

## **LITERACY AND NUMERACY IN NORTHERN IRELAND AND THE REPUBLIC OF IRELAND IN INTERNATIONAL STUDIES**

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Recent international assessments of educational achievement at primary, post-primary, and adult levels allow for comparisons of performance in reading literacy and numeracy/mathematics between Northern Ireland and the Republic of Ireland. While students in grade 4 (Year 6) in Northern Ireland significantly outperformed students in the Republic in reading literacy and mathematics in the PIRLS and TIMSS studies in 2011, 15-year olds in the Republic outperformed students in Northern Ireland on reading and mathematical literacy in PISA 2006 and 2012. Performance on PISA reading literacy and mathematics declined significantly from performance in earlier cycles in Northern Ireland in 2006 and in the Republic of Ireland in 2009. However, while performance in the Republic improved in 2012, it has remained at about the same level since 2006 in Northern Ireland. Adults in both Northern Ireland and the Republic performed significantly below the international averages on literacy and numeracy in the 2012 PIAAC study. Results of the studies are discussed in the context of policy initiatives in 2011 to improve literacy and numeracy in both jurisdictions, including the implementation of literacy and numeracy strategies and the establishment of targets for improved performance at system and school levels.

Both Northern Ireland and the Republic of Ireland have participated in four major international assessments of scholastic achievement in recent years – the Progress in International Literacy Study (PIRLS) and Trends in International Mathematics and Science Study (TIMSS), both organized by the International Association for the Evaluation of Educational Achievement (IEA), and the Programme for International Student Assessment (PISA) and the Programme for the International Assessment of Adult Competencies (PIAAC), organized by the Organisation for Economic Co-operation and Development (OECD). These studies allow for a comparison of the performance of students and adults in the two jurisdictions in the years in which they were administered, and, in the case of PISA, for a consideration of trends in performance over time, since both jurisdictions participated in PISA on five occasions since 2000. Some comparisons can also be drawn

between the performance of adults in Northern Ireland and the Republic of Ireland on PIAAC and their performance on an earlier study of adult literacy – the International Adult Literacy Survey (IALS). In addition to outcomes on tests of achievement, all four provide contextual information obtained from questionnaires. The questionnaires in the school-based surveys (PIRLS, TIMSS, PISA) provide data at the level of education systems, schools, and classrooms, as well as data on students and their homes, while the PIAAC questionnaire provides information at the level of the participating adult.

Despite strong cultural, economic, and geographic links between Northern Ireland and the Republic of Ireland, their education systems have developed more or less independently of one another since separation in 1922. In the past, the education system in Northern Ireland was influenced by developments in curriculum and assessment in the United Kingdom, especially in England, but, in 1999, policy and legislative responsibility for education was devolved from the UK government to a local Assembly. The Republic of Ireland has enjoyed relative independence in educational decision making since its establishment in 1922. Since 2000, officials from Northern Ireland and the Republic have worked collaboratively in the context of the North-South Ministerial Council on such issues as education for children with special needs, under-achievement in education, and teacher qualifications (see <http://www.northernirelandministerialcouncil.org>).

#### THE FOUR STUDIES

The data considered in this paper are drawn from PIRLS, TIMSS, PISA, and PIAAC. PIRLS is a study of the reading literacy of students in their fourth year of formal schooling (Year 6 in Northern Ireland; fourth class in the Republic of Ireland). Although PIRLS was administered on two previous occasions (2001, 2006), Northern Ireland and the Republic took part for the first time in Spring 2011. Both met PIRLS 2011 sampling criteria. The exclusion rate (based on school-level and within-school exclusions) was marginally greater in Northern Ireland (3.5%) than in the Republic (2.5%), though both met a 5% criterion level. In all, 3,568 students in 136 schools in Northern Ireland and 4,524 students in 151 schools in the Republic took part. The overall response rate in the Republic (based on numbers of participating students and schools) was 95%, while it was 79% in Northern Ireland, a level that was reached only after replacement schools were added. The average age of students was 10.4 years in Northern Ireland and 10.3 years in the Republic.

TIMSS is a study of mathematics and science, also of students in their fourth year of formal schooling. It has been administered in fourth grade on four occasions (1995, when it was called the Third International Mathematics and Science Study, 2003, 2007, and 2011). While the Republic of Ireland participated in 1995 and 2011, Northern Ireland participated for the first time in 2011. Participation numbers and rates for TIMSS in both Northern Ireland and the Republic are very similar to those for PIRLS, since the two studies were administered to the same students. Neither Northern Ireland nor the Republic took part in TIMSS in eighth grade in 2011. (The Republic participated in 1995 and 2015.)

PISA is a study of the reading literacy, mathematical literacy, and scientific literacy of 15-year olds and has been administered in OECD and partner countries every three years since 2000. In 2012, it was administered in all 34 OECD countries and in an additional 31 'partner' countries. Northern Ireland has participated in all five cycles to date as part of the United Kingdom sample, while the Republic of Ireland has participated as a full OECD member state. Schools and students in Northern Ireland were over-sampled to allow performance to be reported separately from the UK as a whole. Whereas the samples for the Republic of Ireland and the UK as a whole were adjudicated by the OECD to ensure that they were representative, and that response rates were in line with PISA technical standards, the sample for Northern Ireland was not formally adjudicated, though the OECD has produced results for Northern Ireland, in the same way as it has for other recognized jurisdictions such as Flemish Belgium and the Canadian provinces. In 2012, 2,224 students in 90 schools in Northern Ireland and 5,016 students in 183 schools in the Republic of Ireland took part (OECD, 2013b). In 2012, the Republic of Ireland had a weighted response rate of 99% at school level and 84% at student levels (OECD, 2013b, Table A2.3). Response rates for Northern Ireland, separate from those for the UK as a whole, have not been reported.

For the first and second cycles of PISA, only paper-based tests were employed. Computer-based tests were administered alongside paper-based tests from 2006 onwards in some countries, including the Republic of Ireland. Since Northern Ireland employed paper-based tests only up to and including 2012, only performance on paper-based tests is considered in this paper. From 2015, PISA will be offered in most countries in computer-based format only.

