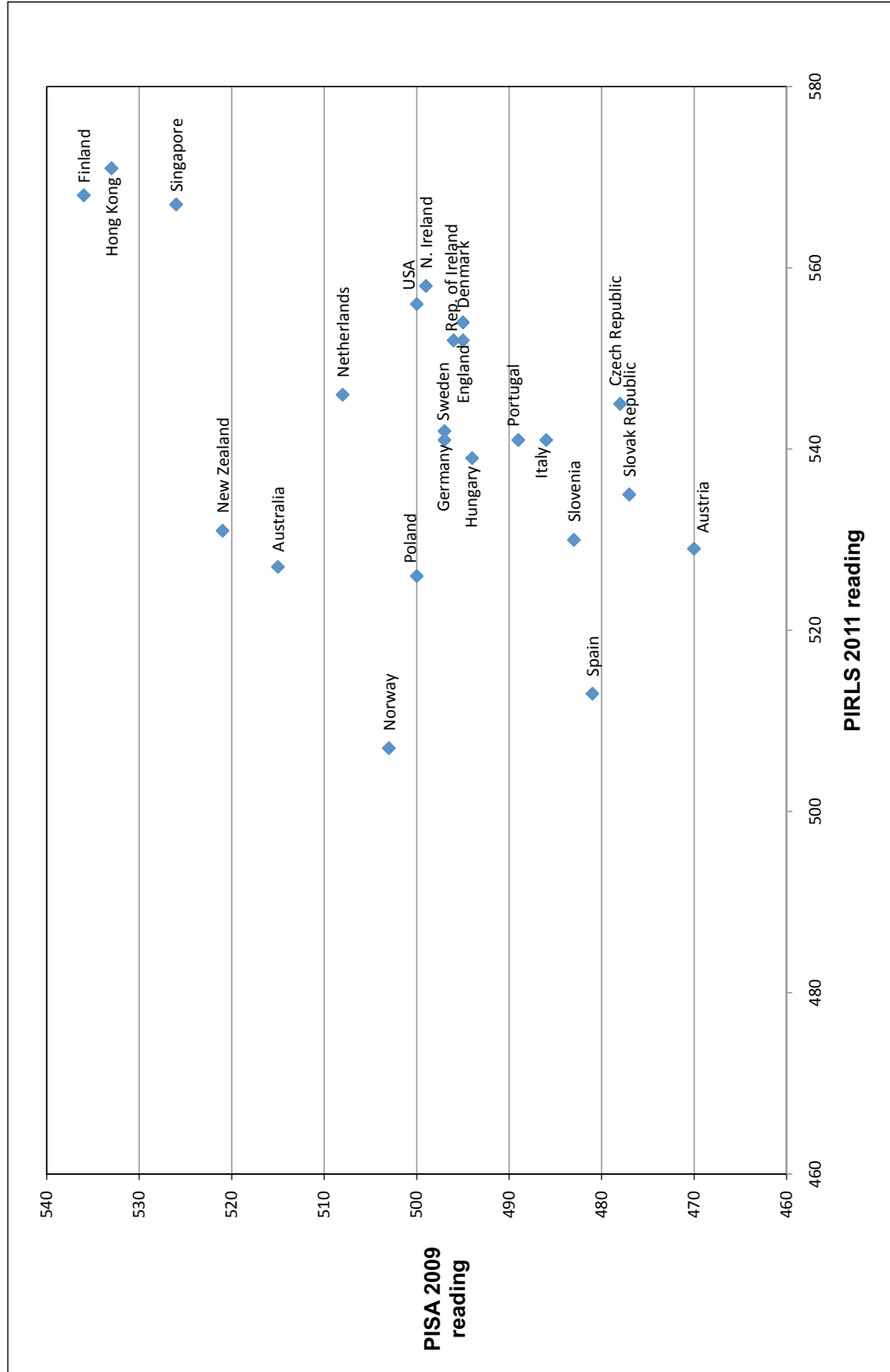


Figure 1.2 Mathematics comparison: mathematics scores on the TIMSS 2011 and PISA 2009 scales