PIAAC is a study of adult literacy (reading literacy, numeracy, computer-based problem solving), which was administered to representative samples of adults in 25 countries/jurisdictions for the first time in 2012 (OECD, 2013a, 2013c). PIAAC allowed for comparisons with earlier international studies, including IALS (the International Adult Literacy Study) which was administered in 20 countries, including the Republic of Ireland and Northern Ireland between 1994 and 1998. In 2012, 3,761 adults (aged 16-64) in Northern Ireland and 5,983 in the Republic participated in PIAAC. Northern Ireland had a response rate of 65%, while in the Republic, the response rate was 72% (the required rate was stated to be 70%, though, like Northern Ireland, most participating countries did not meet it). PIAAC employed a combination of print-based texts (for non-computer users) and electronic or computer-based texts. In Northern Ireland, 10.0% of adults indicated that they had no computer experience, 2.3% said that they were not sufficiently confident to complete the PIAAC tests on computer though they had some skills, and 5.8% 'failed' a basic computer skills test. In the Republic, the corresponding figures were 10.1%, 17.4%, and 4.7% (CSO, 2013). These adults completed the PIAAC tasks on paper. It is unclear why a far greater percentage of adults in the Republic than in Northern Ireland decided that their computer skills were insufficient to do PIAAC on computer. Comparisons between PIAAC and the earlier IALS study can be made on the basis of an unspecified set of common items (OECD, 2013c). However, caution is urged due to differences in the construct of literacy assessed in the two studies and the fact that large proportions of participants completed the PIAAC test on computer, whereas none did in IALS.

#### READING LITERACY

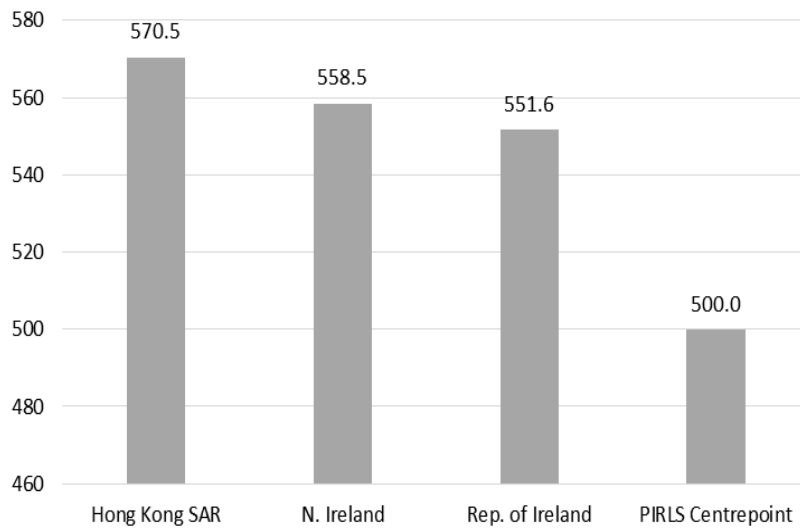
##### *PIRLS Reading Literacy*

In PIRLS 2011, students in Northern Ireland achieved a mean score of 558.5 (Figure 1), which ranked fifth of 45 participating countries; only Hong Kong SAR, the Russian Federation, Finland, and Singapore achieved significantly higher mean scores (Mullis, Martin, Foy, & Drucker, 2012). Students in the Republic of Ireland achieved a mean score of 551.6, which ranked tenth, with five countries (including Northern Ireland) achieving significantly higher mean scores. Students in Northern Ireland and the Republic had significantly higher mean scores than the PIRLS centrepoint (500). In both jurisdictions, broadly similar percentages of students achieved

at the advanced PIRLS benchmark on overall reading (18.6% in Northern Ireland; 15.8% in the Republic). With the exception of Singapore (24.2%), these estimates compare favourably with those of high scoring countries such as Hong-Kong (17.6%) and Finland (18.4%). In Northern Ireland, 13.4% scored at or below the low benchmark, compared to 14.9% in the Republic. These estimates compare less favourably with higher scoring countries such as Hong Kong (6.9%) and Finland (8.0%).

Girls significantly outperformed boys (by 16.2 score points) on overall reading in Northern Ireland. Girls also outperformed boys in the Republic (by 15.4 points). The international average difference, also significantly in favour of girls, was 16.1 points. High-scoring countries such as Hong Kong (16.4) and Singapore (17.0) had differences that were similar to those in Northern Ireland and the Republic, while Finland had a marginally larger difference (20.6).

Figure 1  
*Mean Scores for Hong Kong, Northern Ireland, the Republic of Ireland, and the International Centrepoint on PIRLS 2011 Overall Reading*



Source: Mullis, Martin, Foy, & Drucker (2012), Exhibit 1.1.

*PISA Reading Literacy*

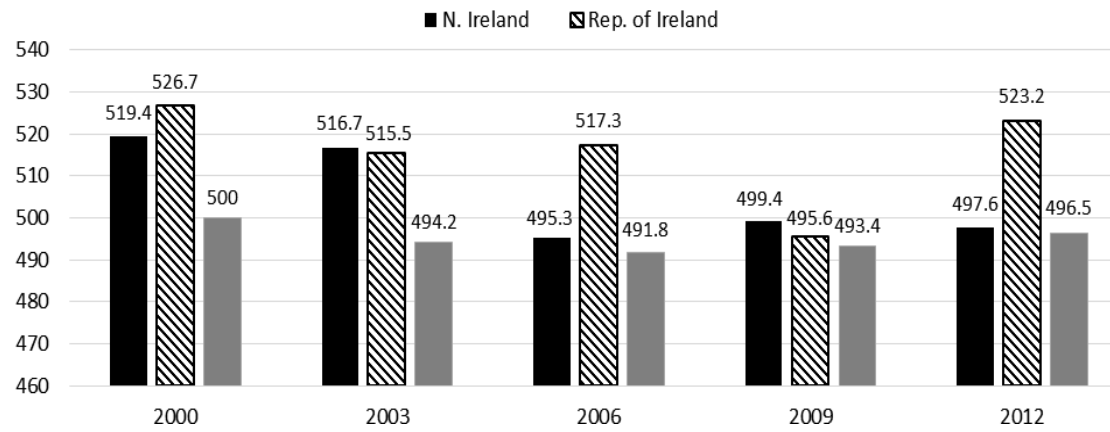
Data on PISA reading literacy are available for each PISA cycle between 2000 and 2012 (Cosgrove, Shiel, Sofroniou, Zastrutzki, & Shortt, 2005; Eivers, Shiel, & Cunningham, 2008; Gill, Dunn, & Goddard, 2001; Goddard, Ahmed, Hill, & Gosden, 2004; Perkins, Cosgrove, Moran, & Shiel, 2012; Perkins, Shiel, Cosgrove, Merriman, & Moran, 2013). In 2000, students in Northern Ireland (519.4) and the Republic (526.7) had mean scores that were significantly higher than the OECD average (500), but not significantly different from one another (Figure 2). While performance on PISA 2003 reading literacy in Northern Ireland (516.7) was about the same as in 2000, there was a decline of 11 points in the Republic, where the mean score dropped to 515.5 (OECD, 2004).<sup>1</sup> Again, however, scores in Northern Ireland and the Republic were significantly ahead of the OECD average, and were not significantly different from each other. In PISA 2006, the mean score for Northern Ireland dropped to 495.3, which was not significantly different from the OECD average. Meanwhile, the mean score for the Republic increased, albeit by just over one point. In 2009, the mean scores for the two jurisdictions converged, with neither score differing significantly from the OECD average. Finally, in 2012, students in Northern Ireland performed at about the same average level as in 2006 and 2009, while the mean score of students in the Republic of Ireland (523.2) was again above the OECD average.

In Northern Ireland, the increase in the percentage of lower achieving students (performing at Level 1 or below on the overall PISA reading proficiency scale) from 13.2% in 2003 to 20.9% in 2006 mirrors the decline in mean overall reading scores between these years (Table 1). The percentage of high achievers (performing at Level 5 or higher) almost halved, from 16.4% in 2000 to 8.3% in 2012. In the Republic of Ireland, the percentage of lower achieving students ranged from 9.6% in 2012 to 17.2% in 2009, the year in which the Republic's mean score dropped by one-third of a standard deviation. The percentage of higher achieving students ranged from 7.0%

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<sup>1</sup> Initially, this decline was interpreted by the OECD as being statistically significant (OECD, 2004). Following changes in the method used to compare achievement estimates across cycles, the international report for PISA 2006 (OECD, 2007) indicated that the difference was not statistically significant.

Figure 2  
*Mean Scores of Students in Northern Ireland, the Republic of Ireland and on Average across OECD Countries on PISA Overall Reading Literacy (2000-2012)*



Sources: Cosgrove et al. (2005); Eivers et al. (2008); Gill et al. (2001); Goddard et al. (2004); Perkins et al. (2012); Perkins et al. (2013).

**Table 1**  
*Percentages of Students Performing at the Highest and Lowest Proficiency Levels on Overall Reading, Northern Ireland, Republic of Ireland and OECD Average (2000-2012)*

	2000		2003		2006		2009		2012	
	Lev 1 & Below	Lev 5 & Above	Lev 1 & Below	Lev 5 & Above	Lev 1 & Below	Lev 5 & Above	Lev 1 & Below	Lev 5 & Above	Lev 1 & Below	Lev 5 & Above
N. Ireland	15.3	16.4	13.2	12.7	20.9	10.4	17.5	9.3	16.7	8.3
Rep of Ireland	11.0	14.2	11.0	9.3	12.2	11.7	17.2	7.0	9.6	11.4
OECD Average	17.9	9.5	19.1	8.3	20.1	8.6	9.6	7.6	18.0	8.5

Sources: Cosgrove et al. (2005); Eivers et al. (2008); Gill et al. (2001); Goddard et al. (2004); Perkins et al. (2012); Perkins et al. (2013).



(again in 2009) to 14.2% (in 2000). In 2012, the percentage of lower achieving students in Northern Ireland (16.7%) was below the OECD average of 18%, while the percentage of higher achieving students (8.3%) was about the OECD average. In the same year, the Republic had fewer students performing at or below Level 1 and more performing at Level 5 or higher than corresponding OECD averages.

In most countries participating in PISA, girls outperformed boys on reading literacy. In 2012, for example, girls in Northern Ireland had a mean score on overall reading literacy that was 27 points (over a quarter of the average standard deviation for OECD countries) higher than that for boys, while in the Republic the difference was 29 points. The OECD average difference was somewhat higher, at 38 score points (OECD, 2013b). This, in turn, was well below the difference of 62 points in favour of girls in Finland.