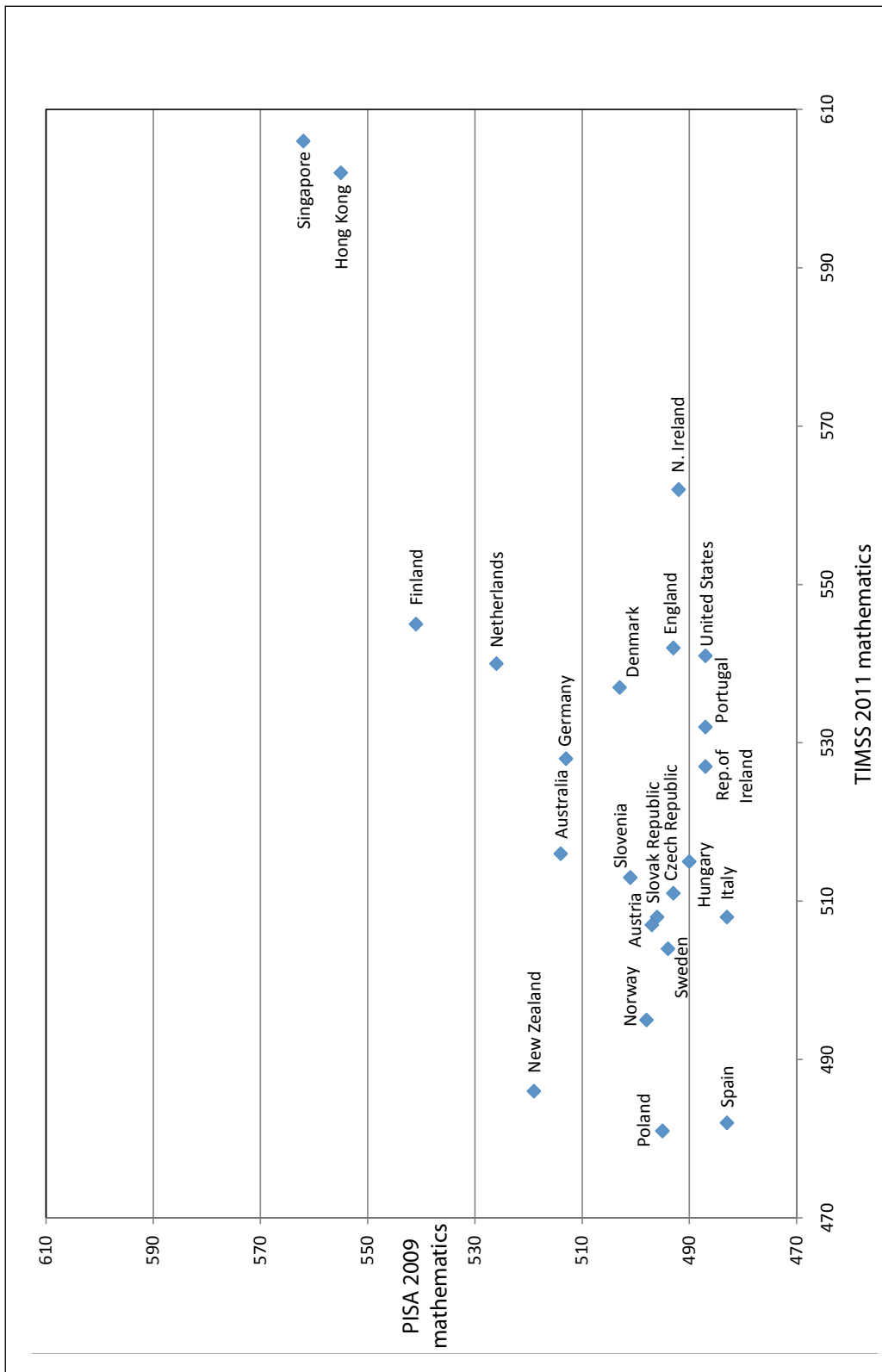
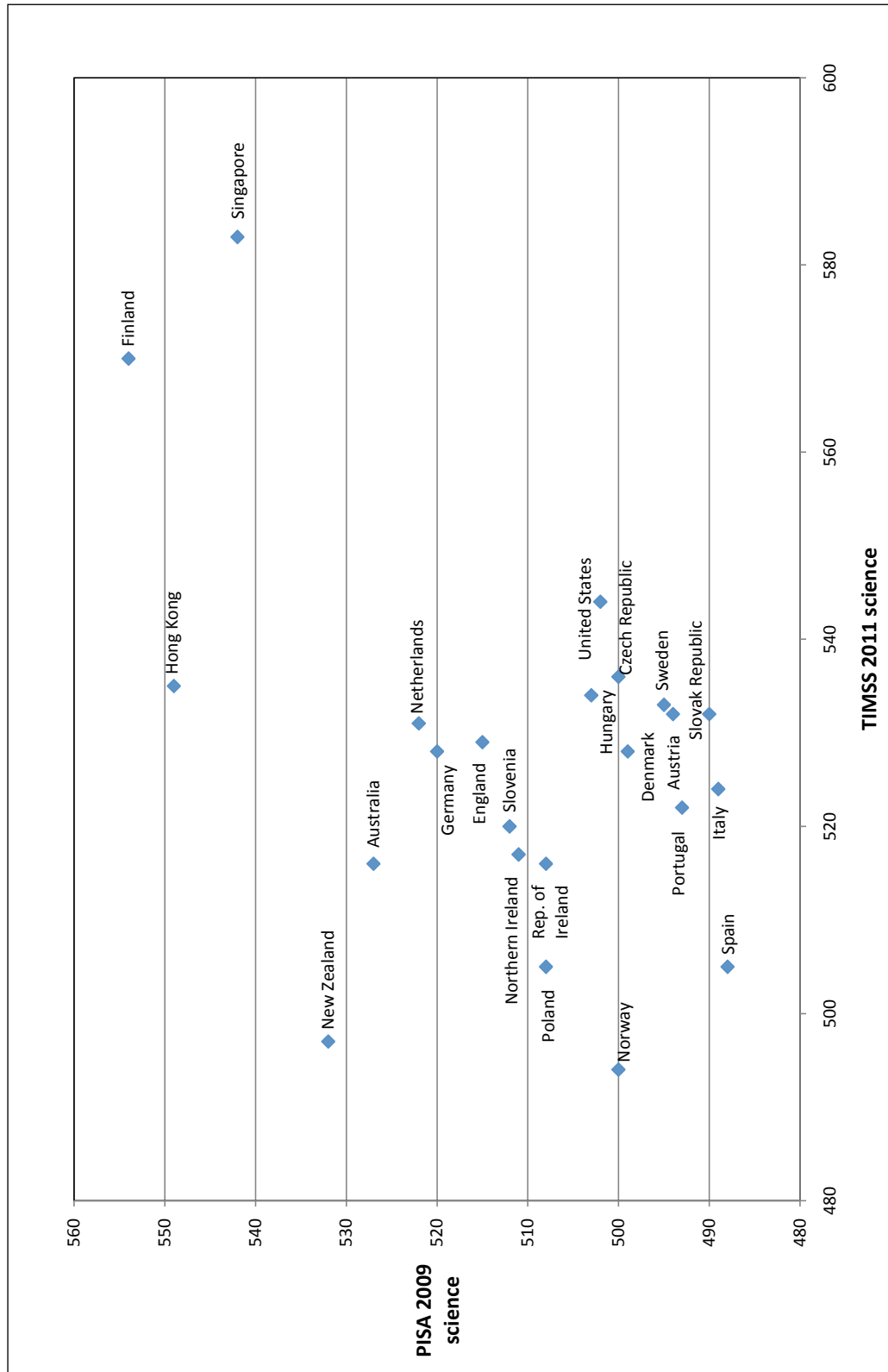


Figure 1.3 Science comparison: science scores on the TIMSS 2011 and PISA 2009 scales



1.4 Conclusion

Northern Ireland's scores for reading and mathematics in PIRLS and TIMSS 2011 indicate high performance. Performance in science is notably weaker, although still above the international average.

The high achievement evident in reading and mathematics in PIRLS and TIMSS at ages 9-10 can be contrasted with performance in these domains in PISA 2009 at age 15, when Northern Ireland's performance was not significantly different from the international average.

In contrast, in PISA 2009, Northern Ireland's science attainment at age 15 was significantly higher than the international average, and similar to its performance in TIMSS science at ages 9-10.