#### *PIAAC Literacy*

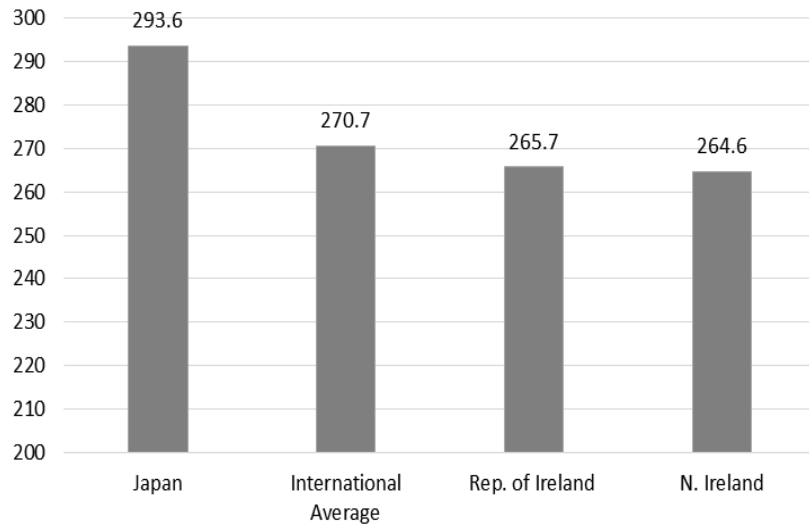
In PIAAC 2012, adults aged 16-65 years in Northern Ireland achieved an adjusted mean reading literacy score of 264.6, while adults in the Republic of Ireland achieved a mean score of 265.7 (Figure 3).<sup>2</sup> Adults in both jurisdictions performed significantly below the PIAAC international average score (270.7) (OECD, 2013a), and well below the highest performing countries, including Japan (293.6) and Finland (287.5). In Northern Ireland, 19.6% of adults performed at or below Level 1 on the PIAAC literacy proficiency scale, while in the Republic the figure was 17.9 percent.<sup>3</sup> The PIAAC international average was marginally lower (16.7%). In Northern Ireland, 9.9% of adults performed at Level 4 or higher. In the Republic, 8.5% scored at these levels. The corresponding PIAAC international average was marginally higher (11.8%).

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<sup>2</sup> Scores were adjusted by assigning a fixed score (85) to all adults who did not complete the PIAAC survey for literacy-related reasons. In practice, adjusted mean scores are not very different from unadjusted mean scores which do not factor in the performance of adults unable to attempt the PIAAC tests (CSO, 2013).

<sup>3</sup> These estimates include adults who did not respond to the PIAAC literacy test for literacy-related reasons (CSO, 2013).

Figure 3  
*Adjusted Mean Scores for Japan, Northern Ireland, Republic of Ireland, and International Average on PIAAC 2012 Literacy (16-65 Year Olds)*



Source: OECD (2013a), Table A2.3

PIAAC provides a breakdown of literacy performance for age ranges between 16 and 65.<sup>4</sup> Adults in the 16-24 year range achieved a mean literacy score of 272.3 in Northern Ireland and 270.6 in the Republic. The corresponding international average was 279.6 (OECD, 2013a, Table A3.2). The underperformance of adults in both parts of Ireland in this age range is surprising in the context of generally strong performance on reading literacy in PISA, especially since the 16-24 year age range in PIAAC overlaps PISA populations for 2003, 2006, and 2009, when students in Northern Ireland and the Republic performed close to the OECD average or higher. It also stands in contrast to performance in Japan and Finland, which did well on reading literacy in both PISA and PIAAC.

<sup>4</sup> Unadjusted mean scores are used in these comparisons.

In Northern Ireland, adults aged 16-65 years in PIAAC achieved a mean score that was significantly higher, by 5 points, than the mean score obtained in IALS in 1994 (Wheater, Burge, Sewell, Sizmur, Worth, & Williams, 2013).<sup>5</sup> The Republic of Ireland's mean score on PIAAC was some 3 points higher than in IALS, a difference that is not statistically significant (CSO, 2013). Poland had a mean score on PIACC that was some 34 points higher than its mean score in IALS, while a number of countries, including Denmark, Germany, Norway, and Sweden, recorded significant declines in performance (OECD, 2013a). There was a significant decrease in the percentage of adults performing at or below proficiency Level 1 in Northern Ireland from 23% in IALS to 15% in PIAAC and in the Republic from 22.1% to 17.5 percent.

There were small but statistically significant differences in favour of male adults (16-65 years) on PIAAC literacy in the Republic of Ireland (5.3 points), Northern Ireland (5.7), and on average across PIAAC countries (3.5), after age, immigration status, language background, and socioeconomic status had been taken into account (OECD, 2013a, Table A3.1).

#### MATHEMATICS / NUMERACY

##### *TIMSS Mathematics*

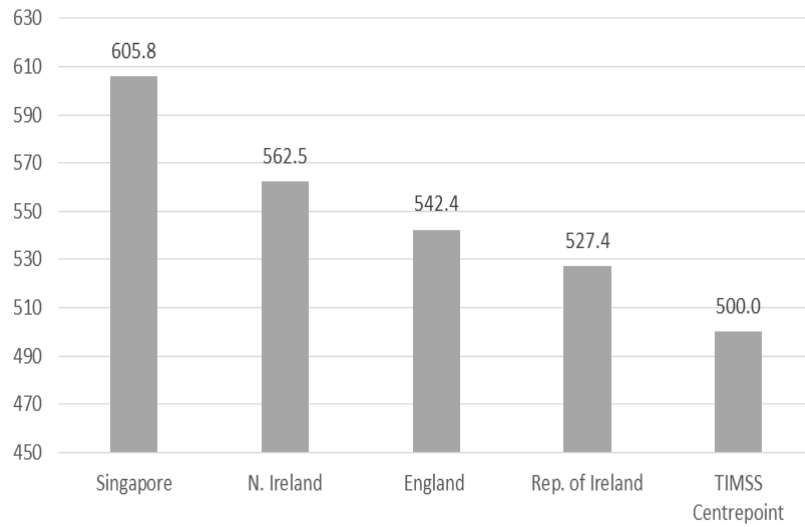
Both Northern Ireland (562.5) and the Republic of Ireland (527.4) achieved mean scores on TIMSS 2011 Mathematics in grade 4 that were significantly above the TIMSS centrepoint of 500 (Figure 4). Students in Northern Ireland performed significantly better than students in the Republic. Students in both jurisdictions lagged well behind students in the highest performing countries such as Singapore (605.8) the Republic of Korea (604.9), and Hong Kong SAR (601.6).<sup>6</sup> Northern Ireland ranked 6th, while the Republic ranked seventeenth.

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<sup>5</sup> To maintain comparability with IALS, data refer to unadjusted scores.

<sup>6</sup> The international standard deviation in TIMSS 2011 was 81.4 points. Hence, Northern Ireland was .53 of a standard deviation behind Singapore, while the Republic of Ireland was just under one standard deviation behind.

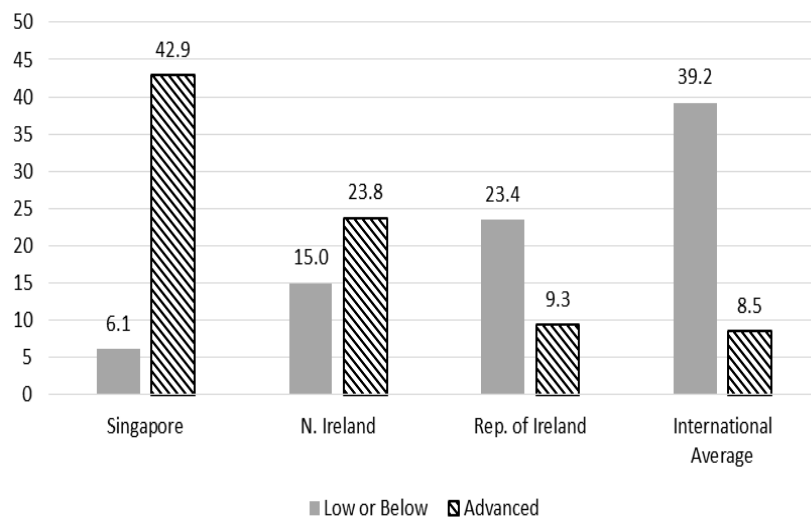
Figure 4  
*Mean Scores for Singapore, Northern Ireland, Republic of Ireland, and the International Centrepoint on TIMSS 2011 Mathematics (Grade 4)*



Source: Mullis, Martin, Foy, & Arora (2012), Exhibit 1.3

In Northern Ireland, 23.8% of students were categorized as performing at the Advanced TIMSS benchmark, compared to just 9.3% in the Republic, which was about the same as the international average (Figure 5). Over 40% of students in Singapore performed at this level. Fifteen percent of students in Northern Ireland performed at or below the Low TIMSS benchmark, compared to 23.4% in the Republic and 39.2% on average across countries. In Singapore, just 6.1% performed at or below the Low benchmark.

Figure 5  
*Percentages of Students in Singapore, Northern Ireland, the Republic of Ireland, and the TIMSS International Average Performing at or Below the Low Benchmark and at the Advanced Benchmark on TIMSS 2011 Overall Mathematics*



Source: Mullis, Martin, Foy, & Arora (2012), Exhibit 2.2

#### *PISA Mathematical Literacy*

As in the case of PISA reading literacy, data for mathematical literacy are available for five cycles between 2000 and 2012. In two cycles (2003 and 2012), mathematical literacy was the major assessment domain (OECD, 2013b). In 2000, students in Northern Ireland had a mean score of 524.2, which was significantly above the OECD average of 500, while in the Republic students had a mean score (502.9) that was not significantly different from the OECD average (Figure 6). Northern Ireland's mean score

dropped steadily since 2003,<sup>7</sup> when it was still above the OECD average, to 486.9 in 2012, when it was significantly below it. The large drop in mathematical literacy between 2003 and 2006 coincided with a large drop in reading literacy, though, in the case of the latter, the average for Northern Ireland did not fall below the OECD average. In the Republic of Ireland, performance was not significantly different from the OECD average in 2003 and 2006, but dropped below it in 2009. By 2012, performance had improved to the point where students achieved a mean score (501.5) that was significantly above the OECD average (though this, in part, was due to the fact that the OECD average was lower than in earlier cycles). The drop in performance in the Republic of Ireland in 2009 coincided with a larger drop in performance on reading literacy (Perkins et al. 2012).

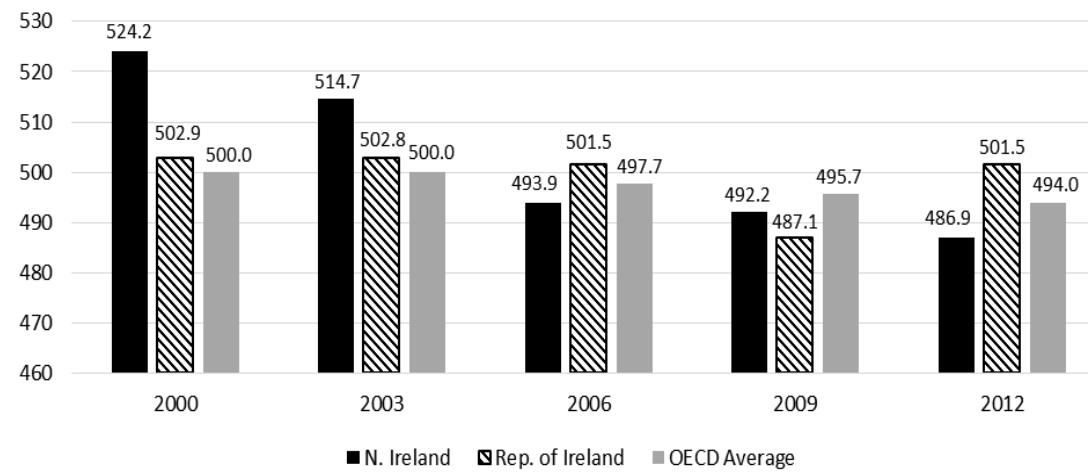
Unlike PISA reading literacy, performance on PISA in mathematics in both Northern Ireland and the Republic of Ireland has been well below the highest performing countries. In PISA 2012, for example, Northern Ireland lagged behind Singapore by 87 points (the OECD average standard deviation in 2012 was 92 points). Even though students in the Republic performed significantly above the OECD average in 2012, their mean score was 72 points (three-quarters of a standard deviation) below that of students in Singapore. It is also worth noting that Northern Ireland and the Republic are among a small minority of PISA countries in which performance in mathematical literacy lags well behind performance in reading literacy.

Although performance on PISA mathematical literacy content subscales broadly mirrors overall performance in 2003 and 2012 (data are not available for other years), students in both Northern Ireland and the Republic underperformed on the Space & Shape subscale. In 2012, for example, students in Northern Ireland had a mean score of 463.4, and students in the Republic, a mean of 477.8. These are significantly below the corresponding OECD average (489.6) (Perkins et al. 2013).

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<sup>7</sup> The OECD (2004) advise against comparing performance in mathematical literacy between 2000 and 2003, since the preferred approach is to link performance from minor back to major domain. This also explains why the OECD average was set to 500.0 in both 2000 and 2003.

Figure 6  
*Mean Scores of Students in Northern Ireland, the Republic of Ireland, and on Average across OECD Countries on PISA Mathematical Literacy (2000-2012)*



Sources: Cosgrove et al. (2005); Eivers et al. (2008); Gill et al. (2001); Goddard et al. (2004); Perkins et al. (2012); Perkins et al. (2013).

In 2003, equivalent percentages of students in Northern Ireland (16.5%) and the Republic (16.8%) performed at, or below, Level 1 on the overall mathematical literacy proficiency scale, compared to an OECD average of 21.4% (Table 2). According to the OECD (2004), these students have insufficient levels of mathematical proficiency to deal with future education needs and the demands of everyday life. By 2009, and in line with declines in overall performance, the percentages performing at these levels had increased to 21.4 in Northern Ireland and to 21.0 in the Republic, and did not differ significantly from the corresponding OECD average (22.0%). In 2012, almost 1 in 4 students in Northern Ireland performed at, or below, Level 1, compared to 17% in the Republic and 23% on average across OECD countries (OECD, 2013b).

In Northern Ireland, the percentage of high achievers (scoring at proficiency levels 5 and 6) declined from 16.7 in 2003 to 10.3 in 2012 (Table 2). In the Republic, the percentage of high achievers was about the same (10-11) in 2003, 2006, and 2012, while, in 2009, when average performance dropped below the OECD average, it was 6.7. The fact that both Northern Ireland and the Republic had equivalent percentages of students at Levels 5 and 6 in 2012 is noteworthy, given that average performance in Northern Ireland was significantly lower than in the Republic. It is also noteworthy that, despite having a mean score that was significantly above the OECD average, there were fewer higher achievers in Ireland in 2012 than on average across OECD countries.

Table 2

*Percentages of Students in Northern Ireland, the Republic of Ireland, and on Average across OECD Countries Performing at the Highest and Lowest Proficiency Levels on PISA Overall Mathematical Literacy (2003-2012)*

	2003		2006		2009		2012	
	Lev 1 & Below	Lev 5 & Above	Lev 1 & Below	Lev 5 & Above	Lev 1 & Below	Lev 5 & Above	Lev 1 & Below	Lev 5 & Above
N. Ireland	16.5	16.7	22.6	12.2	21.4	10.3	24.1	10.3
Rep. of Ireland	16.8	11.3	16.4	10.2	21.0	6.7	16.9	10.7
OECD Average	21.4	16.6	21.3	13.3	22.0	12.7	23.0	12.6

Note: Proficiency levels for mathematics are not available for PISA 2000.

Sources: Cosgrove et al. (2005); Eivers et al. (2008); Goddard et al. (2004); Perkins et al. (2012); Perkins, et al. (2013).



Gender differences in PISA mathematical literacy are small compared to differences in reading literacy. In 2012, for example, male students in Northern Ireland achieved a mean score that was 10.3 points higher than that of female students, but the difference is not statistically significant. In the Republic, in the same cycle, male students outperformed females by a significant 15.3 points. The OECD average difference, also in favour of males, was a significant 10.7 points. On the Space & Shape subscale, the difference in favour of males in Northern Ireland was a non-significant 7 points; in the Republic, it was a significant 24.7 points (OECD, 2013b).

#### *PIAAC Numeracy*

The adjusted mean score of adults (16-65 year old) on PIAAC numeracy was 255.3 in Northern Ireland and 254.8 in the Republic (Figure 7). Both were significantly below the international average of 266.2, and well below top-performing countries such as Japan (285.7), Finland (282.2), and Denmark (277.5) (CSO, 2013, Table 2.7). In Northern Ireland, 26.6% of adults performed at, or below, Level 1, compared to 25.6% in the Republic.<sup>8</sup> The international average was 20.2%, while in Japan, fewer than 10% performed at or below Level 1. In Northern Ireland, 8.5% performed at Level 4 or higher, compared to 7.6% in the Republic. The international average was 12.5%, while in Japan 18.3% performed at Level 4 or higher.

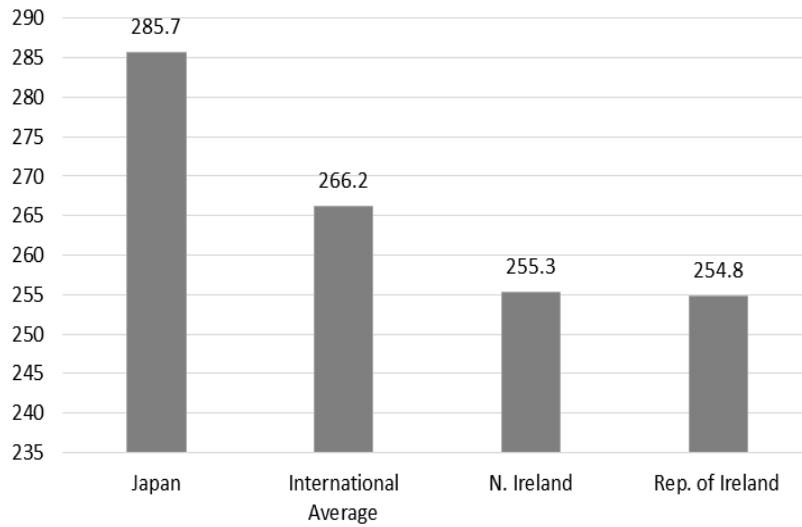
Unadjusted mean scores for adults aged 16-24 years in Northern Ireland (263.6) and the Republic (257.9) were also lower than the corresponding international average (271.3) (OECD, 2013a, Table A2.7). It is noteworthy that some countries, such as Japan and Finland, performed well on both PISA mathematical literacy and PIAAC numeracy, while others, such as Northern Ireland and the Republic, which performed moderately well on mathematics in most PISA cycles, performed poorly on PIAAC numeracy.<sup>9</sup>

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<sup>8</sup> Estimates include literacy-related non-response.

<sup>9</sup> PIAAC does not provide comparisons between performance on quantitative literacy in the IALS study and numeracy in PIAAC.

Figure 7  
*Adjusted Mean Scores for Adults in Japan, Northern Ireland, the Republic of Ireland, and on Average across Countries on PIAAC 2012 Numeracy*



Source: OECD (2013a), Table A2.6.

In all countries which participated in PIAAC, with the exception of Poland, gender differences in favour of male adults on numeracy were statistically significant. In Northern Ireland, the difference was 14.1 points; in the Republic, it was 11.9 points. The international average difference was 11.7 (OECD, 2013a, Table A3.4). Since the unadjusted international standard deviation in PIAAC is 51.3 points, these differences can be considered large compared to PISA mathematical literacy.

#### CONCLUSION

The performance of fourth grade students in Northern Ireland on PIRLS 2011 reading literacy (ranked fifth) can be described as strong, with just 13 points separating them from students in the highest performing jurisdiction (Hong Kong). Students in the Republic of Ireland (ranked 10th) also

performed well, though their mean score was significantly lower than that of students in Northern Ireland. While the percentages of 'advanced' readers in both Northern Ireland and the Republic were on a par with other high performing countries, there were more students performing at, or below, the PIRLS Low benchmark in both Northern Ireland (13.4%) and the Republic (14.9%) than in high performing countries such as Hong Kong (6.9%) and Finland (8.0%).

Students in Northern Ireland also performed quite well on TIMSS 2011 mathematics, with a mean score of 562.5 and a ranking of 6th, albeit further behind the highest scoring countries than on PIRLS 2011 reading literacy. Republic of Ireland students also performed relatively less well on TIMSS mathematics than on reading literacy, with a mean mathematics score of 527.4, and a ranking of seventeenth. The low percentage of students in the Republic performing at the Advanced TIMSS mathematics proficiency level (9%), compared to Northern Ireland and other higher-scoring countries, must be a matter of concern. The Republic's less than impressive performance has been attributed to a number of factors including an over-emphasis in schools on number, compared to geometric shapes and measures and data display, and a stronger instructional focus on lower order mathematical processes than on higher order ones (Close, 2013). Attention has also been drawn to an imbalance in emphasis across curriculum content areas in current textbooks relative to what was envisaged in the Primary School Mathematics Curriculum, as well as the allocation of less time to the teaching of mathematics than in other jurisdictions such as Northern Ireland (Eivers, Delaney, & Close, 2014).

The relatively strong performance of students in Northern Ireland on TIMSS mathematics may be due to a number of factors, including a shift to a skills-based curriculum in 2007, in which there is a focus on teaching numeracy (as well as literacy and use of ICTs), and in which teachers are required to assess their students at the end of Key Stages 1 and 2 on use of mathematics skills using Levels of Progression. It is unclear what effect, if any, the discontinuation in 2009 of the 11+ transfer tests may have had on student performance, bearing in mind that unregulated transfer tests continue to be administered by most grammar schools, with a possible negative effect on curriculum coverage at Key Stage 2 as well as on official efforts to make the educational system more equitable (Shewbridge, Hulshof, Nusche, & Staehr, 2014).

The decline in performance on PISA reading literacy and mathematics in Northern Ireland since 2003 has aroused little discussion in the literature. Reports have not sought to explain the decline which occurred between 2003 and 2006 or the lack of improvement in performance since 2006 (see, e.g., Bradshaw, Ager, Burge, & Wheater, 2010; Bradshaw, Sturman, Vappula, Ager, & Wheater, 2007; Wheater, Ager, Burge, & Sizmur, 2013). One report, while acknowledging the decline in PISA scores, contrasts this with improvements in student performance assessed by teachers at the end of Key Stages 1 (Year 4) and 2 (Year 7) and in the percentages of students achieving five or more A-C grades (including English and Mathematics) on the General Certificate of Secondary Education, taken at the end of Key Stage 4 (Year 12 at 15-16 years of age) (Northern Ireland. Comptroller and Auditor General, 2013). The report also identifies a wide gap between higher and lower achieving students in both GCSE results and PISA. For example, the difference in PISA 2009 reading literacy scores between students at the 5th and 95th percentiles was 315 points in Northern Ireland, compared to an OECD average of 305 and 309 in the Republic. Furthermore, the association between socioeconomic status and reading achievement in Northern Ireland was strong: a 48-point increase in performance was associated with a one standard deviation increase in socioeconomic status (compared with 39 points in the Republic and 38 on average across OECD countries) (Bradshaw et al. 2010).

Performance on PISA in the Republic of Ireland has been largely satisfactory in reading literacy, with students achieving scores that are above the OECD average (except in 2009). Performance on the mathematics test has been less satisfactory, being close to the OECD average (except in 2009). Even in 2012, when performance was significantly above the OECD average for the first time, fewer students (11%) than on average across OECD countries (13%) scored at or above Level 5 on the proficiency scales, while performance on the Space & Shape subscale was particularly poor, especially among female students. A new syllabus in mathematics ('Project Maths') that focuses more strongly on problem solving in real-life contexts might be expected to raise performance. However, students who had experienced the revised syllabus (those in the 23 schools which implemented Project Maths in its initial or pilot phase, all of which participated in PISA 2012) did not differ significantly from students who had not yet experienced the revised syllabus in their performance on the overall PISA mathematics test or on the four content areas (Merriman, Shiel, Cosgrove, & Perkins, 2014).

The decline in performance on reading literacy and mathematics in PISA 2009 in the Republic of Ireland was unexpected. The possibility that this was due to a bias in sampling was considered unlikely in an independent analysis of the sample which showed that it met PISA sampling criteria, and that, as in earlier cycles, it was representative of the population of 15-year olds attending school in the country (La Roche & Cartwright, 2010). Other possible explanations have been explored. The decline has been linked to factors including lower levels of engagement among 15-year olds taking the tests, shifts in the distributions of students across grade levels, with more students in Transition Year (10th grade, where there is less academic emphasis than at other grade levels), changes to test design across cycles (especially in reading literacy), and an insufficient number of common items across PISA cycles, leading in instability in identifying trends (Cartwright, 2011; Cosgrove & Cartwright, 2014; Perkins et al., 2012).

In considering the poor performance of adults in both Northern Ireland and the Republic of Ireland on PIAAC literacy and numeracy, a number of methodological issues merit attention. In the Republic, the response rate for participating adults was 72%; only Korea had a higher response rate (75%). Since Northern Ireland was below the required participation rate of 70%, it was expected to conduct extended bias analyses. However, according to the OECD (2013c), some of these analyses were not conducted, and hence it has not been possible to assess what level of bias, if any, was present in the achieved sample. Both England and Belgium (Flanders) were in the same situation. It is also unclear if the Republic of Ireland was disadvantaged by having a higher response rate than most participating countries, or whether some bias was introduced into the data by the decision of an unusually large percentage of adults with experience of computers in the Republic (17%) to opt out of the computer-based assessment and complete PIAAC on paper, due to lack of confidence in their ability to apply their computer skills in an assessment situation. The corresponding figure for Northern Ireland was 2%, while, internationally, it was 9% (CSO, 2013).

Another factor that should be considered when interpreting performance on PIAAC is that differences between countries were not great. Fourteen jurisdictions (including Northern Ireland and the Republic) clustered within a band extending from 5 points above the international average to 5 points below it on the literacy test. Variation in performance across countries on the numeracy test was greater.

Soon after the administration of PIRLS 2011 and TIMSS 2011 in the Republic of Ireland, but before the results were known, the Department of Education and Skills (2011) launched a *National Strategy to Improve Literacy and Numeracy among Children and Young People 2011-2020*. The strategy, which arose, at least in part, because of a perceived decline in performance in reading and mathematics in PISA 2009, and dissatisfaction with lack of improvement over time in national assessments of English reading and mathematics, outlined a range of measures designed to improve student achievement. At primary level, these included targets for improved literacy and numeracy performance in national assessments, the prioritization of literacy and numeracy across the curriculum, including increased instructional time, a requirement for schools to provide the results of students' performance on standardized tests to the Department of Education and Skills in summary form on an annual basis, and greater use of test results in planning at whole school level and by individual teachers. There is some evidence that these efforts are having an impact on student achievement. The results of national assessments in 2014 indicated that achievement in both English reading and mathematics had improved since 2009, with effect sizes ranging from 0.24 for overall mathematics achievement in sixth class to 0.29 for overall reading achievement in second class (Shiel, Kavanagh, & Millar, 2014). While these gains are welcome, they are unlikely to have a large impact on Ireland's ranking in TIMSS 2015 mathematics, given the large gap between Ireland and higher performing countries, including Northern Ireland, on TIMSS 2011, and the ongoing underperformance of high achieving students.

The targets for reading literacy and mathematics in the *National Strategy* in the Republic, relating to increases in the proportions of students performing at the highest proficiency levels on the 2009 national assessments, and reductions in the proportions performing at the lowest levels, have already been achieved well in advance of 2020 (Shiel et al., 2014). The targets established for PISA reading literacy and mathematics (again reductions in the proportions of lower achieving students and increases in the proportions of higher achievers on both reading literacy and mathematics) have also been achieved (Perkins et al., 2013), suggesting that it would be important to establish new targets, including perhaps targets for schools designated as disadvantaged, in an interim review of the strategy.

The Department of Education in Northern Ireland also produced a strategy in 2011 (*Count, Read: Succeed*) with the aim of improving outcomes

in literacy and numeracy (DENI, 2011) (again prior to the publication of the results of PIRLS 2011 and TIMSS 2011). The measures outlined in the strategy focus to a greater extent than in the Republic on assessment, and, in particular, on achievement of system-level targets at the end of key stages and on the GCSE examinations at the end of compulsory schooling. The strategy includes long- and short-term targets which are based on tests with which all schools are familiar (schools are expected to set their own targets, consistent with system-level targets). The targets assume there will be no grade inflation, either in key stage teacher assessments of cross-curricular competences or in GCSE assessments. It is notable that Northern Ireland does not set targets related to national or international sample-based assessments, with which schools and teachers would be less familiar. The Northern Ireland strategy includes targets in relation to gaps in achievement (such as those between children attending highly disadvantaged schools and children attending less disadvantaged schools), as well as targets relating to overall performance.

The Northern Ireland strategy is perhaps less comprehensive than that of the Republic in that, instead of introducing a broad raft of new initiatives, it sought to capitalize on the existing infrastructure in schools (for example, in relation to school evaluation or provision for special education needs) with the goal of ensuring that all students achieve at higher levels of performance. Neither strategy proposed a restructuring of schooling (for example, a move towards a system based on comprehensive schools) which might have been warranted on the basis of the clustering of lower achieving students in certain school types.

Policy response to performance at adult level has been limited. This may be, in part, because the government departments responsible for school-based education in Northern Ireland and the Republic are not responsible for adult labour market outcomes. The slow response to PIAAC outcomes may also be due to an understanding that most adults performing at the lowest levels of proficiency do not, in fact, lack the most basic literacy skills, as evidenced by the low percentage of adults in both Northern Ireland and the Republic who performed poorly on tests of vocabulary knowledge, sentence processing, and passage comprehension administered in conjunction with PIAAC in 2012 (OECD, 2013a, 2013c). Nevertheless, it would seem important to consider further differences in performance on school-based tests such as PISA and adult-based tests such as PIACC, if we are to understand why discrepancies in performance arise and if there is a need to address them.

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